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Selecting and tailoring of images for online news content: a mixed-methods investigation of the needs and behaviour of image users in online journalism

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DECLARATION

The author hereby grants powers of discretion to the University Librarian at City, University of London, permission to allow this thesis to be copied in whole or in part without further reference to the author, as long as these are only single copies made for study purposes, and subject to the normal conditions of acknowledgement.

ABSTRACT

This mixed-methods investigation explores how image professionals in online journalism search for, select and use images from large online collections. Further, findings from this exploration are used to devise and evaluate a needs-based practical solution for improvement to image retrieval.

The exploratory stage included semi-structured interviews and observations in situ and provided several important contributions to the current understanding of the needs and behaviour of image users in fully disintermediated environment of the online newsroom. This study found that these image users are creative professionals and self-taught, yet, confident image searchers. When illustrating news content, they apply a shared knowledge of how a specific image function (e.g., dominant image) must be presented visually to reach its full communication potential. This common understanding of image communicative functions has two implications on how these professionals search for and select images. Firstly, they begin searches with clear image needs pre-defined on multiple levels of image description, including visual image features, and their behaviour is consistent with targeted searching. This contradicts previously reported preference for browsing as the typical mode of searching in online image collections. Secondly, they do not easily compromise on image needs related to visual features. When searches prove ineffective, they resort to editing skills and tailor the available images to match their original needs.

Further, it was found that the choice of images for headline content can in fact be predicted by a set of 11 visual image features. The features were extracted from a collection of artefacts created in the observation sessions and described by means of the Visual Social Semiotics (VSS) framework. The feature set was implemented as a filtering mechanism in a prototype and evaluated in a within-subjects experimental design study with image professionals. This experiment showed a significant positive change in the behaviour of users when interacting with images pre-filtered strictly to their visual needs, not observed in the baseline system. This was demonstrated through users' ability to immediately engage in the inspection of images on a level of detail, and to make straightforward selections. Images from the experimental sets required no or only minimal tailoring as confirmed in the final VSS-based survey with independent image experts.

Other important contributions of this investigation include the updated models. Firstly, the illustration task process framework, originally proposed in Markkula and Sormunen (2000), has been refined to include the *image tailoring* phase where creative professionals apply editorial treatment before publication. Further, the observations revealed that verifying of images, consistent with the feature in Ellis et al.'s model (Ellis et al., 1993), was an activity critical to making selection decision in online journalism. Therefore, Conniss et al.'s model of the image searching process (Conniss et al., 2000) has been updated to include the verifying phase.

The investigation concludes that in order to meet the needs of creative image professionals in online journalism, image retrieval systems must support targeted searching, and facilitate direct access to required images that can be easily verified for authenticity. The proposed multi-feature filtering system firmly rooted in the image users' needs, appears to be a step towards automating image retrieval.

PUBLICATIONS

Some of the material presented in this thesis has been published earlier. The papers were written by the author, with advice from her supervisors: Dr. Andrew MacFarlane and Dr. Simone Stumpf, both at City, University of London, and with guidance from the external supervisor Prof. Ayşe Göker. Publications 2, 4, 5 and 7 had been peer-reviewed before they were accepted for publication.

1. Frankowska-Takhari, S., MacFarlane, A., Göker, A. and Stumpf, S. (2013). *The role of image editors as image intermediaries*. Poster presented at IV Researchers' Symposium at City University, London, 26th June 2013;
2. Frankowska-Takhari, S., MacFarlane, A., Göker, A. and Stumpf, S. (2014). *Selecting images in online journalism*. Presentation at 6th BCS Doctoral Consortium, London, 15th May 2014;
3. MPhil/ PhD transfer report and seminar, City University, London, 29th October 2015;
4. Frankowska-Takhari, S., MacFarlane, A., Göker, A. and Stumpf, S. (2016). *Identifying components of real-life illustration tasks in online journalism for use in simulated work task scenarios*. Poster presented at ISIC 2016 Conference, Zadar, 21-24 September 2016;
5. Frankowska-Takhari, S., MacFarlane, A., Göker, A. and Stumpf, S. (2017). Selecting and tailoring of images for visual impact in online journalism. *Information Research*, 22(1), CoLIS paper 1619. Retrieved from http://InformationR.net/ir/22-1/colis/colis1619.html;
6. Frankowska-Takhari, S. (2018). *Images in online journalism*. Presentation at Search Solutions 2018, BCS, London, 27 November 2018;
7. MacFarlane, A., Missaoui, S. and Frankowska-Takhari, S. (2019). On Machine Learning and Knowledge Organisation in multimedia information retrieval. Paper accepted to ISKO UK 2019 conference, *The Human Position in an Artificial World: Creativity, ethics and AI in knowledge organization*. London, 15-16 July 2019.

ABBREVIATIONS

ACP – assistant content producer

AI – artificial intelligence

CBIR – content-based image retrieval

CP – content producer

CV – computer vision

DE – duty editor

HCI – human computer interaction

IB – information behaviour

IIR – interactive information retrieval

IR – information retrieval

IS – information seeking

MEDM – manually-entered descriptive metadata

ML – machine learning

P – participant

T – (illustration) task

TA – thematic analysis

UCD – user-centred design

UI – user interface

VSS – the visual social semiotics (framework)

GLOSSARY

***Actual* images**	images taken at the event being reported that show the correct scene, people, location of this specific event. (cf. ready images)
Composite image	images created in image editing software e.g., by overlaying elements of several photos
Concept-based image retrieval	text-based image retrieval that relies on human indexers for classification and description of images
Content-based image retrieval (CBIR)	an approach to image retrieval that applies computer vision techniques and allows automated image classification and indexing
Content producers	image professionals in online journalism, the role is a counterpart of the role of an image editor, photo editor in print media
Dominant news headline image	the largest image on the news homepage, typically communicating the most important news of the current moment
Effectiveness	a system is effective if it helps users meet their image needs and complete illustration tasks without errors (completeness and accuracy).
Efficiency	a system is efficient if it helps users complete their tasks using minimum resources, e.g., time & effort.
Effort	a number of steps/actions required to complete a task
Front page	the main (cover) page of a print newspaper
Homepage	the gateway to an online service
Images	used interchangeably with photos, photographs, visuals, and imagery when appropriate
Illustrations	images created in the illustration tasks and queued for publication

***Pure* photographs**	the authentic photographs unchanged in image editing software (cf. composite)
***Ready* images**	images sourced from image collections, re-used to illustrate news content but not taken at the scene of the reported event (cf. actual images)
(user) *Satisfaction*	freedom from discomfort, and positive attitudes of the user to the product
Semantic content	the meaningful objects in the image and the relations between them
Syntactic image features	low-level features (perceptual features), e.g., colour, background, positioning of objects within the frame
Tailored images	images treated editorially and changed in the editing process

CHAPTER 1. INTRODUCTION

1.1 Rationale and timeliness of this investigation

Communication in the modern world, particularly within Western culture, is increasingly relying on imagery. This phenomenon is often referred to as "*ocularcentrism*" (Sandywell, 2011, p.3), or "*the hegemony of vision*" (Levin, 1993). Sandywell (2011, p3.) explains, "*while human beings have always created images and reflected upon their creations, today we are moving toward a global society structured around the corporate production, dissemination and conspicuous consumption of images*." This shift from predominantly linguistic to pictorial culture (Mitchell, 1994) caters for the innate human attraction to the visual and the pleasure derived from looking (Mulvey, 1975). "*Humans are visual creatures*", claims Koch (2004, p.1084) and to support his statement, he provides evidence from studies in cognitive neurosciences.

What gives the visual advantage over linguistic information? Barthes (1973) states that unlike text, the meaning conveyed in images can be understood at *one stroke* and across cultures. Referring to the photographic image, Rothstein (1974, p.45) states, "[…] *I believe that pictures actually require little explanation. The photographic image speaks directly to the mind and transcends the barriers of language and nationality*." Sontag (1975) points to the context-sensitivity of the meaning in photographs. The immediacy with which images convey meaning suits well the fast-paced modern lifestyle and the expectation for information to be delivered to the world instantaneously and in a *real* time. Expectedly, many domains e.g., art and design, advertising, history, education, medicine, law enforcement, and journalism make use of the available technology and increasingly rely on visual information to communicate with their audiences.

Conniss et al. (2000) identified seven classes of image use in work-related contexts. For example, in science, medicine and education visuals are used for knowledge sharing and to aid understanding of complex concepts, police may use CCTV images to disseminate information in search of suspects and victims of crime. Further, journalism uses photographs for illustrative and emotive/persuasive purposes. In work contexts, image professionals choose images for *audiences* (Wilson, 2016), and they need to make sure that these images suit well the intended use and the expectations of the viewers. The history of journalism shows that having "*great*" photographs helped newspapers win the *battle* for readers (Hollander, 2001; Morton, 2007). People expect to see images with news stories and visuals attract readers' attention and encourage them to read the content (Rössler et al., 2011). There is a human process and human image users involved in the selection and use of images in work contexts. It is essential that these image users are able to retrieve images suitable to the context and purpose of use.

For many professionals, online image collections (e.g., GettyImages[1], GoogleImages[2], BingImages[3]) have become the primary source of images. Taking advantage of the fact that meaning in images is fluid and context-sensitive (Sontag, 1975), these collections provide *ready* imagery for use and multiple re-use. These already vast image collections are growing by millions of new assets every day, however, in order to be more than image archives, they need to ensure that users are able to search through the immensity of their visual content and find what they are looking for. For these collections images are a commodity that they sell, hence, to support their clients they must employ effective image retrieval systems. However, most available image search engines are simply "*re-engineered versions of document or web page search engines*" (Göker et al., 2016 p.5) and they fall short of image users' needs.

In IIR tradition, the effectiveness of image retrieval is measured by the degree to which the system supports its users in meeting their needs (Borlund, 2003), as explained in Beard (1991, p.601): "*An image-information tool that does not help users solve their problems is worse than useless, so the requirements specification must be complete and based on a thorough understanding of the users, their situations, and their needs*." Therefore, the most direct route to improvements of the effectiveness and efficiency of image retrieval lies in understanding of the behaviour and needs of image users.

Despite images being extensively used in many domains, there is still a paucity of qualitative literature investigating how image professionals search for, select and use images from large online collections. This is striking considering the importance of this knowledge for the future of image retrieval and the range of disciplines involved in this field. This PhD research project comes in at a right time, proposing an extensive exploration of *the behind the scenes* of illustrating tasks in online journalism, and aiming to expand the knowledge about the human process within a routine illustration task, and to gain an understanding of the behaviour and needs of image users who source images from online collections (Goal 1). Further, it aims to propose a practical needs-based solution and evaluate its effect on image retrieval, in order to enable image professionals to effectively select images that meet their needs (Goal 2). The goals, objectives and research questions defined for this investigation are presented in Section 1.2.

Previous work done with image users sourcing images from online collections is limited. The existing literature focuses on image users in print journalism (e.g., Hung, 2005, 2012; Markkula and Sormunen, 2000; Westman and Oittinen, 2006), healthcare professionals (Sedghi et al., 2011), architects (Makri and Warwick, 2010), artists, art historians and architects (Beaudoin, 2009 [PhD thesis]), and creative professionals including journalists (Göker et al., 2016). The use of images in these professions is strictly domain-specific. This is the first investigation focused solely on image users in online journalism conducted in situ and involving image professionals from well-established UK-based news services including the BBC Online, Financial Times, Mirror Online, Unilad. Its primary goal is to gain a thorough understanding of the users' needs and

[1] GettyImages at www.gettyimages.com
[2] GoogleImages at https://images.google.com/
[3] BingImages at https://www.bing.com/images

human processes underlying the selection and use of news headline images online. Within the broad narrative, it aims to identify opportunities for a practical solution for improvement of image retrieval. While this investigation is not driven by any solid hypothesis or presumption, the quest for improvement is clearly inspired by Barry's research into user relevance (Barry, 1994) and particularly her statement that it is possible to identify, and therefore, predict selection criteria applied a given group of users with a given task.

Further, inspiration comes from studies in visual semiotics and visual communication, particularly by work of Caple (2013) and Knox (2007a; 2007b; 2009). Their studies provide evidence that images selected to serve a specific function on the news page carry a set of visual features specific to this function. This investigation focuses on the dominant news headline image that is an important feature of news homepages inherited from print. While in traditional newspapers, the dominant image communicates the most important news of the daily edition, in online journalism, it draws attention to news of this particular *moment.* Although the dominant headline image is present on homepages of almost all news services, it has not been researched, and several interesting questions arise: *How do image users select images for this specific function? Does this function require images with a specific set of features? What are these features? Can they be identified?* These questions point to the research areas where the opportunities for a practical solution for improvement to image retrieval may be sought.

Online journalism has been chosen as a domain for investigation for several reasons. It is a relatively young domain – the oldest UK-based news services have been in existence for only about 20 years[4] now – and it emerged with the introduction of the internet to the newsroom and the digitalisation of the processes of image production and distribution. Online journalism covers a wide range of subjects, from political news, to health, education, sport, science, to art and entertainment and provides news to diverse audiences in terms of demographics, interests and preferences. Visuals in online journalism are used to attract readers' attention to the content (Rössler et al., 2011), and to tell stories (Caple, 2013), and they carry multiple functions on news pages, e.g., thumbnail images (Knox 2007a; 2007b; 2009), online galleries (Caple and Knox, 2012; 2015). Photos in online news are sourced by image professionals from large online image collections (e.g., GettyImages).

Considering these characteristics, online journalism bears similarities with several other domains that make use of *ready* imagery such as e.g., web design, education, advertising, e-publishing, blogging. This, in turn, creates a potential for transferability of findings of this investigation onto other domains. Moreover, artificial intelligence (AI) is opening new perspectives and opportunities for online journalism. In the US, projects such as *Heliograf* developed at The Washington Post, *Editor* at The New York Times, *NewsWhip* used at the Associated Press, *Automative Insights* at Yahoo! Sport (Techemergence, 2017), and in Europe, *Graphiq* used at The Reuters, The Guardian's *ChatBot*, and The BBC's *Juicer* (Fanta, 2017) are only examples of the most

[4] Two of the pioneering online news organisations in the UK have been online for about 20 years: The Guardian published its first online page in November 1995, the BBC Online in December 1997.

sophisticated AI-driven journalism to date. The expectation is that AI in the newsroom will speed up research and take over routine fact-based reporting. Robot reporters already cover various news stories including results of matches, elections, financial reports, and are used to update content and produce news tweets. In September 2017, DigiDay UK reported that "*The Washington Post's robot reporter has published 850 articles in the past year"* (Moses, 2017). The popularity of automated journalism is increasingly growing and gaining interest and investment. In July 2017, Google announced a funding for an automated news project aiming to create 30,000 local news stories per month (The Guardian, 2017). The AI brings changes, challenges and opportunities for online journalism but as Gürsel (2016, p.41) says, "o*ne thing about the future of journalism is clear: it must be visual*". Images have long become an integral part of journalistic content therefore, it is crucial to ensure that image retrieval systems provide image users in online journalism with images that meet their needs.

A good understanding of the behaviour and needs of image users is necessary to ensure the effectiveness of image retrieval (Borlund, 2003). Image retrieval is a fast-developing domain. Currently, two distinct approaches to image retrieval exist: concept based and content-based image retrieval (CBIR). Concept-based image retrieval systems are based on textual metadata entered manually by human indexers. There are several existing frameworks that indexers may choose to use for image description and image indexing. These are, for example, Shatford/Panofsky matrix (Shatford, 1986), Enser's framework based on the typology of requests (Enser, 1993), Jörgensen's model (Jörgensen, 1998) expanded by Laine-Hernandez and Westman (2006), Hollink et al.'s framework for the classification of image descriptions (Hollink et al., 2004) based on earlier classification models in the literature, and an image indexing 'pyramid' by Jaimes and Chang (2000). These frameworks allow to describe images in great detail on visual (semantic and syntactic), and the non-visual levels. Relying on manual indexing, this approach suffers from many limitations, e.g. subjectivity and incompleteness of descriptions created by an indexer, and it is time-consuming. Therefore, it is not suitable to large million-item collections of images, which would clearly benefit from an automatic (or at least semi-automatic) process of image indexing and categorisation.

The motivation for development of content-based image retrieval (CBIR) systems is the potential for the automation of the image-categorisation processes and subsequently, for the reduction of human involvement. With the foundations in computer vision and machine learning, CBIR systems are capable of detecting low-level features present in images e.g., colour, shapes, texture, and relations between them. Yet, CBIR systems fall short of fulfilling image users' needs when compared with concept-based systems. The reason being, image users' needs typically relate to high-level image content. Attempts to link the low-level image features to high-level meaning have been made (e.g. relating colours to emotions, objects detection based on spatial positioning within images etc.), yet, the *semantic gap* problem persists. In the meantime, image retrieval systems based on a hybrid approach are gaining in popularity. Such systems use both visual and textual features and use them as complementary to each other (Kaliciak, 2013).

All in all, the need for building effective image retrieval systems that understand image users' needs and support them in completing their image-based work tasks is currently more actual than ever. Imagery seems to be *omnipresent*, online image collections are growing at a fast pace, the Big Data, and social media are rich sources of images. The current knowledge about the needs and behaviours of image users is scarce. This PhD project addresses this lacuna in the qualitative knowledge by an extensive exploration of the needs and behaviours of image professionals in online journalism (Goal 1) and aims to place the findings within the existing literature concerned with models of tasks and processes in the digital image-seeking. Further, inspired by Barry's shared tasks, shared needs and predictability of shared selection criteria (Barry, 1994), it also looks at predictive relevance. It seeks criteria that can be employed to image retrieval to improve the way these professionals search large image collections and to enable them to effectively select images that meet their needs (Goal 2).

1.2 Research questions, goals and objectives

The goals, research questions and corresponding objectives defined for this investigation are presented in Table 1-1 below.

Goals	Research questions	Objectives
Goal 1. **To investigate the image seeking and selection process in online journalism.**	*RQ 1.* **How are images selected in online journalism?**	**1.** to identify and describe the roles of image professionals in online journalism, **2.** to uncover their image needs in relation to work tasks, and the context of image use, **3.** to clarify the process of image searching and selection, **4.** to uncover image selection criteria used in online journalism **5.** to determine the challenges users face when completing search-based illustration tasks
	RQ 2. **How and why are images tailored in online journalism?**	**6.** to uncover how and why images are tailored and to what effect.
Goal 2. **To propose improvements to the way image professionals search large collections of images, in order to enable them to effectively select images that they need.**	*RQ3.* **If applied, will the identified criteria improve the effectiveness and efficiency of image retrieval?**	**7.** to implement the uncovered criteria in a prototype and to test their effect on the effectiveness and efficiency of image retrieval

Table 1- 1. Goals, research questions and objectives defined for this investigation.

RQ1 and RQ2 aim to provide the knowledge about the needs and behaviours of users involved in the image selection process in online journalism. RQ3 is an attempt at establishing and evaluating opportunities for automation of some of the processes in image retrieval. These diverse goals and questions require a conceptual framework suitable to handle such a level of complexity in aims and motives for research. Therefore, a mixed-methods approach that *crosses the boundaries of the traditional paradigm dualism* (Denscombe, 2010) has been

adopted in this investigation. As explained in Methodology chapter (Chapter 3), this approach integrates methods from the qualitative and quantitative paradigm, using strengths of one to complement for the weaknesses of the other, in order to achieve a richer and fuller understanding of the whole (Denscombe, 2010). The success of this project is measured by the degree to which the objectives 1 – 7 have been met.

1.3 Theoretical and practical contributions

This PhD thesis makes several important theoretical contributions to research into the needs and behaviour of image professionals who source images from large online collections. Further, it proposes a practical user-tested solution to improve the design of image retrieval systems.

Most importantly, this investigation provides an in-depth understanding of how image professionals search for, select and use images in a fully disintermediated environment of the online newsroom. Findings behind this contribution come from an exploratory study that included semi-structured interviews and observations in situ (Study I, Chapter 4). The extensive exploration has led to uncovering that image users in online journalism are creative professionals and self-taught, yet, confident image searchers. When illustrating news content, they apply shared understanding of how the various image functions are presented visually to reach their full communication potential. This shared knowledge bears implications on users' image searching behaviour and needs.

Firstly, it has been found that they begin searches with clear image needs that are pre-defined on multiple levels of image description, including visual image features, and their behaviour is consistent with targeted searching. This contradicts previously reported preference for browsing (e.g., Markkula and Sormunen, 2000; Westman and Oittinen, 2006) as the typical mode of searching in online image collections.

Secondly, these users do not easily compromise their image needs related to visual features. Instead, when searches prove ineffective, they resort to using their editing skills and tailor the available images to match their original needs. This finding shows that user needs are not as fluid as it has been reported in the literature (e.g., Conniss et al., 2000; Westman and Oittinen, 2006).[5]

This investigation has validated and updated the image searching model proposed by Conniss et al. (2000) with the *verifying* phase. The observed user behaviour generally mapped well to the original framework. The exception were the activities associated with *verifying* of images. In all searches, verifying of image authenticity and accuracy was an activity critical to making image selection decisions. This behaviour fitted the description of the verifying feature in Ellis et al.'s framework (Ellis et al., 1993). The verifying phase has been added to the Conniss et al.'s model (Conniss et al., 2000), in order to accurately reflect the behaviour of image professionals in online journalism, and with implications on system design.

[5] It is important to note that a direct comparison between the findings about the fluidity of users' needs from this investigation and the earlier studies is not possible due to the time distance, the progress in technology and the universal availability of more sophisticated systems and tools for image editing than in the past.

Furthermore, this investigation proposes an alterantive categorisation for illustration tasks in online journalism. An analysis of real tasks uncovered six basic components of an illustration task. A dichotomous distinction between tasks that required actual images and those that could be fulfilled with ready images was observed. This approach to illustration tasks has not been previously described in the literature, however, the differences in users' behaviour and image needs were evident, significant and sufficient to propose this new typology.

This thesis further improves the current understanding of how images are used after they have been selected and updates a model of the illustration task process by adding the *tailoring* phase. Previous studies (e.g., Markkula and Sormunen, 2000) tend to consider image selection to be the end of the illustration task. In contrast, this thesis includes the *tailoring* phase in the illustrating process. Extending the observations to post-selection activities allows to understand that image tailoring is a remedy for unsatisfactory searches and that there are patterns in how images are tailored. These patterns are dictated by image needs that in turn, relate to users' shared understanding of the visual presentation of image functions.

Another important contribution of this thesis is uncovering of the set of 11 image features recurring in headline images of specific people. This feature set was extracted, by means of the visual social semiotics (VSS) analytical tools, from artefacts created in Study I (Chapter 4). The set has been validated with independent image experts in a series of VSS-based surveys (Survey 1, 2, and 3).

Finally, this thesis also makes a practical contribution by proposing a multi-feature filtering system firmly rooted in the image users' needs as a step towards automating image retrieval. The uncovered set of visual features was implemented as a filtering mechanism in a prototype and evaluated by image professionals (Study III, Chapter 6). A significant positive change in the behaviour of users when interacting with images pre-filtered strictly to their visual needs was observed. This was demonstrated through users' ability to immediately engage in the inspection of images on a level of detail, and to make straightforward selections. Furthermore, images from the experimental sets required no or only minimal tailoring as confirmed in the final VSS-based survey with independent image experts. Image professionals reported higher levels of user satisfaction with the perceived time, effort and selections made from the experimental system. These findings have direct implications on the design and development of CBIR systems. They provide evidence that the proposed solution based on low-level features (understood by CBIR systems) allows to predict relevance of images.

It is hoped that the theoretical and practical results of this study will be useful to information professionals, information systems developers and designers, other people working in the area of content-based image retrieval, computer vision, machine learning, automated journalism, and anyone who may want to use these findings and implement them into working systems. The acquired knowledge may be further of value to the modelling of bot-reporters and automated image searching and selection to illustrate online news content. Just as in the past, journalism has boosted the development of photography, print technology, it is now one of the first domains

adopting robots as image users. The knowledge gained in this study could inform other domains that make or will make use of AI in the not-so-distant future, such as, for example, education where it is believed robots can effectively take on the roles of a tutor, tool or peer in the learning activity (e.g., Mubin at al., 2013), and any other domain where image needs and behaviour of robot image users will be modelled on those of human image professionals.

1.4 Scope and limits of this investigation

Table 1-2 summarises the topics within and outside of the scope of this investigation.

Issue	Within the scope	Out of scope
Domain	Online journalism	Print or broadcast journalism
Image use	The dominant (headline) image, images published on homepages of online news services	Other images: "*image-nuclear stories*" (Caple, 2013), photo galleries, photostories, e.g., "*thumbnail*-style" (Knox et al., 2007a; 2007b)
Image source	*Ready* images from online collections	*Actual* images, or commissioned images
Image content	Images showing specific people	Images showing other objects than specific people, e.g., unidentifiable people, objects
Image features	Focus on syntactic image features as defined in the VSS framework (Kress and van Leeuwen, 2006)	High-level semantics in images, affective/ emotional features
Location	A UK-based research	Non-western cultures
Professionals involved	Image editors, journalists, photographers and image researchers working for online news providers	Non-professionals or image professionals working in print media
Themes	Image users' characteristics, needs and image seeking behaviour, Illustration tasks and illustration process, Relevance and selection criteria Tailoring of images: techniques & the final effect	Algorithms for image retrieval UI and the presentation of results on pages

Table 1- 2. Topics within and outside of the scope of this investigation

Although much of the reviewed literature is concerned with print journalism (Chapter 2), this investigation focuses specifically on image users in online journalism. Although this domain makes an extensive use of imagery, research into this area is scarce. Study I that addresses RQs 1 and 2 is an extensive exploratory study of how images are sought, sourced, selected and used in online journalism. Since nowadays the main source of images are online image collections, the focus of this study is on *ready* images made available by these collections for re-use in a variety of contexts.

To begin with, this investigation is an extensive exploration of the needs and behaviour of image users in online journalism, however, it also aims to propose some practical solutions for improvements of image retrieval. To achieve this, following the exploratory study, the research is focused on a specific type of images that function as the main news headline images online. Although this is an important function of images in online news carried over from print journalism, it has not been previously studied in such detail as other functions, e.g., thumbnail images (Knox 2007a; 2007b; 2009), images used in online photo galleries (e.g., Caple and Knox, 2012),

photos used in image-nuclear news stories (Caple, 2013). Further the focus is on the entity: a *specific person,* one that is most frequently depicted in such images.

Images in this investigation are analysed using the Visual Social Semiotics (VSS) framework on the level of syntactic features as the aim of the investigation is to inform the development and design of (semi-) automated image retrieval systems that currently operate on the low-level features.

The key themes to be covered in this investigation include: the image users' characteristics, needs and image seeking behaviour, the typology and composition of illustration tasks, the relevance and selection criteria and the stages in the complete illustration task process inclusive of the image tailoring stage. A particular focus is on predicting of image relevance, as an opportunity for enhancing image retrieval. Although the identified solutions for improvements will be evaluated with users in Study III (Chapter 6), proposing algorithms is outside of the scope of this investigation. The aim is that any proposed solution is based purely on users' needs and not motivated or limited by what is currently supported by technology.

1.5 Researcher's professional background and interest

Having worked as a Design Researcher at the BBC's User Experience and Design Team within the Future Media and Technology department for seven years, the researcher had gained a good understanding of the organisational structure of the BBC's online news service, the ethical guidelines, and design standards. She also developed a strong personal interest in the domain of online journalism and the use of imagery. This experience enabled the researcher to gain access to participants and conduct Study I. in the participants' real environment. Prior to the study, the researcher had not known the participants in person, however, being part of the same organisation helped her to quickly build rapport with potential candidates for research. Gaining participants' trust was very important for the progress of this investigation, which required participants to consent to being observed while performing *real* work tasks in *real* time. In the post-observation conversations, some participants commented that had the researcher been an outsider, they might have felt judged and less at ease to present and talk about their work.

1.6 Structure of the thesis

The remainder of this thesis comprises seven chapters. The relevant, empirical and scholarly literature is reviewed in Chapter 2, along the following three trajectories: 1) *Information seeking behaviour and needs of image users in the workplace* (Section 2.2), 2) *An overview of current trends in image retrieval* (Section 2.3), and 3) *The use of images in online journalism* (Section 2.4). This literature review reveals the gaps in the qualitative knowledge about image users in online journalism, their needs and image seeking behaviour, and points to the areas where contribution is to be made. Chapter 3 provides a general overview of and a rationale for use of the mixed-methods approach in this investigation. It explains how the qualitative

and quantitative research components have been integrated to complement each other and facilitate achieving the goals set for this PhD project. Chapters 4 – 6 are the *study chapters* and each of these chapters describes a componential study conducted within this investigation.

- Chapter 4 discusses Study I, the exploratory study with image professionals carried out in-situ that contributes the knowledge about the image users, discusses the model of image searching within the context of a wider illustration task process and updates it with the verifying phase. Further, it identifies a set of image features that recur in news images used as the main headline image online. This finding is recognised as the potential device for improvement of image retrieval and is validated with external image experts in Survey 1 described in Section 4.9 of Chapter 4.

- Chapter 5 describes the methods and findings of Study II, a large-scale validation survey with image experts conducted to further solidify the solution for improvement proposed in Study I.

- Chapter 6, presents Study III. which is an experimental study involving image professionals from UK-based online news services. This study is an evaluation of the effect that the proposed solution implemented in an experimental prototype, has on the effectiveness and efficiency of image retrieval. The findings from Study III are quantitatively corroborated in Survey 3. with image experts (Section 6.7). This final survey validates the set of recurring features as the device for improving image retrieval.

A chronological approach is taken to report on each of the studies because this investigation has been designed in a way that the results of each study inform and lead to a subsequent study until the research design cycle is complete at Survey 3. Each of the study chapters (Chapters 4 – 6) begins with a description of the study-specific methods, reports the findings (results), and presents a discussion followed by a section outlining the limitations of the study.

Chapter 7, is the final conclusion of the findings in relation to the research questions, goals and objectives defined for this investigation. It highlights the contributions made by this investigation and suggests directions for future research.

A bibliography of referenced literature is provided on pp. 313 - 336, and Appendices section on pp. 337 - 442.

CHAPTER 2. Literature review

2.1 Introduction

This literature review is carried out along the following three trajectories: 1) Information seeking behaviour and needs of image users in the workplace; 2) An overview of current trends in image retrieval; 3) The use of images in online journalism.

Trajectory 1. Information seeking and needs of image users in the workplace (Section 2.2)

This opening trajectory reviews the available sources as follows. Typologies of information systems users in relation to their searching skills and behaviour are reviewed in Section 2.2.1. The literature on search-based tasks and how these tasks generate and shape information needs, particularly image needs, is discussed in Section 2.2.2. In the following section (2.2.3), Ellis et al.'s model of information searching (Ellis et al., 1993), and Conniss et al. (2000), are discussed in terms of their relevance to this investigation. Further (Section 2.2.4), the review focuses on searching strategies applied by image users, of which *browsing* and searching with an '*image in mind*' are the most relevant to image collections. In Section 2.2.5, studies into image selection criteria are reviewed with a particular focus on criteria relating to image syntax and those identified in the context of journalism. Finally, reports of constraints and challenges impeding information searches are reviewed in Section 2.2.6.

Trajectory 2. An overview of current trends in image retrieval **(Section 2.3).**

This trajectory offers a brief description of the principles and limitations of the currently existing approaches to image retrieval. It begins with a presentation of the concept-based image retrieval (Section 2.3.1) that requires manual input from human indexers. On one hand, the involvement of human specialists usually guarantees high quality indexing on the conceptual and perceptual levels of image description. On the other hand, it is time-consuming and cost-ineffective, therefore, this approach may be more suitable to smaller, static image collections within a single domain. Further, social tagging is briefly presented. It is also explained why this collaborative approach is not suitable to journalistic imagery.

Considering the many shortfalls of the manual text-based methods, it is apparent that the future of large image collections lies in the automated approach to retrieval. Section 2.3.2 outlines the basics of the content-based image retrieval (CBIR) that allows for automatic extraction of various low-level image features. However, CBIR systems fall short of image users' needs. This is because human users' categorisation, needs and interests go beyond the perceptual experience. The review in this section concludes that an effective CBIR (or a hybrid) system must be designed and developed based on the authentic

needs of its users and must extract the perceptual features from images in a manner that is meaningful to the users.

Trajectory 3. The use of images in journalism **(Section 2.4).**

The focus of this final trajectory is on the relevant work into the use of images in journalism and the existing guidelines for image selection. The available literature is mainly concerned with print journalism, while sources about the use of images in online news are scarce. First, the limitations of traditional categorisations of news images are briefly discussed in Section 2.4.1. In the following section (2.4.2) a functional approach to images is presented as an alternative to the traditional aesthetic-based approaches. In subsection 2.4.2.1, thumbnail images (Knox 2007a; 2007b; 2009) and image-nuclear news stories (Caple, 2013) are described as examples of distinct image functions identified with the tools of the visual semiotics framework. This leads on to sub-section 2.4.2.2, that reviews the currently knowledge about the use of images as news headline image (dominant image). This function that is in the focus of this investigation. Section 2.4.3 describes the editing techniques available to image professionals, and Section 2.4.4 provides examples and consequences of malpractice in using image editing software that point to the importance of verifying news images before publication and show that image professionals understand how to manipulate low-level features to achieve a required visual effect.

Chapter 2 ends with Section 2.5 that presents an overview of the recent advances in Artificial Intelligence (AI) in regard to image recognition, selection, and editing. It describes the strengths and the limitations of the currently available AI-based techniques, and points to the ways in which findings from user research may inform the design of automated systems in the future.

Texts selected for this literature review were identified through systematic searches of the following online databases and repositories that provide access to peer-reviewed papers and conference proceedings: ACM Portal[6], ASIS&T publications[7], IEEE Electronic Library[8]; and publishers' websites (e.g., Wiley[9], Palgrave[10]). Additionally, citation chaining to academic literature using e.g., Google Scholar[11] was used and survey papers were screened to identify more primary data sources. Non-academic literature was identified through recommendations from professional image editors and photographers.

The following 5 key inclusion criteria were used in this review:

- Types of studies: peer-reviewed sources reporting on primary qualitative and mixed-methods studies were included. Additionally, non-academic literature for image professionals was included to gain an understanding of the theory and practice of image

[6] ACM Portal at https://dl.acm.org/
[7] JASISTat https://www.asist.org/publications/library/
[8] IEEE electronic library at https://ieeexplore.ieee.org/Xplore/home.jsp
[9] Wiley online library at https://onlinelibrary.wiley.com/
[10] Palgrave at https://www.palgrave.com/gb/
[11] Google scholar at https://scholar.google.co.uk

editing. These publications were selected based on recommendations from professional image editors and photographers.

- Populations of interest: primarily, any research involving image users in print and online journalism, e.g., image editors, journalists, news photographers, was included in this review. Additionally, due to limited number of sources, any research papers reporting on the needs and image seeking behaviour of other professionals who search for and use images to complete work tasks.
- Data type(s): mainly, studies that report primary qualitative and mixed data were included in this review.
- Outputs: any research that reported on findings related to image seeking behaviour and image needs of professionals, post-selection image use, illustration tasks and process, relevance and selection criteria, and visual aspects of images for retrieval.
- Publication language: only papers and publications in English were included.

This comprehensive search was carried out to ensure that as many as possible relevant sources were included in this review, the found literature was most up-to-date, and reflects a variety of viewpoints. A full list of references is available in References section on pp. 313 – 336.

2.2 Trajectory one: Image searching and selection

The themes within Trajectory 1. have been defined based on the *contextual framework* proposed in Conniss et al. (2000) and fall broadly into the following areas: the users of IR systems, the needs of image users, the image seeking behaviour, the criteria applied in image selection, and the currently experienced barriers in image seeking.

2.2.1 Types of users of IR systems

Digitalisation paved the way to online journalism and digital image collections. The roles of image librarians, archivists, and in-house photographers have become redundant in many branches of creative industry, and particularly in online journalism, where nowadays images are primarily sourced directly from online image collections. Image users (e.g. image editors) have become the end-users of image retrieval systems. An understanding of how they perform this role forms part of this investigation. This Section reviews the existing typologies of users of IR systems, and what their behaviour and experiences may reveal about their searching skills and how to best support them.

Most of the user studies in the 1990's investigating information and image seeking by professionals were conducted in intermediated environments (libraries, archives and image collections), where typically requests were submitted to and executed by professional intermediaries (Armitage and Enser, 1997; Enser 1993; Keister, 1994; Ørnager, 1995). The intermediary, a librarian or archivist, has a formal knowledge of and skills in information (or image) retrieval, therefore, can be described as an expert user of IR systems. Bates (2002) identified

skills and knowledge of an effective information searcher. These are: "*substantive knowledge about the systems of access, as well as technical searching skills, known as "declarative" and "procedural" knowledge, respectively"* (Bahvani and Bates, 2002 cited in: Bates: 2002). She believed that unlike an average information searcher, professional librarians possessed these skills as well as the knowledge of information seeking methods, and information retrieval principles.

Based on a user study in a newspaper archive, Ørnager (1995) proposed a typology of searchers based on the types of image requests that they submitted to intermediaries. As a result, she described five types of searchers, however, this typology is applicable only to intermediated environments. For example, Westman and Oittinen (2006) observed some of the behaviours distinguished by Ørnager in print news room where image editors and journalists sourced images from internal photo archives. Fidel's typology of searchers (Fidel, 1991) is built around three dimensions of searching behaviour which include: the level of interaction, a preference for operational or conceptual moves, and a preference for textual descriptors. Interactive searchers tend to frequently change search strategies and refine search queries; operational searchers prefer to use operational moves; conceptualists are more concerned with recall, while free-text searchers have a preference for the use of words. Enser and Sandom (2003) categorised users into two types: *generalist* users and *specialist* users. These two types differ in the way they express their visual information needs, and the type of visual information they tend to engage with. While the former are representatives of general public who tend to engage with images for personal use, whereas the latter are typically professionals who use special-purpose documentary images in order to do their job and apply their professional knowledge to retrieve and view images.

More recent user studies, especially those focusing on information seeking and retrieval on the web (Griffiths and Brophy, 2005; Jansen and Pooch, 2001) expose an imperfect end-user who performs image searches unaided in a disintermediated environment. ''*There is no single type of academic user, nor do users see the world in the categories constructed by researchers and librarians*'' (Harley, 2006 p. 20). End-users, who are not qualified information professionals, lack the in-depth understanding of image retrieval principles, and metadata. They may struggle with verbalising their information needs, to the extend, that in some cases, they may have no awareness of their information need. They struggle with formulating queries and also tend to use different search strategies and tactics than those used in other environments, e.g., libraries (Ford et al., 2002; Jansen et al., 2000). Jansen and Pooch (2001) found that Web searchers used approximately two queries in a session, two terms to search for information, and viewed no more than ten documents.

Studies with a focus on Web searchers (Spink et al., 1998; Ellis, 1998) show that the ineffectiveness of searches is caused by users' limited understanding of how search engines work. For example, only small minority of Web searchers know about and use Boolean operators, and advanced search features. Andrews (1996) found that web users are not willing to engage

into interaction with a system beyond entering a few keywords. He claims that most users do not use advanced search features, nor enter complex queries. Hence, IR systems must offer more automated functionality to support these users.

With the purpose of designing a new web search methodology, Alfano and Lenzitti (2009) differentiate between “basic searchers", "deep searchers" and "wide searchers". Each of these types comes with different search expectations and starting knowledge. The basic searcher has limited knowledge of the search topic and looks for information strictly correlating to the topic. The deep searcher’s intention is to further deepen his knowledge on the search topic, and to look for detailed information, whereas the wide searcher is not focused on the details but prefers to expand his/her knowledge about the domain by looking for information about topics loosely related to the searched keywords.

Tabatabai and Shore (2005) researched patterns of search between novice and expert searchers. The actions characteristic to expert searchers’ behaviour include: (1) using clear criteria to evaluate sites, (2) not excessively navigating, (3) reflecting on strategies and monitoring progress, (4) having background knowledge about information seeking, and (5) approaching the search with a positive attitude. Hollink et al. (2004) suggest that searchers’ ability to search for images is influenced by the following three key factors: the domain, the level of expertise, as well as the specific task that they are performing. Al-Maskari and Sanderson (2011) reported on the results of their study where a group of participants completed searches for 56 topics using the TREC test collection. The results showed that experienced searchers with high cognitive skills were more effective than those with less experience and slower perceptual abilities.

A good understanding of users’ image searching skills, e.g., how they express their needs, how they formulate queries, and their choice of searching techniques, is necessary to establish the level and kind of support they may need when completing search-based work tasks. In a recent study with 13 creative professionals (including two news image editors), Göker et al. (2016) found that the participants from journalism tended to have clear mental models of the various image libraries they used and entered search keywords with confidence. Typically, they applied a variety of strategies to enhance the relevance of retrieved results. For example, they were observed to reuse keywords from some collections that *worked better* in their view, to searches in other image banks. This behaviour implies that the end-users in journalism are skilled and confident searchers, which contrasts with the findings from previous studies, e.g., Markkula and Sormunen (2000) or Westman and Oittinen (2006).

The improvement in image editors’ searching skills and confidence may be due to the time distance between the earlier work and Göker et al.’s paper published in 2016. The previous studies (Conniss et al., 2000; Markkula and Sormunen, 2000; Westman and Oittinen, 2006) were carried out only at the dawn of the internet and the digitalisation era. In print newsrooms, journalists felt that information retrieval was not part of their jobs but should be carried out by trained librarians (Harman, 1986). Journalists would typically locate required visuals with the help of intermediaries (archivists, librarians), and only a small proportion of simple searches would be

carried out by end-users themselves (Markkula and Sormunen, 2000). However, within the next decade, the internet and the digitalisation of image processes changed the journalism. The in-house image archives and the libraries of press cuttings have been replaced with access to online resources. Göker et al.'s study (Göker et al., 2016) describes the behaviour of image editors/journalists working in a modern disintermediated newsroom where end-user searching for visuals has become an integral part of journalistic practice (Quinn and Lamble, 2007).

2.2.2 Image users' needs

In the tradition of interactive information retrieval (IIR) and continued in human-information interaction (Fidel, 2012), the effectiveness of information retrieval systems is measured by the degree to which they allow users to meet their information needs (Beard, 1991). In turn, the improvement of the effectiveness of image retrieval relies on the quality and depth of the knowledge and understanding of these needs. It is users' needs and how they search for what they need that *diverges* one user group from another, as well as from the general public (Clarke, 2010). In order to propose improvements to image retrieval, it is essential to identify image needs of the user group under investigation, to understand how they arise, whether and how they are met, and what barriers impede meeting those needs.

Most theories of information needs refer to Maslow's theory of human needs (Maslow, 1943, 1954), and associate information needs with a state of uncertainty, or ambiguity (Belkin, 1980; Kuhlthau, 1991; Taylor, 1968). Sensing the discomfort, individuals realise their needs and attempt to reduce the mental uneasiness by engaging in information seeking. Information needs exist in people's *heads* and therefore, are not an easily observable phenomenon. Recent studies using functional Magnetic Resonance Imaging (fMRI) (e.g., Moshfeghi et al., 2016) show that there are differences in brain activity of people who once asked a question need to search for information and those who know the answer. Yet, image needs may remain imperceptible to external observers until they are externalised in some form of visible manifestation. Typically, the fact that an individual has actively engaged in searching for information, manifests the existence of a conscious information need, while queries and requests are recognised as a materialised form of users' needs (e.g. Belkin's ASK model as proposed in: Belkin, 1980). Therefore, an analysis of queries and requests is part of many studies into information needs from different domains, e.g. medicine (Keister, 1994), within a particular subject domain or professional group, e.g. art historians (Choi and Rasmussen, 2002), journalists (Markkula and Sormunen, 2000; Westman and Oittinen, 2006), as well as with average web searchers (Goodrum and Spink, 2001). The findings about image attributes in queries and requests are briefly discussed below in the following manner: a) semantic image attributes, b) syntactic attributes, and c) non-visual attributes.

2.2.2.1 Image attributes in queries and requests

a) Semantic image attributes in queries and requests

Research shows that images are most frequently queried based on semantic attributes of images. Queries may be formulated to find types of objects (generic) or specific objects, where the search term is usually a name of a person, object, location. A search for an abstract concept aims at finding images that convey abstract information, concept, emotion or mood.

Jörgensen and Jörgensen (2005) and Westman and Oittinen (2006) found that image queries for specific and general objects entitle over 50% of queries and requests. In journalism, specific queries dominate (Conniss, 2000; Enser, 1993; Göker et al., 2016; Markkula and Sormunen, 2000; Westman and Oittinen, 2006). Within the specific queries, a specific person (who?) and a specific location (where?) constitute the majority of queries. Studies of user needs for general purpose documentary images have revealed a high incidence of requests for specific and named objects, places, events and people (Armitage and Enser, 1997; Enser and Sandom, 2002; Markkula and Sormunen, 2000; Sandom and Enser, 2001). Within the generic queries, a search for a generic person type, e.g., *woman* is the most common (Westman, 2009). Abstract concepts account for only 5% of all queries (Hollink et al. 2004; Westman and Oittinen, 2006).

Most semantic queries refer to objects within images, while queries based on a complete scene account for roughly 25% of all queries (Jörgensen and Jörgensen, 2005, Westman and Oittinen, 2006). Markkula and Sormunen (2000) report that their research showed that in nearly 50% of the search topics, the main focus was not on the objects seen in the photo but on the information about a particular news event, or abstract themes requiring high human reasoning. *Action* images are searched for by means of queries formulated with verbs and constitute for only one tenth of all searches (Jörgensen and Jörgensen, 2005; Westman and Oittinen, 2006).

Searches using generic attributes are most frequently performed on stock image collections (Jörgensen and Jörgensen, 2005; Hollink et al. 2004). Nearly half of generic image queries are modified, and in most cases, the refiners relate to time, location, actions, events or technical attributes (Enser, 1993; Markkula and Sormunen, 2000; Westman and Oittinen, 2006). The modifications lead to a hierarchical narrowing down of the query or giving it a more abstract character (Goodrum and Spink, 2001).

b) Syntactic image attributes in queries and requests

Visual attributes are used in queries much less frequently than semantic attributes (Jörgensen and Jörgenesen, 2005; Hollink et al., 2004). In Enser's study (Enser, 1993) queries mostly referred to a certain colour, or texture. In their study with journalists, Markkula and Sormunen (2000) found that in most cases, syntactic attributes were used to refine the original query by adding *colour* or specifying a shooting distance. Studies (Eakins et al. 2004; Markkula and Sormunen, 2000; Westman and Oittinen, 2006) also showed that sharpness of images appeared to be an important syntactic attribute at the stage of query formulation.

However, it is important to note that most of the studies to date conducted in real-life environments were performed on image retrieval systems that do not offer access points based on image syntax. Markkula and Sormunen (2000) commented on the results of their study: *"The journalists in our study used a digital photo archive supporting traditional textual query operations. Thus, it is difficult to predict how they would change their searching behaviour if they could execute queries based on visual similarity of photos."*

In their study with journalists and non-professional users, Westman et al. (2008) tested a prototype of a multimodal image retrieval system that allowed the users to formulate their queries with the following modes (and combinations of these modes): text, colour, sketch, quality, and category. It was observed that the choice of modes depended on the task type, e.g., a known item tasks led to queries combining text, colour and category modes. Conceptual tasks typically led to queries based on text and category, while visually-cued tasks to a combination of textual and colour-based queries. In comparison with non-professionals, journalists used the colour mode more frequently and drew fewer sketches, were less likely to switch modes and more likely to edit their queries.

An analysis of queries and requests is unable to provide a complete knowledge of users' needs. As shown above, it is particularly ineffective in surfacing needs related to image syntax. Syntactic image features play an important role in image meaning making (Kress and van Leeuwen, 2006). It is known from literature (Caple, 2013; Machin and Polzer, 2015; Knox 2007a; 2007b) that image professionals intentionally use images that include certain syntactic features to convey a required meaning. The importance of syntactic features is even clearer in the examples of malpractice (Section 2.4.4) where image professionals deliberately manipulated syntax of the original photographs, in order to generate a particular visual impact.

c) Non-visual information in queries and requests

This type of image attributes can be extracted from queries that related to the information that is not included in the image itself but in the information associated with the image. In Westman's model (Westman, 2009) the non-visual image attributes are captured at the metadata facet. This information is often in a textual format hence, these searches may be seen as searches for text. Westman (2009) draws attention to the fact that most image retrieval systems are text-based, and non-visual information may be crucial in retrieving a specific known-item search. Searches for a known item account for one tenth of all searches (Markkula and Sormunen, 2000; Westman and Oittinen, 2006). Metadata attached to images is used for the verification of image authenticity, an activity that is essential to journalistic ethics and practice (Section 2.4.4).

To sum up, queries and requests are the easily obtainable and tangible manifestation of user interaction with information retrieval systems, and therefore, many studies rely on their analysis for gaining insight into users' needs. While some trends may be identified, e.g., most attributes relate to the semantics of images, there is a preference for people as objects in images, such analysis does not allow to access a complete understanding of those needs. For example, little knowledge has been gained about users' needs in regard to syntactic image features, possibly

due to the types of retrieval systems used in the studies. There is no further detail of whether any images were actually selected, how they were used, were any additional edits performed on images before publication, and if it was the case, to what effect the image was changed. Fidel (1997) points that images can be used and re-used in many contexts and for a variety of reasons, therefore, intended image uses must be considered as an important factor in shaping of image needs. Taylor (1968) pointed to the fact that a query, while being the most visible evidence of needs, is only a *compromised information need* formulated to suit a perceived capacities and functionality of the particular IR system and collection in use. Therefore, an analysis of queries, as a sole method, will not reveal the complete knowledge of the *authentic* user needs. To gain an understanding of authentic needs, it is necessary to step beyond the analysis of queries and requests.

2.2.2.2 Work tasks as sources of needs

Wilson (1981) claimed that information seeking behaviour was not driven only by information needs, other needs such as psychological, affective, and cognitive, played an important role as motives for information seeking. This is especially valid for information seeking in work environments, where seeking for information is performed as part of work tasks by active information seekers. The task defines the purpose, needs, and information seeking behaviour of the individual, therefore, information seeking of professionals should be investigated within the context of work tasks that lead to information seeking.

In the literature, work tasks are often defined by their characteristics, e.g., in relation to their frequency (routine tasks versus specific tasks), complexity and difficulty. Hamid and Thom (2017) found that more queries were issued in searches on difficult tasks. Aula et al. (2010), identified changes in user behaviour; when given a difficult search task (for example, users were observed reformulating queries into questions, using advanced operators, and taking more time to examine result pages). Hansen (1999) identifies tasks with a well-defined structure, while Toms (2011) differentiates between prescriptive tasks where pre-defined instructions are given at every step in the task, and constraint-based tasks where the discretion to decide how to achieve the task goal is given to the person with the task. Elsweiler and Ruthven (2007) provide a systematic review of task typologies.

A work task can also be perceived as a process. For example, Byström and Hansen (2005) defined a work task as a piece of work that can be broken down into a series of subtasks and activities. Toms and O'Brien (2008) used a framework by Chu (1999) and adapted it to research into humanistic disciplines. The proposed work task process included the following stages: idea generation, preparation, elaboration, analysis/writing, and dissemination. In information and knowledge professions, tasks often trigger information seeking and lead to purposeful search tasks that require the individual with the task to interact with an IR system (Attfield and Dowell, 2003; Byström and Hansen, 2005; Toms, 2011). Marchionini (1995) and Hansen (1999) described information searching tasks, and information retrieval tasks – each respectively, as processes with a defined beginning and ending. Further, the literature (e.g., Byström and Järvelin,

1995; McCay-Peet and Toms, 2009) points to information searching and use as an integral part of information-intensive work tasks, where the whole or part of information may be used to complete the task. Similarly, image searching is integral to the wider work-based illustration task (e.g., Markkula and Sormunen, 2000; Westman and Oittinen, 2006). This holistic approach, as suggested by Vakkari (1999), shifts the focus from a single search session and allows the design and development of information systems that support users in completing work tasks. Conniss et al. (2000) found that image needs of professionals had their sources in the tasks that required the image to be found. They found that the following classes of image searches were typically performed at work: searches for a specific item, semi-specific searches, and vague searches, as well as conceptual (abstract) searches for images representative of some semantic concept.

Göker at al. (2016) propose a metaphor of an *expedition* for image seeking where completing of the task is the goal, and the search strategies and tactics are the paths and routs taken to accomplish the *journey.* Unlike text-based information, images are rarely an information end in themselves. In the workplace, tasks usually provide information about how the image needs to be used and about the context of use.

Fidel (1997) proposes a *bipolar* typology of image retrieval tasks based on the intended image use. It places images on a continuum between the data pole and the objects pole. Images on the data pole, e.g., maps, x-ray images, are typically used as information sources, whereas those on the opposite end (the objects pole), as stand-alone aesthetic objects, e.g., a picture on the wall, an illustration, e.g., a magazine cover image. Further, the use of images as source of information, as well as for their visual value, can be mapped in-between the poles (Fidel, 1997, p. 189).

Fidel's typology of tasks has been used in several studies concerned with the use of images in journalism. For example, McCay-Peet and Toms (2009) carried out a study with lecturers in journalism, editors and reporters, and found that in 60% of cases, images were used for illustrative purposes, in 5% for informative purposes, and in 20% for both. Similarly, Westman and Oittinen (2006) reported that in their study in an editorial office, images on the object pole were used more frequently than those on the data pole. Göker et al. (2016) report that online journalists tend to use images to illustrate information included in news articles, and creative media professionals use images to create impact and improve aesthetics of documents.

These findings may lead to a conclusion that in journalism, images are more frequently used as objects rather than as data sources. However, it is important to note that these studies focus on images selected to accompany a rich text-based content (an article, a copy, etc.). The literature concerned with visual communication and semiotics, however, shows that images serve many functions in journalism. In some of these functions, the image is the dominant element, while the text carries the supportive role. For example, captioned images can be used in online galleries as evidence of events (Caple and Knox, 2012), and information-rich photographs are typically used in image-nuclear news stories (Caple, 2013), as described in Section 2.4.2.1.

Thumbnails represent another specific use of images in online journalism (Section 2.4.2.1). They are small-sized images that typically show an extreme close-up on a face of a single social actor.

Knox (2007a; 2007b; 2009) states that thumbnail images include the minimum amount of visual information to identify the social actor and serve as *"a visual repetition of the verbal name of the person in the story"* (Knox 2007a, p.179). Their visual minimalism is sufficient to fulfil their function online, although thumbnails do not tell a story, do not illustrate the story, and carry no aesthetic value. This suggests that Fidel's continuum (Fidel, 1997) may not be an effective tool for classifying thumbnails, or similar images, used on news homepages.

Conniss et al. (2000) categorised the use of images into seven classes: illustration, information processing, information dissemination, learning, generation of ideas, aesthetic value, emotive and persuasive. They found that journalists used images mainly for illustration and emotive purposes. These findings correspond to the results from Rössler et al., (2011) showing that images in journalism are selected mainly as attention 'catchers'. Markkula and Sormunen, (2000), Göker et al. (2016), and others also reported that journalists in their respective studies searched for "*high-impact*", "*attractive*", "*eye-catching*" images, however, due to time pressure, they mainly used images that illustrated the information presented in the text of the news story. The accuracy of the information in the image (i.e., the image must show the correct people, event, location) was the most important factor in the selection process, while the aesthetic aspect was desirable but secondary in importance. Without further investigation, the required visual qualities are unlikely to be picked up by automated image retrieval. Image users often struggle with verbalising their image needs (Gürsel, 2016; Machin and Polzer, 2015; Markkula and Sormunen, 2000). Even when directly asked about their needs, they describe the intended effect that the required image will have on viewers rather than any specific aspect of the image (Machin and Polzer, 2015). Others adopt the *'I'll know when I see it'* tactic (Goodrum, 2005).

Markkula and Sormunen (2000) investigated image needs in print journalism. Having realised that a query and request analysis would not provide them with enough information about real photo needs, they focused on the participants' descriptions of searches. They identified the following categories of searches:

- search for concrete (specific) objects (people, buildings, places)
- themes (or abstractions that can be interpreted from the photo)
- background information (e.g. photos documenting particular news events, films, TV programmes)
- known item (photograph in this category were usually searched for by publishing time, shooting date, place or the photographer.)

Markkula and Sormunen (2000) found that the context of use: the type of article, page layout, size of the image, other surrounding images and text influenced how images were searched for. However, the authors do not provide information on the actual influence on performed searches, or on the intended use of the images in terms of their functions or what type of content was illustrated (e.g., breaking news or general news stories).

Westman and Oittinen, (2006) reported that image retrieval tasks were context-sensitive and depended on e.g. section of the paper, type of story, page layout, but observed that in some

cases image searchers had had to search for images before they received complete information about the context of use, e.g., the story to be illustrated. This was particularly true about tasks performed by intermediaries who searched for images based on a very brief mentioning of e.g., objects to be depicted in the image, or a general theme, and the size of the image.

Westman (2009) summarised the image needs typically described in the literature (Figure 2-1) and distinguished between two main facets: 1) form and 2) content.

1) Form relates to the degree of specificity or vagueness of the need. For example, in their study with image users in work environments, Conniss et al. (2000) identified specific, semi-specific, and vague needs.
2) Content refers to semantic content in images, visual (syntactic) image features, as well as non-visual information (e.g. information carried in metadata and captions).

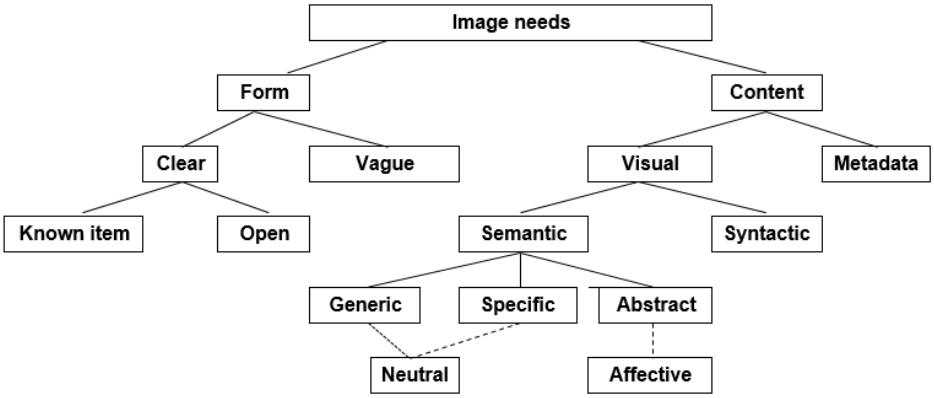


Figure 2- 1. Facets of image needs as presented in Westman (2009, p.70)

In work task-based searches, image users often begin searches with an *image in mind* (Frost, 2001; Greisdorf and O'Connor, 2002; Heidorn, 1999), a pre-conceived visual representation of the needed image. This representation may be vague and or detailed, and may relate to the conceptual content (e.g., objects/people, event, location, abstract theme), as well as perceptual/syntactic features (e.g., colour, shapes, object positioning in the frame) of the required image. For example, a need for close-up shots of human actors is an iterating theme in studies into the use of images in journalism (Caple 2013; Knox 2007a; 2007b; 2009; Machin and Polzer, 2015). Göker et al. (2016) found that image users in the online newsroom began searches with a well-defined mental model, which led to targeted searches.

A good understanding of users' needs is fundamental to the development and design of effective image retrieval systems that must support users in meeting those needs. This investigation aims to address the gap in the knowledge about image users' needs in online journalism. This relatively young domain makes an extensive use of imagery. Every day, image professionals working in online newsroom view and select hundreds of images from large image collections. To develop image retrieval systems that support these image users and similar groups of users, it is necessary to examine their image needs and how these needs arise. A particular effort will be put

into surfacing image users' needs on the syntactic facet, since automated image retrieval operates on low-level image features (Section 2.3.2). The finding that image users struggle with expressing their image needs verbally (e.g., Machin and Polzer, 2015) has methodological implications for the studies with users in this investigation. In order to gain a complete understanding of users' authentic needs, appropriate research methods and elicitation techniques must be employed in the user studies included in this investigation.

2.2.3 Relevant IS models

Investigating why and how people seek and use information, including visual information, falls into the remit of Information Behaviour (IB) studies. Wilson's Nested Model (Wilson, 1999, p. 263) illustrates the interrelations between the core conceptual areas within the overarching area of Information Behaviour. There are many information seeking models and theories described in the literature, (e.g., in: Case, 2012; Fisher et al., 2009; and Fidel, 2012), however, a review of these models shows that most of them have been constructed for text-based information, or propose to treat text and images equally while ignoring differences between these two distinct information modes, e.g. the model proposed in: Ingwersen and Järvelin (2005). Studies of visual information seekers (e.g., Albertson, 2015, Choi, 2010) and studies investigating image searching indicate that visual seeking behaviour is different from searching for textual documents (Choi, 2010, 2013; Conniss et al., 2000; Hung, 2005; Jörgensen and Jörgensen, 2005; Pu, 2005). Image seeking has been recognised as a distinct category in information behaviour research (Albertson, 2015). However, there are only few models that acknowledged these differences and focus specifically on image seeking and searching. One of them is the image searching process model proposed by Conniss et al. (2000). The foundation for this framework is the information seeking model by Ellis (1989). Further, Markkula and Sormunen (2000) proposed the illustration task process model as the shell for the information seeking activities. The purpose of applying theoretical models in studies of users' behaviour is twofold. Firstly, it allows to analyse the observed behaviour and to locate the findings within the existing framework(s), and secondly, the theoretical model gets validated and, if necessary, updated to accurately describe the observed behaviour. In this investigation, image users' activities will be mapped to three models: the image searching process model by Conniss et al. (2000), Ellis et al.'s information seeking model (Ellis et al., 1993), and the illustration task process framework by Markkula and Sormunen (2000). These models will be validated and refined where inconsistencies occur. This approach will result in contributions to research, as well as it will bear practical implications for the design of systems.

2.2.3.1 Ellis et al.'s information seeking model (Ellis et al., 1993)

Out of the many existing information seeking and searching frameworks (e.g., Case, 2012), Ellis et al.'s model of information seeking (Ellis et al., 1993) as presented in Figure 2-2 is considered the most relevant to this study for several reasons. This model was constructed based on an empirical user research with professionals and is a refined version of an earlier framework proposed in Ellis (1989). The updated version (Ellis et al., 1993) includes the following features:

Starting, Chaining, Browsing, Differentiating, Monitoring, Extracting, Verifying and *Ending* (Figure 2-2).

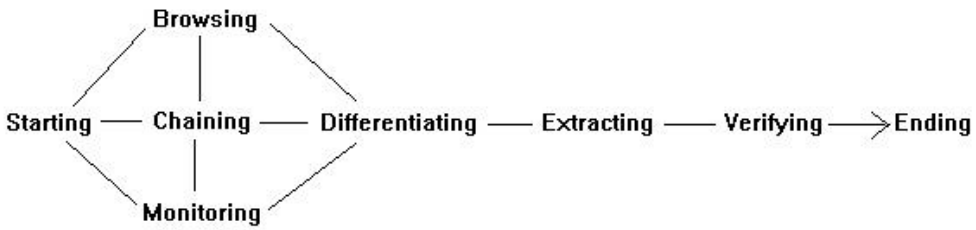


Figure 2- 2. Ellis et al.'s model of information seeking (Ellis et al., 1993)

The features in Ellis et al.'s model (Ellis et al., 1993) are briefly presented below:

Starting is a 'formative feature' of information seeking behaviour that covers e.g. reviewing literature, reading articles and consulting "*knowledgeable colleagues*". This feature resembles of Disambiguation stage in Taylor's model (Taylor, 1968).

Chaining is when users use footnotes, citations (backward chaining) in known material and citation indexes (forward chaining) and navigate forward to new documents (or other information sources) that they have found references to. They follow material by e.g. the same author, conference publications, links on a website, or in the same subject category.

Browsing has been defined as "semi-directed or semi-structured searching" (Ellis, 1989 p. 187) within '*promising*' areas.

Differentiating refers to filtering of the retrieved information based on their knowledge of the differences and quality of information sources they are using.

When *Monitoring* users *switch on* and maintain their awareness of the current developments within the searched domain. To do so, users may follow formal sources of information e.g. journals, conferences as well as informal ones e.g. private contacts.

Extracting occurs when a user sifts out the relevant material retrieved by an information source.

Verifying takes place when a user investigates the accuracy of the retrieved information.

Ending is a final search that compiles all the newly found material with user's pre-existing knowledge.

Ellis et al. (1993) claimed that these features were common to information seeking behaviours of the various groups that they studied. The authors recognised that each and every information seeking session was unique in terms of the individual involved, their needs, circumstances and "*that particular point in time*" (Ellis, 1989 p.178), which would influence the occurrence of any of the features and the order in which they might occur, or repeat, within an information seeking session.

It is the *verifying* feature that differs the updated model (Ellis et al., 1993) from the earlier version (Ellis, 1989) and that makes the 1993 model particularly relevant to this investigation. Verification of information and its sources is an important activity in the news gathering process in journalism. In order to ensure that images selected for publication depict the truth about reported events, images and their sources must be verified for accuracy and authenticity. Studies in image seeking and use in journalism (Markkula and Sormunen, 2000; Westman and Oittinen, 2006) emphasise on the importance of the verification phase of images to be used in newspapers and magazines. In their research into the image seeking behaviour and image use in work environment, Conniss et al. (2000) chose the early Ellis's model (Ellis, 1989) as a point of reference, and the image seeking model that they proposed (described below and presented in Figure 2-3.) does not include verifying as a stage in image searching. Considering the importance of verifying of images in journalism, this is a significant limitation of Conniss et al.'s model (Conniss et al., 2000). Therefore, these two models: Conniss et al.'s (2000) and Ellis et al.'s (1993) are combined in this investigation.

2.2.3.2 Image searching process model by Conniss et al. (2000)

While information seeking models are plenty, models dealing specifically with visual assets are only few. The most comprehensive proposition comes from Conniss et al. (2000). This model was constructed based on an empirical study investigating the image seeking behaviour of professionals who used images in work environments. Based on their findings, they proposed a model of the image seeking process consisting of the following phases: starting, scoping, applying, selecting, iterating, and ending. They used the early Ellis's model (Ellis, 1989) as the foundation. In the starting phase, the user is faced with a task that he/she may have received from someone else. The user defines (and re-fines) his/her image need in relation to the given task, the nature of the topic, e.g., unusual, vague, conceptual or abstract, the context of use, and his/her own knowledge of the subject domain. While the image need is forming, the user also begins developing criteria for assessing the suitability of images returned in search results. *"Whatever the type of request, users often need to identify something distinctive about what they are looking for to assist in searching"* (Conniss, et al., 2000 p.103). A study by Frost (2001) showed that at this stage a mental model of the target image was also being formed, and Lakoff (1987) notes that creating of mental images is an effortful and conscious activity. Göker et al. (2016) observed that when selecting images for editorial content, the image users begin the search process with "*reading the written article, picking up key points from the text, using the title or looking at the topic being covered, and creating an image in mind."* Such a model may be based on the intended use of the image, previous information of the topic, or what is expected to be found (Westman and Oittinen, 2006), as well as the intended impact on viewers (Rössler et al., 2011). Rössler et al. (2011, p.421) provide more details about this phase in the context of journalism: "*Based on prior knowledge and the corresponding text the editor evolves an estimation of the photo which is also influenced by photo news factors. Adjusting this personal*

estimation to the editorial and societal framework, it ultimately results in a selection of photos for publication."

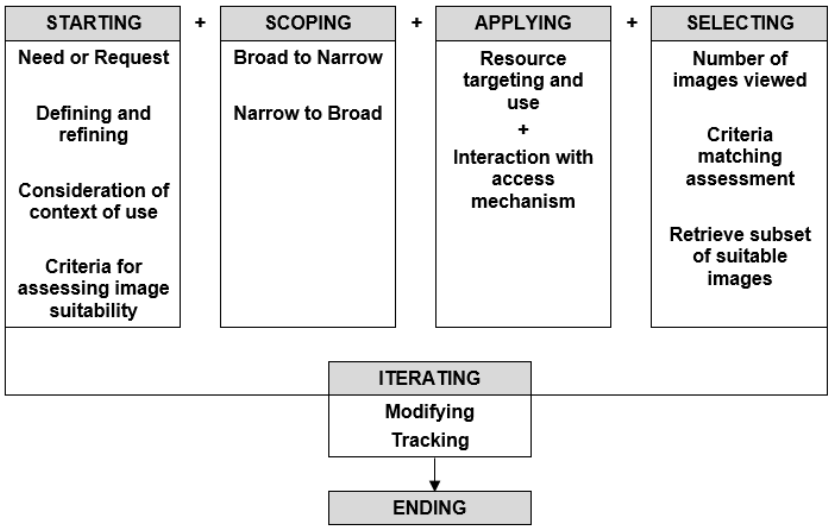


Figure 2- 3. Image Searching Process constructed by Conniss et al. (2000, p.100)

Based on the resources available and the nature of the task, the searchers is now ready to decide on the breadth of the search and moves on to the scoping phase. Conniss et al. (2000) report that in their study, to begin with, most users preferred to retrieve the maximum number of relevant results, therefore, they tended to start with broad searches: they performed simple text searches, searched across categories, set parameters to the widest ranges. In cases when users' needs were more defined, they would begin with a narrow search to return a smaller number of results to choose from. Initial scoping typically follows the starting phase, but scoping may occur repeatedly throughout the image seeking process. In the applying phase, users decided which resource to use. Conniss et al. (2000) state that the choice of tool may be affected by one or several external factors such as: time, money, intermediary, users' expertise and knowledge, expectation towards a particular resource. The selection of search strategies e.g. browsing versus directed search, does not directly depend on the functionality offered by the UI of the system. However, the authors also claim that browsing is the most common strategy used to locate suitable images.

Image selection was described as a process that may comprise of a single stage, or occur in stages, where the initial stage would involve selecting a set of candidate images, and the final selection would be made from this set. This two-staged selection is reported in Göker et al. (2016) who conducted a study with creative professionals and was earlier observed by Markkula and Sormunen (2000) in their study with journalists. The selection phase involves assessing images returned as search results against the selection criteria that were initially established in the starting phase and further shaped throughout the search process. Rössler et al. (2011) explain: *"Checking the incoming photos the editor gets activated to select a suitable photo for the context which has to be illustrated."* However, sometimes for many reasons, it may be impossible to find an image that is a close match to all those pre-defined criteria. The user may have to compromise

on them, and select what is an acceptable image, rather than what would be the best match. The flexibility around criteria depends on many factors, e.g., the nature of task, domain, time, and the type of need. Rössler et al. (2011) point, as well, to ethical and moral judgments as factors influencing the selection process, especially with respect to child protection issues, personal data protection, and copyrights. In making such judgments, journalists refer to editorial guidelines (Westman and Oittinen, 2006). Selection process is also affected by the level of domain knowledge, and operational knowledge of the image seeker (Rössler et al. 2011). It is commonly believed that the evaluation of image aesthetics is subjective and based on personal views and preferences (Markkula and Sormunen, 2000; Rössler et al. 2011; Westman and Oittinen, 2006).

According to Conniss et al. (2000), the image searching process is dynamic in nature and includes iterations to the initial search instance. This, in most cases, is reflected in query modifications, in response to e.g. the shaping of the image needs, too many or too few results returned, too many irrelevant items, or no relevant items retrieved. In the ending phase, the user stops searching. This may follow an exhaustive search – where the user has looked through all the returned images and found suitable images (the best match or an acceptable match), or non-exhaustive, where the searcher has viewed some of the results and yet, found suitable images, or decided to stop searching with no matches found. The process is modelled in phases, however, Conniss et al. (2000) state that the phases are not discrete or sequential, each forming part of a highly dynamic and interactive process.

As already noted, this model bears resemblance to Ellis's model of information seeking (Ellis, 1989) and does not include the verifying phase included in the updated Ellis et al.'s model (Ellis et al., 1993). Previous research as well as the fact that 'fake news' spread fast in today's connected world (Section 2.4.4) draw the attention to the importance of information verification in the context of journalism (Markkula and Sormunen, 2000; Westman and Oittinen, 2006). Göker et al. (2016) conducted a study in an online newsroom and found that the behaviour displayed by news image editors was not consistent with the selecting phase in Conniss et al.'s model (Conniss et al., 2000). The model assumed that the users selected images from a static collection in a traditional 'pull' manner, while the study showed that in online journalism news stories are continuously emerging and fresh images are being endlessly uploaded. To date, the study by Göker et al. (2016) is the only study that included online journalists. However, in the sample of 13 participants, only two participants were online journalists, and a small number of tasks were observed. It appears that all observed tasks were based on *actual* and on-going news stories, as the participants clearly expressed needs for *actual* photos from events that were happening as they were being reported (or encountered) through various information sources. Yet, this is not the only type of news content that is published on news websites. A look on any of the major news website will show that some of the published stories that make headlines relate to future events, e.g., news content promoting scheduled sports events, e.g., football matches, Wimbledon matches, before any of the matches have begun etc. In such cases, a search will be performed for *ready* images (as opposed to actual images) taken at other events in other contexts, that can

be re-used. In this investigation, Conniss et al.'s model (Conniss et al., 2000) will be tested for a wide range of online journalistic content.

2.2.3.3 Illustration task process model

It has been commonly agreed that searching for visual information is not the end goal in itself but serves a wider illustration task. Based on their observations of image users in a newspaper editorial office, Markkula and Sormunen (2000, p.274) proposed an illustration process model. This model encapsulates image searching, however, it suggests that the task ends at the moment when images have been selected for publication: *Select the photos to be published*. The authors report that image users in journalism make acceptable selections, they do not capture any post-selection activities or work carried out on images before publication. The post-selection information use is a heavily under-researched area. In their study with academic lawyers, Makri et al. (2008) observed that the participants tended to edit information that they had found by, e.g., cutting out only the parts of text they found interesting, in preparation for later use. The authors who applied Ellis's model (Ellis, 1989), proposed to update the model with a *collating and editing* stage. Makri and Warwick (2010) used this refined framework to analyse information seeking behaviour of architects with a focus on how these professionals search for and use images. Their findings show that post-selection editing is an important activity carried out by image users on selected images.

It is important to acknowledge that image professionals in journalism are not *employed* in their roles as information searchers but as creative professionals with an expertise in imagery and skills in using image editing software. Online journalism is one of the contemporary creative domains. For example, Göker et al. (2016) included news image editors in their study into image seeking behaviour of creative professionals. However, so far, there is no existing research investigating whether, how, and why images are treated editorially in journalism (or online journalism) before publication.

In this investigation, Markkula and Sormunen's model (2000, p.274) will be used as a starting point for the description of activities within the illustration task process. However, it is accepted that the model in its current form is limited. To allow this investigation to describe the illustrative process accurately, it is proposed that any observations of image users must be extended to include the post-selection activities.

2.2.4 Searching strategies in image collections

Bates (2002) proposed a typology of information seeking modes and differentiated between two active modes: searching and browsing. While the former is defined as an active and directed activity, the latter is considered as *undirected* mode of information seeking[12] in which information seekers have no precisely defined information needs but decide to engage in information seeking activity to acquire some new information. While browsing, they "sample" pieces of available

[12] Bates (2002) defines the following modes of information seeking: searching (active directed), browsing (active undirected), monitoring (passive directed), and being aware (passive undirected).

information in multiple glimpses to then "select" from the many options that interest them most. Ellis (1989 p.187) identified browsing as a feature in his model of information searching and defined it as *"semi-directed or semi-structured searching*" within promising areas. Like Bates (2002), Chang and Rice (1993) claim that browsing enables an effective examination of objects that potentially fall within the interest of the information seeker. Wang (2012, p35) states that additionally, it is particularly suitable in environments where information objects are "*visible and more or less organised"*. Hence, browsing may be used for inspiration, and expanding knowledge about a certain topic or domain. This may involve scanning or moving through the information space in selective *berrypicking* (Bates, 2002), following *information scent* (Pirolli and Card, 1995, 1999), and encountering valuable information serendipitously (Erdelez, 1999; Erdelez et al., 2016). However, browsing is not equal to scanning, as the former is far a more complex process.

In quest for *a deeper understanding of the nature of browsing,* Bates (2007) reviewed and analysed reports from previous studies on the subject of browsing. She suggests that browsing is a phased process composed of the following activities: *1) glimpsing a scene, 2) homing in on an element of a scene visually and/or physically, 3) examining item(s) of interest, 4) physically or conceptually acquiring or abandoning of examined item(s).* Bates (2007) further states that*: "this sequence is repeated indefinitely through further glimpses."* Therefore, equating browsing with scanning is an oversimplification of the matter.

Conniss et al. (2000) included *browsing* as an activity that users may choose to engage in within the *Selecting* phase of the image searching process and consider it to be a mode of information seeking as opposed to direct searching for information. Similarly, Smeulders et al. (2000) contrasts browsing with 'targeted searching' where the user is looking for a specific image.

Some studies (e.g., McDonald and Tait, 2003; Sundt, 2002) have reported on a particularly strong inclination to engage in browsing among users of image collections, especially, among artistic and creative individuals. Clarke (2010, p.115) states that *"creative and visually oriented users may not search for materials according to the same logic that verbally-oriented users would employ",* and points to browsing as the preferred method for finding required images. In a study with artists, art historians and architects, Beaudoin (2009) found that these image users typically engaged in "*active browsing for imagery*" in offline and online resources, with an aim to collect and save images of interest to them. When online, some users tended to carry out preliminary searches with a broad and simple query. Based on the returned results, they either broaden or narrowed down the original search and then engaged in browsing through the results. A small number of participants reported that they would typically browse through offline resources but on the internet, they tended to carry out well-defined searches.

Markkula and Sormunen (2000) who conducted a study in an editorial office and found that journalists relied on simple single-word or single-phrase search terms. Browsing was a preferred strategy to locate required images and played an important role in shaping illustration ideas. Similarly, Westman and Oittinen (2006, p.105) found that for image editors "[b]*rowsing was the main search strategy after the initial query*." They observed that browsing was used mainly to

satisfy thematic needs. Typically, searchers browsed images belonging to the same theme, and focused on their unique features, in order to make a selection. The authors suggested that content-based image retrieval systems could better support browsing by grouping images in theme-based sets.

Hung (2012) conducted a study with image editors who were given three illustration tasks that required searching for news images from the Associated Press Photo Archive Database. The research indicated that image searching was *"an intensively visual activity and browsing is the key move for image searching"* (Hung, 2012, p.23*)*. Browse, enlarge/caption, enlarge, alter, and caption were top five common tactics used across the three searches.

It has been observed, that in a typical session, searchers in professional settings browse through approximately 100 images (Jörgensen and Jörgensen, 2005). Göker et al. (2016) claims that the number of viewed images is much higher in the online newsroom, where ca. 7000 fresh images are received daily.

More recently, Han and Wolfram (2016) conducted a long-term study that involved collecting server transaction logs that contained complete clickstream data for a digital image library. These logs were analysed for patterns to better understand the searching and browsing behaviour of the library users who performed naturalistic tasks. The results reveal relatively short pattern sequences of actions that in many cases duplicate previous actions. The data show little individual item browsing within sessions, which indicates that image users tend to engage in purposeful and directed searching. In their study with creative professionals, Göker et al. (2016, p.15) observed 2 news image editors performing naturalistic tasks. They found that these professionals had clear mental models of the image resources available to them. They tended to begin their searches with a visual representation of the required images, entered search keywords with confidence, and engaged in targeted searching. In their paper, they explain, *"the searchers quickly form a picture in their heads of the required image, and then the rest of the search process involves finding an image that matches the internal image."*

Image users may choose to engage in browsing because, as reported in literature (e.g., Goodrum, 2005; Machin and Polzer, 2015; and Markkula and Sormunen, 2000), they frequently struggle to verbalise their needs for visual information, or because they do not want to exclude potentially suitable images that would not be retrieved through direct searches (Conniss et al., 2000). Matusiak (2006) also claims that less experienced users of image collections engage in browsing to locate information that experienced users find through searches. André et al. (2009) compared the logs of queries for image and general web searches performed on Windows Live. Their analysis of the logs showed that image searchers viewed more pages of results than those searching for general information on the web. Image searchers also spent more time looking at search results pages and tended to click on more results than Web searchers. The authors concluded that either query relevance was not as important for image searches as for Web searches, or that query relevance was much worse for image searches than Web searches.

It is important to note that query-based searching and browsing are distinct and equally important information seeking modes. While neither is superior, each of these modes supports different types of information needs and requires different tools (Bates, 2002). However, the literature (e.g., Clough and Sanderson, 2006; Jackson and Moulinier, 2007 p.60) shows that users tend to *browse* to compensate for ineffective query-based searches. For example, Clough and Sanderson (2006) conducted a user study to evaluate a Cross-Language Image Retrieval System. They found that in cases of query failure users *resorted to browsing* categories and viewing numerous pages of retrieved images, in order to locate the relevant assets (Clough and Sanderson, 2006 p.23).

Many earlier studies claim that browsing is a typical searching strategy applied by the users of image collections. It is believed to help image users to shape their illustration ideas, to specify their needs and selection criteria, as well as to discover valuable visuals serendipitously. However, it is not exactly clear whether engaging in browsing is a matter of choice and preference, or a strategy to compensate for users' lack of searching experience, and/or ineffective retrieval.

Browsing is an effortful and time-consuming activity that requires *"plowing through heaps of stuff to find one particular piece of information"* (Sundt, 2002). In online journalism, time is *precious,* and extensive browsing may not be the most efficient way to retrieve required images. In a recent study, Göker et al. (2016) found that image editors perform targeted searches to find news images. This investigation aims to uncover the searching strategies that image professionals in online journalism use to locate required imagery, as well as investigate the actual motivations for browsing. *Browsing* and *targeted search* will be the terms used in the analysis and reporting of findings.

2.2.5 Relevance judgement and selection criteria

Typically, the relevance assessment occurs after the user has interacted with the information retrieval system through query (a text-based or image-based query, or otherwise), and is performed on the retrieved results. For example, in the image searching process model by Conniss et al. (2000), it is the *selecting* phase where the relevance assessment takes place (see Section 2.2.3). However, the relevance criteria start formulating much earlier in the process, i.e., in the *starting* phase. The relevance assessment is a process of matching of the results to the needs of users. Westman (2009, p.76) explains, *"[t]he relevance of an image refers to its match to the image need that the user has."* While the image need is forming, the user also begins developing criteria for assessing the suitability of images returned in search results. As already mentioned (Section 2.2.2), typically, selection criteria are emerging while a mental model of an image is being created. Before they are applied to the relevance assessment, these initial selection criteria are being modified and refined during the searching process, e.g., on encounters with search results. These relations within a problem space have been modelled and presented in Vakkari and Hakala (2000, p.545).

Before the *relevance revolution* (a term defined and used in Robertson and Hancock-Beaulieu, 1992), topicality was regarded as the key relevance criterion in information retrieval (e.g. Cranfield

projects). It was used as a logical and objective relevance criterion for evaluation of IR systems measured on precision and recall. In the 1990's, a new approach to relevance emerged. It suggested that relevance judgements involved users' perception of information based on their needs at a particular time (e.g., Xu and Chen, 2006). Schamber et al. (1990) pointed to the multidimensional, dynamic, situational, and subjective nature of relevance. From the user-centred perspective, topicality, although important, is insufficient for making relevance judgement. Froehlich (1994) compared relevance to an atom where topicality was in the centre, and other relevance criteria 'gravitated' around it, or might override it. Beyond topicality, other user relevance criteria presented in the literature (e.g. Wang and White, 1999; Wang, 2012) include: *quality, depth, scope, accuracy, validity, clarity, availability, accessibility, recency, currency, authority, cognitive, effect, serendipity.*

Barry (1994) conducted a study that aimed to identify criteria that information users applied when assessing the relevance of documents and found that to make relevance judgements, a given group of users with a specific type of task, and in a given situation, apply a finite set of dynamically evoked criteria.

Studies focussing on visual information (Choi and Rasmussen, 2002; Conniss, 2000; Markkula and Sormunen, 2000; Westman and Oittinen, 2006) also report on topicality as the core relevance criterion applied by image professionals when selecting images. Topical relevance is not sufficient for final image selection to be made. In professional settings, image relevance is directly related to work tasks, context, and the indented use of the image. For example, research into image seeking in journalism (e.g. Markkula and Sormunen, 2000) shows that the following contextual factors affect relevance judgement: the article (genre, type), page layout, the tone of voice of the particular news organisation, and the illustration style they adopt. However, this study does not explain what concrete layouts or types of articles were researched and how they influenced relevance judgments.

Hung et al. (2005) reports on a small-scale research with students of journalism, where participants were asked to complete three news-related illustration tasks. Relevance criteria applied in these searches were identified and compared in the three search tasks: typicality, emotion, action, aesthetic, text, familiarity, context, impression, preference, posture, facial feature, and appearance. Typicality, emotion and aesthetic were applied most frequently and across all tasks. In the general and subjective image searches, the participants reported to rely more on their personal feelings when judging the relevance and selecting images. In the specific image searches, they related directly to the characteristics of the objects in photos. These findings show that image retrieval tasks affect image searching, as reported in much earlier studies e.g. Fidel (1997). Hamid and Thom (2017) conducted a study with 12 students who were asked to search for *specific, general*, and *subjective* images. Different sets of criteria were used to make relevance judgements in each of these searches. The three common criteria used were topicality, appeal of information and composition. However, the order of importance for the criteria differed between the type of tasks.

The relevance of an image may refer to the image as a whole (e.g. the item itself, or on the content level – the scene), or a part(s) of the image, e.g., objects in the image (Conniss et al., 2000). This is evident when one or more images are selected to be used in a composite image (Section 2.4.3), e.g., the objects that are considered relevant may be cut out and put together to form a single image. Some studies found that image relevance judgements are made in stages: initially a set of candidate images is selected, then the final selection is made from the images in the set. Typically, all candidate images in the set are topically, technically, and contextually acceptable (Markkula and Sormunen, 2000). At this stage users compare these images with one another and focus on the differences between them (Westman and Oittinen, 2006). Often aesthetic criteria are applied at this final stage and are decisive for the final selection (Markkula and Sormunen, 2000).

In the most basic way, the relevance of images is assessed based on visual inspection of their content, however, the fact that an *image "looks relevant may not be enough to make the judgement"* (Westman, 2009). User research (Choi and Rasmussen, 2002; Hung, 2005; Markkula and Sormunen, 2000) shows that textual information attached to images is used to judge topical relevance of images. Westman and Oittinen (2006) found that in the image selection process, users tended to alternate between viewing the image that was of interest to them and consulting the textual information about it. In their study, Choi and Rasmussen (2002) found that users might change their initial relevance judgement of an image after they had seen a textual description.

Buerger (2010) identified relevance criteria in image searches by building a conceptual model on clusters of factors used to assess relevance of a media object. His findings showed that relevance assessments were most affected by three factors – Abstract and Affective Features, Information and Topicality, and Visual and Compositional Features.

As already mentioned, Barry (1994) found that users with a specific task apply a finite, shared set of criteria corresponding to their needs. Westman and Oittinen (2006) tried to establish the set of criteria used specifically by image editors in journalism. They conducted a survey with image professionals working in newspaper editorial offices, and asked the participants to rate 47 relevance criteria (pre-defined based on literature), in relation to the importance the individual gives to each when selecting images for news stories. The results showed that criteria classified as Information and content were rated as the most important in the image selection process, and followed by the criteria related to the class of abstract and affective, and features in the visual and compositional class. Abstract and affective class of relevance criteria in Westman and Oittinen's survey (Westman and Oittinen, 2006) included:

- Movement and dynamicity
- Eye-catching qualities
- Shooting time
- Mood of the photograph
- Unexpected element
- Expression of the person

The visual and compositional class included:

- visual features
- lighting in the photograph
- composition
- shooting angle
- colours
- direction of the gaze
- direction of the photograph
- shooting distance

The weaknesses of such surveys are that they are based on pre-defined lists of criteria expressed in the language of the researchers who are typically from the information science background. It is difficult to assess whether the participants had the same understanding of the terms as the authors of the survey. Additionally, it is not clear how the participants rated the criteria, in terms of the type of content/ genre, tasks etc. they focused on when providing their answers.

To uncover how journalists select images, Rössler et al. (2011) used an image selection framework based on news factors. They uncovered that *emotions*, *celebrities*, *execution and technique* as well as *unexpectedness* were rated eminently important in the selection process, while other factors, e.g., *controversy* and *sexuality* seemed to be less important. They concluded that image selection was more orientated towards *vivid* pictures. Although, the discussed studies unanimously confirm that image users in journalism require visually attractive, eye-catching, and vivid imagery, these findings are not useful to image retrieval. Markkula and Sormunen (2000) concluded that these users' descriptions related to aesthetics and were too subjective to be further researched. However, Machin and Polzer (2015) pointed that image professionals tend to describe the required visual effects in images, and to inform image retrieval, it is necessary to uncover concrete image features responsible for these effects. This investigation focuses on the precise process of image selection and it aims to uncover the concrete representations of the relevance criteria such as the specific image features. For example, if colours are regarded as an important criterion, what specific colours or type of colours (e.g., saturated, pastels, etc.) decide about the selection. If – as suggested by Barry (1994) – the shared criteria applied by image professionals illustrating online news content can be uncovered, they may be the first step to automated predicting of relevance.

2.2.6 Constraints in image searching

One of the most consistently reported barriers to meeting the needs of image users in journalism is *time* (e.g., Conniss et al., 2000; Göker et al., 2016; Markkula and Sormunen, 2000; Rössler et al. 2011; Westman and Oittinen, 2006). The evidence from user studies and interviews with online journalists writing online news content shows that they experience a high time pressure at the information gathering phase (Hermans et al., 2009), when they are overwhelmed with huge amounts of information coming through various channels that needs to be prioritised and verified.

Studies concerned with image searching in print journalism show that within the image searching process, the time constraints affect mostly the selection phase. For example, Markkula and Sormunen (2000) reported that time limitations frequently resulted in users making acceptable selections rather than searching for the best selections. The impact of time pressures related to instantaneous real-time reporting on image searching in online journalism has not been previously researched or discussed, but it can be assumed that time is a limiting factor in meeting image users' needs.

Like with texts, searching for images in online image collections requires *"plowing through heaps of stuff"* (Sundt, 2002) in search of one suitable photograph. Information overload, and especially large numbers of irrelevant results is another challenge that image users face. In her study with artists, art historians and architects, Beaudoin (2009) observed large numbers of irrelevant results caused image users a high level of anxiety and frustration.

Other external challenges and constraints mentioned in the literature (e.g., Conniss et al., 2000; McCay-Peet and Toms, 2009; Rössler et al. 2011) include: image availability, copyrights, cost, system functionality.

2.3 Trajectory two: Current approaches and trends in image retrieval

One of the goals defined for this investigation (Goal 2. Section 1.2.) is to propose practical and measurable improvements to image retrieval founded in image users' needs. While Section 2.2 presented a review of the existing literature concerned with the needs and behaviour of image users, this Section is concerned with current approaches and trends in image retrieval. Section 2.3.1 briefly discusses the concept-based image retrieval. Section 2.3.2 focuses on the content-based image retrieval (CBIR) and the semantic gap problem, and finally, Section 2.3.3 provides review of studies carried out on the hybrid image retrieval systems.

2.3.1 Concept-based image retrieval

This Section will briefly explain the principles of the concept-based image retrieval and discuss the main reasons why this approach is unsuitable to large image collections.

Concept-based systems are built on the same principles as information retrieval systems for textual information and rely on manually entered descriptive metadata (MEDM). Textual descriptions such as keywords (or tags), and captions, are added to images manually by a human indexer, and images are retrieved by querying for the added textual metadata[13]. Metadata may include non-visual information about the image, for example, the date of creation, author, focal distance, semantic descriptions about the content, as well as high-level abstract features and concepts capturing emotion, mood, and feelings. MEDM is still used widely and proves to be an effective indexing method for small image collections, for example, a collection within a single

[13] For example, Weinberger (2007) describes in detail the process of manual indexing at Corbis.

organisation where users typically search for specific images about a particular person, object, or event.

The factors that impact on the effectiveness of concept-based retrieval systems are: the fact that, by nature, images are predisposed to subjective interpretations, and that these systems entirely rely on human indexers and their ability to analyse the visual object, verbalise what they see, and choose *suitable* terms.

To ensure consistency, professional indexers may be systematically using one of the frameworks developed for indexing and describing images e.g. Jaimes and Chang (2000), Westman et al. (2010). Yet, their individual personal characteristics, abilities and motivations, as well as their actual location, may all affect the way they perceive and describe images. The descriptions may be also affected by language skills, the breadth of vocabulary, e.g., using synonyms, and ability to spell words correctly, as well as the knowledge of a subject domain and terminology specific to a given domain. The indexing tools also impact on the quality of metadata. For example, if a controlled vocabulary (CV) is available, the pre-defined CV terms need interpreting before they can be used (Rafferty and Hidderley, 2005). Additionally, manual indexing is an extremely intensive activity in terms of time and labour, which may lead to large backlogs of unindexed images and/or incomplete image descriptions.

In some domains, this problem has been effectively addressed with social tagging, a method where web users add their own searchable keywords – tags – to photos, videos, and other online content (Weinbereger, 2007). For example, many social networks, e.g. Twitter[14], and image hosting services such as Flickr[15], and Instagram[16], rely on the users to manually tag published content. Image descriptions generated through this collaborative effort are rich in terms of numbers of tags. However, a large quantity of tags does not guarantee a high quality of descriptions. Kroski (2006) lists several problems related to social tagging. For example, there is a lack of clarity whether users tag content for private use or for public retrieval. Tagging introduces more ambiguity resulting from cultural differences, from the use of specialised tags or tags meaningful only to a small group of users, as well as from tag spamming[17] (Urban Dictionary, 2010).

Considering these problems (Kroski, 2006), such uncontrolled self-organising systems without any form of “representative authority” (Rafferty and Hidderley, 2007), may not be suitable to domains such as journalism, where the authenticity of published information is a matter of ethical responsibility (Holderness et al., 2011; Section 2.4.4.2). While citizen journalism is an important aspect of current affairs reporting, verifying the authenticity of user-generated content is a difficult task, and may contribute to the spread of ‘fake news’ (Dredge, 2014). Therefore, large collections of journalistic imagery require a systematic, objective and controlled method of indexing.

[14] Twitter: www.twitter.com
[15] Flickr: www.flickr.com
[16] Instagram: www.instagram.com
[17] Tag spamming: the use of irrelevant tags to images so that the images are retrieved in more searches (Urban Dictionary, 2010).

The Section below will present selected frameworks for image descriptions frequently applied in manual image indexing, in order to present the richness of the description that they allow.

2.3.1.1 Frameworks for image description

While many of the issues occurring in the indexing of images are similar to those encountered in the indexing of textual documents, there are also many additional difficulties that are unique to the visual medium (Rafferty and Hidderley, 2005, p.1). Chen and Rasmussen (1999, p.292) state, *"images bring with them problems of description and access more complex than those of text".* To date, several frameworks for image description and indexing have been proposed for use in image retrieval. These include, e.g., Shatford/Panofsky matrix (Shatford, 1986), a detailed framework proposed by Jörgensen (1998) and expanded by Laine-Hernandez and Westman (2006), Hollink et al.'s framework for the classification of image descriptions (Hollink et al., 2004) based on earlier classification models in the literature, and an image indexing model by Jaimes and Chang (2000) (Figure 2-4.). The early frameworks such as *Panofsky/Shatford matrix* (Shatford, 1986) tend to focus solely on the visual image content, i.e., the *ofness* and *aboutness* of the image, and a subject access to images, while the more recent ones, e.g, Jaimes and Chang (2000), allow to distinguish between the semantics and syntax of the image, as well as to capture the non-visual image attributes associated with the image (in metadata, keywords, tags, captions attached to an image) but not present in the image itself. Semantic information in an image is carried out by conceptual content and may be analysed on the level of generic or/and specific elements present in the image (the *ofness* of the image), and/ or on the level of the abstract themes present in the image (the *aboutness* of the image). While describing the *ofness* involves decoding and naming of the objects in the image, interpreting the *aboutness* from the image requires previous personal or cultural knowledge, and experience from the viewers. The low-level perceptual image features, also referred to as the image syntax, include: colour, texture, sharpness, shapes, and composition, i.e. the spatial layout of elements within the image frame.

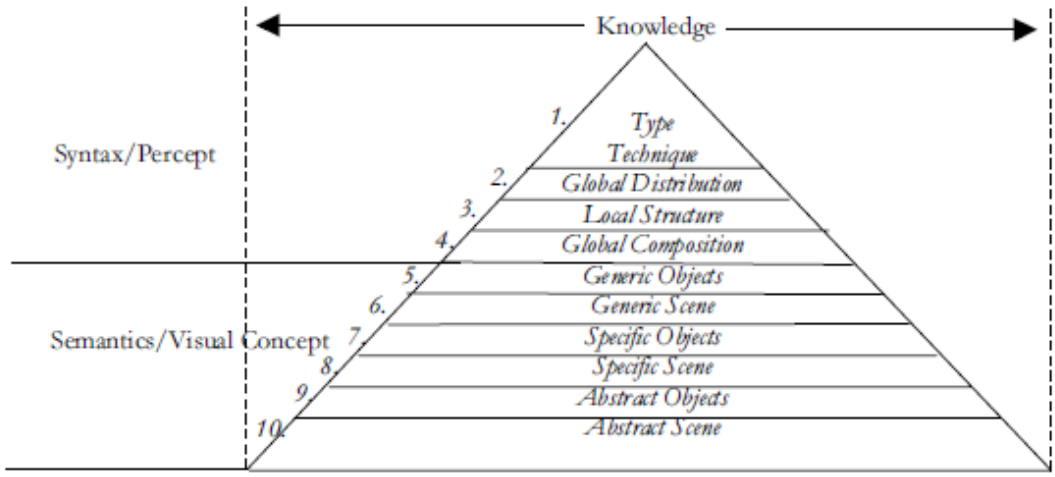


Figure 2- 4. An example of a framework used for indexing of images

The differences between the frameworks lay in the number and granularity of the attributes that each framework allows to capture. For example, in their image indexing framework (Figure 2-4.),

Jaimes and Chang (2000) identified the following layers and attributes in image semantics: Generic Object, Generic Scene, Specific Object, Specific Scene, Abstract Object, and Abstract Scene. Hollink et al. (2004) proposed to divide the semantic level into the General, Specific, and Abstract conceptual levels where each includes the following attributes: object, scene, event, place, time. Hollink et al. (2004) point out that the levels are not exclusive, and to ensure that image descriptions are complete, information at each level must be captured. Jörgensen's division (Jörgensen, 1998) shows the highest level of granularity, and capturing both whole objects (people, objects) and the detail in images such as: body parts, clothing, and text. The novelty of Jörgensen's framework (Jörgensen, 1998) was the inclusion of attributes external to the image itself such as: external relationships (comparison, similarity, reference), and viewer's response (e.g.: personal reaction, conjecture, uncertainty). Jörgensen's framework (Jörgensen, 1998) was tested and further developed by Laine-Hernandez and Westman (2006), who added three additional categories: Weather, Animals, and Visual quality. These image attributes emerged in an analysis of the description and classification of journalistic (reportage) photographs.

A unique aspect of the framework by Jaimes and Chang (2000) is that it gives attention and importance to the description of relations between visual elements in the image. These relations may be of two types: semantic and syntactic, and can be identified for attributes in semantic and syntactic levels. The relations describe how visual elements shown in the same image (on the syntactic level, e.g., two shapes, and on the semantic level, e.g., two people) relate to each other temporally, spatially, and visually. Based on earlier work of Hernandez (1994), Jaimes and Chang (2000) further divided each type of relations into subclasses. Spatial relationships include two subclasses: topological, and orientation. Temporal relations include those that connect elements with respect to time (e.g., in video these include before, after, between, etc.), and finally, visual relations refer to visual features in images (e.g., bluer, darker, etc.). Semantic relations are associated with meaning (e.g., owner of, friend of, etc.). Both syntactic and semantic relations can be further described as specific, generic, or abstract. While they do not explicitly refer to the visual social semiotics (VSS) framework (Kress and van Leeuwen, 1996, 2006), the levels of image description in Jaimes and Chang' model (Jaimes and Chang, 2000) correspond to the *visual resources* in VSS. Using aspects of semiotics to analyse multimedia objects for indexing has been proposed by Rafferty and Hidderley (2005) who view concept-based information retrieval process as a complex communicative process. They claim that a semiotics-based interpretation offers a richer description of non-textual objects to traditional reductionist approaches based on subject classification schemes and controlled vocabularies.

2.3.1.2 An example of a framework for multifaceted image description for journalistic images (Westman, 2010)

Inspired by Shatford-Layne's (1994) call for a multifaceted approach to image categorisation, Westman et al. (2010) developed a multifaceted categorisation for journalistic images. They based their proposition on the results of two consecutive user studies. In the initial study, 10 main classes of magazine image categorisation criteria were defined in sorting tasks with 30 non-expert

and expert users. These category names were analysed, and a framework was developed. In Study 2. this framework was evaluated with a group of 24 experts who categorised images by means of the proposed framework and found it useful for the task. Based on the categorisation task, the researchers also identified and analysed how the classes were interconnected and included the connections in the final model. The facets that emerged as a result of the studies include: Function, Theme, Visual, Story, Photography, Affective, and Description. These facets capture the syntax and semantics of images, the non-visual information, as well as the use of images, e.g., illustration, advertisement. The findings showed that the following classes: Function, People, Objects, Scene, and Theme were perceived as most useful in categorising of magazine photographs. Other classes were considered slightly less useful but on the whole, there was a clear need for a tool that would enable professionals in editorial settings to perform a multifaceted image description. Figure 2-5. presents an exemplary UI where the facets have been implemented.

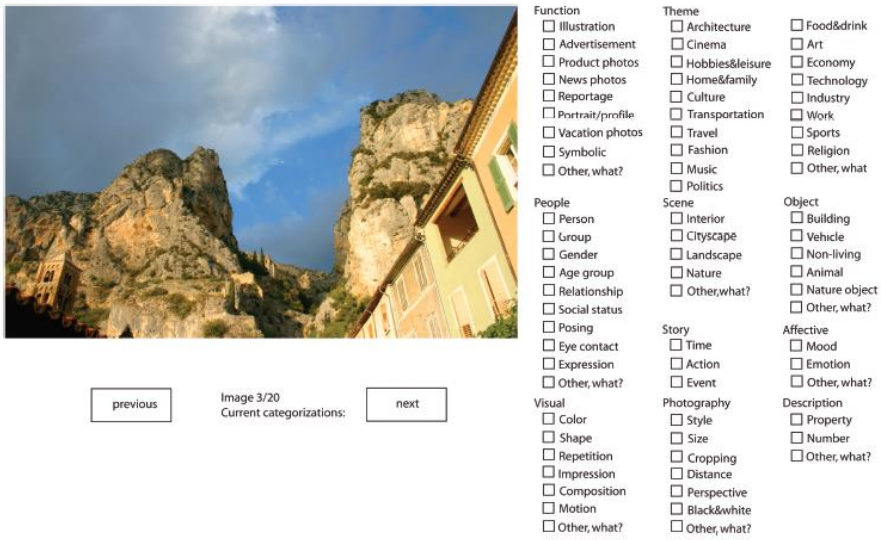


Figure 2- 5. Faceted UI for image indexing from: Westman et al. (2010, p. 306)

Further, connections between the classes were identified, which implies that sets of logical rules may also be developed, for example, *if a People subclass has been chosen, a Story subclass most likely could also be specified*. According to the authors, this faceted model may be used for categorisation of images in workplaces, such as magazine editorial offices. This framework reflects the needs of users from a specific domain and therefore, is an example of *user-centred indexing* (Fidel, 1994). Laine-Hernandez et al. (2010) tested this framework and found that the model can be generalised and successfully applied to characterise other image genres such as stock photography.

On one hand, human indexing proves to be more effective in providing image descriptions adequate to the needs of image users from a specific domain, e.g., journalism, and human indexers are able to capture concepts relevant to users' needs but not readable to computer vision. On the other hand, it is dependent on the individual skills of human indexers and it is time-consuming. This makes concept-based retrieval indexing impractical for large image collections.

2.3.2 Content-based image retrieval (CBIR) and hybrid systems

The manual indexing of images allows for detailed and user-centred description of images on all levels, yet, due to reliance on human input, it proves to be unsuitable to large online image collections. The problems with manual indexing have led to the rise of interest in the content-based image retrieval (CBIR). Being an automated approach, CBIR is grounded in computer vision and machine learning, and is dependent on the developments in these fields. CBIR systems differ from the concept-based systems in terms of how images are queried, indexed, and retrieved. The most popular types of queries used in CBIR systems are:

1) query by direct specification of low level features e.g. a specific colour
2) query by example (and multiple examples) which involves providing an exemplary image to the system that is used as a visual query. The results need to share common elements with the provided example[18]
3) query by sketch that uses a drawn approximation of expected results, for example, blobs or sketches (e.g. McDonald and Tait, 2003; Westman et al., 2008)

These querying techniques (in particular, query by example and query by sketch) remove the necessity to verbally describe an image, hence, they allow to eliminate the subjective element present in text-based queries formulated by humans. Some systems allow for quite a complex query formulation. For example, Zhang et al. (2012) developed a CBIR system that offered users a possibility to formulate a query not only related to objects in the image, but also to the background and external conditions, e.g., a season, weather, time of a day. The UI allowed the user to enter the percentage, relative position, as well as the size of each object in the background. However, relying on image-based queries is rather limiting as it depends on the user's ability to imagine the result before the search has begun. In many cases the searcher may not know what they want to find before they see the retrieved items, and in many cases, searchers tend to modify their queries in the search process (Bates, 2002). Systems based solely on CBIR struggle with enabling users to re-fine their queries. The solutions that are often implemented involve users in providing relevance feedback on the displayed results, e.g., marking returned images as relevant, not relevant, or neutral. Based on this user feedback, the system re-fines the query and adapts it towards features shared by those images marked as relevant.

For automatic indexing, the computer analyses an image and extracts visually perceivable features known as low-level features (syntactic) image features that include general features and domain specific features. Currently, an automatic detection of the following general visual features is possible:

- colours: red, green, yellow, blue etc.,
- colour attributes:

[18] TinEye service at tineye.com offers a 'reverse image search'. This service enables users to trace the usage of a particular image on the web.

    - brightness: dark, light,
    - saturation: saturated, pastel (soft),
    - hue: gradation of colour; a shade or tint,
- texture: roughness, smoothness,
- shapes of objects,
- spatial location of an object/objects in the image.

These features, as well as the relationships between them are automatically detected and extracted by means of algorithms and the set of visual characteristics of the image is stored in a database. The chance for an effective retrieval increases, with the number of features stored for any given image.

In contrast, the application-dependent features include, e.g., detection of human faces, finger prints, and are commonly applied in camera viewers, photo applications as a face recognition tool to help users tag people in photographs. The detection and application of domain-specific features are an area of interest to studies into pattern recognition (e.g., Chen, 2015).

The content-based approach to image retrieval allows to index and categorise images automatically, yet, CBIR systems are still much less effective in fulfilling image user needs when compared to concept-based systems. While computers effectively recognise and match text to text, they *struggle* with identifying, analysing and matching image features (MacFarlane, 2016). Current computer vision techniques can automatically extract low-level features from images, however, humans tend to use high-level information in everyday life and their needs relate to high level concepts. Matching low level content to high level concepts is one of the key problems that concern those involved in the design and development of CBIR systems. In the literature (Enser, 2008; Enser and Sandom, 2003), this problem is referred to as the Semantic Gap problem. To narrow down the semantic gap, some off-line and on-line processing is needed. One major technical barrier lies in linking the low-level visual feature indexes used in most systems today to more desired semantic-level meanings. Vailaya et al. (2001) states: "*users typically do not think in terms of low-level features, i.e., user queries are typically semantic (e.g., "show me a sunset image") (Section 3.2.1.3) and not low-level (e.g., "show me a predominantly red and orange image"). As a result, most of these image retrieval systems have poor performance for (semantically) specific queries*." Tackling this problem is one of the major aims of CBIR research.

In attempts to link low-level features to high-level features, concepts and theories from sciences related to human perception, cognition and psychophysics are used, for example, the application of colour semantics (Corridoni et al., 1999), and colour emotions models to image retrieval (Solli and Lenz, 2008; Solli, 2009). Other examples include theories of object recognition and perception, perception of similarities, and interpretation of parts as one whole, object hierarchy (Jaimes and Chang, 2000) and attempts to capture high-level concepts from low-level image features by clustering them into subclasses, e.g., indoors and outdoors (Vailaya et al., 2001), analysis of different types of spatial/topological relations between objects in the image frame (Hernández-Gracidas et al., 2011). Tahir et al. (2013) proposed a method for recognition of

scenes types (mountains, snow, etc.), and detection of human actions such as phoning, playing instruments. So far, face detection and recognition in images[19] is one of the most successful applications of object detection techniques in combination with CBIR (Zhao et al., 2003). The "*Bag of Visual Words*" framework allows to treat image features in a manner similar to words in text, and classify the *visual words*, the relationships between them, and their occurrence (e.g. Kaliciak, 2013; Yuan et al., 2007).

There have been several attempts made in the field of CBIR to link low-level features to aesthetic values in images that are typically associated with the following visual aspects: sharpness, colourfulness, colour distribution, contrast, saliency, clarity, contrast and simplicity, in addition to lighting, composition geometry, colour harmony, and image noise. Datta et al. (2006) explored the relationship between the low-level content in pictures, and the emotions that the features aroused in viewers. As measures of aesthetic value, the researchers used '*photographic rules of thumb'*, e.g., the rule of third (composition), depth-of-field, convexity, colourfulness, and familiarity. As the result of the study, a classifier for distinguishing between the high and low aesthetic values in images was developed, as well as a regression model for prediction of aesthetics scores in images. A good accuracy in separating high and low rated photographs was achieved for 15 visual features. For the purpose of his study, Obrador et al. (2009), defined the image aesthetic appeal as *"the interest that a photograph generates when viewed by human observers, and it incorporates both objective and subjective factors."* They proposed an algorithm for ranking of images according to their aesthetical appeal and applied it to images on Flickr[20]. This method recognises an image as aesthetically appealing *if it has a large relevant region that is sharp, colourful, well illuminated and well contrasted with the background*. Referring to earlier studies in human perception, Obrador (2008) claimed that people tended to look first at those regions of photographs that were most aesthetically appealing to them. Further, he showed that not all regions in an image needed to be aesthetically appealing in order for the whole image to be regarded as appealing.

Currently, a hybrid approach is used by some popular systems e.g., Corbis[21], GettyImages[22], eBay[23], GoogleImages[24], and EyeEm[25]. Such systems allow the user to enter a textual search term, and are based on thesauri constructed from user queries, while images are also automatically categorised (and retrieved) based on colour, shape, and other visual features (Kaliciak, 2013). More recently, searching-by-image (reversed image searching) is also gaining in popularity. The applications and image collections that offer this functionality include: TinEye[26],

[19] For example, Facebook offer their users a tool for automatic tagging of personal images with names of people shown in the images. It is based on DeepFace software that can compare photos irrespective of lighting or angle. It achieves an accuracy of 97.25% that is extremely close to human accuracy of 97.53% for the same tasks (ExtremeTech, 2015, https://www.facebook.com/facialrecognitionapp)

[20] Flickr at www.flickr.com
[21] Corbis at www.gettyimages.co.uk/photos/corbis
[22] GettyImages at www.gettyimages.com
[23] eBay at www.ebay.co.uk
[24] GoogleImages at https://images.google.com/
[25] EyeEm at https://www.eyeem.com/
[26] TinEye at https://www.tineye.com/

GoogleInsideSearch[27], Flickr. They apply the latest developments in computer vision and machine learning to retrieve visually similar images in terms of shape, composition, colour, or content category. Flickr also uses automated retrieval to surface "*beautiful*" images created by talented users who are not highly engaged in online social interactions (Schiffanella et al., 2015). Consequently, their images despite their high artistic quality, have low visibility "*lurking in the tail of the popularity distribution*." The system uses a set of aesthetic criteria purposefully pre-defined by human professional photographers, to retrieve images of high *artistic* quality.

Research into the use of the CBIR systems with the reversed searching functionality is still scarce, and the available studies focus on identifying use cases where such searches could be useful and applicable beyond tracking images used without appropriate licence (e.g. Thompson and Reilly, 2017). Despite their growing presence, it is fair to say, that neither CBIR, nor hybrid systems are yet in widespread use as most of the commercially available image retrieval systems (and those used in professional settings) rely predominantly on text. 20 years ago, Fidel (1994) stated, "*automated indexing with its dynamic and flexible nature is most fit to tailor indexing to requirements of individual users and requests, yet most of current research in the area focuses on the development of global methods. Regardless of the method, user-centered indexing cannot be developed before searching behavior is understood better*." This remains true to the present day, as most of the work in content-based retrieval tends to focus on the detection of the low-level features or specific concepts or objects, while largely ignoring the image needs of end-users of the system and the way they search for and select images. Jaimes et al. (2006) claim that one of the biggest challenges of building automatic image retrieval systems is indexing of the images at the level that matches the user's interest level. Many studies in CBIR, involve users only in the final stage to test the product (algorithm) but it is not a needs-based evaluation and in consequence, the proposed retrieval method may not be appreciated by potential users. For example, Rodden et al. (2001) describes a study where displaying of image search results based on visual similarities was tested with users, and reports that participants could not see sufficient linking between the proposed way of presenting of visual search results. Since users' needs are the foundation of the effectiveness of systems (Beard, 1991), it is important to propose solutions that are rooted in these needs.

Based on a user study Markkula and Sormunen (2000) evaluated the potential for usefulness and applicability of CBIR system in a journalistic environment. They excluded a possibility of a pure CBIR system to be effective because of the difficulties related to formulating and submitting a visual query: "*it is difficult to envisage common uses for pure visual query without textual search keys combined. The first problem is how to formulate a visual query"*. Therefore, the authors take the view that the main chances of applying automatic visual methods are associated with the browsing stage of photo searching. However, the results of a more recent study by Westman et al. (2008) showed that there was a need to support multimodal image retrieval in the context of journalism that would allow journalists to formulate queries based on one or a combination of the

[27] GoogleInsideSearch at www.google.com/insidesearch

following modes: text, colour, sketch, quality, and category. Once offered such an option (in a prototype), professional journalists were able to combine up to four query modes into a query, and most queries combined at least two of the modes. In comparison to non-professional participants, journalists used the colour mode more frequently and readily refined their queries. However, they drew fewer sketches, and were less likely to switch between modes. Further, Markkula and Sormunen (2000) claimed that a hybrid image retrieval system could effectively support users in browsing, by providing them with results pre-clustered in theme-based sets, or grouped in different photo categories contained in the retrieved set, e.g., a visual organizer could group photos of a specific person into the "passport" photos, single portraits, photos also depicting other people and photos with special backgrounds."

The theme of feature sets is recurring in relation to image retrieval (e.g., Markkula and Sormunen, 2000; Westman and Oittinen, 2006; Westman, 2010). When describing their needs and how they judge image relevance, users usually refer to several features, rather than a single feature, that helped them select the image. This echoes Barry's claims that information users with the same type of tasks, apply shared and finite sets of criteria. According to Jaimes et al. (2006), the main challenge to achieving meaningful retrievals, is to effectively extract and interpret perceptual (syntactic) image features from users' descriptions of their needs. Identifying sets of image features that are meaningful to their users could be the first step to automatically predicting of relevance, and this is the area where improvements to image retrieval (Goal 2) will be sought in this investigation.

2.4 Trajectory three: The use of images in journalism

Images have had an important role in news relay ever since it was possible to reproduce an image in print. Initially, they were regarded as secondary in value in relation to text and used only for illustrative purposes. However, once publishers recognised the impact of visuals on the increase of news readership and sales, the way images were used was diversified. This led to significant investments and fast progress in image reproduction and print technologies. In the mid-20th century, images have come to be an integral part of the journalistic content and by the time the internet entered the newsroom, images had already gained a status of *"an equal partner in news relay"* (Zelizer, 2005) and to the point that access to *great* photographs is extremely important as it may influence whether or not a story gets published (Caple, 2013).

Imagery, and particularly photographs, found their place in journalism for several reasons. Firstly, understanding what is depicted in a picture is *easy* (Rogers, 2003). Unlike the meaning of text, the meaning of an image can be grasped at one stroke, without much analysis or deep interpretation (Barthes, 1973). At a minimum, it involves recognition of objects depicted within the image frame, for example, an image can be *of* a person, of a building, or another entity. This objective '*ofness'* of an image is accessible to many viewers even if the image is viewed in isolation. For this reason, many journalistic images taken in one place of the world can be transmitted worldwide without an additional explanation (Gürsel, 2016).

Secondly, the meaning in the image is not constant but context-sensitive (Sontag, 1975). Images can be de-contextualised from their origins and re-used multiple times in new contexts. The meaning of a re-used image will change with the context in which it is placed and viewed (Sontag, 1975; Wollen, 2003). The same image can be used to illustrate a variety of news stories. The reusability is the quality of images that online collections such as GettyImages, GoogleImages, Corbis, Shutterstock, iStock, etc., thrive on. By providing *ready* images for re-use, they are more than merely image archives or a *photo morgue*[28] of the digital era.

Moreover, photographs used in journalism are often *newsworthy* themselves, sometimes also being the very factor that causes events, shapes public opinion, and plays a critical and highly controversial role in political and military actions (Gürsel, 2016). There are examples of news photographs that had a significant impact on how important decisions were made. Many regimes effectively used imagery to propagate their political ideas and influence public opinion. Some photographs are believed to have had the power to end wars[29] (Kobré, 2008, p.88) and Goodman (1978) referred to such images as *formative worldmaking images*. This has been possible because photography is believed to be a device for stopping time and capturing reality (Wollen, 2003), and photographs are commonly thought as showing the *status quo* of the depicted situation. Especially journalistic images, are believed to be the evidence of events. Sontag (1975, p.64), explains, *"[p]hotographs give us information. (…) It is as if the words don't have the weight they should have, so that one of the statements being made by any photograph is: 'This really exists'."* This statement is true when *actual* images are used. Such images show the scene including correct people, objects, and location of the reported event and are a visual account of the event. In contrast, 'filed' images are typically re-used out of their original context and do not have the informative/documentary role. Sometimes they are used temporarily as *filler* images, until actual photos become available. For example, when the news story "Philippines ferry carrying 251 capsizes" appeared on the BBC news (21st December 2017), image A. (Figure 2-6.) showing Philippine coast guards was initially used. Apart from the headline and the caption, it had a label: *file photo* to inform the viewers that this image had not been taken at the scene of the reported incident. Later, the image was replaced with image B., an actual image from the incident described in the news story.

[28] Photo morgue (file morgue), a now outdated term used in print media for an archive of physical files that included clippings and images related to specific news events stored for re-use.

[29] Examples of powerful journalistic photographs include, e.g., the photo taken by Ut in 1972 depicting a naked girl and other children fleeing a napalm attack during the Vietnam war (http://www.apimages.com/Collection/Landing/Photographer-Nick-Ut-The-Napalm-Girl-/ebfc0a860aa946ba9e77eb786d46207e), Paul Watson's photograph of the body of an American soldier dragged through streets of Mogadishu taken in 1994 (https://iconicphotos.org/2010/03/10/u-s-marine-dragged-through-mogadishu/) prompted the withdrawal of US soldiers from these two wars. Photograph by Kevin Carter in 1993 of a famished Sudanese child being followed by a vulture (http://100photos.time.com/photos/kevin-carter-starving-child-vulture) exposed the extent of the suffering during Sudanese famine, which then became known internationally, or more recently a photograph of a drowned Syrian refugee child published in newspapers (The Guardian, 2015) was believed to have a huge impact on the public opinion in regard to the refugee crisis.

A.  **B.** 

Figure 2- 6. Image A (left): the file photo published on bbc.co.uk/news as a filler image, replaced with Image B. the actual photo (news content published on 21st December 2017, images changed since)

In numerous cases, however, actual images may not exist, for example, photographers were not present when the event was unfolding, or some events have not yet taken place. *Ready* photographs are selected to illustrate such stories. When re-used, photos must carry no ties with the original context because they are not used to visually confirm or inform about the events in the news story but to attract readers' attention to content (Rössler, et al., 2011). This is yet another reason why images have such an important role in journalism. Images appeal directly to the innate human preference for visual and being visually stimulated (Mulvey, 1975). The audiences expect to see images with text-based news. Referring to journalistic content, John Loengard (2010)[30] claims that "*The reader sees before he ever reads and many may never read if there's nothing interesting to see.*" Visually rich content is a distinguishing characteristic of online journalism (Pavlik, 2001). While it is known that the instantaneous, real-time reporting – another quality of online news – puts much pressure on journalists in news gathering process, little is known about the work of image professionals in the online newsroom. Göker et al. (2016) provide some insights from a study that included image editors working in the online newsroom. They found that to source suitable visuals, image professionals view thousands of photographs daily and work to exceptionally tight deadlines. Vobič and Trivundža (2015) report that typically, each piece of online news published on template-based pages requires at least one image and news pages are being continuously updated. They found that image users in online journalism work under a constant pressure to provide suitable visuals and named this experience as "*the tyranny of the empty frame*". Visuals in online newsrooms are predominantly sourced from online news collections such as e.g., GettyImages, GoogleImages, Shutterstock, etc., however, as explained in Gürsel (2016), most of the visual assets providers are not part of the press. While they handle many significant and widely published journalistic images, not all images that they provide are representation of news. News imagery is for them one of many product lines, aside from other creative image uses, e.g., marketing and advertisement, e-publishing and blogging, web design, with the result that they provide generic access to images.

Considering the established position of online news services as the second to TV main source of news (Ofcom, 2017), and the importance of images in journalism, it is important that image users

[30] John Loengard was the Life's magazine picture editor between 1972 and 1987, the picture editor of Time Inc., planning and launching People magazine in 1974, won the first award for "Excellence in Photography" from the American Society of Magazine Editors, and was given the Henry R. Luce "Lifetime Achievement Award" from Time Inc. (2004). In 2005, was included in the list of "One of the 100 most influential people in photography" published by the American Photo magazine.

in online newsrooms can effectively and efficiently access required visuals. There is a need for a domain-specific automated retrieval rooted in image users' needs and underpinned with a thorough understanding of the context of use (Beard, 1991; Conniss et al., 2000).

2.4.1 Traditional categorisations of journalistic images

Journalistic images have been investigated from a variety of perspectives. In traditional classifications, they are categorised based on the editorial section, or the genre of the journalistic content that they are published with. For example, Lester (1991) analysed photojournalistic assignments and categorised journalistic imagery into the following categories: news, sports, features (published in a feature section), illustrations (composite images), picture stories (several photos depicting events in a time sequence), and portraits. Similar categorisations are described in Lewis (2005), Newton (2001), as well as Kobré (2008) who additionally distinguished between spot news photos and general news photos. Although these categories are still commonly used, for example, at journalistic photography competitions, their usefulness to image retrieval is limited. These categorisations do not include images that although were not originally created as news images, could potentially be used with journalistic content. For example, Gürsel (2016) describes instances of images that gained the status of news images only after they had been published in newspapers. Further, they do not capture "t*he relation between viewers and the world inside the picture frame"* (Jewitt and Oyama, 2001, p.145). Joe Elbert[31], a photographer and AME at The Washington Post, proposed an alternative categorisation based on the visual impact that journalistic images have on viewers, and distinguished between four image categories (levels): 1) informational, 2) graphically appealing, 3) emotionally appealing, and 4) intimate, as shown in Figure 2-7.

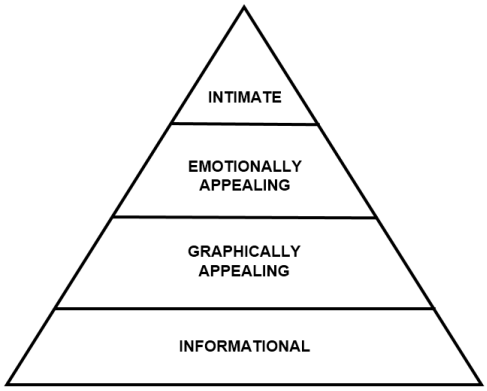


Figure 2- 7. Elbert's pyramid as described in Kobré (2008)

In this classification, (1) informational photos are the most basic category of journalistic imagery. Photos in this category convey information and document the facts in the news story. They prove that the subject exists or that the event has happened, however, typically, they lack visual appeal. (2) Graphically appealing images have attention-grabbing visual elements (e.g. colours, shapes,

[31] This classification is widely referred to in publications for photographers, photojournalists, and image editors (e.g., Kobré, 2008; Fahmy, 2014).

unique composition, light or angle) but lack compelling emotional impact. (3) Emotionally appealing photos go beyond the visual appeal and create an emotional connection with the subject in the image, and finally, at the top of Elbert's pyramid (Kobré, 2008) are (4) intimate photos that go beyond the obvious facts and have enough impact to engage the reader in the news story.

According to Elbert (Kobré, 2008), images categorised on the higher levels: emotionally appealing and intimate, will have most impact on viewers, therefore, are of the highest value to journalism, yet, he further claimed that these images constituted only a minority of images used in journalism dominated by informational imagery. To reflect these proportions, Elbert used a pyramid model (Figure 2-7.). Kobré (2008) suggested that journalistic photographs should ideally represent a combination of aspects characteristic to all levels. Yet, neither Elbert nor Kobré did provide an explanation in regard to these characteristics in terms of concrete image features 'responsible' for creating the desired visual impact.

Handbooks for image editors authored by image practitioners[32] further emphasise the importance of selecting images that are 'powerful' and generate visual impact. Kalish and Edom (1951) believed that readers tended to engage in a story through the lead picture and advised editors to look for images with an *eye-stopping* appeal created by interesting patterns, strong contrasts in tonal value, or those that could be uniquely cropped. McDougall and Hampton (1991, p.34) say that "*In journalism, the key test of a photo's worth is its message content – what it really tells a reader. How effectively a photo conveys its message is influenced by its composition, the arrangement of elements within its borders*." McDougall and Hampton (1991) add, too, that readability of the image related to its size, is one of the key properties to be considered when judging the value of an image for publication. Nowadays, when images are published across different platforms and viewed on a variety of devices differing in screen sizes, this property is of a high importance. Lewis (2005) claims that in the first instance, the value of a news photograph should be judged by its message, while composition and design come next in importance and the questions to ask are: *does the image use its graphic elements well? Is it visually efficient?* Technical quality is also important, and the main concern is the sharpness of the image. Sterling (2009, p. 1053) claims that an experienced editor applies a holistic approach to valuing the worth of journalistic images and considers how the image will work in relation to accompanying text (captions, headlines), and other images and topics on the same page. He further emphasises the importance of the style and tone of voice of the publication. Referring to The Guardian and The BBC Online Sport section, he claims that some publications may put emphasis on images with high-impact colour and strong graphic elements and refers to, while others e.g., Times, Newsweek, Vanity Fair, choose to emphasise portraiture on their front-page. There appears to

[32] It is important to mention that the reviewed handbooks in image editing were written by image practitioners (photographers, photo editors) rather than scholars, and for image practitioners. While the image classifications and selection guidelines presented in these sources are based on personal views of their authors, rather than solid academic research findings, some themes important to this investigation have been identified and are summarised below.

be a common agreement among image practitioners that images must be selected based on the visual impact that they have on viewers.

Further, a review of the published research into the image seeking, selection and use in journalism shows that image users work along these guidelines. Some studies concerned with image use present a simplified view of how images are used in journalism and choose to differentiate between two functions: illustrative and/or informative (Fidel, 1997; Göker et al., 2016; McCay-Peet and Toms, 2009). Conniss et al. (2000) who conducted a user research with professional image users found that journalists participating in their study used images mainly for illustrative and persuasive functions. This corresponds with findings from studies in media and communication. For example, Rössler et al. (2011) show that images in newspapers are used to generate visual engagement in readers, encourage further reading, and information seeking. Rössler et al. (2011, p.415) explain, "[e]*very day thousands of events are happening, and millions of pictures are taken. By choosing photographs for newspapers and magazines, photographic editorial departments want to attract the recipients' attention, evoke emotions and get them to read their stories*." Similarly, studies in media and visual communication (e.g. Fahmy et al., 2014; Garcia and Stark, 1991; Knobloch et al. 2003; Machin and Niblock, 2006) prove that images in print media serve as 'eye-catchers' that stimulate attention and engagement in readers, and in consequence, elicit an interest in the content of news stories. The literature reveals that images depicting 'people' as main objects in the frame are universally considered to have a stronger effect on viewers (e.g. Lewis, 2005, Bowen and Thompson, 2013). This appears to be compatible with current editorial practices as uncovered through a content analysis of press images (e.g., Caple, 2013; Rössler et al., 2011). For example, Rössler et al. (2011) showed that shots including people were clearly dominant in print media. Certain types of photographic shots depicting people are also associated with creating a strong visual impact in viewers e.g. close-up images of human faces are believed to generate a high visual engagement in viewers, which may have its basis in a people's natural preference to look at human faces over almost any other visual stimuli (Pascalis and Kelly, 2009). Using attention grabbing imagery in journalism is encouraged in the professional literature and practiced by image editors who express a need for visually appealing, vivid, and attractive images (e.g. Markkula and Oittinen, 2000, Rössler et al, 2011). Some studies further established that the following criteria were considered as important in image selection in journalism: colour, composition, presence/absence of people (Westman and Oittinen, 2006). To improve the effectiveness of CBIR systems that operate on the level of image syntax, it is necessary to identify the concrete visual features that engender required visual effect. For example, if *attention-grabbing* effect (typically associated with the use of colour) needs to be achieved, it needs to be established which colours or colour attributes (e.g. saturated vs. non-saturated colours) are those that are believed to be responsible for this effect. The traditional aesthetic-based approaches to imagery do not provide this level of image description.

2.4.2 The functional approach to images

Westman et al. (2010) and Westman (2011) defined the term 'function' as *the function served or purpose image was taken for*" and in a user study that involved image categorisation, they found that journalistic images were typically deployed to serve one or multiple functions in newspapers, such as: *being a proof of a news event, catching the readers' attention, filling up pages, conveying information, bringing a new aesthetic or informational dimension* to news stories. Based on the user-categorisation, Westman (2011) distinguished the following functions of journalistic imagery: product photos, illustrations, symbol photos, reportage, portraits, news photos, advertisement, travel photos, and miscellaneous. Jaimes et al. (2006) argues that the intended use of the image influences the choice of the search strategies, therefore, identifying the image functions and how they serve these functions is central to the effectiveness of image retrieval. Westman (2011, p.48) claims that the *purpose of use* is a possible criterion for image categorisation, and further, explains, "*a functional approach to image description could aid retrieval through the analysis of image features that correlate with specific image functions*". While the literature discussed so far shows that images are used on news pages to serve specific functions and a specific type of images will function similarly within the specific context, another question arises: *how can the common features in images deployed to serve any specific function be identified?*

2.4.2.1 Using the Visual Social Semiotics (VSS) framework to analyse images

While most available frameworks for image analysis (e.g. the visual content analysis, the aesthetic framework as described in: Leeuwen and Jewitt, 2001) focus mainly on the semantic content of images, the Visual Social Semiotics (VSS) framework (proposed by Kress and van Leeuwen (1996, 2006) and further developed by Jewitt and Oyama (2001)), puts "*emphasis on the syntax of images as a source of representational meaning*" (Jewitt and Oyama, 2001, p.136). In brief, the VSS surfaces the relationship between syntactic image features and visual engagement created by these features and provides analytical tools for deconstruction (and construction) of visual meaning in images, based on, e.g., gaze, positioning of objects in the image, framing, colour (a description of the individual VSS resources and interpretations is provided in Appendix G.). Unlike time-based language, images are regarded as a space-based semiotic mode. The relations between objects and/or people within the image (or parts of the image) tell the viewer whether they relate to each other in a meaningful way, e.g., who is the actor (doer), and who is the passive recipient of the action. The framework offers an interpretation of visual image features in terms of the quality of visual engagement that each of these features engenders. The foundations of the visual social semiotics lay in the fact that in societies of Western world, despite people's differences in age, ethnicity, gender, etc., there are visual features that evoke generally uniform reactions in viewers.

Providing tools for interpreting meaning from the image syntax, the VSS has a potential to facilitate meaningful CBIR that operates on low-level features and relations between them (Section 2.3.2). However, except for the work of Rafferty and Hidderley (2005) (see Section

2.3.1.1), semiotics-based approaches to image analysis have not been used in the context of CBIR. In contrast, studies in the field of the discourse and communication have been successfully applying social semiotics to image analysis. For example, Caple (2013) analysed images functioning as visually rich image-nuclear news stories in print, while Knox (2007a; 2007b; 2009) focused on visually minimalist *thumbnails* on news homepages. These studies and their importance for this investigation will be briefly discussed below.

Caple (2013) analysed a corpus of 1000 photographs used in *image-nuclear news stories*[33] published in a popular Australian newspaper, The *Sydney Morning Herald*. The author found that there was a clear visual trend present in photographs deployed in this particular function. The key findings showed that 90% of the 1000-strong image corpus included a person/people as the main object of the image, being involved in some type of an action. The analysis then focused on the 942 images that included people. In a summary, the visual analysis showed that:

- 94% of these photos showed the actors on a fully-conceived background, i.e., the settings depicted within the frame were recognisable in most of the photographs.
- 91% of the images used in this function showed people looking outside the picture, or at someone/ something within the image frame, not at the viewer (Gaze type: offer).
- A clear preference for images showing the whole figure and more than one person was identified.
- Profile photographs constituted a large majority of the sample at 78%.
- Equal power between the viewer and the represented human actor was present in the majority of the analysed photographs.
- 56% of the images included an element that dominated in the frame, and the use of size of the object was the main method for applying salience.
- Strong connection framing was observed in many images.

Using the VSS framework tools allowed Caple (2013) to identify a trend in the arrangement of image features used in this specific function, and the type of the visual impact that these images are deployed to generate. She concluded that images in this function do not seem to engage viewers through the represented participants but through specific compositional choices. She also suggested that some of the impact is a result of the combination of the meaning resulting from simultaneously occurring features and that some combinations tend to cluster, e.g., gaze at the viewer (demand) and close-up (intimate distance), long shot (impersonal distance) and profile (detachment).

While Caple's analysis (Caple, 2013) focussed on the visually rich image-nuclear news stories in print, Knox (2007a; 2007b; 2009) investigated the use of visually minimalist thumbnail images on

[33] Image-nuclear news stories are a distinct genre of news content that makes use of journalistic photographs, where the photograph is its central part (*nucleus*) accompanied by a headline and a short caption as its *satellites* (Bednarek and Caple, 2010; Caple and Bednarek, 2010; Caple, 2013).

news homepages. He analysed 15 editions of the homepage of the *Sydney Morning Herald* (smh online) and observed that there was a clear trend in the visual representation of images used as thumbnails on news homepages. Knox (2009) found that:

- 93% of thumbnail images were small photographs depicting a single human actor. A strong relationship between the actor and the headline, and/or the lead text was identified: in 91% the actor was mentioned in the headline, and in 99% in the lead text.
- thumbnail images were typically extreme close-up shots of the actor who in 83% of the analysed images was positioned in the centre of the shot. Knox (2009) describes, the actor *"fill*[s] *the viewer's field of vision as construed by the boundaries of the image."*
- Thumbnails were completely decontextualised, showed only faces and no scene or other objects in the background.

When compared to other uses of images in news, for example, photographs used in online galleries (e.g., Caple and Knox, 2015), or those used in image-nuclear news stories in print (Caple, 2013), thumbnail images presented bare informative and visual minimalism. They do not tell a story and add no evidence or context to the verbal text of the story they link to. They are a visual repetition of the verbal name of the person in the story and seem to literally "put a face to the name" (Knox 2007a, p.179).

Visually, thumbnails carry the minimum amount of information necessary to identify the social actor they depict (Knox, 2007a). The semiotic potential of photography is not fully exploited in thumbnails (Knox, 2009, p.153), the meaning is consistently conveyed through the distance (close-up), and the small size of the frame limits the use of other compositional choices, for example, positioning within the frame, depth, type of background. These images are stripped of any context or reference to events or locations and all context is provided by verbiage and can be used and re-used for a variety of news stories provided the story relates to the actor in the image. Yet, this minimalistic visual presentation is sufficient for the close-ups to effectively serve as *graphical summaries* of the subject of the longer story to which they are hyperlinked, and to engage viewers (Knox, 2009).

Further, Knox's analysis (Knox, 2007a) shows that typically, the hyperlink in the thumbnail does not take the reader to a 'more complete' image but to a longer text-based version of the news story that may not include any image at all. Knox (2007a) reports that over 50% of the analysed articles from the *smh online* homepage, had no images. 10% of stories had images with no relation to the thumbnail on the homepage, and only about one-third of the long stories featured an expanded version of the thumbnail from the homepage.

The use of thumbnail images as described in Knox (2007a; 2007b; 2009), resembles of how *text-enhanced thumbnails* are used to aid searching for information on the web (Woodruff et al., 2001). Currently, online search engines tend to display thumbnail images next to text snippets. For example, Google uses thumbnails for searches related to food (Schwartz, 2016), and the BBC's

search (www.bbc.co.uk/search) returns search results as a list of thumbnail-text items, in order to enable web searchers to effectively identify relevant information online.

This use, however, differs from how thumbnails are used in image retrieval on the web. Image retrieval systems (e.g., BingImages, GettyImages, GoogleImages) tend to display search results as thumbnails. This enables image searchers to access and browse through large numbers of images quickly. Typically, the displayed thumbnails are a shrunk and/or cropped version of the original photograph reduced in quality (compressed files) and readability (Suh et al. 2003). To be able to view the whole original image and attached image information (caption, metadata), the user must interact with the system by e.g., hovering over or clicking the thumbnail.

Below, Table 2-2 compares the visual minimalism of the thumbnail faces as presented in Knox (2007a; 2007b; 2009) with the visual richness of image-nuclear news stories described in Caple (2013).

Visual Presentation	**Visual minimalism**	**Visual richness**
Image function	*Thumbnail images* online (Knox, 2007a; 2007b; 2009)	*Photographs in image-nuclear news stories* in print (Bednarek and Caple, 2010; Caple and Bednarek, 2010; Caple 2013)
Image size	Small size	Typically, large images
Visual features		
	Single identifiable human actor	One and many human actors (identifiable and unidentifiable)
	Close-up of a face (intimate distance)	Whole figure shots, scenes
	Minimum background visible (settings unrecognisable)	Fully conceived background (recognisable settings)
	unspecified	Offer gaze
	unspecified	Profile shots
	Maximal salience in the frame	*unspecified but both object and settings are important*
	Object positioned centrally	*not applicable (Caple, 2013)*
	unspecified	Colour photographs
	unspecified	Quality important
	unspecified	Vertical angle: medium (equality)

Table 2- 1. Visual features of thumbnail images (Knox, 2007a; 2007b; 2009) compared with those of photos used in image-nuclear news stories (Caple, 2013) to demonstrate differences between the feature sets in relation to the image functions

These studies show that images in journalism (print and online) are used to fulfil well-defined functions. These functions require images that include distinct set of visual features. The main strength of the discussed studies (in particular as described in Caple, 2013) is that they were

conducted on a large sample of images which ensures statistical validity. However, in terms of limitations, little is known of how the manual analysis was performed in terms of the rigour, e.g., how many experts were involved in the image analysis, and whether they worked independently, whether there was always an agreement between them in terms of feature detection, and how they resolved disagreements, etc. Additionally, it is important to note that in all presented studies, the analysis was performed on images already published in the newspaper, and there is no information on how these images had been selected, and whether and why they had been tailored before publication.

2.4.2.2 How are images used in the dominant (headline) image function online?

So far, two types of news content requiring images have been discussed: a) the image nuclear news stories in print and b) thumbnails on news homepages. Each of the functions appears to be fulfilled with a specific type of news images, and – what is particularly important to this investigation – the uncovered differences relate to the image syntax, e.g., the number, size and positioning of objects within the image frame, the type of background (blurry or realistic), and that these choices are made consciously and intentionally by image users. Each image type carries its own set of visual characteristics that makes this particular type fit to fulfil its specific function in news, and that is how these images must be selected. Using a type of image unsuited to its function will have negative consequences on viewers' experience. This echoes Arnheim's claim (Arnheim 1970, p.27) that depending on the cognitive task, an appropriate choice needs to be made in regard to *the visual range of the situation* (the detail and the context) revealed to the viewer, while incorrect choices will hamper the process of understanding. Referring to illustrations used as visual aids, Arnheim (1970, p.27) explains it as follows: *"the visual aid* […] *offered by an illustration may be severely impaired simply because the size and range of the portrayed objects are inappropriate for the function. An inadequate percept may upset the whole ensuing train of thought."*

This investigation aims to uncover how news images are selected and used in the function of the dominant photograph online. The dominant photographs are a prominent feature of almost all news homepages (Utt and Pasternack, 2003). Although many homepages work as aggregated pages automatically pulling content from other sections of the website, still, the dominant photograph is manually selected from online image collections by dedicated image professionals curating homepages[34].Yet, to date, there has been no research conducted to examine images selected to fulfil this specific function in terms of how these images are sought, i.e., image needs, dimensions along which relevance judgements are made, or criteria applied in the selection process. To quote Arnheim (1970), once again, *"to find the appropriate range of a problem is almost tantamount to finding its solution."* Much research has been done on the dominant photograph on the newspaper front page. In studies examining the traditional newspaper reading, the main image and the headline are the principal cues that attract the most visual attention upon

[34] Own observations and discussions with image professionals at the BBC Online, Mirror Online, and FT.

a first-time viewing of a page (e.g. Küpper, 1990; Garcia and Stark, 1991; Holmquist et al., 2005; Bucher and Schumacher, 2006; Quinn et al., 2007). Generally, it is believed that images get to be published on the front page because they are a visual representation of a newsworthy journalistic content (Reisner, 1992). However, Ang (2000, p.12), gives a different view on pictures used on front pages and their relation to the headlines: *"front-page pictures do not necessarily have anything to do with the leading news stories: indeed, a photograph of a flash-in-the-pan beauty may be used to disguise the fact that there is no suitable picture for the lead story on a shares fraud, which is hard to illustrate"* otherwise. Rössler et al. (2011) and Caple (2013) claim that in some cases, availability of visually attractive imagery may increase newsworthiness of a story and be a reason why a piece of content gets published. The reviewed literature shows that the dominant photo is a commonplace feature of print newspapers used to communicate the most important news of the edition. The dominant photograph is reported to be the entry point to the front page and achieves this through its salience of size Garcia and Stark (1991).

More recently, Machin and Polzer (2015) applied the social multimodal paradigm[35] to the analysis of visuals used in journalism. They shed some light on the actual visual presentation of the dominant images. They look specifically at images used on the front page of Metro[36], a UK-based free newspaper. Their analysis reveals that the dominant image is most frequently a close-up photograph of a known person. The photograph is used in a non-literal, symbolic rather than a documentary manner, e.g., a large public event will be represented by a one-person, close-up shot showing their facial expression and thereby communicate their mood rather than showing a wide angle shot and documenting the large scale of the event. The authors also interviewed image editors about the images that they needed and how they made image selections. They found that image editors typically described the required photographs by referring to the visual effects that they wanted to achieve, e.g., *attractive*, *attention grabbing.* As mentioned in Göker et al. (2016), these are not qualities that image retrieval would pick upon. To operate effectively, CBIR systems require information about concrete visual image features derived from image users' needs.

Little research has been conducted into the selection and use of images on news websites. Online news services have come to be part of the mass-media landscape in the end of 20th century. The Guardian news website was launched in 1995, and the BBC news online service was established in 1997. Online services with print parentage, such as the Guardian, the Independent, and the Times in the UK, and New York Times, Time in the USA, were almost exact copies of their print editions. Initially, their news pages were heavily reliant on text and used exactly the same images across the platforms (e.g., Arant and Anderson, 2001). Services such as BBC Online and SkyNews have no roots in print and their visually-dominant online format grew out of broadcast media. Currently, all these news services are also available on small-screen mobile devices which creates a separate set of requirements.

[35] The social multimodal paradigm derivate from the semiotic approach
[36] Metro at www.metro.co.uk

Most image selection guidelines and handbooks (see: Section 2.4.1) were written in the pre-digital era, with print media in mind, and the existing studies concerned with users' needs and image seeking behaviour also focus mainly on print journalism. In this work, a view is adopted that online journalism is a stand-alone domain of journalism, rather than a variant of print/broadcast journalism. Its distinguishing characteristics are the instantaneous real-life reporting (Pavlik, 2001), and the requirement to provide images to all news content published online (Vobič and Trivundža, 2015). Time-pressure in the online newsroom is much more significant than in other creative professions (Göker et al., 2016).

This PhD project will investigate how journalistic images are selected for the function of the dominant image for use online. Like the front page in newspapers, the homepage is regarded as a gateway to the service, also referred to as the "*company's face to the world*" and similarly to the front page, it is thought to have the power to either encourage or discourage visitors to use the site (Nielsen and Tahir, 2001). Organisationally, homepages function to orient the reader to the service through navigational information and links and act as a *"central point of navigation"* where visitors may navigate to from other sections of the website (Brinck et al., 2002; Cooke, 2003; Nielsen and Tahir, 2002; Thurstun, 2004). Interpersonally, they communicate *"the authority of the voice of the newspaper, value the content presented visually and verbally, and establish communality among the authors and readers of the newspaper by building familiarity"* News websites are carefully designed and tested for usability in a series of iterations and *beta* versions. For example, since this study began in 2013, the BBC homepage has undergone three rounds of re-design work that involved radical changes in layout and colour scheme. Interestingly, the use of images remained almost consistent across the designs. Knox (2009) reports on a similar tendency about the homepage of the *Morning Sydney Herald* that was a subject of his research for several years (Knox, 2007a; 2007b; Knox 2009).

The dominant photograph is typically the largest photo positioned at the top of the homepage. Eye-tracking studies show that dominant images effectively alert readers to the most important news stories (Outing and Ruel, 2004). While the dominant photograph in print news communicates the most important news story of the day, on news homepages, it is the news *of the moment*. Online media are reactive to emerging news stories and news homepages may have several editions per day. Typically, a dominant image online is accompanied with a headline, and optionally a short lead text. In addition to the main home page, online services often have homepages for other editorial sections dedicated to specific news genre, e.g., the domestic news section, sport section, etc. and many websites run a unique dominant photograph in each section of their website.

Although the dominant image is a feature of almost all news homepages (Utt and Pasternak, 2003), this image variant has not yet been investigated for image retrieval. With a view to inform the design of image retrieval, this investigation aims to gain a thorough understanding of how dominant images function online and how they are selected, and to identify the visual features that are considered important when photos are selected for this function.

2.4.3 Image editing techniques available to image professionals

Unlike previous studies, this investigation will extend beyond the selection process to capture whether and to what extent images are tailored before they are published, this section provides an overview of the basic image editing techniques available to image editors using image editing software such as e.g. Adobe PhotoShop, GIMP etc.

Ang (2000, p.1) defines image editing as "*a process in which photographs are selected and assembled from various sources in order to produce an illustrated publication, web site or exhibition, according to defined aims and requirements*". Image editing software such as: Adobe Photoshop allows the user to make sophisticated and undetectable changes to digital photographs.

The main image editing techniques used on photographs include 1) cropping, 2) scaling, 3) technical retouching, and 4) creative retouching, and are described below:

1) Cropping is one of the most commonly used image editing techniques. It is believed that "a photograph becomes more effective when its fat is pared away" (Hurley and McDougall, 1971, p. 12), so cropping is regarded as a corrective editing device. Cropping "a part of the whole" to show only the essential detail or correct the composition (framing) of an image helps to ensure that the meaning of a picture is grasped "*at one stroke*" (Barthes, 1973), and the image is visually more powerful, for example, a close up on a detail may bring out a more dramatic effect in the image. However, cropping is also a "sharp-edged tool that cuts both ways. It can help a picture speak emphatically" (Hurley and McDougall, 1971, p. 12) or if used for a wrong reason, for example, to make the image fit a fixed-shape space in the page template, it can destroy the photograph, affect its meaning and mood, *upset* its composition and visual impact, and other visual and non-visual aspects of the image (Ang, 2000)

2) Scaling involves resizing of the original image to a smaller or a larger size to fit the fixed and limited space designated for this image one page. The readability of the image is at stake: when the scaling to a larger size the image may become pixelated and out of focus; and when the size is reduced, details become indiscernible in small images. A size of pictures on a page affects the interpretation of the importance of the news story that the image is published with (Wanta, 1988).

3) Technical retouching a photo involves changing a small area of an image in order to improve its appearance by removing or concealing defects (Ang, 2000). Tools used for retouching include cloning tool, burn tool, dodge tool, air brush. However, in news journalism only minimal technical retouching is acceptable and any changes that could lead to breaching of the integrity of a photo are not allowed (Lewis, 2005, p. 221). The

border line between “improving *the technical quality of a photo and falsifying it must be clearly drawn and never crossed”* (Lewis, 2005, p. 221).

4) Creative retouching includes creating composite images (*composographs*) made of multiple photographs, adding graphics, enhancing and/or changing colours of selected items in an image, removing or adding objects, and cloning in new backgrounds. Image A. in Figure 2-8 is a collage and image B is an example of a composograph. The BBC’s internal guidelines for image editors (BBC, 2018) state that images must be created in such a way that it is obvious to the viewer that it has been composed of multiple images.



Figure 2- 8. Dominant images published on www.bbc.co.uk Image A. is a collage (7th June 2017), and Image B is a composite (10th June 2017).

2.4.4 Image integrity and verification of images used in journalism

This Section discusses the importance of verification of the authenticity of images and reliability of image sources in the selection process. As previously mentioned, news images are widely believed to be true accounts of events, yet, in the era of digitalisation, news influx, social media and citizen journalism, news readers are exposed to ‘fake news’ frequently spread through circulation of manipulated imagery. Hence, the verification of images is a particularly important topic in journalism. The Sections below will provide real-life examples of deliberate image manipulation and *selective framing* practices performed to mislead news readers. The most obvious and deliberate image manipulation is usually performed on the image content level and involves, e.g., removing objects/people from the picture. However, in many cases it is also performed on perceptual image features, e.g., colours, tones, changing positioning of objects. This is particularly important to this investigation, as it emphasises the role of the syntactic image features in the meaning-making. Many studies (e.g., Markkula and Sormunen, 2000; Machin and Polzer, 2015) report that image editors search for ‘vivid’, ‘eye-grabbing’ images, however, they struggle with naming concrete visual image features responsible for the visual impact in images. Yet, as the examples (Section 2.4.4) of malpractice show, image editors were able to intentionally change specific syntactic image features, in order to elicit a specific effect, e.g., enhanced colour saturation and excessive colourisation for a *more dramatic effect*.

This Section will end with a brief summary of the key editorial guidelines for image professionals in journalism. One of the guidelines refers to maintaining of the integrity of the image, which, in turn, limits the possibilities for image tailoring, and points to the need for a more effective image retrieval.

2.4.4.1 Image manipulation: real-life examples and consequences

a) Manipulation of image semantic features

The most obvious and frequent type of image manipulation is performed on the image content, and involves, e.g. removing objects, which consequently, impacts on the *ofness* and *aboutness* of the image.

Figure 2-9. presents one of the earliest examples of image manipulation performed on a documentary image. The original photograph was taken 1940's and shows Joseph Stalin pictured in the centre of the frame and Nikolai Yezhov to the right. Having fallen into disgrace, Yezhov was 'removed' from the original image in the process of retouching (King, 1997).

A.  **B.** 

Figure 2- 9. An early example of image manipulation: removing a person from a photograph for political reasons (image source: OpenCulture at www.openculture.com)

While the content of the photograph A. in Figure 2-9. was altered for political reasons, Figure 2-10. below shows a more recent example of an image altered for aesthetic reasons. A video camera that belonged to the journalist crew and visible in the original photograph (A) had been removed before the image was circulated by the Associated Press agency to its clients.



Figure 2- 10. Sunday, Sept. 29, 2013, a Syrian opposition fighter takes cover during an exchange of fire with government forces in Telata village. On the left - the unedited original, on the right - the altered photo sent to AP (Image source: Associated Press, 2014)

Adding (pasting) objects to photographs is another manipulation technique that breaches the integrity of photographs. The original photograph of David Cameron (A) in Figure 2-11. was published on 11th November 2015 on the Downing Street official website. After an hour of the publication, the original photo was replaced with the one of prime minister wearing a poppy (right). Yet, the original photo had already been circulated on social media (The Guardian, 2015).

A.  **B.** 

Figure 2- 11. Image A is the original photograph of David Cameron published on 11th November 2015, that was replaced with the altered image B. (Image source: The Guardian, 2015)

Both examples showed how content of images can be altered by removing or adding elements in the frame. The reasons vary from political motives to purely aesthetic impression, however, in all cases the integrity of images was compromised.

b) Image re-use leading to malpractice

One of the qualities of images is that their meaning is context-sensitive. Images can be re-used in a variety of contexts and therefore, are a valuable commodity for image collections. It is often the accompanying verbiage, e.g., headline, caption that provides the contextual information to news readers. Yet, deliberate re-use of images to mislead viewers into believing a false account of events is regarded malpractice. Figure 2-12. is a photograph that was used by the BBC to illustrate news about a massacre in a Syrian school that took place on 25th May 2012, with a caption that states that the photograph was provided by an activist and could not be independently verified.



Figure 2- 12. This photograph was used by the BBC on 25th May 2012 to illustrate news about a massacre in a Syrian school, but it was actually taken by Marco di Lauro in Iraq in 2003. (Image source: The Telegraph, 2012)

However, it was recognised by Marco di Lauro, its author, who had taken the photograph in Iraq in 2003, and was immediately removed from the BBC's website.

Figure 2-13 is another example of image re-use malpractice. The image that was originally taken during anti-austerity riots in Greece in 2012, was used in the US presidential campaign (snopes.com, 2016). This image was circulated by Trump's campaigning team with an intent to spread fake news about violent actions carried out by supporters of the rival party.



Figure 2- 13. An example of image re-use malpractice (image source: snopes.com, 2016)

These examples show that metadata information associated with the image needs to be verifiable in terms of authorship, location, time of creation, and actively verified by image professionals in the process of image selection. Authenticity of images needs to be verified, as in journalism "*in no circumstances will a posed or fake photograph be tolerated*" (the credo of the Missouri Photo Workshop established by C.C. Edom in 1949).

c) "Selective framing"

As part of Donald Trump's presidential campaign, *selective framing* was also used. In Figure 2-14., Hilary Clinton was shown being helped to the door as a visual 'proof' of her ill health, while in fact she had tripped on the steps (wired.com, 2016). In selective framing images are deliberately selected to show only part of the situation. In this case, Trump's campaigning team aimed to discredit his political opponent.



Figure 2- 14. An example of selective framing malpractice (image source: wired.com, 2016)

Figures 2-12 to 2-14. show examples of editorial misconduct and deliberate image manipulation, or malpractice resulting from insufficient verification of the authenticity of images. In all these cases, however, the reader was misled to believe the images showed the reality as it was. This in turn, leads to a breach of journalistic ethics and a question arises about the role of imagery in journalism and to what degree photography in news can be relied on for facts (Becker, 2003). In the world of photography and journalism there has also been an ongoing debate over exactly how much editing should be allowed in news photography.

d) Manipulating of image syntactic features

Previous examples showed alterations made to the content of images (adding and removing elements), and instances of misleading use of images. This Section will discuss alterations performed on the syntax of photographs, and their consequences on viewers' experience. Image A. in Figure 2-15. ahows an original photograph depicting Soviet soldiers raising a flag over the Reichstag as a symbol of victory (New Yorker, 2014). Photo A. was later manipulated (contrast, smoke) for a more dramatic visual experience.

A.  **B.** 

Figure 2- 15. Yet another example of early malpractice. Yevgeny Khaldei, the author of the image added smoke and contrast to the original photo A. (Image source: The New Yorker, 2014)

Similarly, Figure 2-16. shows two images, of which image A is the original unedited photograph taken on 5th August 2006 and showing smoke billowing from burning buildings destroyed during an overnight Israeli air raid on Beirut's suburbs, and image B is the altered image where the smoke was made to look more intense and darker.



Figure 2- 16. Smoke billows from burning buildings destroyed during an overnight Israeli air raid on Beirut's suburbs, Aug. 5, 2006. On the left - the unedited original, on the right - the altered photo sent to Reuters (Image source: Montagne, 2006)

The original picture was taken by a freelance photographer for Reuters and the news agency sent it to its clients for publication. As soon as the edits had been detected, Reuters detracted the photograph from circulation and issued a statement which said that manipulating photos was in conflict with the agency's strict ethical standards, and that Reuters did not intend to deliberately mislead the public. Garry Hershorn, a photo editor for Reuters, said that changing of the content of photographs was not allowed at the agency: *"Reuters has zero tolerance to doctoring photos this way. You can't add information; you can't take away things."* (Montagne, 2006).

On one of its covers in 1994, TIME featured a close-up photograph of O.J. Simpson (Figure 2-17). The face of the man was significantly darkened in the editorial process, which led to complaints from readers about racial bias (abcNews, 2012). In response, image editors tried to explain that they used the exagerrated coloration in order to evoke a more "*dramatic tone*" in the image (Mallonee, 2015).



Figure 2- 17. Unaltered photograph published by Newsweek and the altered darkened image in TIME (Image source: abcNews, 2012)

As shown in the examples above alterations made to colours and tones result in changes of meaning in the image. Similarly, moving objects within the frame of an image as in the 1982 case of National Geographic (digitally positioning the Pyramids of Giza closer to each other so the whole scene would fit on the cover), or changing the type of shot to isolate objects will impact on the integrity of photos. Image A. in Figure 2.18 shows a photograph of Barak Obama accompanied by two other officials visiting a Louisiana beach, a site of the oil spill. The 19th June

issue of The Economist (Peters, 2010) made use of this photograph on its cover. Yet, Barak Obama is shown standing alone, head down. The change of shot and additionally eliminating the two people changes the meaning of the image, and shows the US president isolated, *looking forlornly at the ground* (Peters, 2010).

A  B 

Figure 2- 18. Image A. was cropped to show Barak Obama isolated (Image source: Peters, 2010)

These and other[37] examples show that alterations to the syntax of photographs are not rare cases (these are only the cases that have been identified). These alterations are made to colours, tones, saturation, positioning of objects within the frame, changes to types of a photographic shot. When asked, image professionals typically struggle with relating specific syntactic features to a particular visual effect, yet, in all cases presented above, the concrete changes were made deliberately during the editorial process with an intention to enhance or change a meaning conveyed in the original photographs. Changes to image syntax have impact on vieweing experience, and therefore, lead to breaching of image integrity. Hence, it is important to understand how syntactic features can be meaningfully interpreted into visual impact they engender.

2.4.4.2 Ethical standards for the use of news imagery

Each major photo press agency and news provider has a set of ethical standards and guidelines on the use of images in news publications (e.g., BBC, 2018; Reuters, 2018). Most of these guidelines are universal and can be summarised to the following points:

1) Pictures must always tell the truth

Most guidelines for image professionals working in the journalistic context, (Reuters, AP, BBC, The Guardian) allow cropping, scaling, and minor corrections to colour balance, however, adding or removing any objects from news photographs is regarded unacceptable. Associated Press ethic code states:

"The content of a photograph must not be altered in Photoshop or by any other means. No element should be digitally added to or subtracted from any photograph. The faces or identities

[37] Other 'operations' on the syntax include airbrushing for improved skin tone, smoothing imperfections, slimming effect etc. http://www.alteredimagesbdc.org/.

of individuals must not be obscured by Photoshop or any other editing tool." (Associated Press, 2015)

The meaning of images is context-sensitive, so image editors must use appropriate editing devises, for example, captions to help readers to correctly interpret images.

To ensure that the truth is depicted, images and their sources must be verified for authenticity.

2) The integrity of the image must be retained. Only minimal technical retouching and minor adjustments are allowed. "These include cropping, dodging and burning, conversion into grayscale, and normal toning and colour adjustments that should be limited to those minimally necessary for clear and accurate reproduction" (Associated Press, 2015)
3) Illustrative images, and composite images must not look like a photograph or try to imitate reality.
4) Photos containing violence or offensive content must be flagged, and the least offensive image should be used to tell the story.
5) Photos that could allow to identify victims of crime, or those accused of crimes or who are witnesses to them, except in unusual circumstances, or photos of children must not be used.

These multiple examples of malpractice presented in Section 2.4.4 build a strong case for verification of images in online journalism where digital cameras and editing software are widely available, and information spreads now faster than ever due to social media platforms. Previous studies into image searching (e.g., Choi, 2010) reported that image users preferred to use images from credible sources trusting that these images were of known origin and of 'good' quality. Research in news editorial offices (e.g. Markkula and Sormunen, 2000; Westman and Oittinen, 2006) showed that verification was part of journalistic practice in print media. Metadata (any non-visual information, e.g., date, location, caption) associated with the image was important for verification of images.

Additionally, the presented editorial guidelines show that only a limited range of image tailoring techniques is allowed to be performed on news images. The integrity of the image needs to be preserved. Hence, it is yet another reason why improvements to the effectiveness of image retrieval are necessary. Image retrieval systems must enable users to select suitable and verifiable images that can be used and re-used on news websites with no or minimum of editorial manipulation.

2.5 AI techniques for image use

The use of artificial intelligence (AI) technologies is currently transforming many domains that rely on computer-based systems. As mentioned in the Introduction (Chapter 1), AI has been successfully applied in journalism, where robot reporters cover fact-based news stories including results of matches, elections, financial reports, and are used to update content and produce news tweets (Fanta, 2017). The use of bots speeds up research and relieves human journalists from

the routine fact-based reporting, therefore, the popularity of automated journalism is increasingly growing and gaining interest and investment. Considering that images are an integral part of online news reporting (Vobič and Trivundža, 2015), seeking intelligent solutions for automating the selection and use of images seems to be a natural way forward for AI-driven journalism.

An important aspect of AI is the ability of computers to learn directly from data (Warwick, 2012). This AI technique is known as machine learning (ML) and requires high amounts of data to be fed to computers in one of the following learning methods: a supervised learning, a semi-supervised learning, or using an unsupervised approach (Russell and Norvig, 2016). The most advanced of the currently available AI systems use Deep Learning approach (Pouyanfar et al., 2018). "*This solution allows computers to learn from experience and understand the world in terms of a hierarchy of concepts, with each concept defined through its relation to simpler concepts*" (Goodfellow et al., 2016, p.1).

If the training process involves visual data, then ML is combined with computer vision (CV) techniques. Current CV techniques can automatically extract low-level features from images (shape, colour, and texture), and successfully identify many objects in images including human faces. Most advanced image systems are able to detect relations between objects within the frame and generate meaningful image descriptions (Karpathy and Li 2015).

Intelligent algorithms have been successfully implemented on Flickr and EyeEm, popular social image hosting platforms. They allow for detecting visually attractive images based on conventional aesthetic values that include the use of rule of thirds, and contrasting colours (Schiffanella et al., 2016). More recently, Google also added an AI-based feature that enables Google Photos app users to identify the most *boring* images in personal image collections, such as: photos of receipts and screengrabs (Sulleyman, 2017).

Adobe offers intelligent photo editing software (Photoshop 19.1) powered by Adobe Sensei, the company's proprietary artificial intelligence (Adobe, 2018). The tool that includes face recognition, automatically identifies the most prominent subject in the image, and allows the user to select it (and manipulate it) with just one click (Chin, 2018).

Recently researchers at MIT (Aksoy et al., 2018) proposed a method for generating *soft segments* in images by automatically fusing the high-level information from a neural network with low-level image features. These segments correspond to semantically meaningful regions. The resulting image representations aid targeted image editing tasks that otherwise, require much skill and labour.

The available AI-based tools for object recognition appear to be very advanced, however, for several reasons, they are also still very fragile. Firstly, computer vision reads information from pixels and regions, and is inferior to human vision that can easily interpret *true complexity from entropy, and identify a signal from noise.* CV can be easily fooled with a change of a single pixel (Su et al., 2018). The researchers found that changing one pixel in about 74% of the test images that they used in an experiment made the neural nets wrongly label what they saw.

Further, even the most sophisticated AI-based systems are not capable of extracting high-level semantics from pixels. Humans typically do not think in terms of low-level features (Vailaya et al., 2001), but formulate their thoughts as high-level concepts. Therefore, just as CBIR systems that use computer vision (Section 2.3.2), other AI-based tools too face the semantic gap problem (Enser, 2008). Being capable of listing objects in images, even if the list of objects is exhausted, semantics of the image still may not be captured, semantics is about the relationships between the objects and a broader understanding of the context. Whilst with the current techniques a person can be easily identified, concepts such as elections, credit crunch, are impossible for computers to extract. Hence, the semantic gap problem continues to persist.

Matching low level content to high level concepts is one of the key problems that concern those involved in the design and development of intelligent systems. AI is long way off and may never replace human image professionals (MacFarlane, 2016), but it is already here to support them in the most routine image-based tasks.

Therefore, the aim of research, such as this investigation, is to uncover the authentic needs of human image users and identify those aspects of the needs that can be used to facilitate automation of image-based tasks.

2.6 Conclusions

This literature review was undertaken to establish the contours of the current research landscape and identify gaps in the existing knowledge about the needs and information seeking behaviour of image users in professional settings. It was carried out along the following three trajectories: 1) Image searching and selection (the user), 2) Current approaches to image retrieval (the system), and 3) The use of images in online journalism (the information). The chapter ends with Section 2.5 that provides a brief presentation of the current state of AI techniques for image processing, and an explanation to why AI-based solutions are not yet mature enough to fully support image retrieval.

The review revealed that while there is a rich body of literature concerned with users of text-based information, research into the needs and behaviour of image users is scarcer. While there have been some studies carried out in print journalism (e.g., Conniss et al. (2000); Hung (2005; 2012); Markkula and Sormunen (2000); Westman and Oittinen (2006)), the use of images in online journalism has been heavily under-researched and there is little understanding of the needs and image searching behaviour of professionals working in the online newsroom. This PhD investigation focuses solely on online journalism to establish *who, in terms of their roles and skillsets, are the image professionals working in the online newsroom.*

Gaining a good knowledge about illustration tasks is important as tasks generate needs in professional settings. Therefore, many studies in print focussed on classifying illustration tasks and used e.g. Fidel's typology of tasks (Fidel, 1997), or Conniss et al.'s seven classes of image use (Conniss et al., 2000). These uses of images are also recommended in the professional

literature for image editors working in print journalism. A question arises whether *the existing classifications are suitable to describe illustration tasks in the online newsroom.*

Understanding of users' needs is fundamental to the effectiveness of image retrieval. Findings from previous studies show that image users frequently describe their conceptual needs, and search queries relate to concepts, while information about users' needs on the perceptual level is limited to descriptions of visual effects required in images. As suggested in Machin and Polzer (2015), it is necessary to reach beyond these descriptions, to the concrete visual features that engender these effects. Therefore, the question posed is, *what are the needs of image users in online journalism? What are the needs that relate to the perceptual level of image description?*

Further, mapping users' activities to existing theoretical frameworks is another way to gain a good understanding of their behaviour. So far, there have been only few image-seeking models presented in the literature of which Conniss et al.'s image-seeking process model (Conniss et al., 2000) appears to be the most comprehensive framework to date. However, evidence from existing studies with journalists (Göker et al., 2016, Markkula and Sormunen, 2000; Westman and Oittinen, 2006) points to potential limitations of Conniss et al.'s framework (Conniss et al., 2000) and it is expected that in result of this investigation, this framework will be validated and updated should inconsistencies occur. The questions to answer are: *is image users' behaviour in online journalism consistent with the stages in Conniss et al.'s image-searching process model (Conniss et al., 2000)? If not, which areas need to be updated?*

Research investigating image selection criteria in print journalism appears to agree that topicality is the main relevance criterion, yet, insufficient to enable users to make the final selection. Previous studies with journalists identified the need for visually attractive images. However, these studies fail to recognise that the descriptions relate to visual effects required in images rather than to subjective aesthetic values of an individual image user (Machin and Polzer, 2015). Identifying shared criteria applied by image professionals with a similar type of task (Barry, 1994) may be the first step to automated predicting of relevance. Hence, the questions to answer are as follows: *what selection criteria do image users apply in online journalism? Is there a trend in how these criteria are used?*

Earlier studies in journalism report that image editors work in highly time pressured environments, and that due to ineffective searching, image users compromise their needs, and all too often, rather than choosing the 'best' image, they make only acceptable selections. In the online newsroom due to instantaneous real-time reporting, time is expected to be one of the key challenges to image retrieval. Since image collections are updated with millions of new images daily, numerous irrelevant results may be another barrier to effective image searching. It is important to establish *what the challenges are, and how they shape image users' needs in the context of online journalism.*

It has been commonly agreed that searching for visual information is not the end goal in itself but serves a wider illustration task, however, with few exceptions (Makri et al., 2008; Makri and Warwick, 2010), information use post-selection remains a heavily under-researched area. In this

investigation, Markkula and Sormunen's model (2000, p.274) will be used as a starting point for the description of activities within the illustration task process in online journalism. It is proposed that any observations of image users must be extended to include the post-selection activities, to allow this investigation to describe the illustrative process accurately and answer the following question: *how and why are images tailored in online journalism?*

The findings from this investigation aim to provide recommendations to guide the development and design of content-based image retrieval (CBIR) that operates on low-level (perceptual) image features. This investigation intends to apply the visual social semiotic (VSS) framework (Appendix G.) and reach beyond the *visual effects* to identify a set of specific features responsible for these effects. *If uncovered, could this set assist predicting of image relevance, and therefore, be a step to automating of the image retrieval?*

To sum up, this literature review allowed to identify gaps in the existing knowledge of the *who*, the *what*, and the *why* of image selection and tailoring in online journalism, to be addressed in this investigation (Goal 1). This knowledge will be used to propose a practical needs-based solution for meaningful image retrieval that will be applied and evaluated with users (Goal 2). The evidence from the evaluation will result in a set of recommendations and guidelines for the design of future image retrieval systems.

CHAPTER 3. Research methodology

3.1 Introduction

Research methodology is understood as "*a theory of methods that guides the description, explanation, and justification of methods in empirical studies"* (Wang, 1999, p. 53). The Interactive Model of Research Design proposed by Maxwell (2005, 2013) has been used as the theoretical framework for the design of this investigation. This model constitutes of five design elements: 1) Goals; 2) Conceptual framework; 3) Research questions; 4) Research methods; and 5) Validity. These components dynamically interact with one another, while research questions are at the centre of the model. Their central position emphasises the fact that research design must be *question-led,* and when defined, the questions will dictate the choice of approach and methods used for investigation and data analysis. Table 3-1. re-introduces the goals, research questions and objectives defined for this investigation.

Goals	Research questions	Objectives
Goal 1. **To investigate the image seeking and selection process in online journalism.**	*RQ 1.* **How are images selected in online journalism?**	**1.** to identify and describe the roles of image professionals in online journalism, **2.** to uncover their image needs in relation to work tasks, and the context of image use, **3.** to clarify the process of image searching and selection, **4.** to uncover image selection criteria used in online journalism, **5.** to determine what challenges users face when completing search-based illustration tasks
	RQ 2. **How and why are images tailored in online journalism?**	**6.** to uncover how and why images are tailored and to what effect.
Goal 2. **To propose improvements to the way image professionals search large collections of images, in order to enable them to effectively select images that they need.**	*RQ3.* **If applied, will the identified criteria improve the effectiveness and efficiency of image retrieval?**	**7.** To implement the uncovered criteria in a prototype and to test their effect on the effectiveness and efficiency of image retrieval.

Table 3- 1. Goals, research questions and objectives defined for this investigation, originally presented in Chapter 1.

While more traditional models of research design tend to present the process in a linear and systematic manner (cf. Gorman et al., 2005, p. 35; and Grix, 2010), Maxwell sees research as a dynamic, iterative process that cannot be completely pre-defined before studies have taken place. It is the interactive nature of this model that makes it particularly suitable to this investigation that includes an extensive qualitative exploratory research followed by evaluative and experimental studies. The primary aim of the exploration is to provide a broad and rich contextual narrative and understanding of the needs, behaviours and experiences of image users in online journalism. The

scope for the exploration has been defined based on the Contextual Framework proposed by Conniss et al. (2000, p. 49), and focuses on the following six key areas: 1) the image user and the workplace, 2) illustration tasks and image needs 3) the illustration task process, 4), selection criteria 5) challenges, and 6) the tailoring of images. The information behaviour of this group of image professionals has not been previously studied, therefore, it is hoped that the knowledge acquired through this investigation will extend the contours of the current research landscape. Further, this investigation aims to reach beyond the theoretical contributions and sets to propose practical solutions for improvement of image retrieval. Within the broad qualitative narrative, opportunities for improvement of image retrieval are actively sought. This involves looking out for indicators of *unmet* needs arsing from the discrepancies between what the users need and what the current systems do for users (Robson, 2000). Seeking to eliminate or reduce these discrepancies provides the focus for improvement. To achieve this, a more focused line of inquiry has been integrated within the exploratory endeavours. It involves a *needs analysis* and aims to identify indicators of unmet needs, in order to ensure that the proposed solution delivers what is actually needed. Furthermore, the pragmatic approach adopted in this investigation asks to put the acquired knowledge to test and measure how well it works when applied in practice (Descombe, 2010). Therefore, in the final stages of this investigation, the proposed solution has been implemented as a search feature, and evaluated with users for its effect on image retrieval. In this multi-level sequential design, the components are linked dynamically, they interplay and allow the componential parts to organically feed on each other's findings and learnings, and lead this investigation to the final conclusions. This is visually presented in Figure 3-1 below.

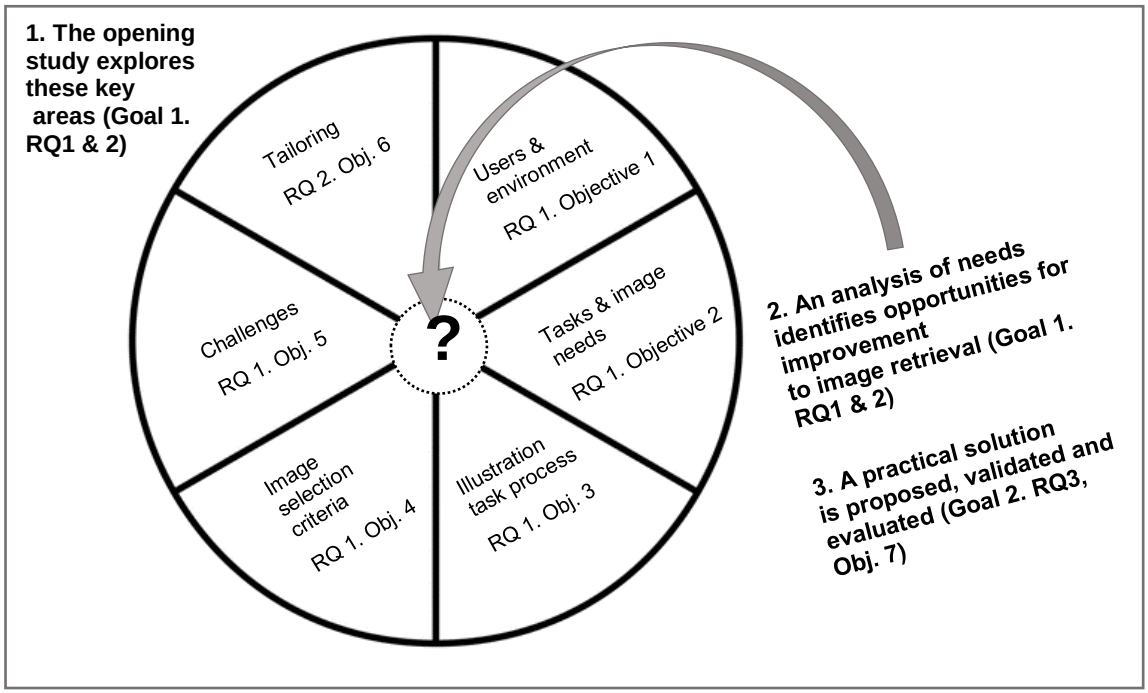


Figure 3- 1. A visual presentation of the aims of this investigation.

This investigation aims to address diverse goals and questions and it requires a conceptual framework that would be suitable to handle this level of complexity and diversity in aims and motives for research. This calls for a mixed-methods approach that *crosses the boundaries of the*

traditional paradigm dualism (Denscombe, 2010). This approach integrates methods from the qualitative and quantitative paradigm, using strengths of one to complement for the weaknesses of the other, in order to achieve a richer and fuller understanding of the whole (Denscombe, 2010). This chosen approach allows to acquire rich qualitative knowledge about image users, and facilitate seeking of pragmatic outcomes that can be applied and empirically evaluated.

3.2 Mixed-methods approach

3.2.1 Viewpoints on qualitative and quantitative approaches, and mixed-methods design

In a traditional dichotomous view on research approaches, qualitative and quantitative research stand in opposition to each other. Researchers in each of these streams select sampling strategies, and inquiry and analysis methods within the single chosen approach, and expect that the selected methods will produce and use data of one type, i.e., qualitative research will produce and deal only with qualitative data. Coming from interpretive tradition, qualitative research is interested in interpreting deeper meaning, and understanding of multiple realities represented in the collection of personal narratives or observed behaviours and activities (Bryman, 2001). One of frequently cited descriptions of qualitative research is by Corbin and Strauss (2008, p.13) who state that *"Qualitative research allows researchers to get at the inner experience of participants, to determine how meanings are formed through and in culture, and to discover rather than test variables."* Grbich (2013) continues in their tradition and claims that *"qualitative research gives insights into people's individual experiences, enables the exploration of little known behaviours, attitudes and values."* Gorman et al. (2005, p.3) highlights the contextual nature of qualitative research and defines it as "*a process of enquiry that draws data from the context in which events occur, in an attempt to describe these occurrences, as a means of determining the process in which events are embedded and the perspective of those participating in the events, using induction to derive possible explanations based on observed phenomena*." The data inquiry methods in qualitative research tend to be of the inductive and relatively flexible qualitative nature. Data analysis in this tradition is also less structured, unconcerned with measurement or quantification. The analytic focus is on the personal and social meaning located within the discourse. The analysis process permits much input from the researchers involved in the study and values participants' perspective. Qualitative studies are criticised by quantitative purists for being highly subjective, unstructured, prone to research bias and researcher effect. Not supported with numeric data and being case-specific, results of qualitative research are not to be generalised.

In contrast, the quantitative approach is typically adopted in studies attempting to test pre-defined hypotheses. It is associated with a positivist approach rooted in strictly scientific methods. Data collection is systematic, rigorous, and transparent. Quantitative studies attempt to establish a solid knowledge about *objective* reality. The use of statistical analysis and probabilistic sampling permit the generalisability of quantitatively achieved results. Purely quantitative research is

criticised for being highly reductionist and context-void in attempts to uncover 'objective reality' (Denscombe, 2010). It misses the point of qualitative research relying on pre-defined fixed responses and not permitting participants to use their own words, which limits the richness of the produced data.

This clear-cut dichotomous distinction between qualitative and quantitative research presents the two approaches as incompatible and mutually exclusive. As the premise is that research should strive for consistency between the various components of the research process: the questions, the design, the data collection and analysis from within the single paradigm, researchers' choices of research tools are limited to those compatible with the selected approach. Guest et al. (2012) claim that such viewpoint is not practical, and often, not supported by evidence from practice. There are numerous examples of qualitative studies that tested hypothesis and many hypotheses have been generated from quantitative studies. Guest et al. (ibid.) argue that it is not the collection methods that decide what type of research e.g., interpretive or positivist, the researcher is engaged in but the type of data it produces and how these data are analysed. They promote a broader view of qualitative research that accepts that qualitative studies can also produce quantitative data which can be analysed either quantitatively or qualitatively, and vice versa, quantitative research may be a source of qualitative data. In quantitatively-oriented analysis, the researcher may be interested in evaluating the frequency and co-occurrence of particular recurring ideas, while qualitative approach is most useful in capturing the complexities of meaning within a data set. The stance that qualitative and quantitative approaches are not mutually exclusive but complementary to each other has been taken further in the mixed-methods approach.

Mixed-methods is associated with pragmatism. Bazeley (2018) describes it as a *philosophical assumption based on pragmatic grounds*[38], while Denscombe (2010, p.116-117) refers to pragmatism as *a philosophical partner* of the mixed-methods approach. He abstracts the underpinnings of pragmatism to the following core ideas about knowledge:

- "*Knowledge is based on practical outcomes*", its value is reflected in its usefulness and applicability to real-life problems,
- The aim of research should be to empirically test what works
- No single or best scientific method exists that can achieve *indisputable* knowledge
- Knowledge is never absolute or perfect. "*It is inevitably a product of the historical era and the cultural context within which it is produced*."

[38] Bazeley (2018) explains the relation of mixed-methods to pragmatism in the US school of thought and to the critical realism popular amongst the British scholars.

- Dualism (e.g. qualitative versus quantitative) and dichotomies (facts versus values, subjectivity vs. objectivity) in philosophy and science do not help in practice. It is proposed that the qualitative and quantitative approach each has its strengths and the two are complementary to each other, rather than being incompatible opposites.

Bergman (2008, p.1) explains, that the mixed methods approach is *"the combination of at least one qualitative and at least one quantitative component in a single research."* This combination may include a collection of diverse data types, a use of diverse methods for data collection and analysis. There are many ways that these components can be brought together. Morse and Niehaus (2009) suggest that in a mixed-methods investigation, one of the methods is subservient to the other and will not produce contribution of its own. In contrast, Creswell and Tashakkori (2007) claim that aside of the mixed outcome, the methods also generate their own independent results. Yin (2006) claims that to be considered as mixed-methods, research design must involve mixing, comparability, and integration of research components from questions, instruments, sampling, to analysis. Having reviewed a number of mixed-methods investigations, Bazeley (2018, p.7) defines the mixed-methods approach as follows: "*include any research that involves multiple sources and types of data, and /or multiple approaches to analysis of those data, in which integration of data and analysis occurs prior to drawing final conclusions about the topic of the investigation*". In this view, *integration* is the most important characteristics of mixed-methods approach that distinguishes it from *multi-methods* research. In the latter approach, multiple methods from different paradigms are used within a single investigation but each has its own remit and questions to answer. Most importantly, the integration of findings from these separate componential studies occurs at the point when final conclusions are drawn. In contrast, integration in mixed-methods can take place at any or all stages in the research process: at the research design level, during the data collection, and/or at the analysis and interpretation stage. Bazeley (2018) emphasises that *integration* is the pillar of the mixed-methods approach. Referring to Bryman (2007), she defines integration as *mutual illumination* occurring between the different research components. At the design level, the qualitative and the quantitative approach each comes with its strengths and weaknesses in terms of how effectively it allows researchers to answer specific research problems, or aspects of problems. The premise of the mixed-methods approach is that the use of various approaches produces a better understanding of the researched problem than either approach could alone because the limitations of one method or component are counter-balanced with the strengths of another one (Guest et al., 2012). Therefore, mixing of research components encourages the use of various paradigms, generates stronger and more convincing evidence and provides a more comprehensive and richer understanding and knowledge, and leads to interdisciplinary collaboration (Denscombe, 2010). *Timing, weighting* and *purpose* are the dimensions that the integration of qualitative and quantitative components can be described along (Plano Clark and Creswell, 2008).

From the analytic perspective, mixed-methods is leaning towards interpretative orientation. Referring to work by Howe and Eisenhardt (1990), Fielding and Fielding (1986) and others, Bazeley (2018) claims that all scientific observation and analysis involves assumptions, choices

and interpretation made by researchers. This also includes methods that are associated with purely quantitative approach such as e.g., surveys. These methods are typically informed by literature reviews or/and qualitative exploratory studies hence, they are driven by inductive qualitative understanding and interpretations made by researchers (Morse, 2015). Moreover, "[t]*he act of analysis is an interpretation, and therefore of necessity a selective rendering of the 'sense' of the available data*" (Fielding and Fielding, 1986, p.12), and quantitative data are no exception to this. Statistically obtained data, too, need to be interpreted to provide knowledge about the world.

This leads on to the issues of validity in mixed-methods research. Some early definitions of validity (e.g., Black and Champion, 1976; Johnston and Pennypacker, 1980; Kerlinger, 1964; Miles and Huberman, 1984; Searle, 1999) tend to refer to measurements and tests which are activities typically associated with quantitative paradigm, while the more recent ones attempt to be more universal and include references to phenomena. For example, Jupp (2006, p.311) states that validity is: "[t]*he extent to which conclusions drawn from the research provide accurate description of what happened or a correct explanation of what happened and why."* Unquestionably, all research including qualitative studies must be assessed for its quality (Steinke, 1985). While there is a consensus that the judgement of the soundness of quantitative studies is made based on a framework of internal and external validity, the criteria for validity of qualitative studies are still subject of discussion. Qualitative approach acknowledges that understanding is constructed and that multiple realities exist therefore, generalisation of findings is not achievable. Instead, qualitative research aims for *transferability*, i.e., the application of findings to similar cases. To be possible, transferability requires that a detailed description of the investigation should be provided to the readers to enable them to make a judgement whether there is sufficient similarity between the studied settings and their settings for the uncovered knowledge to be applicable. Other criteria for qualitative studies include: credibility, dependability, confirmability (Denzin and Lincoln, 2005; Lincoln, 1995). Qualitative components in mixed-methods studies, as already mentioned, mean that much interpretation is involved, and generalisability of findings is not the aim of such research. It is also important to remember that what is inferred from a study must be adequate to the sample (Bazeley, 2018). Qualitative explorations usually involve qualitative purposeful sampling, which will not facilitate statistical generalisability of results. A *legitimisation* has been proposed as the criterion (Onwuegbuzie et al., 2011) but has not been used widely. Denscombe (2010) and Bazeley (2018) suggest several strategies for enhancement of validity in mixed-methods research and ensuring transferability of findings. One of them is *reflexivity*. Researchers must be reflexive on their actions and acknowledge that their presence will affect participants' behaviour and, subsequently, the quality and honesty of data. Reflexive researcher will be aware of the interpretive nature of the analytic process, and will ensure that the original connection between the raw data and the interpreted findings is maintained and a track record of the process of interpretation. is kept. Section 3.6.1 explains how reflexivity was applied in this investigation.

Another strategy for improved validity is maintaining transparency. Guest et al. (2012) promotes transparency as one of the key qualities of mixed-methods research. This quality needs to be

ensured at the level of the investigation as a whole, as well as for each individual study within the investigation. Transparency involves providing explicit and clear descriptions and explanations in regard to research design, the integrated components, how they relate to each other, and what the benefits and limitations of the integration are (Guest et al. 2012). Transparency must be ensured at the level of each individual study included in the investigation. This can be achieved by creating and providing detailed study and session protocols (Kelly, 2009). Bazeley (2018) recommends visualising of design elements and links between them, e.g., links between research questions, data sources and the acquired knowledge. This will aid an understanding of how the different elements of the investigation fit together in a single whole. Strategies applied to ensure the validity and soundness of findings from this investigation are discussed in Section 3.6.

To sum up, mixed-methods approach has been adopted in this investigation because it is particularly well-suited research driven by diverse research questions. It allows for mixing of various research components, e.g., methods, sampling, data analysis, and allows to achieve richer and more complete understanding of the researched problem than any single-method research would.

3.2.2 Approaches used in the studies of information retrieval and use

Kelly (2009) presents a typology of information retrieval research where studies are placed on a continuum depending on whether their focus is on the IR system, IIR interaction, or users' needs, behaviour and experiences.

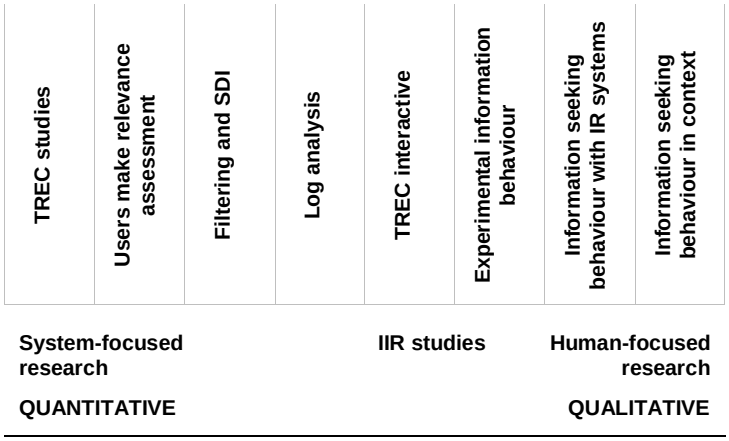


Figure 3- 2. A typology of information retrieval research adapted from Kelly (2009, p.10).

Positioned at one extreme of the continuum, the system-focused studies are concerned with the development and testing of IR systems. Examples, of such studies are Cranford tests and TREC studies (Voorhees and Harman, 2009). Some system-centred studies may involve users, but the aim of these studies is to evaluate the 'goodness' of the system rather than to gain knowledge about the user. Instead, in such studies, assumptions about an ideal user are made and measures

of precision and recall are applied. These studies use quantitative research methods for data collection and analysis.

Studies positioned on the opposite end of the continuum focus on users, their information (also image) needs, behaviour and experiences, and more recently, also include the recipient (Wilson, 2016). Research approach adopted in these studies is predominantly qualitative. Typically, data is collected through interviews and naturalistic observations in-situ. Examples of such studies in the domain of image retrieval include: Beaudoin, 2009; Conniss et al., (2000), Sedghi et al.,2011. Some key studies referenced in this work combine several methods in their research studies without an explicit reference to a mixed-methods design. For example, Markkula and Sormunen (2000) and Westman and Oittinen (2006) use interviews and observations in-situ as their main inquiry methods and complement them with the analysis of search logs. Westman and Oittinen additionally used surveys. Surveys and search logs analysis are usually associated with system-focused studies, e.g., quantitative system-evaluation, whereas, in these studies, these methods were applied to gain a better understanding of user behaviour. Hung (2005, 2012) conducted experimental task-based studies in-situ to uncover user searching tactics and moves on a fully-operational commercial system.

Although they are placed on a continuum, there is a wide divide between the system-oriented IR studies and the person-centred studies. The former types usually aim to propose novel algorithm-based solutions to enhance the system. Numerous IR-focused papers (e.g., Datta et al., 2006; Obrador et al. 2009) report results of evaluative studies with users. In many of these studies, the summative evaluation stage is the first and the only time that users were involved in the development cycle of the proposed system. Proxy users[39] (e.g. students) rather than real or intended users were typically recruited to participate in those experiments. This subsequently bears implications on the validity of users' motivations and information needs. Tasks used in such studies were constructed to suit their purpose of testing the *goodness* of proposed functionality. They have no or little foundation in users' actual information needs, as these needs had not been identified through studies with users. It is fair to say that such studies are typically driven by technological possibilities, knowledge and skills of those who write algorithms, and are, at the same time, limited by those factors. On the other hand, the pre-dominantly qualitative user-centred studies (e.g., those referenced above), aim to gain knowledge of authentic users' needs, experiences and behavioural patterns, and provide in-depth qualitative knowledge of the researched problem. This knowledge is typically interpreted into system design guidelines (e.g., Conniss et al. 2000), however, these are rarely, if at all, evaluated with users, let alone being implemented into real IR systems. It may be argued that the development of actual systems is not the aim of the human-oriented studies, however, the persisting dichotomous distinction between these two approaches does not facilitate user-centred development of systems.

[39] Proxy users ae people who play the role of a user when eliciting requirements or for the purpose of evaluation (Sharp et al. (2007)

In IIR tradition, that this investigation is situated in, the *goodness*[40] of a IR system should be measured by how effectively and efficiently it enables its users meet their needs. These needs must be identified to inform the development of any IR solutions, and prior to the evaluation of proposed improvements. The human-centred interaction (HCI) domain provides a model of the user-centred design (UCD) process, where any design cycle that focuses on users rather than systems, begins with the identification of users' needs e.g., through formative research, then moves on to the stages of design and prototyping, followed with a summative research with users

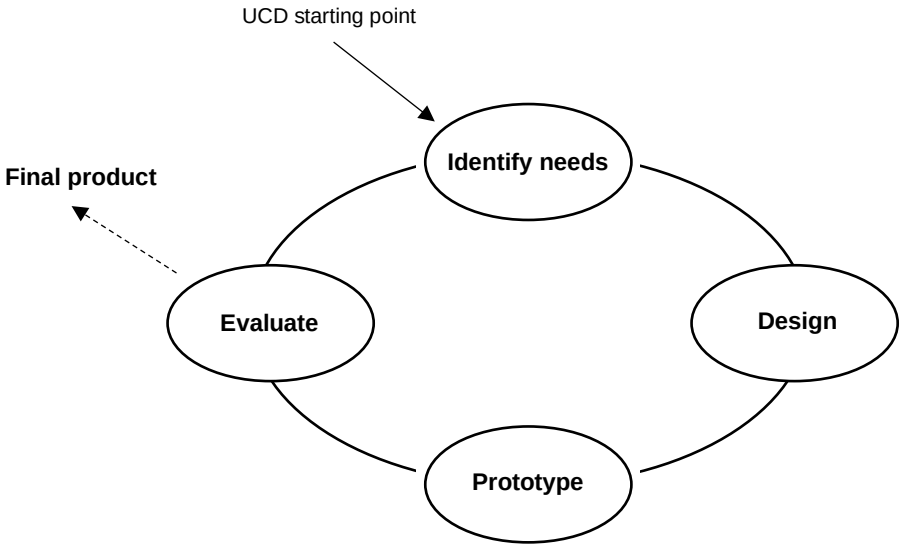


Figure 3- 3. User-centred design cycle adapted from Sharp et al. (2007)

to evaluate the proposed solution. In some rare cases a single cycle may lead to a final product. However, complex interactive systems, e.g., IR systems often require several iterations of the UCD process, before a fully-functional product can be delivered.

This mixed-methods investigation could be mapped on Kelly's research continuum (Figure 3-2) between the mid-point and the human-centred research end. The initial stage that included exploratory observations of users in situ, places this investigation closer to the qualitative studies into users' information seeking behaviour. At this initial stage, the investigation focused on uncovering users' information behaviour and needs in the context of online journalism, however, without regard to any specific IR system. This qualitative exploration allowed to gain an in-depth understanding of the natural behaviour and needs of this particular group of image users, and facilitated identifying opportunities for improvement of image retrieval. Indicators of unmet needs were identified. These point to discrepancies between users' needs and what the current systems offered to users. Proposing a practical and user-centred solution that would eliminate or reduce these discrepancies was the focus of improvement. A solution was defined and implemented in a prototype system for evaluation with users. At the stage when the evaluation experiment was carried out, this investigation moved closer to the centre of the IR research continuum. The experiment was carried out on an isolated slice of the search process, and manipulation was

[40] A term used in Kelly (2009, p10) in reference to the quality of the system.

involved. The experimental study aimed to investigate users' behaviour when interacting with the proposed solution and gauge whether it allowed them to meet their needs in an effective and efficient manner, rather than only evaluate the performance of the proposed system in terms of precision and recall as it is done in traditional IR studies.

3.2.3 The rationale for the use of a mixed-methods approach in this investigation

The use of mixed-methods approach is motivated by the diverse nature of the research problem defined for this PhD research project. While this investigation aims to fill in the gaps in the qualitative literature concerned with image needs and behaviour of a specific group of image users (Goal 1), it is also concerned with proposing a practical and measurable solution for improvements of the effectiveness and efficiency of image retrieval (Goal 2). Addressing this complex and diverse problem requires a strategy that "*crosses the boundaries of the conventional paradigms by deliberately combining methods drawn from different traditions*" (Denscombe, 2010, p. 108). This is exactly what a mixed-methods approach provides. The research questions (RQs) defined for this investigation (presented in Section 1.2. and re-introduced in Table 3-1.) had been derived from a scrupulous review process of the relevant scholarly and professional literature concerned with image use in general and specifically in online journalism (see: Section 2.3.1). This process revealed how little is known about the characteristics of this particular group of image users in terms of their skills, performed tasks, image needs and image seeking behaviour. RQ 1 (*how are images selected in online journalism?*) and RQ 2 (*how and why are images tailored in online journalism?*) asked for an in-depth exploratory investigation into the 'world' of these professionals with an aim to uncover, understand and interpret their needs and behaviour in the process of image seeking and use. The '*how*' and '*why*' in RQs 1 and 2 covered more detailed questions such as, e.g., *the who?* (in terms of roles, skills, and context), *the what?* (in terms of tasks, image resources), and *the why?* (causal reasoning for actions in image seeking). These key areas have been identified based on the Contextual Framework proposed by Conniss et al. (2000, p. 49) which allows to map the multiple interactions between the factors that influence the way a user searches for, selects and uses images in the professional context. Similarly, these areas were investigated in a study conducted in print journalism by Markkula and Sormunen (2000), which is one of the key research work referred to in this investigation. It is believed that *covering* these six topics will provide a holistic description of the researched domain.

RQs 1 and 2 sought insights into the world and reality constructed by this specific type of image users whose needs and behaviour had not been previously investigated. Therefore, a predominantly interpretive research with a *purposeful* sample was required (as defined in, e.g., Bryman, 2001). It was important for the researcher to be able to grasp the subjective meaning of the world of the participants and their actions performed in their original context of an online newsroom and editorial office. Hence, it was important that this initial exploratory study (Study I) was conducted *in situ*, which places this study at the human-centred end of the IR studies continuum (Kelly, 2009). Due to scarcity of literature about the needs and behaviour of image

users in online journalism, the qualitative exploration was not based on any firm hypotheses or preconceptions. An understanding of the explored issues was sought mainly within the data. This geared the choices towards a free-flowing type of research in which participants would be able to develop their own thoughts within a pre-defined framework of topics and fill in the gaps in knowledge, in regard to the *how* and *why* of image seeking in this domain. Therefore, the research design in the initial part of this investigation focused on the collection and analysis of qualitative data. The strong qualitative component of the initial stage of this investigation (sampling strategy, data collection and analysis) was particularly crucial to begin the exploration of users' needs and image seeking behaviour. Nevertheless, on its own, it would be insufficient to fully answer RQ 1 and 2, and certainly, it would not permit this investigation to progress and address RQ 3 (*If applied, will the identified criteria improve the effectiveness and efficiency of image retrieval?)*. The quantitative components integrated in this research project included validation surveys conducted on visual data. The aim of these surveys was to establish the presence, frequency and recurrence of a pre-defined set of image features that originated from the exploratory study. These features were then proposed as the practical solution for the improvement of image retrieval, and implemented for a needs-based evaluation with users. RQ3. was addressed through a small-scale experimental design study that due to qualitative sampling and producing mixed data, was a mixed-methods component in its own merits. Section 3.3 explains how the individual components were integrated in this investigation.

3.3 The integration of research components in this investigation

While various typologies of mixed-methods research exist (e.g., Denscombe, 2010; Guest et al. 2012), there is much freedom in how mixed-methods studies are designed (Bazeley, 2018). The research questions identified for this investigation imposed a chronological sequence on the componential studies. RQ 1 and 2 had to be answered before the criteria applied to address RQ 3 could be specified. This resulted in a multilevel sequential research design that opened with a pre-dominantly qualitative exploratory component with an integrated needs analysis. This was followed by supporting quantitative studies that aimed to corroborate the findings from the exploration and produce a well-defined hypothesis for the needs-based empirical evaluation at final stage of this investigation. Figure 3-4 below illustrates how the components were put together within the sequential multi-level structure of this investigation.

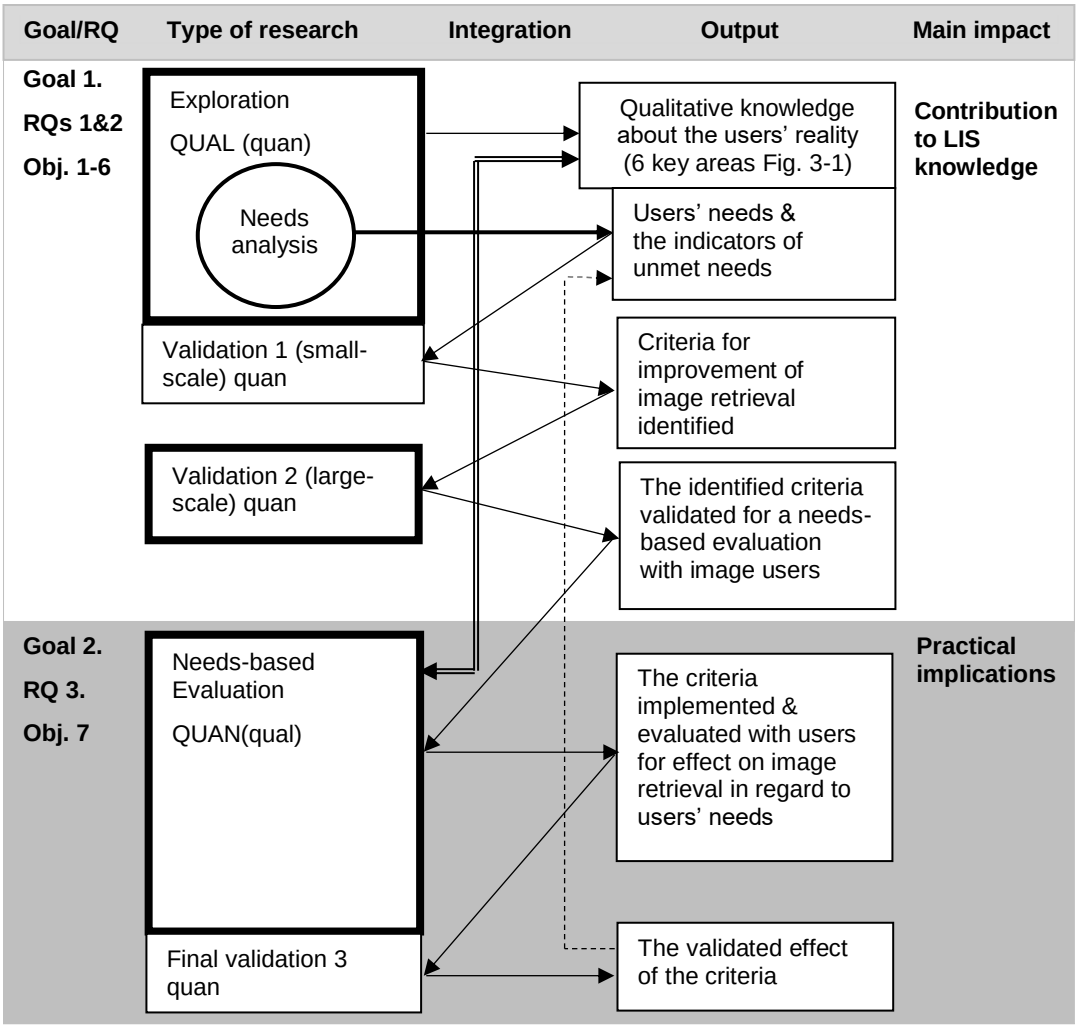


Figure 3- 4. A visual presentation of how the research components have been integrated within this investigation

In this a chronological sequence each step provided information for the succeeding phase. Decisions about the design of the studies and methodological choices were interdependent and influenced each other. Inquiry instruments and sampling were incrementally refined, and hypotheses and measures were developed based on information from a preceding step. For example, by the stage when RQ3 was to be addressed, the exploratory phase and the supporting validating studies had to be complete. Findings from these studies provided the criteria (RQ 3.) for the improvement of the effectiveness and efficiency of image retrieval. These criteria were used in the evaluative research with users.

A predominantly qualitative approach was taken to the main thrust of the exploration in Study I. but this study also produced enumerated data used to establish patterns in users' behaviour. Following Guest et al.'s weighting representation (Guest et al. 2012, p.198), this study has a QUAL(quan) weighting. All validation surveys (Survey 1 in Study I, Survey 2. In Study II, and Survey 3. in Study III) used quantitative inquiry method to produce quantitative data for quantitative analysis, hence, these surveys are marked as quan. Finally, the evaluation study predominantly quantitative in nature was complemented with a subsidiary qualitative element, which in relation to Guest et al.'s weighting (Guest et al., 2012 p.198) is represented as QUAN(qual). Table 3-2. below shows and explains weighting, i.e., the dominance of one approach over the other or equality of approaches, in each of the studies in this investigation.

Research types in this investigation	Type (Weighting)	Explanation
Exploration	QUAL(quan)	Predominantly qualitative approach: qualitative methods used for exploratory inquiry, qualitative sampling, data generated in the study are predominantly qualitative, enumerated data (counts) produced from the main inquiry to establish presence, frequency, patterns
Validation	quan	Quantitative inquiry method to produce quantitative data for quantitative analysis (count incidence of codes: presence/absence, frequency, prevalence), and percent agreement for the validation of the results
Evaluation	QUAN (qual)	Quantitative and qualitative approach, testing of a proposed solution measured against pre-defined parameters (effectiveness & efficiency), structured observation as a method, qualitative sampling, data generated in the study are quantitative and qualitative and analysed accordingly, Quantitative data (counts) will be collected about the effects of the proposed solution, while qualitative data will inform about the reasoning and context

Table 3- 2. Types of studies in this investigation described in regard to qual /quan weighting, based on definitions from Guest et al. (2012, p.197)

Figure 3-5. below presents a procedural diagram that shows the structure of this investigation, and how the studies, and their key components, related to the research questions and to one another. The studies were integrated in a chronological sequence and fed findings into succeeding studies, hence, each was a necessary element of the whole. The choices in regard to inquiry methods are explained in Section 3.4.

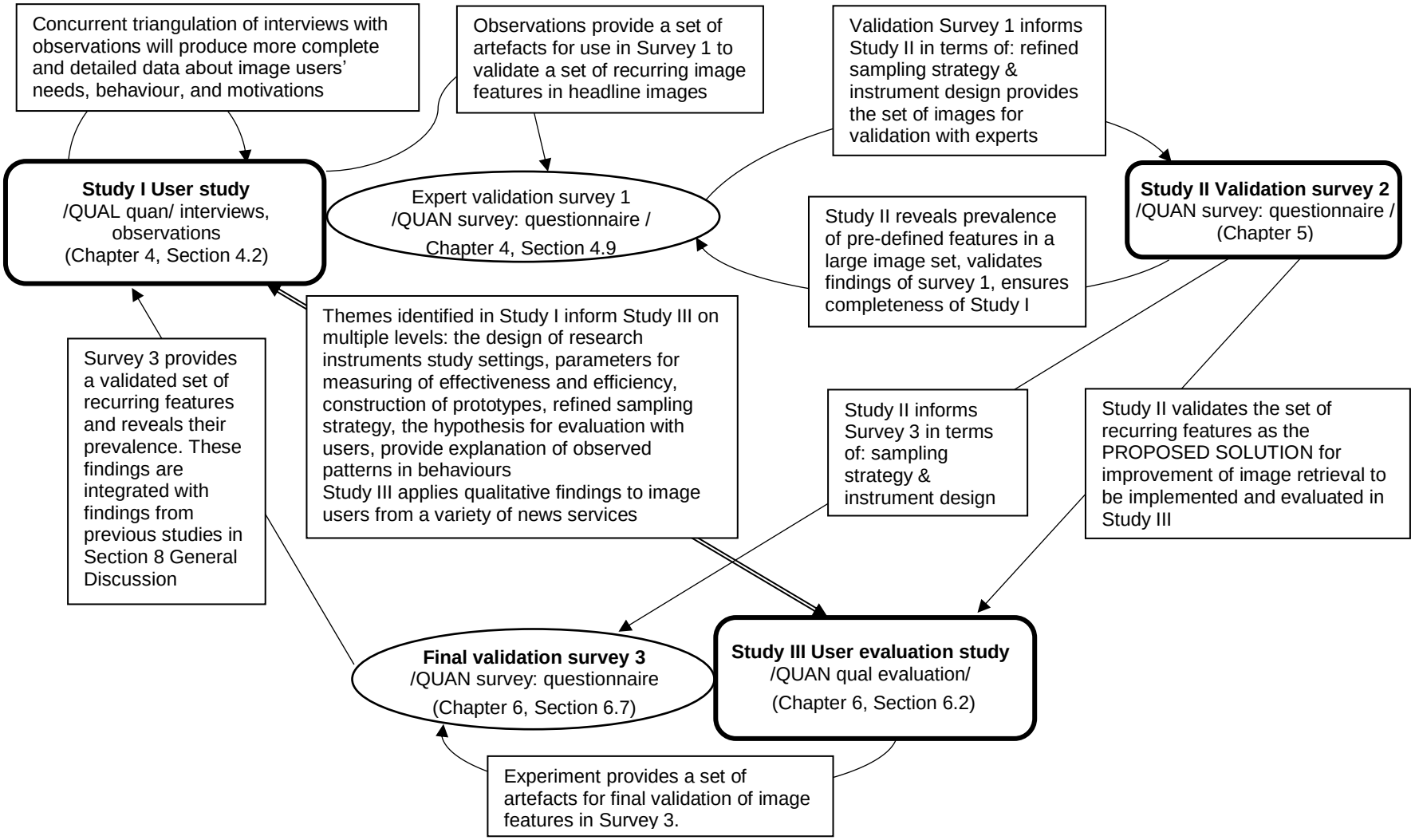


Figure 3- 5. A detailed diagram that shows how the research components have been integrated within this investigation

3.4 Integration at the inquiry level

Studies rooted in a single tradition (i.e., either exclusively qualitative or quantitative) apply inquiry methods and tools, and sampling techniques compatible with the single approach. A mixed-methods research, such as this investigation, must adopt a diverse approach to data collection. The choices of inquiry methods, sampling techniques, research instruments etc., depend on the nature of the research questions and objectives that each study or a study component aims to address. Thorough planning is required to ensure that the data are collected effectively (Guest et al. 2012) and will enable addressing the research questions and objectives set for the investigation. The planning phase for this investigation covered the following issues: identification of target population and access to potential participants, the selection of methods suitable to research questions and objectives, the design of effective research instruments, and ethical considerations, as well as *practicalities* such as schedules, equipment, location, data storage etc. While reading the relevant professional literature, the researcher paid much attention to acquiring the basics of the professional jargon and terminology used in journalism, e.g., *genre, synopsis, retouching, airbrushing, composite, filed image*.

This investigation comprised of three key studies and two supporting studies (Figure 3-4). The exploratory Study I. included: interviews and observation sessions (Chapter 4, Section 4.2), and a validation survey (Survey 1) with image experts (Chapter 4, Section 4.9). Study II. was a validation study (Survey 2) carried out on a large set of images (Chapter 5). Finally, Study III. was executed as a needs-based evaluation with users (Chapter 6, Section 6.2) and was supported with Survey 3, the final survey (Chapter 6, Section 6.7).

The exploratory part of this investigation asked for qualitative inquiry methods and sampling. Semi-structured interviews were chosen as the most suitable method to gain insights into the research problem. Interviews were triangulated with observations in-situ and the interviews and observations were scheduled to run concurrently. Triangulation was used to compensate for the limitations of interviews. Observing participants at work allowed the researcher to directly witness image users' actual behaviour in terms of interactions and activities they were performing and engaging in while completing image-based (illustration) tasks. Some observational categories concerning the needs and behaviour of users had been pre-defined based on the relevant literature and applied, in order to aid the researcher to attend to important users' activities.

Three validation surveys (Study I, Survey 1; Study II, Survey 2; and Study III, Survey 3) modelled on TREC studies (e.g., Voorhees and Harman, 2009) were used to corroborate the findings independently. These surveys involved external image experts. Surveys 1. and 3 were conducted on small sets of images that were created in the study sessions with users. These surveys were carried out as a co-coding research activity. Survey 2 (Study II) was carried out on a larger set of visuals sourced from the BBC homepage. Quantitative fixed-choice questionnaires were used in all expert validation studies.

In the chronological sequence, the evaluation of the proposed solution for improvement of image retrieval was conducted towards the end of this investigation. It was designed as an experiment in situ that involved structured observations of users performing a set of pre-defined tasks. The inquiry method, instrumentation and measurements used in the evaluation study were informed by the findings gained in the exploration, and the findings were validated in Survey 3.

Table 3-3. below signposts to the methods sections in each of the individual studies that describes the methods, instruments and session protocols in details.

Study	Inquiry	Section
Study I.	Interviews & observations	Section 4.2
	Survey 1.	Section 4.9.4
Study II.	Survey 2.	Section 5.2.3
Study III.	Experiment	Section 6.2
	Survey 3.	Section 6.7.4

Table 3- 3 The method section in the individual study chapters.

3.4.1 Sampling strategy and techniques

The important thing to remember is that what is inferred from a study must be adequate to the sample (Guest et al., 2012), and the interpretation must be consistent with the sampling design (Denscombe, 2010). The way a sample is selected will have an effect on the type of and validity of the conclusions that can be reached and the wider population to which they apply.

In this investigation, non-probabilistic purposive sampling was used to source candidates for both user studies: Study I that included observations and interviews (Section 4.2.1), and Study III, the experiment, (Section 6.2.5); as well as to locate experts for the quantitative surveys: 1, 2, and 3 as described in the following sections: Section 4.9.2, Section 5.2.1, and Section 6.7.2, respectively. Purposive sampling is recognised as a sampling method appropriate for qualitative studies that focus on the transferability of findings rather than the statistical generalisability of results (Firestone, 1993; Morse, 2000).

A snowball sampling technique was applied to locate eligible candidates for all studies in this investigation. This technique begins with a small number of eligible participants who then nominate other potential informants with the same characteristic. The sample then grows similarly to a snowball rolling downhill, hence the name of the technique (Patton, 1990). The snowball technique is typically used in situations when access is needed to niche populations that may be hidden or small in number, or groups of professionals with an expertise or skills in a specialist field (Morgan, 2008, p. 816). In Study I and Study III, image professionals working in online journalism were identified as the target population. The target population for the surveys were image experts (i.e., photographers, image editors, etc.).

A minimum size of the sample was established for each study. It was decided that Study I and Study III required a minimum of 8 participants. The final sample in Study I included 12 participants (with the pilot participant), and 11 participants (including the pilot participant) were recruited to

take part in Study III. Small numbers of participants are a common practice in qualitative exploratory studies and experimental descriptive studies with at least 6 participants (Firestone, 1993; Morse, 2000). Previous studies that used purposeful sampling and small samples of participants include some of the key texts referred to in this research, e.g., Beaudoin (2009), Göker et al. (2016), Markkula and Sormunen (2000), Sedghi et al., 2011, and Westman and Oittinen (2006).

3 image experts were required for each of the quantitative surveys in Surveys 1 - 3. These studies were modelled on TREC studies that typically use three experts (e.g., Voorhees and Harman, 2009). Although these surveys with experts were quantitative in nature, the same purposive sampling strategy as in user studies was used to sample participants.

Table 3-4. presents the sampling strategies, techniques and sample sizes intended for the individual studies in this investigation.

	Study I		**Study II**	**Study III**	
Data collection method	Interviews & Observations	Expert validation Survey 1	Expert validation Survey 2	Experiment	Final expert validation Survey 3.
Target group	Image users in online journalism	Image experts	Image experts	Image users in online journalism	Image experts
Required minimum number of participants	N ≤8 + 1 (pilot study)	3 exactly + 1 (pilot study)	3 exactly + 1 (pilot study)	N ≤ 8 (n+2) + 1 (pilot study) An even number of participants required for experimental design	3 exactly + 1 (pilot study)
Sampling strategy	Non-probabilistic: purposive	Non-probabilistic: purposive	Non-probabilistic: purposive	Non-probabilistic: purposive	Non-probabilistic: purposive
Section in this report	**Chapter 4 Section 4.2.1**	**Chapter 4 Section 4.9.2**	**Chapter 5 Section 5.2.1**	**Chapter 6 Section 6.2.5**	**Chapter 6 Section 6.7.2**

Table 3- 4. Sampling strategies, techniques and sample sizes in the individual studies in this investigation

The relevant sections, as shown in Table 3-4, describe in detail how the sampling methods worked for each individual study, and how issues related to the decisions made in the recruitment process were addressed to ensure validity of findings.

3.4.2 Ethics

In all research that involves human participants, potential ethical implications must be considered before any study takes place. Maxwell's Model of Research Design followed in this investigation (Maxwell, 2005) proposes that ethics is an essential value integral to every aspect of research design and it is a moral responsibility of the researcher to protect participants from harm and ensure their well-being (Tindall, 1994). Throughout this investigation, the guidelines described in the University's ethics forms and guidance documents (City, University of London, 2015) were followed strictly, in order to ensure the individual studies were conducted ethically and their integrity was not compromised at any stage. These guidelines enabled the researcher to identify

"the areas of operation that require[d] *careful consideration"* (Wise, 1987, p.56). These were: informed consent, confidentiality, participants' safety and wellbeing, and accountability as suggested in Burman (1994). The ethical approval from the University Research Ethics Committee was obtained prior to each individual study in this investigation (see Appendix F.). The approval process ensured that the research was designed ethically i.e., participants were able to make informed consent about participation prior to the study, confidentiality was ensured, and identifiable personal data were stored securely.

Informed consent is the fundamental criterion of ethically conducted research. Only a person who has a full and correct understanding of the aims of the study, what it involves, and who it serves (Burman, 1994), can make an informed decision about participation. To ensure that an informed consent was obtained from all candidates invited to participate in this investigation, an information pack was created for each of the componential studies. These packs are attached in Appendices section for each study (Appendices A - E). In general, the information packs covered the following aspects of the relevant study: the aim of the study, the role of participants, the research schedule and the research methods. It also explained confidentiality and data protection, and how the collected data will be stored, used and reported. Information about any potential risks and benefits was included, and the withdrawal and complaint procedures were clarified.

Some sources (e.g., Bannister et al., 1996; Harding, 2013) suggest that to ensure maximum transparency, it is important to honestly and truthfully explain to participants the role of the researcher in the research and her personal gains from the research. The role of the researcher as a student at City, University of London was clearly stated in the information packs provided to candidates. The prospects of obtaining academic qualifications after completion and the requirements for publishing reports from the studies, which could potentially enhance career prospects for the researcher were also explained. Along the feminist research tradition (Burman, 1996), it is also a good practice to explicitly state the benefits that participation in the investigation will bring to the participants. The benefits identified for participants in this investigation were clearly stated in the information packs for the individual studies.

The researcher is responsible for protecting participants from harm and eliminating or reducing any potential risks for participants (Harding, 2013). To ensure fully informed consent, participants must be informed about any (even potential) risks related to the research. Harding (2013) claims that the issue of harm needs to be considered particularly for studies that involve participants in their professional capacity. This is because such studies typically ask participants to explain or perform job-related tasks and share their real experiences. In such studies, participants may feel that they are being judged on their competence and skills or compared with other professionals in the study. This may have negative effect on participants' self-esteem. This issue was considered as particularly relevant for the studies in this investigation. All participants were recruited to be observed and share their experiences as professional image users (Study I and Study III) or apply their professional knowledge to make expert judgement about images (validation surveys with image experts: Surveys 1 – 3). It was important to ensure that candidates

correctly understood the motivations for this investigation, its goals, and that no judgement or comparison of their skills would be made or needed to inform this investigation. The *no harm* principle was included in the information provided to participants for each study, and it was clearly explained how the data would be collated and that any personal data would be de-identified. In the recruitment, each participant was allocated a code number, for example, Participant 1 (referred to as: P1). The number was assigned by the order in which participants responded to the Call for Participation and noted on their consent forms. This helped to de-identify the data, as no real names were used in any of the documentation or reports. Further, participants were informed that they could withdraw from the study at any time without being penalised and the complaint procedure was explained in the information packs together with the contact information for the researcher and the main Supervisor. To show their consent to participate in the studies, participants had to read, sign and date two identical copies of a consent form for the relevant study (Appendix A4 – E4). One of the copies was for the participant and the other stayed with the researcher and was stored safely with the data from the research, according to the University's guidelines (City, University of London, 2015).

Studies that involved face-to-face sessions (Study I and Study III) with participants required more considerations in regard to ethical implications (e.g., harm and risks) than the email-based surveys (Surveys 1 – 3). For example, special consent from participants to being audio/video recorded was sought from participants in user studies (Study I and Study III), which was unnecessary for the survey studies. The ethical considerations unique to each study will be discussed in relevant sections as shown in Table 3-5.

Study	Inquiry	Section
Study I.	Interviews & observations	Section 4.2.2
	Survey 1.	Section 4.9.2
Study II.	Survey 2.	Section 5.2.1
Study III.	Experiment	Section 6.2.6
	Survey 3.	Section 6.7.2

Table 3- 5. The ethics section in the individual study chapters.

3.5 Integration at the level of analysis and interpretation

A mixed-methods investigation produces qualitative and quantitative data, and allows for the data to be analysed according to the needs of the investigation. Types of data collected in the studies within this investigation are presented in Table 3-6. below.

Studies	**Study I**		**Study II**	**Study III**	
Inquiry methods	Interviews & observations	Survey (1) questionnaire	Survey (2) questionnaire	Experiment	Survey (3) questionnaire
Data types	qual & quan	quan	quan	quan & qual	quan
Data formats	Transcribed text & images	Text	Text	Transcribed text & images	Text

Table 3- 6. Data types and formats collected in each individual study in this investigation

Qualitative data can be treated qualitatively or quantitatively (counts), and quantitative data can be treated as numeric values or qualitatively (Guest et al., 2012). In the analysis, qualitative and quantitative data are given a similar analytical treatment: preparing data, reviewing and exploring data, coding, analysing and interpreting, and finally, reporting (Bazeley, 2018). Table 3-7. provides an overview of the procedures undertaken in the analytical process carried out in this investigation.

Procedures	Key steps
Preparing data for analysis	Transcription of audio data, quality checks, segmentation of the data, linking of the data by *case* (participant, session, task), visual data: labelling, linking to case, enumeration of data for quan analysis (counts)
Exploring the data	Reading and re-reading of textual data, reflecting, applying initial codes, comparing, contrasting & linking between ideas in different data sets, *memoing,* descriptive statistics
Coding, analysing & interpreting	Further, reading and re-reading of the data, data coding, grouping into thematic categories & subcategories, & themes, going beyond factual categories to conceptual themes across different segments of data, seeking relationships between data from the diverse sources for completeness, re-contextualising enumerated data in the qualitative
Reporting	Presenting integrated findings in discussion, visuals and tables included where appropriate

Table 3- 7. An overview of the procedures undertaken in the analytical process carried out on the data collected in this investigation.

3.5.1 Thematic Analysis

This investigation, particularly the interviews in Study I, produced qualitative data. These data were analysed for relationships, patterns and themes with Thematic Analysis (TA). The goal of most qualitative data analyses conducted in IIR is to reduce the qualitative responses into a set of categories or themes that can be used to characterize and summarize responses (Kelly, 2009, p. 127). Grounded Theory (GT) is often associated with theme generation yet, it is a complete methodology rather than an approach to analysis. The key assumptions of GT are: the researcher, at the start of the investigation, has no underlying knowledge of the research problem area that could influence the interpretation of data, the analytic process is fully inductive and findings are derived from the data, GT-based research is not concerned with any numerical data, and its efforts concentrate on theory-building (Corbin and Strauss, 2008). This investigation was driven by a set of well-defined research questions with the intention to locate its findings within the existing knowledge about image use and users. It did not meet any of the basic requirements of the pure GT. Therefore, Thematic Analysis (TA) was chosen for the analysis of data in this research project. While detailed explanations of TA methods and procedures are provided in: Boyatzis (1998), Braun and Clarke (2006), Guest et al. (2012), here is an overview of the key principles applicable to this investigation. While it may generate a theory – or more commonly a *microtheory,* as defined in Grbich (2007) – theory-building is not the primary aim of TA. It is mainly

concerned with describing and understanding of how people feel, think, and behave within a particular context relative to a specific research question. TA is *practical* and this characteristic goes well with the pragmatism of mixed-methods approach adopted in this investigation. Guest et al. (2012, p.) states, *"The greatest strength of TA is its pragmatic focus on using whatever tool might be appropriate to get the analytic job done in a transparent, efficient and ethical manner."* This approach uses quantitative techniques in combination with interpretive and other techniques to address a research problem, which suits mixed-methods studies. It handles well factual (illustrative) themes, conceptual themes and categories, and numeric data. TA analysis follows the three initial steps proposed in GT, i.e., *reading verbatim transcripts, identifying possible themes, comparing and contrasting.* It shares with GT the systematic qualities, the continuous comparison of data in an iterative manner: moving forward, backwards and across the data sets. It requires a comparative and reflective approach to analysis resulting in adjusting and modifying codes and categories when new themes emerge.

Guest et al. (2012) recommend co-coding as an activity that enhances the soundness of findings produced from a TA analytic process. In this investigation, co-coding was conducted on the visuals collected from the sessions with image users. Survey 1 (Section 4.9) and Survey 3 (Section 6.7) were both co-coding (validation) studies that involved independent image experts who assessed the images for the presence/ absence of a pre-defined set of image features. These studies required that the visual qualitative data were converted to counts, as described in Section 3.5.2.

3.5.2 Use of counts and descriptive statistics

Applying quantitative analysis to qualitative data requires the data to be converted to numerical values. Counts are a strategy integral to analysis of mixed data (Bazeley, 2018). In this investigation, counts were applied to both textual data and images. Figure 3-6. below presents how the code counting and descriptive statistics were used and re-contextualised with the original qualitative data.

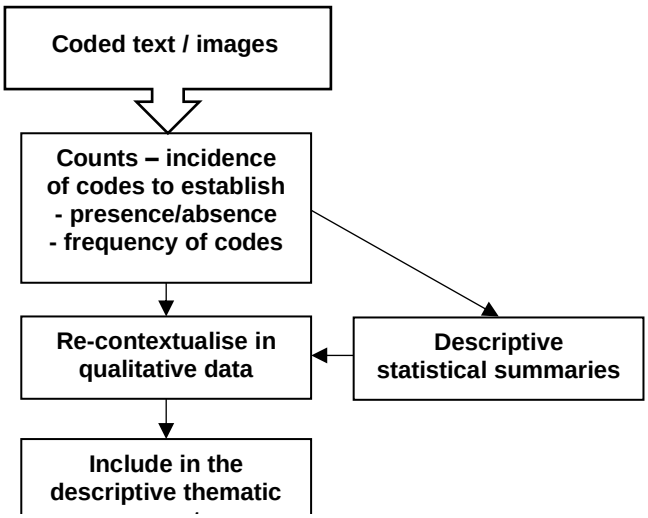


Figure 3- 6. The process of code counting and descriptive statistics in this investigation

Frequency counts were applied to textual data from observations to establish the number of cases with a particular code, e.g. counting the recurrence of specific visual feature across an image set, and to identify contexts with the same code, e.g., understanding the relation between task and specific behaviour. For the visual data, counting presence/ absence was applied with an aim to establish the presence of pre-defined visual image features in three validation surveys with image experts. Further, frequency counts were used across the whole sample of images to establish the number of cases (images) with a particular code (a visual feature). These were calculated in percentages. Further, a percent agreement was calculated between the experts' responses.

3.5.3 The visual analysis of images

This investigation produced image-based data which included: images created by participants in observations in Study I. (Chapter 4, Section 4.2.6) and in Study III. (Chapter 6, Section 6.4.2). Once the images were collected, they were labelled and linked to the individual *case*: study, participant, task, and resource. In Study II. published images were sourced from the BBC homepage specifically for the validation (Chapter 5). The textual data associated with each image, e.g., news headline, date, synopsis, were kept in a spreadsheet.

There are several existing frameworks for image analysis, as described in van Leeuwen and Jewitt (2001). Each has its distinguishing aim and focuses on different aspects of image and provides descriptions at different levels of visual meaning. In this investigation, the visual social-semiotics (VSS) framework was applied to image analysis. The visual features (visual resources) and interpretations used in the VSS are included in Appendix G. There are several reasons why VSS is the most suitable framework for this investigation. It allows to interpret images based on their syntactic features and relationships between them. VSS has been effectively applied for the analysis of journalistic images by researchers from the field of visual communication and visual semiotics. These studies identified distinct sets of visual features recurring in news images in the following functions, e.g., photos used in image-nuclear news stories (Caple, 2013), in online galleries (Caple and Knox, 2012; 2015), and as thumbnail images (Knox, 2009). These findings were an inspiration for this investigation, as CBIR systems operate on low-level syntactic features. It was expected that identifying recurring features for an image function that is universally *understood* by image professionals, and providing a meaningful interpretation of these features is a key to addressing the existing semantic gap problem.

In the studies mentioned above, two researchers performed the visual analysis independently and then the results of the co-coding activity were compared. In this investigation (validation studies), images were visually inspected for the features defined in the VSS framework. In the analysis process, the VSS visual resources were applied as a priori codes and converted to *counts* for establishing of the presence/ absence of features, their frequency and identifying patterns and trends in image tailoring.

3.5.4 Integrated interpretation and reporting

In this multi-stage mixed-method investigation, a staged approach to integration was adopted between the individual studies. Since the findings were sequentially fed from Study I to Study II, and finally to Study III, the results of each study were also reported in stages. However, within each individual study, the data came from several sources, e.g., qualitative data from interviews and qualitative comments, mixed data from observations, and quantified counts from visual artefacts. Therefore, a complementary analysis of these varied sources was carried out. Bazeley (2018, p.92), explains that in this approach to analysis, "*data from different sources, of different types and each with different strengths, beneficially come together in a complementary way, and provide a more refined and rounded understanding and a better sense of the whole*." The complementary strategies that were applied to integrate data analysis and its results in this investigation include descriptive, comparative and iterative analysis: weaving and merging of data in the analysis. The key benefits of a complementary approach are that it leads to better supported outcomes. For example, if findings from one source confirm the results of the other, similar conclusion can be drawn, or the same categories can be applied across methods, the results have a greater credibility. In contrast, discordance or inconsistent outcomes indicate problems that need to be addressed by the researcher. It was hoped that the thorough planning and effort invested in the design of this investigation would ensure high coherence of results. However, data about isolated cases, outliers and negative cases were to be included in the analysis and the final report. This was done in line with the principle of transparency (Section 3.2.1), and to ensure that the most complete and rich picture of the explored reality would be presented to the readers.

It is particularly useful in mixed-methods investigations when a single source is insufficient to answer research questions (see: Section 3.6.2). The findings from each individual study were integrated and reported in a single discussion section. Similarly, complementary integration was adopted to the whole investigation and the outcomes of this PhD research project are compiled in Chapter 7. Below, Figure 3-7 shows how the complementary analyses and integration were carried out.

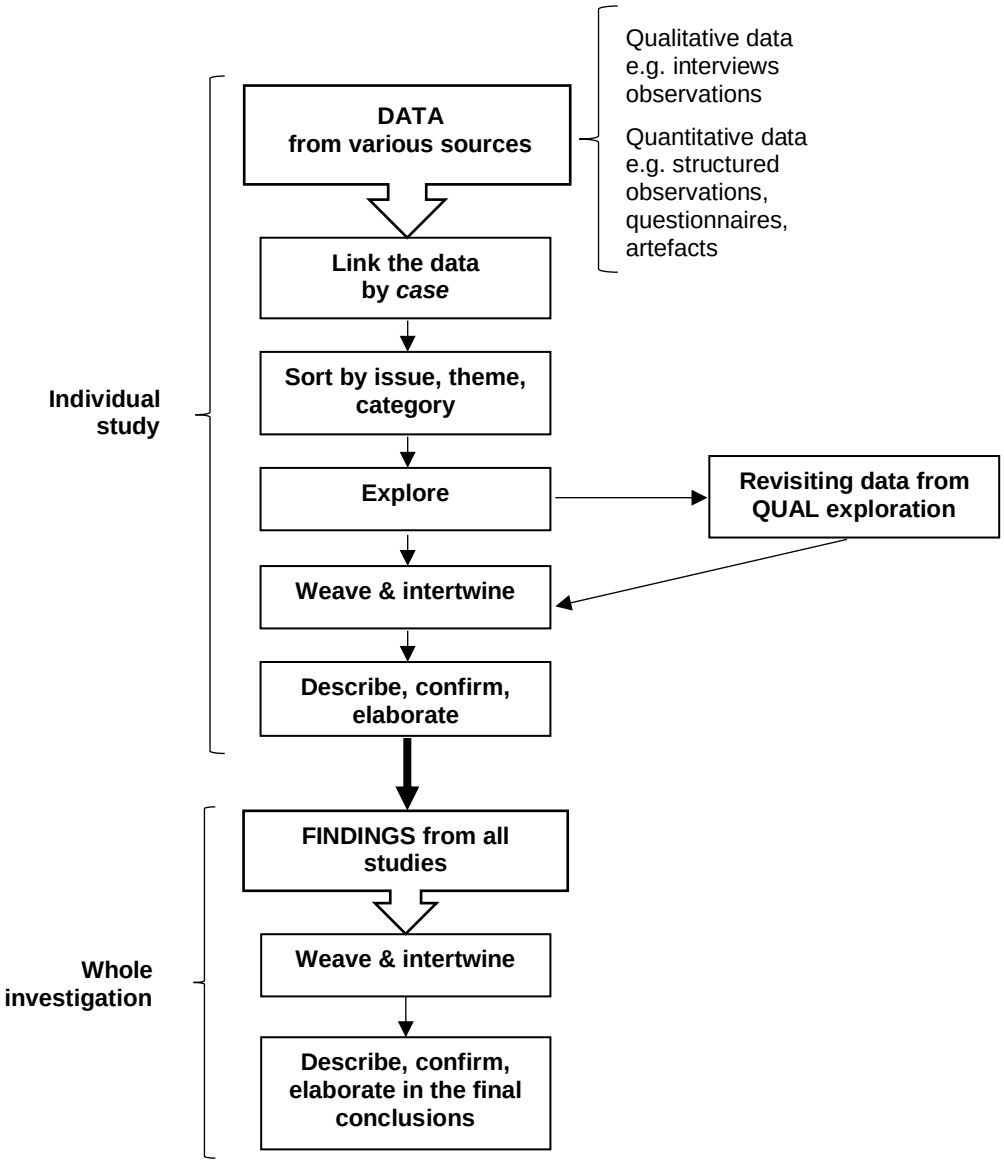


Figure 3- 7. The complementary analysis of the diverse data sources carried out in this investigation, based on the process presented in Bazeley (2018).

Table 3-8. provides signposts to the analysis sections for each individual study.

Study	Inquiry	Section
Study I.	Interviews & observations	Section 4.3
	Survey 1.	Section 4.9.5
Study II.	Survey 2.	Section 5.3
Study III.	Experiment	Section 6.3
	Survey 3.	Section 6.7.5

Table 3- 8. The analysis section in each individual study in this investigation.

3.6 Ensuring soundness of findings

Validity is one of the core elements of research design (Maxwell, 2005). It is claimed (Vogt et al., 2014) that interpretive research and studies that use open-ended inquiry instruments create potential for bias and "*views expressed by participants may be unintentionally distorted"* in the analytic process (Harding, 2013, p.173). Although Guest et al. (2012) and Bazeley (2018) argue that the bias in qualitative studies is not greater than in other types of studies because all research conditions affect participants' responses and behaviour. This investigation began with a strong qualitative component (Study I) where the interpretation of the data by the researcher was required and unavoidable, in order to draw conclusions. Then, the findings from Study I fed into Studies II and III, and informed the design of research instruments and the criteria for measurements. Therefore, all subsequent components in this investigation were highly dependent on the interpreted meanings and the available data sets that had been originally produced from the qualitative exploration. Furthermore, instead of generalisation, this investigation is aiming to allow for and facilitate transferability of its findings to other similar settings. In consequence, the criteria of validity that are normally used in quantitative studies, do not apply to the findings of this investigation. There are strategies to enhance the soundness of findings of interpretive research. Guest et al. (2012), Bazeley (2018), and Long and Johnson (2000) point to: rigour and triangulation, transparency, and reflexivity. These criteria will be put into practice at every stage of this investigation.

a) **Rigour and triangulation**

Rigour is a demonstration of integrity and competence, legitimacy of the research process. Tobin and Begley (2004, p.390) claim that "[w]*ithout rigour, there is a danger that research may become fictional journalism, worthless as contributing to knowledge*". Several steps were undertaken to ensure that rigour was maintained throughout all research phases in this investigation.

To ensure rigorous data collection, a variety of inquiry methods had been considered in relation to the research questions and objectives defined for each individual study. As suggested in the literature (Denscombe, 2010), methods were triangulated (e.g., interviews and observations), to ensure that the findings can be checked against the results of another method. All methods and research instruments, before they were used in the actual sessions with participants, had been tested in pilot studies.

Sufficient samples of participants from the target audience were recruited in both studies with users. The sample in Study I (Section 4.2.1) included 12 participants, and 11 participants (including the pilot participant) took part in Study III (Section 6.2.5). These numbers meet the requirement of at least 6 respondents for qualitative exploratory studies and experimental descriptive studies, as suggested in Morse (2000).

Thematic Analysis (TA) was chosen for the analysis of data in this research project (Section 3.5.1). TA offers a strict and rigorous process and techniques for handling data and examining them for relationships, patterns and themes (Guest et al., 2012). The rigour was achieved through

continuous reading and re-reading of data, the iterative comparison of data across data sets. This ensured that codes and categories were being adjusted and re-adjusted whenever new information emerged.

Several well-established frameworks and theoretical models from the literature about information seeking (e.g., Conniss et al., 2000; Ellis et al., 1993), were applied to the interpretation of data collected in this investigation. This allowed to create reliable codes and categories for analysis and to locate the findings within the already existing knowledge (Section 4.3; Section 6.3).

To further enhance rigour in this investigation, data analysis was aided with a computer-based qualitative analysis software, Atlas.ti, as recommended in the literature (e.g., Rambaree, 2007). The tools available in Atlas.ti helped to identify relationships in the data, group elements of data in categories, and establish hierarchical connections between them. The software also offered an instant view of the rich and complex relationships in the data. It was easy to navigate between the related elements when the lists of codes and categories had to be updated, which helped the researcher to handle the large volumes of collected data.

To further ensure that the data from user studies were interpreted with rigour, 3 validation surveys were carried out on visual data sets (Survey 1. – Section 4.9; Survey 2 – Chapter 5; Survey 3 – Section 6.7). Each of these surveys involved 3 independent image experts (9 experts in total) who visually inspected provided images and co-coded them for the presence of visual features defined using terminology and concepts of the visual social semiotics framework (Kress and van Leeuwen, 2006). The recruitment and methods used in the surveys were modelled on TREC research that has a long history of investigating information retrieval (Voorhees and Harman, 2009). The data collected through the surveys were analysed quantitatively, using percent agreement. Where appropriate, the results were compared with qualitative findings from user studies (in Study I and in Study III), in order to quantitatively corroborate the findings.

b) Transparency

To achieve transparency, this thesis provides detailed text-based descriptions and visual presentations of the processes and activities undertaken in all studies in this investigation. The choice of methods, and the design, purpose and application of research tools and materials are clearly explained in the individual study chapters. The coding procedures are described, codes and coding schemes are provided in Appendices. All perspectives, those that are coherent and confirmatory of the results, as well as those demonstrating isolated views of image professionals are included in the reported finings. This is done to ensure the provided description of the reality is rich and most complete. Whenever it is possible, unique verbatim quotes from studies with users (Study I and Study III) are included in the findings sections and in the discussion chapters in this report. This is done to enhance credibility and transparency of the interpreted findings (Guest et al., 2012), and to enable the readers to distinguish between the raw data and the interpretations made by the researcher. It is known (e.g. Harding, 2013), that interpretation of data even if conducted rigorously carries an element of subjectivity. Including quotes in support of these interpretations, gives readers an opportunity to read for themselves what participants

had actually said in the sessions, and to make their own judgement of the quality of researcher's interpretations.

c) Reflexivity

Researchers involved in mixed-methods studies are encouraged to be reflexive on how their actions and presence may have affected the data collection and analysis, and the quality of collected data (Guest et al., 2012). In this investigation, the researcher took on a variety of roles: the interviewer, observer, facilitator in an experiment, analyser, coder. In the planning session for each study, the researcher reflected on the potential effect that her presence might have on participants' responses and behaviour and subsequently, on the honesty of data. This enabled the researcher to plan for measures to be taken in order to minimise the bias and researcher effect. For example, it is known that data collected in interviews can be affected by the interviewer's personal identity, age, gender, ethnicity (e.g., Denscombe, 2010). While these qualities cannot be changed, their effect may be counterbalanced to certain extent by rapport-building strategies, polite, and cordial attitude, showing genuine interest in the subject, being receptive to participants' responses but passive and neutral. The researcher kept a record of any issues that arose during sessions in her fieldnotes. Additionally, fieldnotes included researchers' own thoughts, questions and reflections about sessions, individual responses, etc. These notes were kept separately from the data obtained from participants but were used as meaningful reminders of participants' reactions and carried rich contextual information. The researcher also reflected on each study after it had been completed. The researcher applied a simple reflective cycle consisting of the following three questions: *what? so what? now what?* loosely based on Driscoll's reflective cycle (Driscoll, 1994). These questions helped to establish what was observed and what the observed situation meant in the context of the session and for the future of this investigation. The theoretical limitations of selected methods were an important subject of this reflective practice and had a significant impact on the methodological choices made in this investigation but, what is more important, the reflective activity also focused on how the studies were actually conducted in terms of procedures, tools, the completeness and accuracy of data sets, etc. Reflexive analysis included the quality checks carried out on the data sets, *memoing* (noting) any adjustments made to codes and coding schemes, following the rigorous process of TA. The reflective process conducted in this research contributed to identifying the strengths and limitations of each of the componential studies presented in the study chapters. Chapter 8 is a personal reflection of the researcher on the research process, the different roles the investigation required from her to take up, and the ups and downs that she experienced.

3.7 Summary

Chapter 3 discussed the methodological choices made in this investigation. Mixed-methods was adopted as the most suitable approach to produce the in-depth knowledge about image users' needs and behaviour (Goal 1), and to propose and evaluate a practical device for improvement of image retrieval (Goal 2). Table 3-9. below presents the final research schedule with the key

details about each of the three studies integrated within this investigation, and pointers to the appropriate sections in this document.

Goals	**Goal 1**			**Goal 2**	
Research questions	**RQs 1 & 2**		**RQ 2**	**RQ 3**	**RQ 3**
Objectives	**1 - 6**		**6**	**7**	**7**
Research purpose	**Exploration**	**Validation**	**Validation**	**Evaluation**	**Validation**
Timing	**Sequential**		**>>>**	**>>>**	**>>>**
Weighting	**QUAL quan**	**QUAN**	**QUAN**	**QUAN qual**	**QUAN**
Studies	**Study I**		**Study II**	**Study III**	
Inquiry methods	Interviews & observations	Survey: questionnaire	Survey: questionnaire	Experiment	Survey: questionnaire
Dates	2013/2014	2014	2015	Jan – July 2016	Aug – Dec 2016
Data types	qual & quan	quan	quan	quan & qual	quan
Sampling	qual	qual	qual	qual	qual
Data analysis	Thematic analysis	Percentage agreement	Percentage agreement	Thematic analysis	Percentage agreement
Section in this report	4.2	4.9	5	6.2	6.7

Table 3- 9. The final research schedule with key details about each of the three studies integrated within this investigation, and pointers to the appropriate sections in this document.

CHAPTER 4. Study I. – The qualitative study with image users in online journalism and validation survey 1.

4.1 Introduction

This investigation opens with Study I. that is an extensive exploration into the world of the image users in online journalism. This study is driven by two aims: 1. to uncover how images are selected to illustrate online news content (RQ1), and how and why images are tailored before publication (RQ2), and 2) to identify within the broad narrative from the exploration concrete opportunities for improvement to image retrieval to be evaluated in the experimental study that ends this investigation (Chapter 6). To gain a broad understanding of the user's image seeking behaviour and needs in online journalism, Study I. has been designed to focus on the following six areas: 1) The image user and the workplace, 2) Illustration tasks, 3) Image users' needs, 4) The illustration task process, 5) The relevance assessment and selection criteria, and 6) Challenges in the illustration process specific to the online environment. The extent of this investigation and the corresponding aims are presented in Figure 4-1.

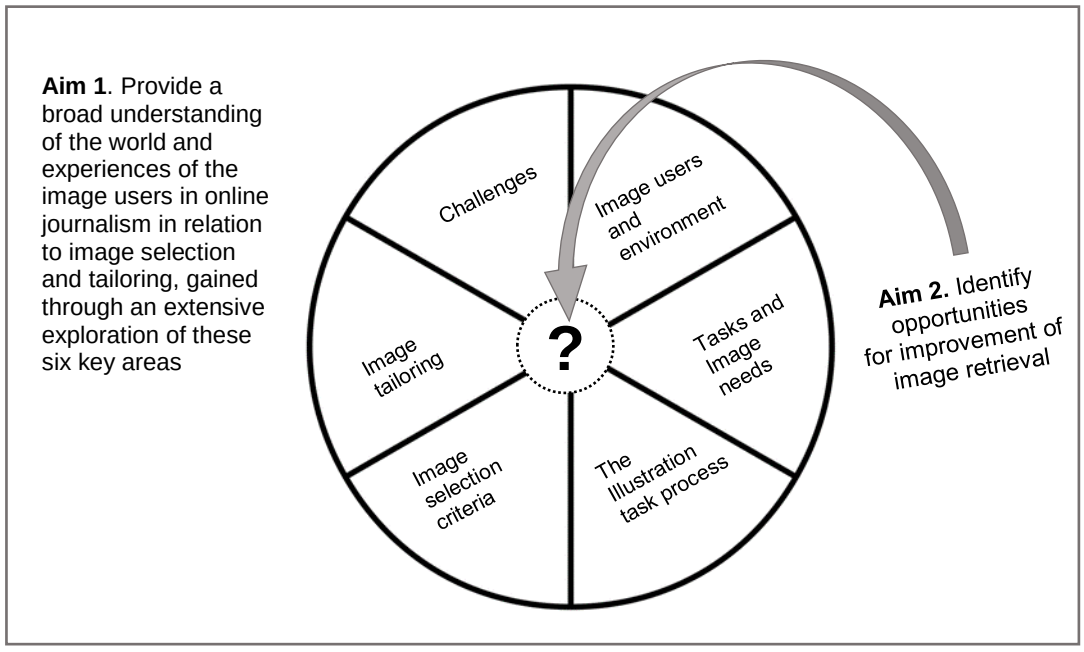


Figure 4- 1. A visual presentation of the aims and the six key areas researched in Study I. The areas have been defined based on the Contextual Framework proposed by Conniss et al. (2000)

The research questions 1 and 2 are further broken down into a set of focussed questions (Table 4-1).

Research sub-questions	Themes and literature	Data source	Results presented in
'Who' are the professionals involved in the image seeking and selection process?	Profession: job roles, responsibilities, skills, work environment (typologies of IR users, see Section 2.2.1)	Interviews	Section 4.72
What types of illustration tasks are typical for online journalism?	Tasks sources, goals, components and structure (e.g., Borlund, 2003; Byström and Hansen, 2005; Conniss et al., 2000; Fidel, 1997; Marchionini 1995; Toms, 2011)	Interviews, Observation	Section 4.7.3
What are the work-related image needs of these specific image users?	Image users' authentic needs (Conniss et al, 2000; Markkula and Sormunen, 2000, Westman, 2009; Westman and Oittinen, 2006)	Interviews, Observation	Section 4.7.4
What are the stages in the image searching process?	Stages and activities in the process in reference to models: Conniss et al, 2000; Ellis et al. 1993; Markkula and Sormunen, 2000,	Observation	Section 4.7.5
What are the criteria used for image selection?	Relevance and selection criteria in reference to Conniss et al, Markkula and Sormunen, 2000, Westman and Oittinen, 2006	Interviews, Observation,	Section 4.7.6
What are the challenges to task completion specific to online journalism?	Conniss et al. 2000 Westman and Oittinen, 2006	Interviews, Observation	Section 4.7.9
How and why are images tailored in online journalism?	Tailoring techniques applied, visual image features present in the tailored images, The VSS framework (Kress and van Leeuwen, 2006)	Image analysis and Survey 1.	Section 4.7.7 and 4.7.8

Table 4- 1. Research sub-questions, pre-defined topics, data collection methods,

Since the focus of this study is on individual experiences, motivations and intentions driving the image selection and illustration processes, a predominantly qualitative approach has been adopted in Study I. Semi-structured interviews and observations have been chosen as the most suitable inquiry methods for this investigation. The interviews facilitated an exploration of the main research areas and resulted in gaining systematised factual knowledge about this particular group of image users, their profession, work environment, tasks, selection criteria, and challenges they face. Observations in situ complemented and enriched these data by providing real-life instances of authentic activities undertaken by image users in order to complete illustration tasks.

The interviews and observation sessions took place between November 2013 and January 2014 (The schedule is available in Appendix A3). 12 image professionals working in online journalism were recruited (Section 4.7.1), and took part in individual semi-structured interviews (Section 4.2.5.). 10 participants from the sample also agreed to be observed while performing *real* illustration tasks in the environment of their workplace (Section 4.7.2). The tasks that they typically worked on involved searching for and selecting images for the function of the dominant headline image on the homepage.

Images are used in multiple functions in online news, e.g., thumbnail images (Knox, 2007a; 2007b); online image galleries (Caple, 2012). Studies in visual semiotics and visual communication provide evidence that each of these functions requires a specific and visually distinct type of image to carry out the full potential of this function. This investigation focuses on images selected to serve as the dominant headline image on the news homepage. Since almost all online news services feature the dominant image on their homepages, it is one of the most important image functions in online news. Yet, it has not been previously researched in terms of the distinct features and in the context of image seeking and selection. In the final stage of this Study, the focus was narrowed down to dominant news images of a specific person/ people. Dominant images showing specific (identifiable) people have been identified in this study as the most popular sub-category of this function.

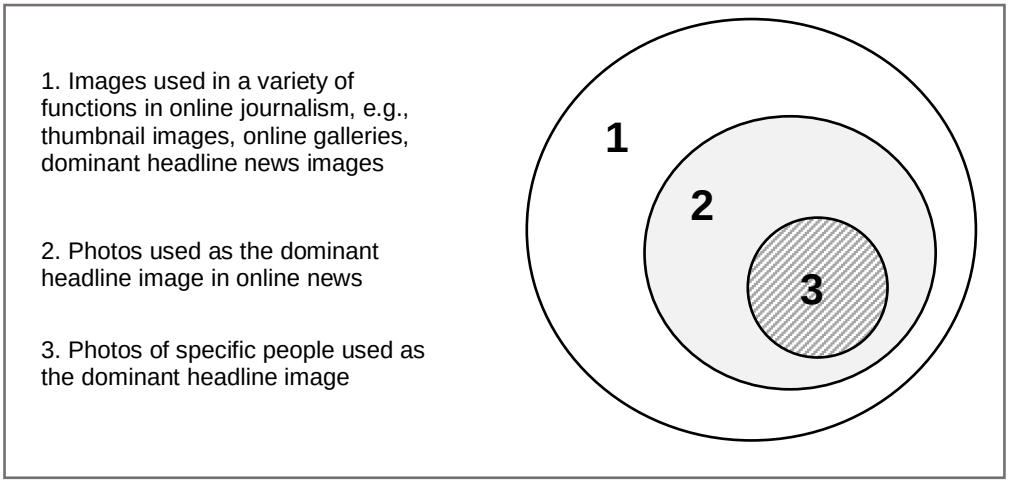


Figure 4- 2. Journalistic imagery and its sub-sets. Study I. focuses on Sub-set 2., and then the scope of the investigation narrows down to Sub-set 3.

Thematic Analysis (TA) was used to derive the codes and themes from the data. The data from the interviews provided findings in regard to a general understanding of image users' behaviours and how contextual and environmental factors influenced these behaviours. The interviews were complemented with observations (Section 4.2.6) that aimed to uncover natural behavioural patterns of the participating professionals. It was expected that the thorough understanding of the needs, behaviour and experiences of image users would allow to identify opportunities for improvement to image retrieval. As the final outcome of Study I, a practical needs-based concept was proposed for implementation and evaluation with users.

The images selected by the image users and the final illustrations created in the observation sessions were collected for a visual analysis. Initially, the researcher visually inspected these artefacts to identify visual image features present in them. The concepts and tools of the visual social semiotics (VSS) framework (Appendix G) were applied for this analysis. Further, in a manner similar to inter-coding for textual data, a validation survey 1 was conducted with three image experts who independently examined the images a high inter-coder percent agreement. The aims and methods used in this Survey are presented separately in Section 4.9.

4.2 Data collection: *interviews and observations*

This Section provides a detailed description of the research process in Study I. It begins with the presentation of the sampling technique used to locate and recruit image users working in online journalism. The profiles of the recruited participants and the context of their workplace are described in detail. This is followed by a presentation of step-by-step protocols of the interviews and observation sessions conducted in-situ between 5th November 2013 and 24th January 2014.

4.2.1 Sampling

4.2.1.1 Non-probabilistic sampling

Study I (interviews and observations) sought "*privileged information from key players*" in a very specific domain (Denscombe, 2010). *Image professionals working in online journalism* were identified as the target population. The job roles related to print journalism typically include: image (or photo) editors and journalists. In this research, in the *Call for participation* (Appendix A1.) a broader term *image professionals* and examples of roles *e.g., image editors, online journalists* were used not to exclude any job roles specific to the online domain. A non-probability sampling technique known as snowball sampling or referral sampling (Patton, 1990) was used to recruit participants for this research project. When using this technique, the researcher begins the study with a small number of participants and relies on them to nominate other potential informants who share the same characteristic and therefore, are eligible for the research (Morgan, 2008, p. 816). With this approach, the sample grows similarly to a snowball rolling downhill, hence the name of the technique. The snowball technique is typically used in situations where the target population is difficult to get access to as there are no formal lists or other obvious sources for locating members of the target population (Morgan, 2008, p. 816) that may be hidden or small in number, for example, when the population of interest are a group of professionals with a specialist set of skills.

At the time when she embarked on this research project, the researcher had been working at the BBC as part of User Experience and Design Team for over 6 years, which helped her to locate the Central Editorial Team and establish an initial contact with a senior member of the team (P3). P3 was informed of the study and its purpose, and agreed to participate in a Pilot study (Section 4.2.4). He assisted the researcher in recruiting his colleagues for this study by advising on the structure of the team, liaising between the researcher and potential candidates for the research, providing contact details for potential candidates. The researcher then contacted the individual candidates by sending direct emails to them with an invitation to and general information about the study (Appendices A1 and A2). Once candidates had expressed their interest in the study, and self-assessed their eligibility based on their age and current job role, they were sent an Information Pack with detailed information about this project. To further assess their eligibility, candidates were sent an entry questionnaire.

While snowball sampling proves effective in recruiting participants from hidden and hard to reach populations, Morgan (2008) claims that it may also result in a biased subset of the total population of potential participants. Some eligible participants may never be included in the sample as they are not linked to the original set of informants. The original informants may misinterpret the eligibility criteria, for example, they may try to recruit only people like themselves which may result in underrepresenting other types of eligible participants that the researcher has no knowledge of. To avoid such biases, the researcher interviewed P3 who had been in his current role for over 10 years and has a thorough knowledge of editorial processes and workflows in online journalism. P3 was able to advice the researcher on the various responsibilities carried out by CE team members and which job roles had to be included in the study to enable the researcher to capture the complete picture of illustration and editorial processes that were in focus of this project. The snowball sampling technique proved effective in recruiting participants within one organisation, the BBC Online. However, attempts to broaden the sample with participants from other news organisations failed, and only one non-BBC participant was recruited (P8). The existing participants were helping the researcher to establish contacts with professionals outside the BBC. In all cases, non-BBC image professionals working for commercial and profit-driven news services when approached, were not able to participate for a variety of reasons, for example, some did not get approval from their managers to participate in the study as they worked under high time pressure. Others – although they confirmed that they understood the aims of this research - were still protective of their professional skills and admitted they did not want to *give away* the tricks of the trade because they had worked hard to acquire them. Some candidates said they did not always feel confident about the decisions they made regarding image selection and were afraid that they would look incompetent when compared with others.

It is important to note, that after the recruitment process had been completed, a potential for bias was identified. Contrary to the intentions of the researcher and the aims of this investigation, the purposeful sampling resulted in a convenience sample. All but one participants were sourced from a single news service (The BBC Online). There was a potential for this research to become a *case* study of practices shared by image professionals in one organisation. In cases where there is a potential for bias, it is necessary to be transparent about the processes (Guest et al., 2012). Detailed descriptions of the sampling techniques and process, and the participants' profiles are provided to ensure transferability of findings. It is believed that this level of detail will provide sufficient information to the readers to enable them to establish the similarities between the settings in this study and their settings. Further, the literature review showed that it is not an uncommon practice to conduct qualitative research into image needs within one news service. Several key texts referred to in this investigation, report on such studies. For example, Markkula and Sormunen (2000) observed journalists at the newsroom of *Aamulehti* (Finnish newspaper), Westman and Oittinen (2006) in an editorial office of a daily Finnish newspaper (unspecified), Rössler et al. (2011) observed image editors at *Stern* (a weekly news magazine in Germany).

4.2.1.2 Entry questionnaire and the eligibility criteria

Before they were accepted for the study, all participants who responded to the Call for Participation letter and self-assessed themselves as eligible for the study based on the two minimum eligibility criteria (age and current profession) were asked to fill in an Entry Questionnaire (Appendix A5.). The purpose of the questionnaire was to assess the suitability of each participant for the study, and to monitor any bias that could potentially occur because of the snowball sampling technique. The data from the Entry questionnaire enabled the researcher to create a set of participant's profiles and ensure that all relevant image-related job roles were represented in the study. These profiles are presented in Table 4-8. Those eligible candidates were added to the list of participants and scheduled for an individual interview session.

The primary recruitment criteria for this study were limited to participants' age and current profession and were defined as follows:

- *Age*: over 18 years of age, AND
- *Profession*: currently employed a) in a role that involves image selection and editing for online publication, b) at a UK based online news service covering the following subjects: world news, UK news, sport, entertainment, art and culture, technology, science.

4.2.1.3 Determining the sample size

Data saturation is often used as one of the indicators for determining of the sample size necessary for a qualitative study (Harding, 2013). However, there is no agreement in the academic world on what saturation means. Some sources (e.g., Patton, 2002) take the richness of the collected data as the indicator of saturation. Others (e.g., Lincoln and Guba, 1985) propose to end the data collection only when the information from the data becomes repetitive and no new themes can be derived. If this approach is taken, it is not possible to determine saturation before a study has been complete. As an alternative method, Morse (2000) provides a list of factors that need to be considered before the minimum number of participants can be determined for any study: the scope of the study (studies with a narrow scope reach saturation quicker); the nature of the topic (studies with a clear and well-defined topic require fewer participants), quality of data and study design (empirical studies that provide rich and experiential data require small samples). Provided these factors are considered, according to Morse (2000), qualitative studies may require as few as six participants. The factors described by Morse (2000) were carefully considered for Study I: this study focused on a single domain of online journalism and clear areas for investigation were defined within the main topic of image seeking and use. A set of focused questions (Table 4-1) led the research and directly dictated the choice of the qualitative methods: interviews and observations in-situ. The interviews were expected to provide the participants with the space to talk about their own experiences in their own words, while the direct observations would result in rich and experiential data about the actual needs and behaviours of this specific group of image users. However, additionally, factors such as resources need to be taken into consideration, for

example, how much one person can *physically* manage to achieve within the time period allowed for a study. This study was approved by the City University's Ethics Committee for a minimum sample of 8 participants and maximum of 16 participants (Appendix F). In total, 12 participants (eleven – BBC staff and one non-BBC online journalist – P8) were recruited. Further, 10 participants from this sample also participated in individual observation sessions. For most factual topics such as: e.g., job role and responsibilities of image users in online newsroom, a typical working schedule, and types of tasks, repetition and redundancy of information was observed within the first initial interviews with participants in the same job roles. However, personal experiences captured through a retrospective narrative or in observations were more unique to each image user and required several sessions with individual participants until the collected data could be considered satisfactorily rich, i.e., the data would present a range of perspectives (the most complete range), and no completely new themes were emerging from the data (See: Section 4.3.).

In the field of image retrieval and image seeking, user studies with small numbers of participants are not rare, especially when the participants are professionals. The examples of previously conducted research with small samples include some of the key texts referred to in this work, e.g., Göker et al. (2016) 13 participants including two from news services, Markkula and Sormunen (2000) – 8 participants performing altogether 20 single illustration tasks, Westman and Oittinen (2006) – 9 interviews and 6 single task observations. Earlier, Barry (1994) suggested that it is possible to uncover the full range of relevance criteria from a sample of fewer than 10 participants.

4.2.2 Ethics

To ensure that this study was conducted ethically, issues such as data protection, confidentiality, participants' safety and wellbeing were carefully considered early in the research planning phase of this investigation. The guidelines described in the University's ethics forms and guidance documents (City University, 2013) were followed strictly to ensure the studies were conducted ethically and their integrity was not compromised at any stage.

The ethical approval from the University Research Ethics Committee was obtained prior to this study. The approval process ensured that the research was designed ethically, i.e., participants were able to make informed consent about participation prior to the study, confidentiality was ensured, and identifiable personal data were stored securely (see Appendix F1.).

To enable participants to make informed consent about participation in this investigation, the following information was provided to candidates and prospective participants in the Information Packs for participants. The aim of the study, participants' role and contribution, information about timescales, research methods to be used in this project, confidentiality, data protection and storage, benefits and risks involved, withdrawal and complaint procedure were explained. The role of the researcher as a student at City, University of London was clearly stated. Harding (2013) states that it is essential to honestly and truthfully explain to participants the role of the researcher

in the research and personal gains from the research for the researcher, e.g., obtaining academic qualifications after completion, publishing reports from the study and potentially enhancing career prospects. In studies that involve participants in their professional capacity where they will be asked to explain or perform job-related tasks, it is important to explain the no harm and risks involved (Harding, 2013). Such studies may have an effect on participants' self-esteem, if they feel judged in terms of quality of their work, comparison to others. The purpose of the research and how the data will be collated and used was clearly stated. The no harm principle was included in the information provided to participants. Participants were informed that any personal data would be de-identified, and each of them was allocated a code number, for example, Participant 1 (referred to as: P1). The number was assigned by the order in which participants responded to the Call for Participation and noted on their consent forms. This helped to de-identify the data, as no real names were used in any of the documentation or reports. If participants wanted to know the difference between anonymity and confidentiality of data, these were explained clearly, and it was emphasised that the only people who would be aware of individual responses, would be those involved in the research. With more apprehensive participants, an agreement was made that they would be able to review the researchers' notes at the end of the session.

The researcher also sought consent from participants to being audio-recorded in the interview sessions in Study I, and video-recorded in observations in situ. Participants were informed about the rationale behind the video recordings as a backup data source for analysis, and that the videos would capture the screen of participants' computers and their voices, but not their faces. Participants could decide whether they wanted to consent to being video or only audio recoded, and were presented with alternative data collection techniques, for example, thorough note taking, saving screen grabs of their screens. All personal data and raw data in any format (notes, artefacts and video recordings) collected from the research were kept secure in the researcher's personal locker at work place and all computer files were password protected. Participants were assured about the importance of confidentiality in this study and told that if they required, they would be given access to recordings of their individual sessions and any contentious sections or all data would be removed from the study. Subjects were also assured that they could withdraw from the study at any time for any reason, and without giving a reason.

Prior to the individual sessions, all participants read and signed two copies of the Consent Form (Appendix A4) created according to the University Ethics Committee guidelines. The consent forms further demonstrated the Researcher's commitment to confidentiality and data protection, and provided information about how the data would be collected, stored and disseminated. If any adjustments or exceptions were required by participants, these were noted on their consent form and adhered to by the researcher.

The researcher had a good experience of conducting qualitative research in a professional capacity (design researcher at the BBC from 2007 – 2014), research methods and design module during the Masters degree at City, University of London, a Course in Counselling skills for effective rapport building, active listening, interviewing techniques, e.g., open and reflective questioning

and non-leading probing, ethics of counselling profession, sensitivity to body language e.g., needing a break etc. As already stated consent asked prior to each study and no pressure for participating or completing the study without being penalised. Information about the complaint procedure was also provided together with the contact information for the researcher and the main Supervisor. Incentives of £30 worth vouchers were offered to participants as a way to express the appreciation for their time and contribution.

4.2.3 Study environment: interviews and observations

Since the observation sessions were conducted in-situ, this Section provides detailed information about the study environment in regard to the online news service and particular section of the service that was in focus (the BBC Homepage), workspace set-up, and the online image collections used by image professionals to source images for illustration tasks. All interviews and observations sessions with the BBC participants were conducted at the BBC Online editorial office in Manchester, UK. The BBC Online is currently one of the largest on-line news services in the UK, with no print 'parentage'[41]. Its history goes back to 1996/1997, when the first version of the online service was launched (Waybackmachine Internet Archive, 2015).

4.2.4 Pilot study

A pilot study was conducted on 17th April 2013. Due to his rich professional experience, P3 was regarded to be an appropriate participant for the pilot study. The pilot study was done remotely via an online communicating tool Lynk that allowed audio and video communication, as well as screen sharing. Prior to the study, a consent form was emailed to the participant, who signed and dated it, and returned via the internal post. The pilot comprised of two parts: an interview of approximately 45 minutes and an observation session of approx. 20 minutes.

The primary aim of the pilot interview was to test the initial version of the topic guide in terms of the scope, and the validity of topics and questions included in the guide. As the initial set of topics, questions and probes was formulated based on literature concerned mainly with print journalism (e.g., Ang, 2000; Kobré, 2008; Markkula and Sormunen, 2000; Westman and Oittinen, 2006), there was a high potential that some of the questions might be irrelevant or invalid in the context of online news. The feedback from the pilot interview was used to refine the topics and questions in the Topic Guide to suite the reality of the domain in focus of this investigation. For example, the original version of the topic guide included questions in regard to task flows and possible scenarios of how image editors might receive requests for images from journalists and act as intermediaries for finding images for them (as it would typically happen in print journalism, e.g., Kobré, 2008; Ørnager, 1995; Markkula and Sormunen, 2000; Westman and Oittinen, 2006). However, in the pilot interview with P3, it was soon established that these scenarios were irrelevant to the work of image professionals in online journalism who worked independently from journalists. They hand-picked journalistic content, searched for images and used their own

[41] News websites with print parentage include The Guardian, The Times, FT, and any other news services that grew out of a print edition, while The BBC, SkyNews, and Yahoo!, MSN, are those with no print parentage.

expertise in images to select and edit images in a way that, by their professional judgement, would most effectively promote this content on the BBC homepage (www.bbc.co.uk).

This pilot interview also showed that while speaking about image needs, P3 expressed a clear need for images that would have a specific visual impact on viewers e.g., a need for attention grabbing images. However, verbalising the actual visual features responsible for this effect proved difficult for him. This confirmed the need for triangulating the interviews with observations of image users in situ. The pilot observation covered a single illustration task related to a breaking-news story: Margaret Thatcher's funeral, as it was being reported live. This was a *real* work task allocated to P3 at that time, he was illustrating news updates while the event was taking place. The image he selected for the story in the pilot session is presented in Figure 4-3. below.



Figure 4- 3. Illustration Task 6 Thatcher's funeral - live update

The researcher could see the screen where P3 conducted the search, selected the image, and made minimal edits to fit the image in the frame of the promo box. P3 was using the think-aloud protocol to narrate his actions and decisions. This pilot observation tested the participant observation sheet and resulted in a refined version of the observation sheet (Appendix A7) used in the main study. Some questions were reformulated and simplified, which allowed to save time for actual observations and debriefing questions after the session.

Having completed the pilot, P3 expressed interest in participating in the main study. Since the participant later referred to the pilot illustration task several times in his interview session in the main study, the findings from the pilot were also included in the results of the study (T6). Such decision could be taken justifiably, since the pilot study was conducted with the rigour of the main study and all topics included in the main study were thoroughly covered. This pilot study ensured that the topics and probing questions in the topic guide were valid and relevant, the observation sheet allowed to record all activities in the observed processes, the time with participants was used well, and overall, the main study could effectively answer the research questions defined for this study of the investigation.

4.2.5 Interviews

The main part of Study I. was designed as an exploratory and explanatory study with an aim to gain an in-depth knowledge and understanding of needs and behaviour of image users in online journalism. 12 eligible participants took part in individual interview sessions. The interviews were

scheduled to suit the participants' busy work schedule between 5th November 2013 and 24th January 2014. (A schedule of this study is provided in Appendix A3). The interviews took place at the participants' work place (Section 4.7.2) 10 sessions took approximately 60 minutes, while interviews with P11 and P12 lasted about 5 minutes each and were followed by observations. Participant were welcomed by the researcher to their individual sessions. The researcher re-introduced herself, thanked the participant for agreeing to participate, and explained the purpose of the interviews and this investigation.

The interviews had a semi-structured format. One of the key strengths of this method is its suitability to gaining insights into the research problem in a participant-led conversational interview. The semi-structured format of the interviews allowed participants to develop ideas and speak freely about issues in their own language. A number of studies into users' information needs used semi-structured interviews as a method of inquiry, e.g., Beaudoin, 2009; Choi and Rasmussen (2002), Conniss et al. (2000), Göker et al. (2016), Markkula and Sormunen (2000), Sedghi et al., 2011, and Westman and Oittinen (2006). In Markkula and Sormunen (2000), and Westman and Oittinen (2006), the authors use a term thematic interviews but the description of the protocol ensures that they used semi-structured interviews). The individual character of the sessions as opposed to e.g., a focus group, suits well the exploration of sensitive subjects (Denscombe, 2010). The literature (e.g., Harding, 2013) shows that job-related matters are considered a sensitive subject and that some people are unwilling to give away tricks and trades of their profession, or are protective of certain practices used in their company or industry. Others may be afraid of being judged, compared and perceived incompetent. To address these issues, one-to-one interview sessions were designed and an effort was made to ensure that the sessions were conducted in a non-judgemental atmosphere. The measures taken included: ensuring that the prospective candidates, and later participants, had sufficient information about the aim of the investigation, their role and contribution, the researcher's role as interviewer and research student, how the data would be deidentified for analysis and reporting. These issues were addressed in the Call for Participation, Information Pack, and the oral introduction to the interview sessions. The Consent form (Appendix A4) clearly stated that the researcher was obliged to maintain confidentiality. An understanding of these preclusive measures was checked and confirmed in a conversation with each participant prior to their individual session.

These semi-structured sessions were a naturally flowing conversation-like interviews bounded by the topics in the topic guide (Appendix A6). This format of interviews enabled the researcher to collect data in a systematic way, while giving her the flexibility to adjust questions, in terms of wording and order, according to the natural flow and dynamics of each individual session. Participants led the pace in the interview sessions, as they answered open-ended questions and could develop their own ideas within the specific topics pre-defined in the Topic Guide (TG). The Topic Guide used in this study is presented in Appendix A6. The initial set of topics was developed based on the themes that emerged from the literature review (Chapter 2) and the final version of TG with questions and probes used in this study was developed after the pilot study with P3. (Section 4.2.4).

The final set of topics covered in TG included:

Topic 1: *The job role (of an image professional in online journalism)*
Topic 2: *Illustration tasks and image needs*
Topic 3: *Illustration task process*
Topic 4: *Image selection criteria*
Topic 5: *Challenges*

Topic 1. *the job role* related to image users in online journalism in terms of their skills and the environment they worked in. While the literature provides much information about the roles and work settings in print journalism (e.g., Markkula and Sormunen, 2000, Westman and Oittinen, 2006), little is known about who the image users are in online journalism. Topic 2. focused on Illustration tasks in terms of what a typical illustration task involved, how these tasks were generated, carried out and completed. The existing literature focuses on print journalism, however, there is enough differences between these two domains to expect that tasks and task processes carried out in print differ from those in online journalism. A discussion about Topic 3. aimed to gain only a general understanding of how images were typically and available resources, as the actual in-depth understanding of the subject would come from observations. Topic 4. was defined to investigate what images were required and what image selection criteria and particularly, any criteria that related to visual image features were decisive in the selection process. Topic 5. related to challenges that image professional typically faced when performing illustration tasks.

The questions and probes in the Topic Guide were updated several times during the research as new ideas and concepts were emerging. The updates included a change to the order in which questions were asked within some topics and the introduction of new probing questions to enable the participants to include more concrete examples of discussed issues. For example, while it is known that image users speak about image needs in generic terms relating to visual effects (e.g., eye-catching, attractive), a probing question (*What visual aspects of images are important to you?*) was introduced to help them focus on the concrete image features producing the required effects.

Questions had to be adjusted to the roles the participants held in the editorial team. The questions for Duty Editor were focused on general practices in the illustration process and the quality of illustrations in online journalism, while questions for CPs and ACPs related more to their individual experiences and behaviours in regard to *real* illustration tasks that they typically worked on. For example, P10 was a Duty Editor whose job role did not include seeking or selecting images but monitoring and approving of work of content producers and assistant content producers in the team. Some questions in the topic guide were modified to suit his role, e.g., Topic 4. Q1. (selection criteria) *When approving of an illustration, what aspects of images do you take into consideration?*

Due to their extremely busy schedules, P11 and P12 were able to participate only in short sessions lasting about 15 minutes each. They took part in short individual interviews about their roles and skills (approx. 5 min.) and the remaining time was entirely devoted to observations.

Since they were the last participants recruited in the study, it was decided that observing their work was more beneficial to this research than completing interviews. A preliminary analysis of data showed that at that time consistent themes were already emerging from interviews, which indicated that most of the topics had been sufficiently covered in conversations with other participants. For example, a good clarity was achieved in terms of roles, responsibilities, how tasks were generated, who was involved, and how images were sourced. Observations, on the other hand, always provided more opportunity to capture the actual unique experiences and interactions within the image seeking process that were invaluable for uncovering of the actual image needs and image seeking behaviour.

The sessions were audio-recorded when consent had been granted, and additionally, thorough notes were taken by the researcher in each session. Only P6. did not agree to being audio-recorded. Instead, thorough notes were taken in the session and she also read the notes after the interview and approved them. After each individual interview, the researcher summarised the key themes and issues emerging from the session. This allowed to follow upon and compare the main topics across data from all sessions. After the interviews, participants were invited to take part in observations, and individual sessions were scheduled with those who expressed an interest in continuing their involvement in this study.

4.2.6 Observations

The in-depth interviews contributed insights about participants' roles and experiences, and provided a general understanding of typical task types and task processes. As explained earlier, interviews are an effective method for an in-depth inquiry into people's experiences but their downside is that retrospective narration is reliant on human memory and recall, which are imperfect. This makes interviews ineffective in gaining the knowledge of the authentic users' actions and needs. To compensate for these limitations of interviews, direct observations were incorporated in Study I. Interviews and observations were triangulated in some of the earlier studies with image professionals in journalism that are key to this investigation, e.g., Conniss et al. (2000), Hung (2005, 2012), Markkula and Sormunen (2000), Westman and Oittinen (2006). Conniss et al. (2000) considered interviews to be the crucial and most informative part of their research, they complemented this method with *informal* observations of participants performing image-based search tasks. Hung (2005, 2012) and Markkula and Sormunen (2000) conducted interviews post-observation, mainly, to explain the observed behaviour. Markkula and Sormunen (2000) and Westman and Oittinen (2006) observed participants performing natural tasks, collected and analysed queries and requests, and logs of interactions for a more complete picture of the processes. Hung (2005, 2012) conducted two experimental studies in which participants were observed performing simulated search tasks on the image collection they normally used at work. They used the think-aloud protocol in observations, and interviews had a debriefing character.

The observations in this study were designed to address research questions 1 and 2., and corresponding objectives: 2 to 6 as presented in Table 4-2.

Areas for observation	Research question	Research objectives
Illustration tasks and needs	1	2
Illustration task processes		3
Image selection criteria		4
Challenges		5
Image tailoring process	2	6

Table 4- 2. Areas for observation and the corresponding objectives

The observations were conducted at participants' work places *(in situ*). Observing participants at work allowed the researcher to directly witness image users' actual behaviour in terms of interactions and activities they were performing and engaging in while completing image-based (illustration) tasks. A distinction between search tasks and illustration task was made, i.e., search tasks were understood to be integral part of illustration tasks rather than an aim in themselves. Markkula and Sormunen (2000) made this distinction and proposed an illustration process model that includes the search task (as well as the use of alternative image resources). However, their model appears to be incomplete towards the end of the illustration process. They ended the observations when images had been found. They report that image users often made acceptable selections rather than *best* selections but do not investigate how images were used after they had been selected. This is clearly a shortcoming of these studies. The observations in Study I. were purposefully designed to cover the complete illustration tasks process: from the moment when the illustration task was received by the participant, to the point an image was ready and queued for publication, to investigate whether editing of images was carried out to aid searching and compensate for the unsatisfying selections.

Observations served well the exploratory purpose of this investigation, while the think-aloud protocol provided explanations to the observed users' behaviours. The think-aloud protocol is a commonly used technique (e.g., Markkula and Sormunen, 2000; Hung, 2005, 2012) to uncover the reasoning behind users' actions and decisions, otherwise, internalised and therefore inaccessible to external observers. It is regarded as more intrusive than its alternatives, e.g., stimulated recall, but at the same time more representative, and accurate because it does not rely on recall. It is also more systematic than spontaneous self-reporting (Kelly, 2009) where participant decides what is important to be mentioned and discussed, and when to comment.

The think-aloud protocol approach allowed the researcher to capture the participants' way of thinking and decision-making as the participants were being engaged with the system. The lesser degree of intrusiveness was compensated for by the prompt explanation to actions and decisions at the moment they were being made. The key limitation of this technique is that it may feel unnatural to some people to speak while they are performing a cognitive task, such as image searching and creating an image for publication (Denscombe, 2010). To elicit explanations from

participants with minimal intrusion, the researcher prepared non-leading probes, studied terminology and jargon of the profession prior to the sessions.

Observations are also prone to selective attention and researcher bias, therefore, a detailed observation schedule was developed to guide the observations (Appendix A7). From the participants' perspective the observations were free-flowing, i.e., the participants were observed carrying out real-life tasks, in real-time, at their workplace and using the tools they normally used. There was no prescribed number of tasks to be completed within a session. Making direct comparisons between natural tasks is more difficult than between pre-defined tasks, as in e.g., Hung (2005, 2012). Therefore, the observations were guided by a rigorous protocol. All tasks were observed from the moment the task was received until the task was complete with an illustration ready for publication or until the user made a decision to drop the task, e.g., due to unavailability of required images. Before the sessions, a literature-based list of activities in the illustration process (Table 4-3) was created and used for reference. The items in the list were a compilation of stages and activities in the following existing models: the illustration process model proposed in Markkula and Sormunen (2000, p. 274), image searching model by Conniss et al. (2000), the information searching process model by Ellis et al. (1993) and moves and tactics in image searching observed by Hung (2012) in a study with journalists. The activities observed in Study I were mapped to the stages in these models and compared for similarities and differences. It was important that the stages and activities were associated with observable actions demonstrated through overt behaviour that was *measurable, understandable with minimum interpretation, relevant, and content independent, complete, precise categories, easy to record* (Kelly, 2009). These activities were analysed for occurrence and frequency, and the researcher was able to uncover behavioural patterns and contextual factors influencing participants' behaviours.

In this study, ten participants consented to be observed in individual observation sessions. Six sessions lasted no more than 60 minutes, and two were short observation sessions of approx. 10 minute each. The sessions were video and/or audio recorded. P2 requested to be only audio recorded during the observation session since temporarily he was using only one screen (normally all staff use two screens – see: Section 4.7.2), and confidential work-related messages were appearing on his screen while he was working on the tasks. This session was particularly supported with thorough note-taking and screenshots. Ultimately, a total of 28 single illustrations tasks performed by ten image professionals were observed. For each illustration task, the observations captured the complete process from the point the task was received to the final stage, when the illustration was queued for approval and publication, or in case of two tasks 13 and 23, to the point when the tasks were dropped.

4.2.6.1 Tasks

Observed participants were engaged in performing real illustration tasks from the initial moment when the tasks were allocated to the final task stage of preparing the image for publication.

An illustration task was regarded to be natural or real if it met the following criteria: it was (1) work related, (2) performed in the natural environment, and (3) generated for the person performing the task:

(1) the task had to be genuinely generated and performed for work-related purposes, and NOT for the purpose of this research.

(2) It had to be performed in the participants' natural environment (workplace) with access to equipment and software normally used to perform such tasks, and finally,

(3) it had to be generated for the participant that was being observed and appropriate to his/her job role and level of seniority.

For each observed illustration task, the researcher used an observation data collection sheet (Appendix A8) that was developed after the pilot study (Section 4.2.4), and was divided into three sections:

1. Questions about the task
2. While performing the task and activity observation sheet
3. Post-task questions

4.2.6.2 Observation protocol

a) **Starting an observation session**

All sessions began with welcoming of the participant, reading and signing the consent forms, clarification of any issues, and following up on any matters from the interview sessions. The participant described the task(s) that he/she had been allocated to by the Content Producer on duty. This allowed the researcher to capture data about each task:

- the source of task: how the task was generated
- the title of the original article and the URL,
- type of news story: breaking/spot news, rolling news, or general news story,
- how soon is the story and image to be published: immediately, within the next hour, etc.
- genre: UK news, world news, technology
- the context of use: e.g. homepage
- expected challenges.

b) **During the observation**

Participants were observed while performing their real work task from the task reception to the point when the task was submitted for approval before publication. The aim of the observation was to capture the complete illustration task process and all activities in the searching process,

as well as in the image editing process. The researcher was using a pre-defined list of activities (Table 4-3) based on the phases in the image searching model by Conniss et al. (2000), the illustration task model by Markkula and Sormunen (2000), and Information searching model proposed by Ellis et al. (1993). The list of phases and observable activities was not regarded as complete, and allowed for adding 'new' items, should they occur.

Source	Stages of illustration task	Activities associated with the stages (CODES)	Examples of observable action or evidence from *Talk-aloud* protocol
Markkula & Sormunen 2000 (Illustration process)	**Illustration task [received]**	◊ Acknowledging the task ◊ Accepting the task ◊ Familiarising with the task (components)	◊ Verbal acknowledgement of the particular task ◊ Verbal expression of intention to work on the particular task ◊ Reading information associated with the task
Conniss et al. 2000 (Image searching process model)	**Starting [search]**	◊ Familiarising with the content ◊ Ideation (criteria)	◊ Opening (on-screen) and reading task-related content ◊ Mentioning (unprompted or probed) ideas, e.g., I need, this requires…
	Scoping	◊ Selecting the strategy ◊ Selecting the source ◊ Formulating the query (re-formulating)	◊ Selecting image source and navigating to an image collection ◊ Mentioning (unprompted or probed) I'm looking for….
	Applying	◊ Interacting with the IR system (capture the use of search features)	◊ Entering a search term ◊ Using search features: ◊ Pressing search
	Selecting (moves and tactics in Hung, 2005, 2012)	◊ Browsing through results ◊ Assessing the results (enlarging, captions) ◊ Selecting an image OR Selecting a set	◊ Browsing, scanning the results in thumbnails, ◊ Scrolling up/ down ◊ Opening some results to view enlarged image ◊ Selecting candidate images
	Iterating	◊ Changing the approach, e.g., search query modification, etc. ◊ Interruptions/ distractions	◊ Entering search term 2, 3… ◊ Navigating to image collection 2, 3… ◊ Asking for break ◊ Participant observed being engaged in an activity not related to research, e.g., reading emails
	Ending [search]	◊ Final selection made (OR not made)	◊ Final selection made and saved OR ◊ The task ended with no selection – communicated verbally AND/OR moving on to another task
Ellis et al. 1993 (Information searching model)	**Verifying**	◊ Image verified for authenticity	◊ Image textual description or metadata consulted
This investigation and Makri & Warwick (2010)	**Tailoring**	◊ Image manipulation techniques applied	◊ Image opened in editing software (e.g. photoshop) ◊ Editing techniques applied: 1…. 2…. 3…. n….
	Other	◊ Specify….	◊ Specify

Table 4- 3. A pre-defined list of activities in illustration task and a coding scheme.

A record sheet was designed (Figure 4-4) and for each observed task, all activities were scrupulously noted by the researcher in the order they occurred.



Figure 4- 4. A 'tool' used in observations to record image users' activities within each illustration task

Search topics and search terms used for each individual search were written down in the record sheet. A record of editorial techniques that were applied on illustrations before publication was kept, in order to capture the extent of editorial tailoring carried out.

During the observation, participants were engaged in the think-aloud protocol and talked about what they were doing and thinking of doing, and explaining rationale for their decisions and actions. This enabled the researcher to get a better understanding of the decisions made by participants at each stage of the illustration process. Even though there were some differences in the observed processes, common patterns were identified. The observations were video recorded, and the researcher was able to cross-check her notes with the recordings in the analysis process.

c) **Post-observation interview**

At the end of each task, the participants answered a set of post-observation questions. Post-observation questions encouraged participants to reflect on the tasks, the process of image seeking and factors that might have affected the final selection, and the quality of the selected images and tailored illustrations prepared for publication. Selection criteria were discussed. No pre-defined lists of criteria were used to enable the participant to talk about their decisions in their 'own' language. If the task was not completed, reasons for dropping of the task were discussed. A set of artefacts was collected from the observation sessions for visual analysis. This set included: images from the candidate subset, the selected image, and the illustration created from this image for publication. Section 4.3.3 provides details of how these artefacts were analysed.

4.3 Data analysis and integration

4.3.1 Preparation of data for analysis

The raw data collected in this research included audio and video recordings, text, and still images. The pre-analysis preparation of data included transcription of the audio data and segmentation of data.

4.3.1.1 Data from interviews: transcription and segmentation

A large majority of data collected and prepared for analysis in this investigation were in textual format. These included transcribed data from in-depth interviews and talk-aloud protocol used in observations. All narrative (audio) recordings were transcribed verbatim for analysis. The transcripts included any meaningful verbal fillers and pauses that were considered indicative of certain reactions and feeling, e.g., pause of hesitation or surprise, frustration. Probes and researcher's explanatory notes were included in the transcript in square brackets. Textual data also included the observation record sheets filled in by the researcher during sessions, and researcher's field notes and post-session summaries. In this investigation, text was analysed as proxy for participants' experience in regard to image use. The focus of interest was on participants' experiences, knowledge and behaviour as represented in the text, unlike in discourse analysis where the text is analysed as object in and of itself (Denscombe, 2010). Textual data files proved to be easier (than audio or video files) to navigate through, create interlinks between the data units, and search through. It was also easier to integrate textual data for coding in Atlas.ti, the software used for analysis.

The textual data were segmented into smaller parts, by topic and by question. As described in Section 4.2.5 the interviews had a semi-structured format, i.e., the sessions were guided by topics defined in the topic guide (Appendix A6). Questions formulated for each topic were open-ended and there was no fixed ordering. While this approach allowed participants to talk about the topics in their own language and freely, and focus on the matters important to them, it resulted in slight differences in the flow of the transcribed texts. Segmentation aided the comparison of data across the data set. In the initial reading of the transcribed text from each individual interview session, the researcher, located each of the 5 topics covered in the topic guide (Appendix A6) and question within the topic. Segment tags for Topic (number) and Question (number) were created e.g., T1Q1 [text including the question and participant's response]. The interview data were tagged. This enabled linking between the related topics and questions across the whole interview data set while maintaining the original flow of the text. Further, segmentation enabled the researcher to determine which topics were covered across the sample, and to identify the questions that were not asked.

4.3.1.2 Observational data: deductive coding and data linking

The observation sessions were video recorded with participants' consent. While observing the participants, the researcher was filling in the observation record sheets, i.e., recorded observed

actions taken by participants in the sheet. The actions were assigned labels (a priori coding scheme is presented in Table 4-3.) in the observation sessions. After the study, the text-based records were compared with the video recordings. Ultimately, the data from the video recordings were presented for analysis in textual format and entered in MS excel spreadsheet.

Segmentation, as described above, was not applicable to the qualitative comments from observation sessions in Study I. This was mainly due to the fact that participants were working on real tasks and each of the sessions had an individual and unique flow. Instead, the data from observations was linked to their individual *cases*: the session, participant, image. For example, one source of data from a single session was the transcribed data from the think aloud protocol, which was a record of participant's narrative, another data source was the observation sheets completed by the researcher while observing the participant, and field notes. It was important for to maintain the links between these pieces of data from the different sets

The presentation of the data in a spreadsheet allowed for an easy comparison of the actions undertaken in the task process by task, by participant, by stage in the illustration process.

4.3.2 The analytic process and integration

The literature was scarce so basic information about the profession and routine tasks was not available. The implication was that much of the data collected from the interviews was factual. For example, in Topic 1. Profession, typical questions and probes used included:

- *What is your role?*
- *When do you start/ end work?*
- *What skills/ tools/ resources do you use in your job role?*

The responses were compiled in *lists* and the items in the lists were compared for commonalities and differences. The duplicate answers were removed, while thematically similar answers were grouped in categories. This ensured that a full range of views was included, allowing a rich perspective on the discussed topics and patterns to be identified. The analysis showed that factual themes repeated and there was a high level of consistency in the findings emerging from factual data.

The interviews also provided thematic data that required a deeper and more complex analysis. The transcripts were read and re-read several times. Some a priori codes based on the literature (scholarly texts concerned with general information users' behaviour, and image users' in print journalism) had been prepared, it was expected that themes would be emerging directly from the data. To begin with, the (segmented) transcript from the first interview was printed out, read and re-read, and summarised. The data were compared in an iterative manner and initially, a priori codes were applied to the text. For every new piece of meaningful information, a new code was created and assigned to it. In this study, a sentence was the smallest unit for coding. If an existing code could not *contain* a piece of data, new codes were added. A similar process was carried out on the next four interviews (in the order in which they had been conducted in the user research),

and the *codebook* was kept up to date. After these interviews had been initially coded, a project folder was created in Atlas.ti. A list of initial codes was entered (Appendix A8), and additionally, a "good quote" *tag* was used to highlight quotes that had a good explanatory potential. All transcript documents were uploaded to the project folder. Reading of the data and coding continued until the final piece of data was read and assigned a code/s. Since the codes were being developed in an iterative manner, they had a different level of granularity. They were compared and the following relationships were looked for between them, e.g., cause-effect, hierarchical relationships, maps of meanings. When a relationship was identified, they were grouped under a higher-level code or category. For example, at one point two codes emerged: *feeling rushed* and *working to tight deadlines*. These codes were grouped under: fast-paced environment, and the codebook was updated accordingly. The changes were recorded in memos. As the initial coding was also modified, all transcripts were re-read and re-coded accordingly (Table 4-4).

Label	**Fast-paced environment**
Definition	Use when participants speak about feeling rushed, under time pressure, and working to tight deadlines in relation to illustration tasks and their work
When not to use	when participants speak about activities not directly related to illustration tasks, e.g., other responsibilities they may have within the editorial team or the organisation
Good quote	*"Always more work than hands"* (P1)
Memo (comments)	feeling rushed + working to tight deadlines

Table 4- 4. An example of how codes were being developed and merged

Grouping of conceptual themes led to thematic categories and subcategories. Relationships between these categories from different segments were sought to create themes. Then, the themes were cross-linked and compared to similar (or contrasting) findings from other data sources. For example, early in the analysis, a theme emerged: *'we are all about colour"* (in vivo, phrase from the interview with P1.) that summarised the importance of *vivid*, bright and saturated colours in image selection consistently self-reported by participants, with some participants claiming that they did not choose images with soft colours as a general rule. The chosen complementary approach to analysis allowed to further compare this finding with the data from observations which provided the evidence of the actual actions and patterns of image users' behaviour. However, the findings from observations showed that the choice between images with saturated colours and those with soft colours is not dictated by the image users' preference but by image use and the type of news content that they are illustrating. The data from the observations showed images with soft colours were used less frequently, but for a different purpose. Further, the analysis of the images created in the observations provided 'hard' physical evidence of both types of practice (T4 – John Cole obituary vs. T10 – Dr Who promotional image). This complementary analysis allowed to see the similarities and contrasting evidence, which led

to expanding of the initial findings. This, in turn, ensured completeness and accuracy of the integrated outcomes presented in the discussion.

4.3.3 The analysis of images

The data from interviews and observations enabled the researcher to understand why, how and when images were manipulated for the required visual effect that was achieved in each complete illustration. Further, to be able to fully understand the actual image users' needs, the selection and tailoring processes, the researcher conducted a manual analysis of the artefacts collected in the observation sessions with image professionals (Section 4.2.6). All these images were analysed as objects for presence of visual image features and the visual social semiotics framework (Appendix G) was used to identify and label these features for analysis. The initial visual inspection was carried out on the content level to establish the main object of the photograph. Further, images were manually inspected for syntactic image features such as: positioning of the object within the frame, colours, type of shot, as defined in the VSS.

For each image, this information was supported and cross-checked with the data collected from the talk-aloud protocol from the observation session in which the image was selected and tailored. Additionally, the observation sheet (Section 4.2.6) was used to map the tailoring activities carried out on the original image to achieve the required effect in the final illustration. Table 4-5 shows how results of the analysis were recorded.

Original image (1) Tailored image (2)	Features in image (1)	Tailoring techniques	Features in image (2)
(1)  (2) 	One specific person in the foreground Whole figure shot Body positioned centrally Colour photograph Saturated colours Blurred (unidentifiable) background	Cropping to change the photographic shot, extending background to the left for better composition, positioning of the person to the right, increased blurring of the background	One specific person in foreground Waist-up shot Positioned to centrally and more to the right Blurred (unidentifiable) background

Table 4- 5. Results of the visual analysis of the image used in T11.

A distinct sub-group of images showing specific (identifiable) people (typically one person) emerged. The feature frequency was established across the set of artefacts. This led to the identification of a set of image features recurring in these images. The results of this analysis were further validated with three independent experts in Survey 1. (Section 4.9).

4.3.4 Soundness of the findings from Study I.

In this study, several steps were taken to ensure the soundness of the findings. To begin with, an ethics approval had been sought and granted for this research prior to sessions with participants (Appendix F1), and City University's ethics guidance documents were adhered to throughout the study. This was done to ensure that the study was conducted ethically. A thorough literature review (Chapter 2) had been undertaken to define clear research questions (Section 1.2). Having considered a variety of research methods, their limitations and strengths, and after consultations with the supervisors, the researcher selected complementary data collection methods: observations and interviews (Sections 4.2.5 and 4.2.6) for this study. The methods and research instruments were tested in a pilot study (Section 4.2.4). Clear eligibility criteria had been set out for candidates and all potential participants had been appropriately assessed for eligibility (Section 4.2.1) before being accepted for the study. To ensure that participants' natural behaviour could be captured, the study sessions were conducted in situ, at participants' real work environment and with real work tasks. This allowed including a full range of activities (appropriate to the focus of the study) in the observations, and over a full cycle of each activity, i.e. from the point when an illustration task was received, to searching for images, to when the image/s were selected, and to the final stage of the process when the image/s were ready for publication. Moreover, the interview questions were adapted to the roles within the editorial team. Further, to ensure the completeness of data corpus, the sessions with participants were recorded (either in audio or/and video format, and/or by making thorough field notes and summaries of sessions). A record of situational context was kept for each session and task in the above- mentioned field notes, the procedures performed when analysing the data throughout the study were documented (). The rigorous process in the data analysis with TA, as described in Braun and Clarke (2006) and Guest et al. (2012) was strictly adhered to throughout the analysis. Additionally, the data was collected over a long period of time, which helped to eliminate the bias that could have potentially been caused by, e.g., certain events or genres dominating news. Finally, a thorough description of the research context: the environment, work tasks, work processes, resources, and the roles of people involved in performing of the illustration tasks, was provided for anyone who may want to transfer the findings to another environment to be able to make a judgment of what is suitable for transfer.

4.4 Data quality assessment

4.4.1 Data from interviews

In the initial stages of the analysis (Section 4.3), the collected data were assessed for completeness. The data collection period began on 5th November 2013 and ended on 24th January 2014. During this time 12 interviews were conducted of which 10 lasted approx. 60 minutes and 2 interviews (P11 and P12) lasted 5 minutes. This accounts to 610 minutes of

interview data (10 hrs). Table 4-6 shows how the topics were covered in the individual interview sessions.

Participant	P1 – P10	P11 – P12	Total
Topic 1	YES	NO	83%
Topic 2	YES	YES	100%
Topic 3	YES	NO	83%
Topic 4	YES	NO	83%
Topic 5	YES	YES	100%

Table 4- 6. Results of the quality check on data: two topics had been discussed by all participants, while three topics by 83% of the recruited sample.

Factual topics, such as, e.g., responsibilities of the image user's role, working patterns, available tools, how tasks are generated, were covered within a few early interview sessions. This was mainly because all participants but one, were recruited from a single organisation. When the data became repetitive and redundant, the questions were not asked again.

4.4.2 Data from observations

10 observation sessions were completed where 9 sessions took approx. 60 minutes, 1 session too approximately 40 min, and 2 sessions (P11 and P12) 10 minutes each. In total, 480 minutes' worth of observations (8 hrs). P10 took part in interviews but his role of Duty Editor did not involve carrying out illustration tasks, therefore, he was not recruited for the observations. P6 who was interviewed, moved to a different job shortly after the interview session, and did not take part in the observations. Table 4-7 presents a summary of observation sessions. A complete list of tasks is presented in Appendix A9.

Participant	P1	P2	P3	P4	P5	P7	P8	P9	P11	P12	Total
Sessions in minutes	60	60	60	60	60	60	60	60	10	10	**500 (8.5 hrs)**
No. of tasks received	3	2	3	3	3	4	3	5	1	1	**28**
No. of completed tasks	3	2	3	3	2	4	3	4	1	1	**26**

Table 4- 7. A summary of observation sessions: time per session, no. of received and completed tasks

Observations were performed on natural tasks generated and performed in real-time, therefore, the number and types of tasks carried out in each session differed. Mode for the observation tasks was 3 tasks completed in 60 minutes but it is important to remember that the pace and timing of the sessions were affected by the study protocol that also included the introduction to the observation, the think-aloud protocol during the task, occasional work-related breaks (e.g., to check emails), and debriefing questions at the end of the session.

4.4.3 Artefacts

The artefact set included 35 selected images, and 26 illustrations created from these images in the editorial process, including one image that P7 took herself after an unsuccessful search. The images are available to view in Appendix A9.

4.5 Demographics of the sample and the study environment

4.5.1 Participants' profiles

Twelve participants took part in this project. Eleven participants were BBC staff and one worked for a smaller UK-based online news service. Their job roles varied in seniority: 7 participants were employed as Assistant Content Producers (ACP) that were the most junior roles in the hierarchy of the BBC Central Editorial team, 3 worked as Content Producers (CP), and 1 as Duty Editor (DE) who had the most senior role in this team. The non-BBC participant (P8) held two roles at the news service that she worked for. She was employed as an online journalist, as well as a content editor (CE), and it was the latter role that made her eligible to participate in this study. Since only P8 was a non-BBC staff, data gathered in interviews and observation sessions with her were collated and analysed together with data from other participants, and only in a case where a discrepancy in findings is significant, the results are presented and discussed separately. The participation was voluntary and each participant could withdraw at any time, or could participate in all or as many stages of the research as he/she decided to. During the research:

- P6 changed her job before she was able to participate in the observation session. The new job disqualified her from the research.
- P10 as a senior member of staff was not involved in any hands-on image editing work during the duration of this study, therefore, he was only able to take part in the interview session.
- P11 and P12 each took part in individual short observation sessions (each up to 15 minutes), and a single illustration task was observed in each session, due to other work-related assignments that they had to undertake that day.

Table 4-8 presents participants' profiles and provides details of their roles and experience.

4.5.1.1 Participants' job roles and responsibilities

All BBC staff who participated in this research were part of the Central Editorial Team (CE Team) responsible for providing images for the following sections of the BBC Online: BBC Homepage, BBC radio stations homepages, BBC iPlayer Homepage, for desktop and mobile devices.

The overall aim of the Team's effort is "to create compelling promotional content for the BBC homepage, and reflect BBC or external events in a compelling and imaginative way in a range of interfaces" (BBC, 2013).

Duty Editor (DE) was a senior role within the CE Team and the main responsibility of this job was to assure that images selected for publication on BBC website met the ethical standards and guidelines of the organisation, and "*are appropriate to the subject matter*, [are] *of the highest quality, both aesthetically and technically*" (P10). The DE was consulted by other Team members when there was a potential for an image-related controversy to arise and had the authority to approve or disapprove of image choices. They also handled image-related complaints from the

audiences. If necessary, the DE might introduce changes to the editorial practice of the team. During every shift, there was always at least one DE on duty.

Content Producers (CP) report directly to the DE. Their main responsibilities while on duty included:

- seeking, editing, or creating appropriate images using Photoshop to illustrate online content, but mainly:
- monitoring news for breaking news stories, developments in rolling news, fresh general news and features,
- generating illustration tasks for Assistant Content Producers (ACP)
- ensuring the tasks are delegated across the team, ideally, according to ACPs skills and interests,
- ensuring ACPs have access to appropriate tools, for example, software and image collections, to be able to perform and complete a task;
- if necessary, providing advice on how to best approach the illustration task, for example, by brainstorming image ideas;
- monitoring the quality of work of ACPs,
- training new ACPs in:

There was at least one CP on duty at any given time. If short of staff or an unexpected influx of information occurred, CPs would take on and perform illustration tasks on the BBC Homepage, or other sections of the BBC website.

Assistant Content Producer (ACP) was the most junior role in the CE Team, and typically, ACPs work to direction from the Content Producer or Duty Editor, on a range of editorial production, monitoring and research tasks. These tasks included:

- seeking, editing, or creating appropriate images using Photoshop to illustrate online content,
- writing contextual copy for promotions or images,
- setting up new content aggregations around trending search topics or updating old ones, using the BBC's Content Publishing System.

The role of an ACP was the most *"hands-on"* in terms of image searching and selection, therefore, it was at the centre of this research project.

In her role of a Content Editor, the role of P8, the non-BBC staff, was comparable to the one of a BBC CP, however, during a typical working day, her responsibilities were equivalent to those of an ACP as described above.

No.	Gender	Job title*	Interviewed/ Observed	Experience in image editing in years	Educational background	In current role (years)	CPS	PS	Image seeking, selection and editing	Image selection approval	Illustration tasks generation
P1	M	ACP	I/O	5	Media studies	5	Y	Y	Y	N	N
P2	M	ACP	I/O	2	Media studies	2	Y	Y	Y	N	N
P3	M	CP	I/O	10	Visual design	8	Y	Y	Y	Y	Y
P4	M	ACP	I/O	4	Media studies	2	Y	Y	Y	N	N
P5	F	ACP	I/O	5	Web design	5	Y	Y	Y	N	N
P6	F	ACP	I	2	Education	2	Y	Y	Y	N	N
P7	F	ACP	I/O	4	Social Sciences	2	Y	Y	Y	N	N
P8	F	CE*	I/O	8	Journalism	8	Y	Y	Y	Y	Y
P9	M	CP	I/O	12	Journalism	6	Y	Y	Y	Y	Y
P10	M	DE	I	12	Management	8	Y	N	N	Y	Y
P11	F	ACP	I/O*	5	Visual design	5	Y	Y	Y	N	N
P12	M	CP	I/O*	8	Journalism	8	Y	Y	Y	Y	Y

Table 4- 8. Participants' profiles based on answers from the Entry Questionnaire (Appendix A5.)

Job titles*: DE – Duty Editor; SCP – Senior Content Producer; CP – Content Producer; ACP – Assistant Content Producer; CE – Content Editor (non-BBC participant) the responsibilities of a CP and ACP

Software*: CPS – Content Publishing System; PS – Adobe PhotoShop;

I/O* – P11 and P12 each took part in short interviews and individual observation sessions (each up to 15 minutes) where a single illustration task was observed in each session.

4.5.2 Study environment

Since the observation sessions were conducted in-situ, this Section provides detailed information about the study environment in regard to the online news service and particular section of the service that was in focus (the BBC Homepage), workspace set-up, and the online image collections used by image professionals to source images for illustration tasks. All interviews and observations sessions with the BBC participants were conducted at the BBC Online editorial office in Manchester, UK. The BBC Online is currently one of the largest on-line news services in the UK, with no print 'parentage'. Its history goes back to 1996/1997, when the first version of the online service was launched (Waybackmachine Internet Archive, 2015).

4.5.2.1 BBC's Homepage (www.bbc.co.uk)

All BBC participants were members of the BBC Central Editorial Team, and an editorially independent team, that provided images for the dominant image feature (referred to as the 'promo box') on the six thematic sections of the BBC homepage (bbc.co.uk).

For news services without print 'parentage' such as the BBC, the homepage serves two roles: it communicates the most important news of the day, and is a gateway to the service that enables its users to explore the wealth of BBC content on the web. The version of the BBC homepage that was live while this study was conducted, had been designed in 2011[42], and it was a response to a growing competition for audience from other news providers (Montgomery, 2011). This design of the BBC homepage was based around a 'carousel' central feature.

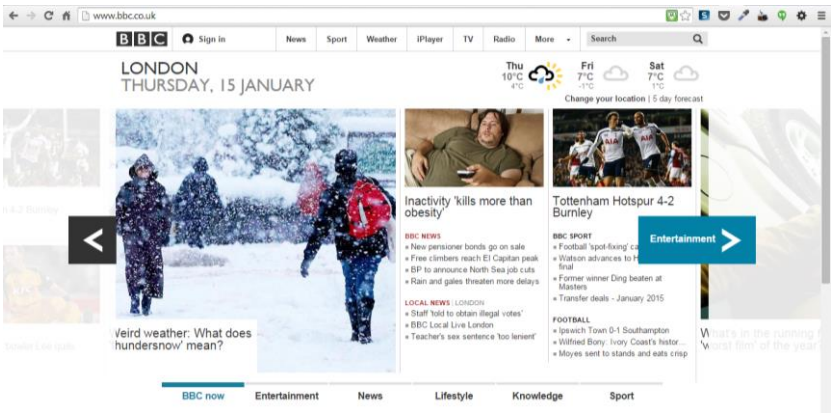


Figure 4- 5. The BBC homepage as of 15th January 2015.

[42] In July 2015 a new design of the homepage has been launched (bbc.co.uk)

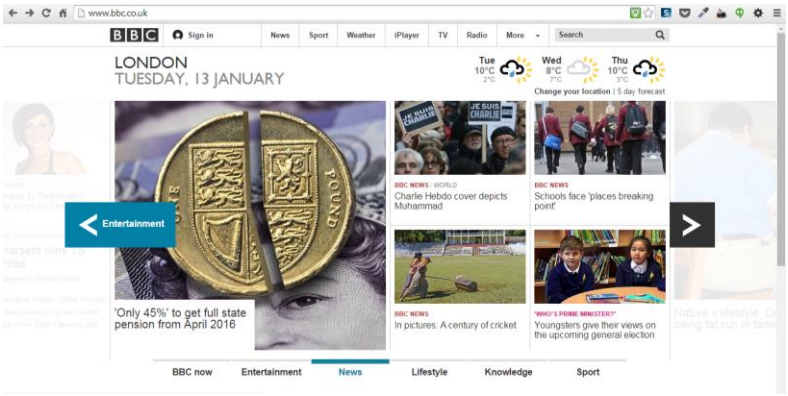


Figure 4- 6. The News section of the BBC homepage as of 13th January 2015

The page included images and links to news stories but offered little textual information. By default, it opened on the *BBC now* section that displayed a range of news stories from different content categories and genres to give an overview of the most current news on the BBC. By means of the side arrows, a user was able to navigate to other sections: Entertainment, News, Lifestyle, Knowledge, and Sport.

The page had a strong visual presentation, and each section of the carousel displayed one dominant image with a headline surrounded by smaller images. Such presentation tends to signal a clear priority of news stories at any given moment in time (Figures 4-5 and 4-6) through the dominance of the image in the so called 'promo' box. The members of the Central Editorial Team who participated in this research were responsible for finding and selecting the dominant images on each of the 5 sections of the homepage throughout the day. Typically, each section of the homepage was updated up to five times between 7am and 8pm each day. However, the homepage also responded to breaking news stories which would typically override the routinely scheduled updates. The BBC claimed that their design was inspired by user preference to 'swipe' through content and an increasing growth of touch-screen devices (Montgomery, 2011). The production and editing of information on the BBC homepage was enabled by an in-house built Content Publishing System (CPS).

4.5.2.2 Individual workstations setup and access to software

In the editorial office, all participants had access to the internet via a high-speed broadband, with no limits on upload/download data. All participants had Adobe PhotoShop (CS5) installed on their computers. The non-BBC participant (P8) used a laptop to do her job that was also her personal device, however, it was not shared with others in the company.

The BBC CE Team members worked on a rota-basis, so they shared their computers with at least one colleague, although they used separate login details, and had no access to each other's personal files and folders, unless these had been saved on a public shared drive. To do their job, they normally used two screens. Typically, one of the screens was used for performing of image searches, information search and verification, accessing the task list and work emails, and publishing images in the CPS, while the other, for editing or creating images in PhotoShop,

4.5.2.3 Online image collections

All BBC's image professionals had access to three image collections[43]:

- ELVIS (Electronic Visuals Image Store), an in-house built image resource that allowed its users to access news images from Reuters, The Associated Press, MetPolice, and other agencies. Most of the images available via ELVIS were of a high technical quality for broadcast and online publishing.
- BBC Pictures, a website contained high resolution stills from programmes current and forthcoming BBC programmes,
- Getty Images (www.gettyimages.com), a licence-based external image collection.

These collections will be described below in regard to search features and functionality they offered to users.

a. ELVIS user interface and search features

Photos were delivered to ELVIS by photo agencies, e.g., The Associated Press (AP), Reuters, as well as MetPolice, and they were stored in the permanent internal database. All BBC image professionals had access to ELVIS from their individual workstations and conduct searches themselves. ELVIS interface was separate from the Content Publishing System (CPS) so selected photos had to be first downloaded and saved to an individual PC, then called up to the CPS for publishing. Each image record in the database consisted of a thumbnail, low-resolution and high-resolution copy, and textual descriptions: metadata, and captions. This descriptive information had been provided by the photo agencies, and usually included the minimum of the following details about each image in their databases:

- format, size in pixels, and resolution,
- information about photo source, e.g. photographer, photo agency, shooting place and date,
- subject information,
- copyrights info,
- keywords (relating to the subject and content),
- captions.

Captions provided more concrete free-text description of the subject of each photograph, and gave more detail about the context in which the photograph had been taken, and by standard, agencies included information about the following facets: *who, what, when, where*.

An example of textual information including captions for an image is presented below in Figure 4-7.

[43] The non-BBC participant (P8) used *ShutterStock* (www.shutterstock.com), and occasionally, *GoogleImages* (https://images.google.co.uk/).

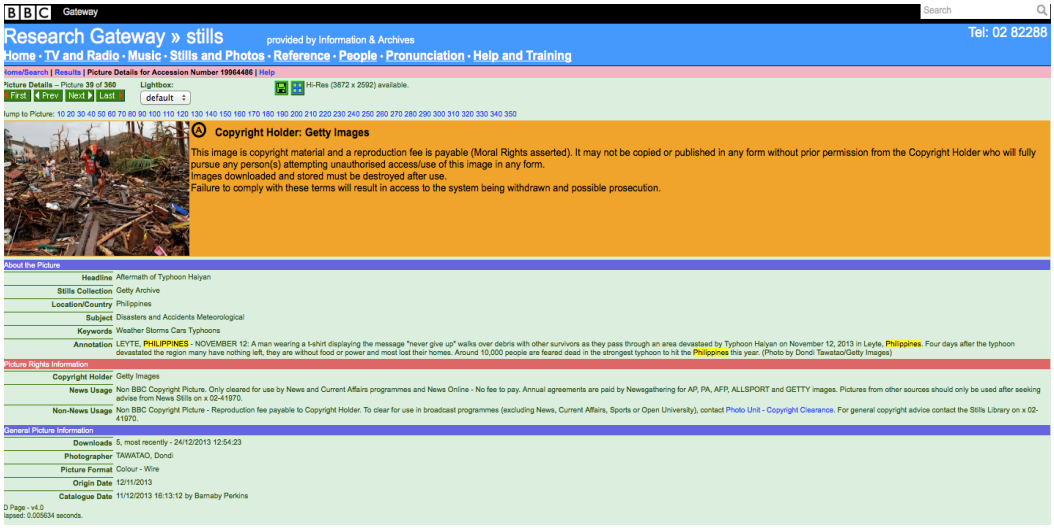


Figure 4- 7. BBC ELVIS - textual information including captions for an image (example)

Figure 4-8. shows a screenshot of a default start page of ELVIS UI.

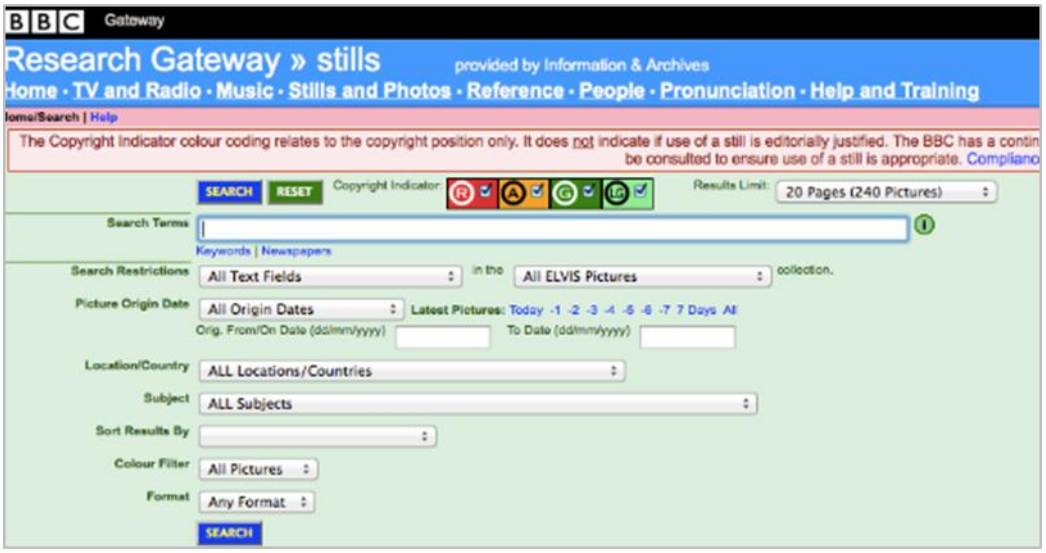


Figure 4- 8. BBC ELVIS - the default start page

This database offered a typical free-text based search mechanism. The input mechanism was not case sensitive, and was able to deal with misspellings. The user could also search the database using an index of pre-defined keywords and select a term from the list of keywords. Additionally, the following commands could be used when searching for an image:

- Leaving space between words will find items that include BOTH search terms;
- Using a comma (,) between words will find items that include search term 1 OR term 2;
- Using a minus symbol (-) will find items that include term 1 NOT term 2;
- Using a set of inverted commas (“”) will find the exact phrase.

Table 4-9 below shows an example:

Command	Search term	Result
Space	typhoon philippines	find items that include BOTH search terms
,	typhoon, philippines	will find items that include search *typhoon* OR *philippines*
-	typhoon - philippines	will find items that include *typhoon* NOT *Philippines*
“ ”	“typhoon haiyan”	will find the exact phrase: *typhoon Haiyan*

Table 4- 9. Example of rules in BBC ELVIS

Further a *Keywords search restrictions* functionality (Figure 4-9.) was available to indicate where the keywords should be looked for, e.g., annotation only, headline only, etc.

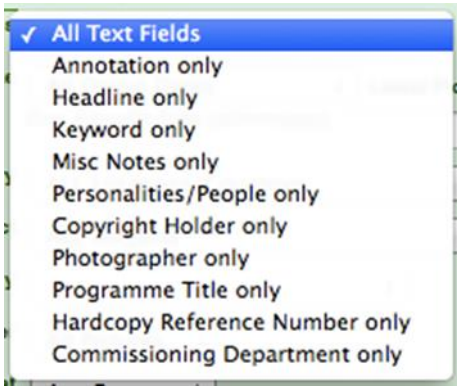


Figure 4- 9. BBC ELVIS - Keywords search lists

The system did not allow for a use of wildcard but accounts for misspeling. Other search features available on ELVIS included: filters and sorting options.

The following filters were available:

Copy rights

Since the images in ELVIS were from various copyright sources, the Picture Class Filter (Figure 4-10) allowed the user to select a required copy rights category.



Figure 4- 10. BBC ELVIS – the copy rights filter

The filters were colour-coded, and the codes had the following meaning:

i. RED – coded images are non-BBC copyright images and ALL areas of the BBC had to obtain clearance for usage and pay the relevant reproduction fees to the copyright holder.

(A) AMBER – coded images (A) were non-BBC copyright and were only cleared for use by News programmes, News Online and World Service usage. ALL other areas of the BBC had to obtain clearance for usage and pay the relevant reproduction fees to the copyright holder.

(G) GREEN – coded images were copyright cleared for use by the BBC for reproduction in any manner but in some circumstances needed to be cleared by Talent Rights for artist rights clearance.

(LG) LIGHT GREEN - coded images were cleared for use by the BBC for reproduction in any manner (e.g. broadcast, online, print, publicity).

Photo origin dates and range dates:

By default all origin dates was set up, and the choices included: an exact origin date, origin date on or before a date, on or after a date, and between date ranges.

Location/ Country

A filter for geographical locations was available as an A-Z list of countries.

Subject list

A subject lits was available to filter search results by subject headings (Figure 4-11).



Figure 4- 11. BBC ELVIS – a fragment of the subject list

Format (orientation)

By default all images regardless of orientation were displayed in the results but it was also possible to filter images by: landscape or portrait orientation.

Colour filter

All pictures, colour only, black and white only where the options for filtering according to the use of colour in images.

The sorting options available prior to search enabled image users to sort images by:

- newest/ oldest pictures on top
- headline A-Z
- catalogue date
- most popular on top
- catalogue date and most popular

Results display

Image search results could be displayed in a list or grid view. In the grid view, 12 thumbnails were shown on each page image, each with a brief image description. A click on the [i] icon on the image opened a pre-view pop-up window. For detailed information about the image, the user needed to click through to the individual image page (Figure 25. - captions).

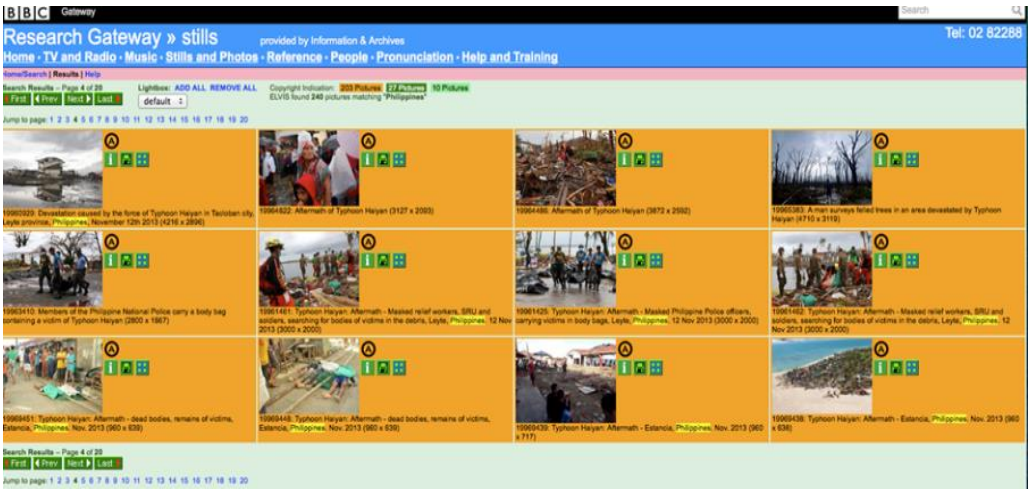


Figure 4- 12. BBC ELVIS - a typical search results page

b. BBC Pictures

BBC Pictures was an internal collection of images from the BBC's current and forthcoming programmes. Search features included searching for visual assets by: programme title, BBC TV channel or Radio station, and dates. Neither of the systems (BBC ELVIS and BBC Pictures) allowed for searching by similar images, or compare images. Images needed to be opened in a separate window and saved (or minimised) for later access and comparison. The input mechanism in this system was not case sensitive, and was able to deal with misspellings.

c. Getty Images

Getty Images is an image collection available online via www.gettyimages.com. The BBC had access to images from Getty on a pay per image licence. Getty Images offers editorial news photographs, as well as creative (stock) images of high technical quality.

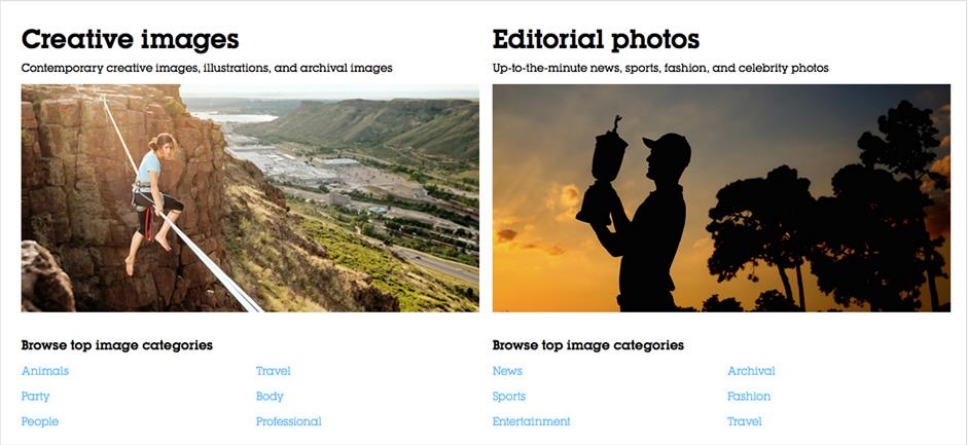


Figure 4- 13. GettyImages - the starting page 2014

Editorial images include news, sport and entertainment photographs of real well-known public personas, e.g. Barack Obama, and events, e.g. the Oscars gala, while creative images collection contains *stock photos* that are shot by professional photographers, and are inspired by research into publishing trends, and staged to visualise concepts such as e.g. adventure, innovation, or emotions like happiness.

Search features that were available in *advanced search* on GettyImages at the time of the study are shown in Figures 4-14 and 4-15. Images were searched for by keywords or image number in case known-item searches. A distinction was made between editorial and creative images (and video content). Each group had their own specific sets of filters available, e.g., creative images could be filtered by rights, those licenced versus royalty-free. Editorial images could be returned by theme: sport, entertainment, news etc. Further, mechanism for filtering by orientation and colour were available.

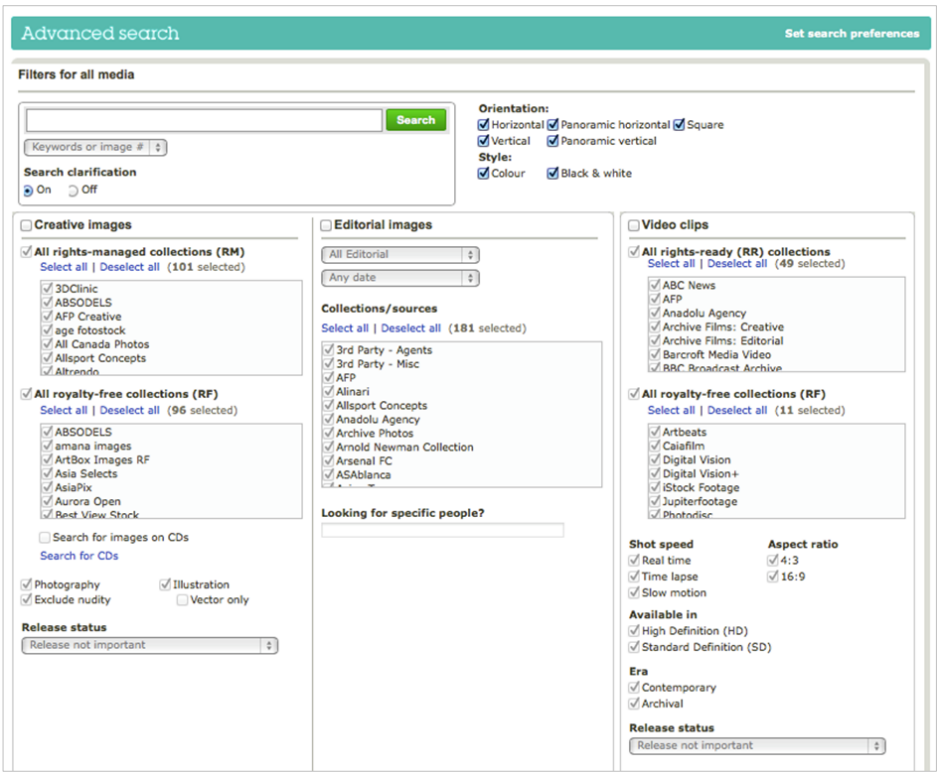


Figure 4- 14. GettyImages - advanced search features 2014

d. Shutterstock

The non-BBC participant (P8) worked as a journalist and image editor for the UK-based branch of Dipnot.TV[44], a Turkish online news service, and to source images, she used *ShutterStock* (https://www.shutterstock.com), and occasionally, *GoogleImages (*https://images.google.com/*).*

Shutterstock collection also based on text input, allowed to exclude keywords. The filtering features allowed to filter images by editorial/ non-editorial, photo/vector/ illustration, colour, and orientation. Additionally to these standard filters, it allowed for filtering images by the presence (or absence of) people in images.

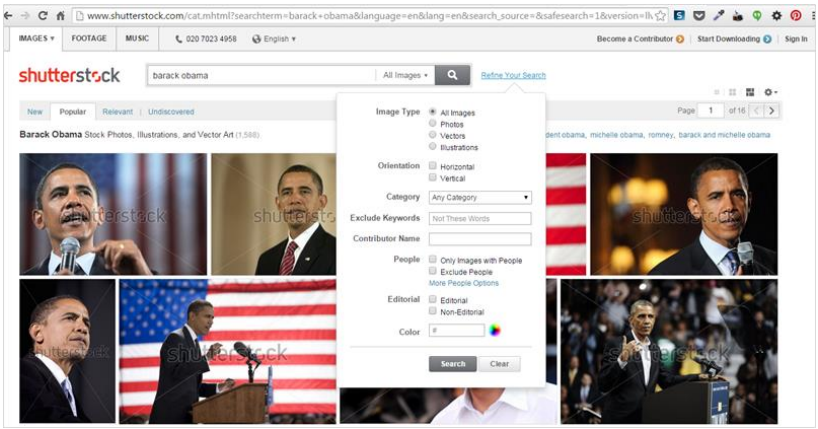


Figure 4- 15. Shutterstock images – homepage 2014

[44] The UK branch of Dipnot.Tv has since shut down and is available only in the Turkish language at: www.dipnot.tv

4.5.2.4 BBC's content publishing system (CPS)

The BBC's Central Editorial Team was responsible for selecting images to illustrate stories featured in the *promo box* (the term used internally by CE Team). The promo box was the largest image placeholder on the homepage and featured a dominant photo and a headline. While other surrounding stories and images were automatically aggregated from different pages across the BBC website, the headline news content was manually curated by Content Producers at CE Team. It was the responsibility of Assistant Content Producers (see: Section 4.7.1 for description of the roles) to search for, select and editorially tailor images for these hand-pick news stories. There was one *promo box* in each of six sections of the BBC Homepage: BBC now, Entertainment, News, Lifestyle, Knowledge, and Sport.

The size(s) and shape(s) of the *promo box* were pre-defined in the templates of the BBC's content publishing system (CPS). Figure 4-16. shows a typical layout of the BBC now section of the BBC Homepage with a *supersize promo box*.

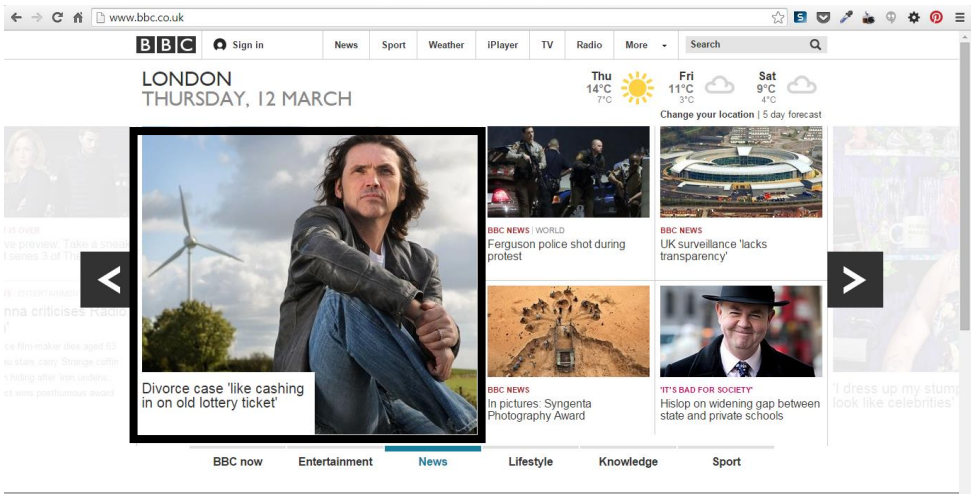


Figure 4- 16. A typical layout of the BBC homepage

The sizes and shapes of promo boxes used on the BBC Homepage at the time when this research was being carried out included:

Large promo (Supersize)

The dimensions of the supersize promo were defined at: width = 488px, and height = 443px.

The promo had an overlay referred to as *furniture*, for displaying the headline of the content. This overlay expanded vertically on roll-over and covered the let bottom corner of the image to display more information about the featured content.



Figure 4- 17. An example of a supersize promo

The supersize promo could contain a single image, or a mini-photo story consisting of up to 4 images.

Mini promo

The dimensions of a mini-promo were defined at: width = 488px, and height = 218px. When expanded on interaction, the *furniture* covered the left half of the image, and displayed information about the content. The available variations were: a single image or two images as presented in Figure 4-18.

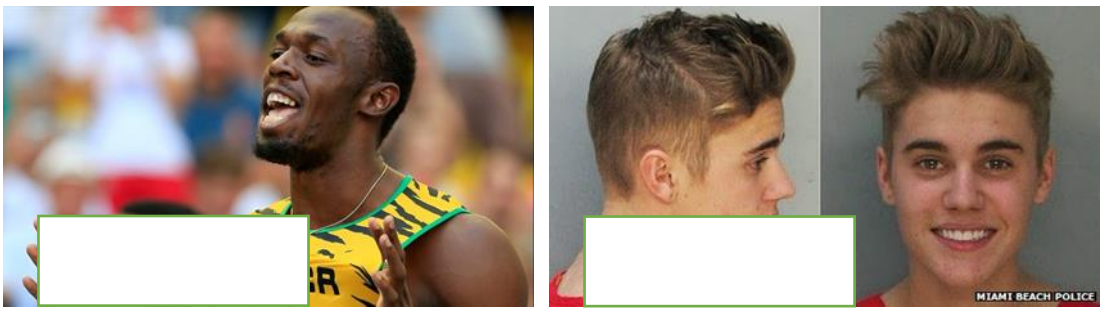


Figure 4- 18. Promo space variations

The *Supersize promo* was always used on the BBC now section – the section that the BBC Homepage opens on by default, and on the News, and Sport sections when the published content was considered of high importance. The *Mini-promo* was used mainly in Entertainment, Lifestyle, and Knowledge sections. CPs made a choice of the size of the promo box depending on the importance of each individual news story that was to be featured in the promo box.

4.6 Findings from Study I: interviews and observations

4.6.1 Introduction

Study I. is the opening study in this investigation that is exploratory in nature and has been designed to provide a broad and systematic understanding of the following six areas related to the image seeking behaviour and needs of image users in online journalism: 1) The image user and the workplace, 2) Illustration tasks, 3) Image users' needs, 4) The illustration task process, 5) The relevance assessment and selection criteria, and 6) Challenges in the illustration process specific to the online environment. 12 image users working in online journalism participated in semi-structured face-to-face individual interviews (Section 4.2.5), and 10 of them were also observed performing real work tasks in situ (Section 4.2.6). The observations were carried out at the participants' workplaces and the think-aloud protocol was used to elicit the information about how and why image users were making decisions when searching for news images. The results of this study will be presented in relation to the research questions and objectives identified for this study, and therefore, they will be presented in the following order: Section 4.8.2 describes who the image users in online journalism are in terms of their roles, responsibilities, skillsets in relation to creative image editing, as well as image searching, their competence in and strategies for illustrating online news content, and their perception of creative tasks. Further, findings related to the fast rhythm of the online newsroom will be reported. Section 4.8.3 focuses on the presentation of the findings about typical illustration tasks carried out in online journalism. The categories of tasks used by the image professionals will be discussed. To follow, a dichotomous distinction between tasks based on actual images and those based on ready images that emerged from this study will be presented. An explanation of its implications on the reporting and interpretation of the remaining results will be provided. Section 4.8.4 presents the image users' needs uncovered in tasks requiring actual images and in tasks to be completed with ready photos. Section 4.8.5 details the stages in the search-based illustration task process and shows how the process differs depending on whether an actual or a ready image is being sought. An illustration task process updated with verifying and tailoring stages is proposed for tasks requiring ready images. Section 4.8.6 is devoted to the criteria that users apply to actual and to ready images in the selection process. Section 4.8.7 explains the challenges that image users face when performing search-based illustration tasks. The following Section 4.8.8 explains how, why and to what effect ready images are tailored.

The opportunities for improvement of image retrieval have been identified on the cross-section of image needs, relevance assessment and selection criteria. Section 4.8.9 presents the set of visual features recurring in news images used as the dominant image on news homepages. This set is proposed as the criteria for the improvement of image retrieval to be evaluated in an experimental study in this investigation (Study III, Chapter 6).

Section 4.9 presents the aim, methods and results of Survey 1. conducted with three independent image experts who independently examined the images collected in the observations.

4.6.2 The image users in online journalism

This Section focuses on Objective 1 (RQ1) set out for this study by identifying and describing the roles of and the *working day* of image professionals in online journalism. These findings emerged from data from interviews and observations in-situ with image professionals in online journalism.

4.6.2.1 Image-related roles

This Study was conducted with image professionals working at the BBC Central Editorial Team (CE Team) responsible for providing images for the BBC Homepage, BBC iPlayer, BBC radio stations homepages on desktop and mobile devices. The overall aim of the Team's effort was "*to create compelling promotional content for the BBC homepage, and reflect BBC and external events in a compelling and imaginative way in a range of interfaces*" (BBC, 2013). The image-related roles that were identified within the BBC Central Editorial Team (CET) included: Duty Editors (DE), Content Producers (CP), and Assistant Content Producers. The team had a hierarchical structure, where the role of the Duty Editor was the most senior position, and ACPs were in the most 'hands-on' role in terms of performing of daily illustration tasks. ACPs worked to direction from the Content Producer or Duty Editor, on a range of illustration tasks, and their main responsibilities included image sourcing, image editing and/or creation of composite images for online news publications, therefore, ACPs were placed at the centre of this research Study.

In this study, 1 DE, 4 CPs, and 7 ACPs took part. When asked about her role as ACP, P7 summarised it as follows: *"we curate user journeys across BBC Online. So, we publicise news stories on BBC homepage and create promotions for BBC programmes. So, if there's a programme like Strictly Come Dancing, we come up with a plan to promote it by choosing or creating attractive, eye-catching images."*

4.6.2.2 ACPs: skilled image editors, and self-taught image searchers

On entry, the role of ACP requires solid skills in the use of image editing software such as e.g. Adobe PhotoShop (PS) for image manipulation, as well as creation of composite images. The image professionals participating in this study emphasised on the importance of strong PS skills in their roles, and in the entry questionnaire, all rated their own PS skills as advanced or expert PS users. All participants said that they had taken a formal training or a course in PS prior to applying for their current positions, and that they also attended in-house training courses in advanced PS skills to improve their skills. They also attended an internal course in image selection and editing skills for publication that focused on visual aesthetics, image idea generation, and creating illustrations with visual impact. This course was conducted internally by senior image professionals within the organisation.

The participants perceived themselves as creative professionals and regarded their profession as part of the *creative industry*. The participants demonstrated clear illustration strategies for the function of the dominant news image, for example, they typically "hooked" (P5) a story to a specific person and searched for photos of that individual. However, they felt that they did not have

enough *time* to show-case their creative skills at work, e.g., create an image that would include drawn elements. Some participants explicitly said that they compensated with their creative skills for ineffective searches in routine tasks, which consumed *too* much time.

Before an image can be edited and used, it needs to be found. Traditionally in print media picture editors tended to work directly with photographers, or sourced images from image libraries by submitting an image request to a qualified intermediary (e.g. an image researcher, librarian, or archivist). In their report, Markkula and Sormunen (2000) reported on an emerging trend for disintermediation of image retrieval in newspaper editorial offices, yet, in print, intermediaries were still perceived as a necessary link in the chain of image-related roles in journalism. Their skills and expertise in image retrieval were channelled to the manual indexing of images for future retrieval, and they dealt with image requests less frequently (Ørnager, 1995; Markkula and Sormunen, 2000; Westman and Oittinen, 2006).

In the online environment, neither did the image professionals work directly with photographers, nor did they have access to an image library operated by a qualified intermediary – practices previously described in print editorial offices in Ørnager (1995), Westman and Oittinen (2006)). Tasks were generated by CPs for ACPs, they could be also proposed by ACPs themselves. Tracking statistics of what topics were trending, and monitoring news channels for fresh news was the source of tasks. To source images for online news publications, the image professionals performed image searches as end-users of the available image retrievals systems. Image searching was an integral part of all illustration tasks undertaken by the image professionals. P9, who had a previous experience of working in print journalism, commented on the differences between the two environments:

> **P9 (CP):** "*In print you're commissioning your own photographers. You work a lot more closely with photographers. With this job online you're doing what you can with images that have already been created and provided via an agency. These are images that have been created for use in a broad range of publications. They are not bespoke*."

The ability to find suitable images seemed of high importance to the tasks and the quality of the illustration that was produced with the use of these images. However, in the job descriptions there was no requirements for skills in regard to image seeking. When asked about training opportunities in image searching, the image professionals said that shadowing and a *peer-to-peer* training were typically offered to all new team members, and this included a demonstration of how to use the internal and external image resources (BBC ELVIS, BBC Pictures, and GettyImages) in terms of UI basic search features, and copy rights information. The participants felt that searching was a skill that came with time and experience "*something you learn on the job*" (P5), and for some "*it's been trial and error for quite a long time*" (P1). P5 and P1 also believed that their experience with searching for images for personal use, e.g., on Google images, helped them with conducting image searches at work. In general, these professionals were skilled image editors who worked independently to illustrate news content and identified themselves with creative professions, such as graphic designers, digital artists. Although all illustration tasks (as

observed) were search-based, searching for images was not formally recognised as a skill they would need to be trained in but one they would practice on the job.

However, images found through searches were highly valued. P10, who was the Duty Editor, explained:

> "*Photoshop and those sorts of skill will always be skill sets that we will develop with the people. So, the real focus is around making really strong image choices. I always say that fundamentally you can do the cleverest image in the world; you can work on something and create something really wonderful. But it's still unlikely to have more impact than a really, really well selected image that you haven't had to do anything to. So, for me the start point is to make excellent choices*."

4.6.2.3 The fast rhythm of a typical working day

The key characteristic of online journalism is its dynamic environment, as already described in the relevant literature (e.g., Pavlik, 2001). Unlike print media, it enables journalists to publish information in a 24/7 cycle, and instantly while events are happening or shortly after they have occurred. This results in several versions of web pages throughout the day. For example, each of five key section of the BBC Homepage is scheduled to be updated 5 times every day between 7am and 8pm. This cycle is normally observed when there are no breaking news stories that normally override scheduled updates. For example, on 23rd July 2013 there were at least 7 updates on the BBC Homepage in the BBC Now section, to provide fresh news about the birth of the Royal Baby. On one hand, this dynamically updated content gives consumers immediate view on events, which is highly valued, on the other hand, it requires from CPs and ACPs to work to very tight and fast shifting deadlines. In interviews, the participants claimed that the average time typically allowed for searching and selecting images to use on live content on the BBC Homepage is about 10 minutes, for creating an illustration.

All members of the CE Team (and P8) worked in 8-hour shifts on a rota basis, over 7 days a week. They began their working day at 7am, and the first update on the live Homepage was scheduled for 7.30 am. The last shift ended at 8pm, and the last update of the day was scheduled for 8pm.

In general, the participants felt that the environment they worked in was fast-paced, and there was usually "*more work than hands*" (P1), which directly affected the decisions they made in the image searching and selection. While carrying on searches, they often commented that it was taking them too much time, and that tight deadlines were the key barrier in finding better quality images for illustrations.

4.6.3 Illustration tasks and search tasks

Findings in this Section address Objective 2 by providing information about the typical illustration task, its basic components and how these components shape image searching. A dichotomous distinction between tasks based on *actual* images and those based on *ready* images that emerged from observations will be presented. An *actual* photo was described by the participants as *a photo taken at the scene of the event related to the news story defined* in the task, while photographs available for re-use in multiple contexts were referred to as *ready* images. An explanation of implications of the proposed categorisation on the reporting and interpretation of the remaining results will be provided.

Both interviews and observations covered the topic of illustration task. In interviews (Topic 2), the participants were asked to talk about typical illustration tasks that they performed and how the tasks were generated and allocated. In the observations, the participants were being observed carrying out real illustration tasks. In total 28 tasks were observed of which 26 tasks were completed and 2 were dropped when search results had not provided suitable images. Through successful searches 35 separate images were retrieved and used to produce 25 illustrations. In one case (T5), the task was completed although the search was unsuccessful. P7 completed the task by taking a photograph by herself. One final illustration was created per task. In 5 cases, the illustrations were composed of several images. In tasks 5 and 14 – three images were used in a collage style, in tasks 10 and 27 – two images were used in each task (one image was used as the background, and the other provided the required object in a composite image), in T9 – elements of four separate images were cut out and used in one illustration on creative backgrounds. Table 4-10 below presents the editorial sections and number of tasks per section observed in this study, while the full list of tasks with headlines is presented in Appendix A9.

Editorial Section (Homepage)	Illustration Task No.	Total (N=28)
UK news	6, 8, 26, 28	4
World news	1, 14, 19, 20, 21, 23, 27	7
Entertainment and arts news	4, 10, 22, 24	4
Sports news	2, 7, 9, 11	4
TV/Radio content	3, 12, 15, 16, 17, 18	6
Science and environment	13, 25	2
Other: 7-day news quiz	5	1

Table 4- 10. Editorial sections covered in tasks (Appendix A9.) Ts 13 and 23 were dropped and T15 was completed with a photo taken by the participant (P7) after a search had not brought required results

Journalism is a domain that covers a variety of topics from various thematic sections, which was reflected in the tasks observed in this study: 7 tasks related to news content from the World news section, 6 tasks aimed to provide illustrations to promote TV or radio content. 4 tasks were carried out in each of the sections: entertainment and arts news and sports news, 4 related to UK news, 2 to science and environment section, and 1 was to be published in News magazine monitor section.

4.6.3.1 Types of tasks

a) Image users' typology of tasks

In the interviews, when asked about types of tasks they worked on, the participants differentiated between: *topical,* and *non-topical tasks*.[45]

Topical tasks

In the words of P3 (CP) topical illustration tasks were based *"on news content that was current and was being talked about".* Topicals were based on breaking news stories that made headlines on the homepage – especially, if there was a potential that a particular story might develop into rolling news. Breaking news stories had a direct dependence on the real-time of the events that were being reported, therefore, it was critical that these tasks were prioritised over other tasks and completed in a shortest possible time. 5 minutes to 10 minutes for breaking news was generally considered an acceptable time for completion of an illustration task related to a breaking news story. Topicals also included tasks based on news content promoting future scheduled events e.g. upcoming sports events, political debates, elections. Such content typically generated much interest in readers and the news content was created to build up the atmosphere before the upcoming event. The image professionals said that they would typically take approximately 30 minutes to complete such tasks.

Non-topical tasks

Non-topical tasks were based on general news stories and features that had no (direct) dependence on 'real-time' events while the story was being reported. These news stories had a longer 'shelf-life' (P9) and were concerned with broad (general or abstract) topics such as e.g. economy, credit crunch, and unemployment. Tasks based on content promoting TV and Radio programmes also fell in this category. Non-topicals were usually regarded as lower priority tasks: there was no real-time pressure for task completion, and the level of interest in the news content that *non-topicals* were based on could potentially generate was not regarded as high (when compared to any of the stories covered in topical tasks). Although, the image professionals reported that the average time-on-task for *non-topicals* was up to 30 minutes, they also claimed that they always tried to complete these tasks in the shortest time possible because of the lower priority and a high potential for the story to be short-lived if a breaking news story came up next.

This division of tasks clearly reflected the nature of the online journalism. The topicals reflected the fast-paced ever-changing context with real time updates of the ongoing news stories unique to online journalism (Pavlik, 2001), as well as the ephemeral nature of online news where news content typically got overwritten by another fresher story and its value decreased fast (Siapera, 2012).

These tasks required a high investment of effort in finding suitable images within a short time so that the content could be published in a timely manner. On the other hand, non-topical stories

[45] This was an internal typology of tasks that might not be used outside of this particular news organisation.

were being pre-prepared as space-filler stories which catered to the audience's expectations of news updates throughout the day, even if no breaking news stories were being reported. Keeping up with news and having regular updates communicated that the news homepage was *'live'* and *"we were up to date with news"* (P10). While there was more time allowed to create potentially interesting images for non-topical stories, the motivation to take more time to work on such tasks was low, as the priority of these stories was low, too.

b) A task typology identified from the observations and useful for this investigation

This distinction between topical and non-topical tasks was elicited from the interviews with the image users. They found this task categorisation useful when prioritising tasks and allocating time for task completion. However, a closer integrated analysis of the tasks performed in the observations and the processes they involved revealed an alternative way that the tasks could be categorised. A clear distinction between tasks requiring actual images and those that could be completed with *ready* images was observed. The differences were observed in the image users' needs, the illustration strategies, searching behaviour, image selection criteria and tailoring techniques applied by users. It was found that tasks that required actual images were typically based on breaking news stories (e.g., T7, T14), or stories focused on a specific event (e.g., T19). Tasks that could be completed only with ready images or composites made of ready images, were typically based on general news features, news content promoting radio programmes or future events. Breaking news stories for which there were no actual images available were also completed with ready imagery.

Although it has been reported that journalists tend to search for and use the most *current* images (e.g., Markkula and Sormunen, 2000), the distinction between actual and ready imagery has not been made in previous studies into image searching. The reason for this may be that the differences in how actual and ready images are sought become explicit only in the environment of online newsroom that stands on instantaneous real-time reporting. The only study that included image editors from online journalism in their sample is Göker et al. (2016). The authors report that unlike the image searching behaviour of other creative professionals (bloggers, copywriters in advertisement), the behaviour of editors is not consistent with the existing image searching models such as e.g., Conniss et al. (2000). The latter tend to engage in information filtering rather than retrieval. There is little detail provided in their paper but it appears that non-journalists in their sample used *ready* images to complete their tasks, while the editors made use of images that "*come on the wire concurrently with news stories",* are fresh and taken at the scene of the event. This description matches closely the notion of the *actual* image, as defined for this study. The proposed distinction between actual and ready imagery may account for the different image searching behaviour of the user groups involved in Göker et al.'s study, as it does in this investigation for a single user group but dealing with the two types of tasks.

Since the focus of this investigation was on the retrieval of images from online image collections containing images for re-use, this distinction between tasks was considered most suitable to this investigation.

4.6.3.2 Basic illustration task components

It was observed that in all cases the participant received a written task from a content producer on duty or in one case from the duty editor (T6). The task were received via an excel spreadsheet that allowed shared access, or via email, and included a set of details about the news content that required an image. The written details of the tasks were collected and their structure compared across the 28 tasks. All observed tasks included the following 6 components: the headline, URL to the location of the content, editorial section, the image size, image use (e.g., headline image on the BBC now section), deadline for publication. While participants were performing the tasks, they were observed acting on the information provided in the tasks. Table 4-11 below shows how components were used by image professionals to identify the subject of the task, and to inform and plan the process of completing a search-based illustration task.

Task components	Image professional used this component to:
Headline	Identify the subject of the content, generate ideas, formulate a query and search term.
URL to news content	Navigate to content (or synopsis) to further determine the subject of the content
Editorial section/ type of content	Determine whether it is breaking news/ spot news or general news feature Determine the level of editorial treatment permitted
Size of illustration	Decide about the size of the illustration to be created, select appropriate images in regard to orientation, and how they can be edited to fit the template frame
Image use, e.g. headline image on the homepage	Determine the importance of the content
Deadline for publication	Determine the priority and importance of the content. This, in turn, influences the choice of search strategies, resource, and editorial techniques

Table 4- 11. Basic task components and how they informed searches

Image professionals used the headline to establish the subject of the news content by identifying who or what the story was about. This was apparent when they were reacting to the headline by saying: *this story/news is about,* or *this is about,* or *what we have here is a story about, or I'm working on a piece of content about*, or *this is a radio interview/programme/drama about*. Then, they would name a person (e.g., Sophie Ellis-Bextor, Usain Bolt, John Cole), or geographical location (Azerbaijan), or a specific event (doctors arrested at Gezi Park, Thatcher's funeral) as the main subject of the news. This subject was used to formulate the image queries and search terms. When the content titles did not include any named entities, the participants navigated to the article and read the synopsis. The URL provided in the task was used to navigate to the original content where more information was available (e.g., the complete article, the synopsis of a TV/radio programme). For example, having read the headline in T26: P9 said*, "This's a piece on the life terms for prisoners.* [navigated to the article] *So, this is saying that a court has said that whole life terms for killers are not wrong."*

The editorial section informed the user about the genre of content, and whether the content was a breaking news story, spot news or generic feature etc. In case of breaking news and spot news, an actual image from the actual event was typically searched for (unless it was known that such an image did not exist). The integrity of such image had to be preserved, hence only minimum of

editorial treatment was permitted. Size of the image (e.g., supersize promo or mini-promo) generated a need for images in certain orientation. For example, participants mentioned that when they searched for images to fit into the size and shape of the mini promo they preferred to use images in landscape orientation. Participants knew that if the image was to be used as the dominant photograph on the BBC now homepage, the news content was of high importance and priority.

In the literature (e.g. Elsweiler and Ruthven (2007) provide a comprehensive review), tasks have been described in terms of e.g., complexity, frequency (e.g., a routine task). It is also known that image needs are directly shaped by work tasks and the context of image use, e.g., the type of news story, page layout and the size of the illustration required (Westman and Oittinen, 2006). This study investigated tasks at the level of task components and how each component directly influenced the shaping of image needs and searching behaviour. Based on the observations in situ, it is believed that these six components are sufficient to generate authentic image needs in users for them to initiate image searches. In this investigation, uncovering of these components also had a methodological value. A good understanding of the task structure was central to the construction of simulated work task situations in the experiment conducted in Study III. (Chapter 6).

4.6.4 Image needs in online journalism

This section is a further pursuit of Objective 2 in regard to image users' needs. In IIR tradition the effectiveness of image retrieval is measured by how well the system meets users' needs. Users' needs are processed internally and therefore, not easily observable. But they come from tasks (Conniss et al., 2000). Tasks required searching for and selecting images for the function of the headline news image.

4.6.4.1 The visual effect sought in images

When asked about images that they were typically looking for, the participants agreed that they searched for visually attractive images, and used the following descriptions: '*arresting*', '*dynamic*', '*attractive*', '*punchy*', '*stunning', 'striking', 'eye-catching'* images, '*something that stands out'*. These responses corresponded to the findings from previous relevant studies (e.g., Markkula and Sormunen, 2000; Westman and Oittinen, 2006), and showed that as in print, the use of images in online journalism fell into the *emotive and persuasive* category (Conniss et al., 2000). However, these descriptions of visual attractiveness of images tell little about the actual image users' needs and led previous studies to a "*dead end".* For example, Markkula and Sormunen (2000) regarded these descriptions as related to aesthetics and therefore being too subjective to investigate.

However, Machin and Polzer (2015) pointed that these adjectival expressions describe the visual effects required by image users, and it is important and possible to look beyond these effects to uncover the specific image features responsible for these effects. Another important finding from the interviews, already reported in the literature (e.g., Machin and Polzer, 2015), showed that

image users struggled with articulating their needs on the level of visual features. The participants had to be probed about the visual aspects of images that they selected and used. For example, many participants mentioned the importance of colours in image selection ("*we are all about colours*" P1), however, the interviews did not produce information on the required level of specificity. This study aimed to gain a deeper understanding of the actual specific features responsible for the visual effects required in news headline images, therefore, further needs analysis focused on the data collected from observations and from the artefacts created by users.

The observational data revealed that when illustrating breaking news content, image users were not concerned with the visual appearance of *actual* image. Instead, the focus was on their *actuality.* Actual images captured the attention of viewers because they were used as 'witnesses of events' as described by Sontag (1975). They were used to report what was happening right there and then, and additionally, communicate to readers that the news service was up to date with the latest news. P3 described his experienced of working on tasks based on rolling news and requiring actual images:

> *"It's rolling news where I feel quite nervous. Because you can - by the time you've chosen an image the story could have moved on further. We might choose an image of a blazing fire and it might take 20 minutes for us to create the promotion and to get sign off from our Duty Editor. By the time we've placed it, the fire's out. Or conversely, we could get a picture of somebody being taken to safety and make it a reassuring story and then suddenly there's an extra explosion and the story's moved on. So that's where we have to be very careful. Are our image choices going to mislead the audience into thinking that situation is different from how it actually is?"*

The focus here is clearly on the semantic content of the image and the use of actual images can be mapped to the data (information) pole on the Fidel's continuum of image tasks (Fidel, 1997).

As it will be shown in subsequent sections, finding and selecting actual images was a straightforward process: if at least one actual image relevant to the topic of the news story was available, the selection was made and the task completed. The tasks requiring ready images were those more problematic because searches usually resulted in numbers of images that could potentially be selected and re-used. This investigation focuses on ready images and aims to identify the visual features that together make an *eye-catching* news headline image.

4.6.4.2 The analysis of search topics

To shed the light on the image users' needs, queries and search terms were manually collected from observations in this study. They were analysed and grouped into the categories identified in earlier studies (Markkula and Sormunen, 2000; Westman and Oittinen, 2006).

10 image users were observed performing 28 illustration tasks. All the tasks were search-based and 35 images were retrieved and used to create 25 illustrations (in addition, one task was completed with a photo taken by the image professional after an unsuccessful search – T15). In total, 40 search topics were identified.

Image need facet (1) Markkula and Sormunen, 2000; (2) Westman and Oittinen, 2006	Examples of search topics in this study	Search topics %				
		This study	Study (1)		Study (2)	
		Queries	R	Q	R	Q
Specific person	Usain Bolt, Tim Peake	55	54	56	37.9	49.1
Specific objects	TARDIS, Beetham Tower					
[news] event	Gezi Park doctors arrested, Thatcher	10	3	22	0	0
Generic objects	Women's magazines, human face	7.5	20	0	31.8	18.3
Named geographical location/landmark	Detroit, Azerbaijan	10	5	0	10.6	6.9
Place type	Prison, diner, nursery	7.5	2	0	0	1.3
Theme	Women's football, South African landscape	5	7	18	3	21.5
TV/radio	Don't panic	2.5	4	4	0	0
Known item	Justin Bieber	2.5	3	0	10.6	0
Action/event	-		2	0	6.1	2.8

Table 4- 12. Results of Queries analysis in this study compiled with the results from earlier studies Study 1 by Markkula and Sormunen (2000) and Study 2 Westman and Oittinen (2006), requests (R), queries (Q)

The results in Table 4-12 were compared with those reported in previous studies conducted in print journalism: Markkula and Sormunen (2000) and Westman and Oittinen (2006). The comparison showed that search topics identified in this study fell into the categories from the two previous studies in print journalism, with only one category: action/event being not represented. At this point, it is important to note that a direct and precise comparison between the results of the two previous studies and this study was not possible. This was mainly because the earlier studies had been conducted in intermediated environments of print journalism where image editors could choose to search for images by themselves or submit a request to an archivist. Moreover, the queries had been collected from logs and as the authors admitted in the reports, they had been unable to trace the link between the logged queries and any specific news content or news events. As previously stated in the literature (Taylor, 1968), a search term is not a direct reflection of the query. Nevertheless, some trends across the previous and this study could be observed and explained.

It was found that names of specific people and objects dominated in this study. This category constituted 55% of all search topics, of which majority were a search for a specific person's name (in one case: T22, two people's names were used: Beyonce Jay-Z, as both of them were identified as the subject of the news content). This result was higher than reported in previous studies but corresponded to the general trend that specific named objects (including people) typically constituted a majority of search topics used in journalism. In regard to the remaining categories, a general tendency was that they included fewer topics than the previous studies. For example, in Markkula and Sormunen's study, the second most common category was the documentary, event-related photographs. In this study, this category also came as second important but at a much lower frequency of 10%. In print journalism, requests for an image of a generic object were common, while in this study such searches constituted only 7.5%. Westman and Oittinen (2006) classified 21.5% of the search topics as themes, while Markkula and Sormunen (2000) identified

18% of search topics in this category. In this study, only 5% were classified as themes. There could be two explanations to these discrepancies. Firstly, the news content selected for headlines was typically related to specific people. This was because of a general belief among editors responsible for selecting stories to be promoted on the homepage that stories about people generated much more interest in readers than other stories. P9, explained, "*Again, I think people engage when they see figures and faces*".

Secondly, image users tended to associate a generic or collective subject of the content with a specific person, a tendency also observed in e.g., Jörgensen, (1999), Markkula and Sormunen (2000) and Westman and Oittinen (2006). For example, in T2 the subject: "women's football England" was associated with Tony Duggan, in T9 the football clubs were associated with specific players. Abstract concepts were observed in search terms, as the general strategy was to relate abstract to concrete objects, which typically was a person that could be associated with the content. P5 explained that when illustrating subjects that were considered too generic or abstract, it was a typical practice to "*hook it on a person or an event or something like that and then you can sort of narrow it down from there*." This was a common illustrative strategy, which may explain the high occurrence of search topics in the specific person/object category and the lower numbers in generic objects, themes, and others observed in this study. Further, the studies in print journalism reported on a frequent use of refiners, e.g., refiners were used in more than half of searches in the study by Markkula and Sormunen (2000) and these usually referred to colour. In this study only three searches were refined and in all cases the modifiers related to the geographical location> UK, British, England. This occurred when image users entered a generic search term (T2: women's football, T15: women's magazines, T26: prison) into GettyImages search. This particular collection is based in the USA and the results appeared to be skewed to US-based customers.

The study by Markkula and Sormunen (2000) reported that colour was used as the most common refinement for search terms. The data from interviews in this study showed that colour was considered as an important visual attribute related to the attractiveness of images, however, it was not used to formulate or refine search terms in observations and by default only colour images were retrieved.

While this analysis of search terms can only provide knowledge about users' compromised needs (Taylor, 1968), rather than authentic needs, it allows to gain some understanding about how search terms are formulated in searches for ready images. The image professionals identify the subject of the news content primarily from the headline, or the synopsis. If a proper name of a specific person or object is present in the headline (or synopsis), it is always used as the search term.

4.6.4.3 Image needs and assessment criteria in tasks requiring actual images

In this study, 9 tasks were described by the image users as requiring an *actual* image. These were tasks: 6, 7, 14, 12, 13, 19, 23, 24 and 25. While 7 of these tasks were based on breaking news, T19 related to a story focussing on a specific event (doctors arrested at Gezi Park protests), and T12 required a still from a specific TV show classified in this study as a type of an actual image. The needs in tasks requiring *actual* images were clear and specific in terms of the *ofness* of the image. An *actual* photo was described by the participants as a photo taken at the scene of the event related to the news story to be illustrated. When it comes to search term formulation, in some cases, the name of a person related to the news event was used to retrieve photographs showing scenes from the event, rather than showing the specific person.

For example, in T6:

> The subject of the news content: *Thatcher's funeral*
>
> A need for: *an actual image from the funeral* [of Margaret Thatcher]
>
> Search term: *Thatcher* [newest first]

The search term 'Thatcher' was used to find images to illustrate a live report from Margaret Thatcher's funeral, rather than to locate a photo of Margaret Thatcher herself. Justin Bieber was a search term used to find photographs from an incident involving the celebrity that the image professional had seen broadcast on TV. Similarly, 'Philippines' was used to find photos of scenes of typhoon Haiyan that had reached Philippines. These nuances in regard to needs and search term formulation were uncovered only because the think-aloud approach and observations in situ were carried out. Other methods, e.g., search logs would not provide this level of information. The search terms used in the remaining tasks requiring actual images are presented in Table 4-13.

Image need facet	Search terms
Specific people/ objects	Usain Bolt, Tim Peake, Muhammad Asghar, Red pandas US
News event	Gezi Park doctors arrested, Thatcher, Philippines
TV programme	Don't panic
Known item	Justin Bieber

Table 4- 13. Search terms used in tasks requiring actual images

The search terms formulated to find actual images clearly were compromised queries. The image users (including the non-BBC user) had an expectation that the initial search term consisting of the specific name and the use of 'newest first' search feature should retrieve the relevant images on top of the first search page. In the observations, in 7 of the tasks, the need for an actual image was met through a simple single search, while 2 tasks (T13 and T23) were dropped from the headlines because no actual images for these stories were found on the first search result pages. Caple (2013), and earlier Rössler et al. (2011), said that the availability of visually interesting

imagery may decide about whether news articles get published in print newspapers. This study in online journalism showed that in some cases news content for which *actual* images were not available would not get visibility on the homepage.

P1 and P3 said that the actuality of the photograph was critical to making a selection, while the visual appearance and the quality of actual images were of secondary importance. Some actual images were CCTV shots of poor quality in terms of resolution, sharpness, and brightness, yet, they were perceived as the best shots suitable to the content. P9 referring to actual images said,

> *"I think, if you've ever got a story that involves an individual, whether it's a murder case or whatever, even if the image isn't of the highest quality, that's why you'd use a picture of them because you'd think, oh, this is about this person (…)"* and elsewhere he added, *"So, I think when it's news images, you accept that you're not always going to get the most perfect, pristine image but it's the best image, it's the most appropriate image you can get."*

4.6.4.4 Image needs and assessment criteria in tasks requiring ready images

19 illustration tasks (67.8% of all tasks) required a *ready* image to be completed. These tasks were based on news content related to future events, radio programmes, obituaries, as well as news stories for which actual images were not available.

Image need facet	Search terms
Specific people	Tony Duggan, John Cole, Usain Bolt, Nick Clegg, Luis Suarez, Romelu Lukaku, Adam Lallana, Frank Lampard, Kelly Brown, Dr Who, Sophie Ellis-Bextor, Beyoncé + Jay-Z, Mandela
Specific objects	Tutankhamun, TARDIS, Dundee oil rig (refined from Scotland oil rig), Country Life, Stubs kangaroo,
News event	Ukraine protests
Named geographical location/landmark	Table Mountain, Detroit, Azerbaijan, Beetham Tower
Generic objects	Women's magazines (refined to UK women's magazines, British women's magazines), human face, oil rig
Type of place	prison (refined to UK prison), diner, nursery
Theme	Women's football (refined to women's football England)

Table 4- 14. Search terms used in tasks requiring ready images

A *ready* image was generally understood to be a photograph retrieved from an image collection for re-use in a new context. P9 described ready images as "*These are images that have been created for use in a broad range of publications. They are not bespoke*." Ready images were used to illustrate general news stories, TV/radio programmes promotions, or content related to future events. Two types of needs were identified in searches for ready images: semi-specific and open, and vague.

The semi-specific and open needs arose when a named person/object was identified as the main subject of the content (Ts 1, 4, 5, 8, 9, 10, 11, 17, 15, 22, 27, 28). The name of this specific entity was used as a search term, and its presence in the image was critical for the image to be considered for selection. For example, when working on T11 (Australia vs. Scotland), P4 read the

headline and the synopsis. He identified the subject: *"There is a big rugby match tomorrow"*. P4 looked up the team line-up information in Wikipedia and chose "*a star player*" Kelly Brown as an instance (representative) of the collective subject (Scottish rugby team). He used the player's name as a search term and the presence of this specific person in the frame would be applied as the initial criterion in relevance assessment.

When image users searched for ready images of specific people/objects, they tended to have some visual representation of the images they needed. In the literature, this representation is referred to as an *image in mind* (Frost, 2001) or a *visual prototype* (Greisdorf and O'Connor, 2002). In her interview, P5. explained, "*Sometimes you can build the imagery in your mind and you just hope to find something that's anywhere near."*

While starting T15, P7. commented,

> *"The idea is there. There's certainly an element of I'll know when I see it. I think sometimes that's certainly the case where you are trawling and you think I'm not really sure I will absolutely know it when I see it. That can work, but it can also just be a giant waste of time. I do think it's better to have some idea of what you want."*

Some participants had more precise criteria in mind at this point in the searching process, and used expressions such as: *"I need an image of…"* , "*what I want is something*…." The criteria that they mentioned also related to visual image features: colours, the type of shot, the visibility of the face, the salience of the person (object) in the frame, and the modality of the background.

> P1 *"We want to stand out so bright colours and a big picture of Matt Smith."* Vs. P2 *"An old photo and soft colours."*
>
> P7. "*So, obviously an ideal shot would be a good clear picture of her face, fairly close up, but that's not always what we get*".
>
> P2 "*I'm also looking for as clear background as possible. I don't want the background very crowded, noisy and distracting*."
>
> P4 "*You want them to be the main person in the frame.* [Referring to an image published on the homepage of another service] *It was a massive celebrity and he was just right at the back in a corner…. It was Usain Bolt and they had him literally in the background of the picture like really small. I was like 'spot the Bolt'*."

If the needed photograph was of specific person, their face had to be clearly visible, and what's important, a 'required' facial expression could be already defined in the searcher's mind. P10 retrospectively explained how an idea of a photograph of Andy Murray started shaping in his head. The photo was to be used as a headline image promoting Murray's final match at Wimbledon.

> "*What I wanted was to say this is a make or break moment* [for Murray]*. This could be everything for Andy Murray. What I wanted was a photo of him looking tense. Now Andy Murray usually looks very serious but I wanted something where he's wiping his brow.*

Or he's just looking a little bit more stressed than normal to say - I'm nervous, this is everything, this is a big deal."

Similarly, P4 explained that he wanted the players (in T9 and T11) to look "neutral", not to imply defeat or victory of any of the teams before the event has taken place. This indicated that details such as facial expression, were an important assessment criterion in image selection.

In one case (T15), P7 identified the subject of the content and the query as: *"women's magazines".* Although she used a generic object search term, she began the search with a well-specified vivid representation of the image in her mind. P7 said,

> "*I need [a photograph of] a pile of women's magazines, stack on a coffee table, and yes, I've seen this done before.* […] *no, I'm not after any photo that I know, it's just that this is the easiest, the… sort of standard way you would do this* [illustrate this content]. She further explained: *"I feel like I've seen it before. I feel that on other news sites, like The Guardian or Mail Online, I've seen an image like that. I feel I know it exists, because I have a very clear vision in my mind of just a scattering of magazines."*

So far, these findings show that most participants created *images in mind* that would include at minimum the critical object (e.g., a specific person), while others were able to describe the needed image more precisely, also in terms of syntactic image features. In their study, Göker et al. (2016) found that image users in journalism searched for photos closely matching their *image in mind*. In contrast, some participants (e.g., P1, P9) in this study stated that having a too precisely specified visual representation could lead to '*disappointment*' and inability to locate required images. This was observed in T15.

A need for the most recent images was observed through the use of "most recent first" search feature. There were two reasons mentioned for this preference in relation to ready images. Firstly, the newest images would show the person in the image looking current. P4 said, "*You need to consider how much a person would change over time, two years let's say.*" Secondly, it was expected that the *newest* images would be of a higher quality because of the technology available to photographers. Only in one case, P2 expressed a need for an old image as his intention was to create an illustration that would engender 'nostalgia' (T4 John Cole's obituary).

In some tasks neither the headline nor the content included any specific entity that could be immediately identified as the subject of this content and the search topic. In tasks 2, 3, 15, 26, where a generic object or theme was the main subject of the content, the image professionals said that their image needs were vague to begin with. These needs prompted them to begin what they referred to as *"broad"* searches. To produce an illustration to T3 (BBC Radio 4 Off the Page: The Dark Side), P1 familiarised himself with the content by reading a short synopsis of the programme. He had identified that "*the focus is on… OK. It is an interpretation of the dark side of human psyche*." He paused and then entered a search term "human face" in the search box. "*Not sure… Yes, I have a vague idea of… This could be an image of an evil face, or a normal human face that is distorted to make it look evil*." The need for an image depicting a person's face came

from the image user's belief about viewers' preference for faces. Later, P1 explained how this need formulated in his head: "*People like faces, people like things that they recognise and that's what people look at. When you're walking down the street people don't really look at people's faces because you're not supposed to but when you're on the Internet, you can look at much as you want. People become a little bit more likely to look at a face because they get an opportunity where they might not do in society*." This explanation resonates with human innate preference for looking at and the ability to recognise faces (e.g., Valenza et al., 1996), and with people's general attraction to visual (e.g. Malvey, 1975), but also shows that image users when selecting images tap into a variety of knowledge about the needs and expectations of their audiences.

P9 tasked with illustrating T26 (Court of Appeal upholds principle of whole-life prison terms) said,

> "*So, there's a piece on the life terms for prisoners. So, this is saying that a court has said that whole life terms for killers are not wrong. With this kind of story, obviously a generic picture of a prison… [thinking]. We could also probably find a generic picture of a prisoner in a cell or someone in a prison. Because of the nature of the story, it's not particularly about an individual or a particular prison [you'll be] fine to go with something generic. You want to be careful that you're not identifying a prison or a prisoner, so, you'll be looking at generic prisoner images*"

He used a generic place type search term "prison". The search in Gettyimages provided him with images of US-based prisons. P9 decided that the search was *"too broad"* and refined the search term to: *uk prison* to reflect his need for geographic location-specific images. A similar need was identified in T15, and T16 – where images of US-based restaurant were needed.

The analysis of the search terms did not identify any searches for abstract concepts. However, as already mentioned the analysis of search terms is not an ideal method for uncovering of authentic needs. The observations revealed that image users had abstract needs. For example, P8 used a search term: "Ukraine protests" (T20), which could imply a need for an actual photo showing a scene from this specific news event unfolding at the time (similarly to T14 Philippines or T19 Gezi Park). The comments made by P8, showed that she needed a generic image not depicting any particular scene from the protests or any specific protester (hence not an actual image). She described her rather vague (at this point) needs as follows:

> *"I need something symbolic but not too abstract… It needs to be related to the current crisis [in Ukraine], the protests but nothing, no scene in particular… It needs to be like… like a book cover, that tells you this is about the protests in Ukraine".*

Across the searches for ready images, there was a clear need for images showing people. P5 and P9 referred to images showing people as images with a *human element*. As mentioned before, this need was always present when the news content related to a specific person (people), but it was also true for stories that did not relate to any specific person. P1 when searching for a generic photo of 'women's football', said, *"I'm looking for the sort of photo that's in my mind which is of English women's footballers celebrating but from a rear viewpoint."*

The exception to this were searches for images needed for illustrating audio stories for radio. In T16 that involved a promotion of a radio drama, P7 formulated her query, and said that she needed *an image of a diner* and *no people.* She explained that she did not want to give faces to people from radio programmes, in order not to affect listeners' imagination.

In searches for ready images, there was a need for photos that would work *well* across different platforms. This was a need specific to online journalism and dictated by the requirements of devices used to view websites. P5. explained:

> *"I think we try and go for - well, I certainly try and go for big, bold images rather than sort of long shot distance thing. It's just for how it looks in the thumbnail more than anything, because another concern of ours is how things look on different systems and different sizes."*

P1 said, "*So sometimes you would have an image that works very well on a big promotion on the Homepage. But doesn't fit well on the mobile or say I had a picture of like a crowd in a riot or a protest or something. That doesn't usually translate very well on a small screen. So, we need to source - usually we try and source things that will work on both. So, strong individuals or something striking*."

To sum up, tasks requiring *actual* photographs and those that could be completed with *ready* images generated different sets of image needs. When searching for actual images, the image users were concerned with the actuality of the photograph, i.e., there was a need for a photo taken at the scene of the event that could *witness* for what had just happened or was happening. If the story involved a known person, there was a preference for the person to be shown in the image. The visual presentation and quality of actual images were of secondary importance and could be compromised for *actuality*.

In contrast, the visual appearance of *ready* images was important from the start of searching. The required images were described as '*arresting*', '*dynamic*', '*attractive*', '*punchy*'. Tasks based on news stories relating to specific people generated semi-specific and open needs. The specific person was the critical object in the photograph and their name was used as the search term. Already at this stage in searching, image users had some visual representation of the required image on the level of visual features, e.g., a clear need for either bright or soft colours, a visibility of face, a particular type of shot. One participant specifically talked about a need for an image showing the specific person with a particular facial expression.

Vague needs would typically arise from the content with a generic or abstract subject for which there was no obvious relation to any specific named entity. Taught by experience, the image users tried to "avoid" broad queries as these tended to return too many irrelevant images. They had shared strategies to deal with content with generic / abstract subjects. This included: relating the subject to some representative instance, in particular, to a specific person, and using the name of the specific entity as a search term; or putting more effort into generating a clearer visual

representation (image in mind) of the needed image, for example, by narrowing the boundaries of the need to a geographical region e.g., UK women's magazines.

A need for ready images of the *highest* [available] quality, sharp, crisp, and with the *highest* resolution was universally expressed. Images had to be legible on large and small devices.

Table 4-15 below provides a summary of the needs observed in this study in relation to the image needs facets presented in Westman (2009, p. 70).

Facets of image needs (Westman, 2009)	**Image needs in this study**		
	Actual images	**Ready images**	
Form	Clear (specific) including known item	Clear and open (semi-specific)	Vague
Content: Semantic	Specific (identifiable) *person/people or object(s) AND an identifiable location, scene or event*	*Specific person/people or object AND a generic (unidentifiable) location, scene or event (preference for people)*	*Generic object(s), scene, type of place, unidentifiable people (or no people, e.g. radio content)*
Visual effects	Not specified at this stage of need formation	high quality, sharp, 'arresting', 'dynamic', 'attractive', 'punchy' 'compelling' legible across platforms	
Visual features	Not specified at this stage of need formation	Face visible Colours (bright or soft), Type of shot	Face not visible Other features not mentioned at this stage
Metadata	Taken at a specific location and time Verifiable source	Newest or oldest first	No preference expressed

Table 4- 15. A summary of needs observed in this study

4.6.5 The Illustration task (T) process in online journalism

This Section presents the stages in the illustration task process observed in online journalism and addresses Objective 3 defined for this study. The goal of the illustration tasks observed in this study was to provide an illustration to a given piece of news content, e.g., a text-based article or a video clip, with an aim to promote this content on the news homepage. All illustration tasks in the online newsroom were search-based. The models referred to in this section are: the illustration task process model proposed by Markkula and Sormunen (2000, p. 274), the image seeking model proposed by Conniss et al. (2000), and Ellis et al.'s information seeking model (Ellis et al. 1993).

The image searching activities carried out by the participants in this study were compared with the stages in Conniss et al. (2000). This model was chosen as the most suitable to this study since it appeared to be most comprehensive of all models focused on images. It describes the image searching process in detail, and recognises its dynamic and interactive nature. It

emphasised on the importance of situational and environmental context, personal factors, the nature of the tasks, as well as the context of use. It is based on the information seeking model constructed by Ellis et al. (1993), however, it does not include the verifying phase. The literature provides empirical evidence that verification of images and sources is an important step in the selection process in journalism, therefore, it was considered important to investigate whether *verifying* is carried out by the participants in this study. Further, the illustration task process model as proposed by Markkula and Sormunen (2000) ends with image selection. In this study, it was decided that the observations would embrace the complete illustration process: from the point the task was received to the moment the illustration was queued for publication. This enabled the researcher to observe how and why image users tailored images.

As described in Section 4.8.4, in 9 illustration tasks (n=28) a need for an actual image (images) was identified, while in 19 tasks a need for a ready image was expressed. Tasks requiring actual images included single simple searches. Figure 4-19. presents the illustration task process for tasks requiring actual images. In two cases, the searches were unsuccessful, but the image users did not attempt to iterate the searching process as the actuality of images was the critical criterium and in both cases the tasks were dropped. On the other hand, searching for ready images included multiple searches, several iterations, modifications (e.g., refining search terms), changing of resources. Figure 4-20. presents the illustration tasks process and variations for tasks completed with ready images. More time and effort were invested on some of the activities when ready images were required. For example, when the need was semi-specific and open (Section 4.8.4), more effort was put into the ideation phase and familiarising with task. For vague needs (Section 4.8.4) the ideation stage was short, but a more extensive browsing was observed. Towards the end of the illustration task, in many cases, heavy image tailoring was performed.

Sections below describe the individual phases identified in the illustration tasks process with the multiple searches and variations from the single linear search process.

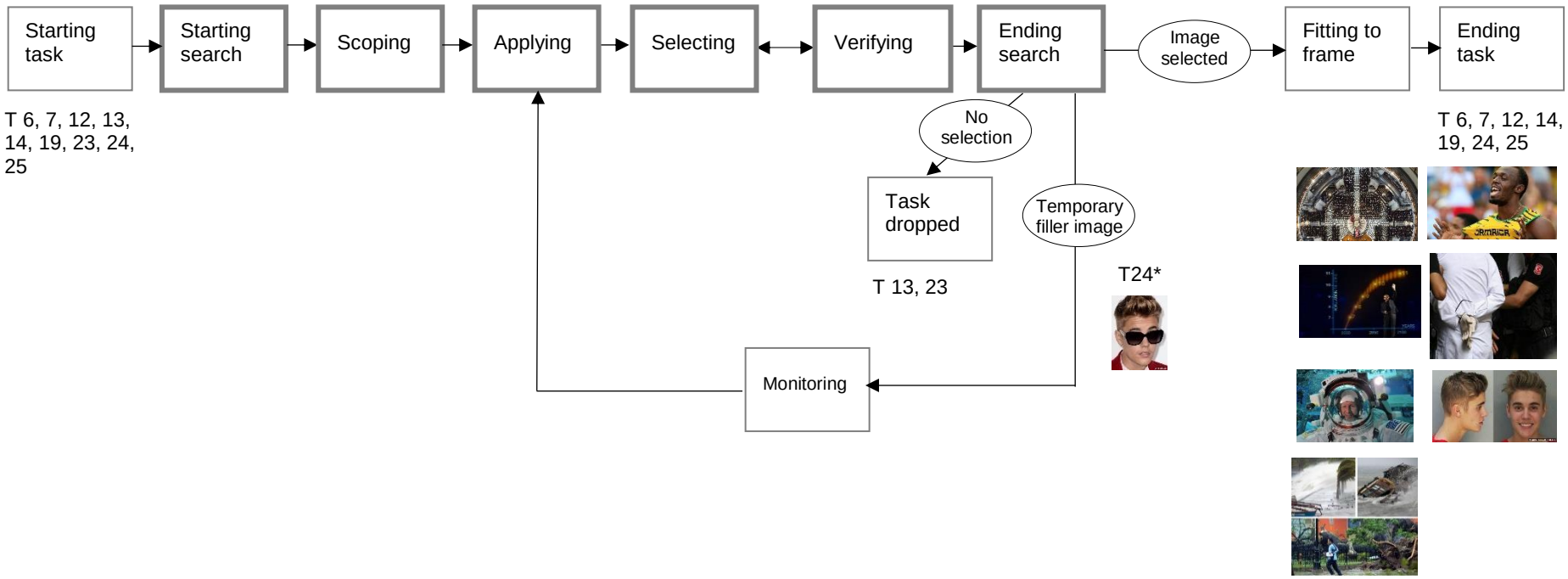


*Figure 4- 19. An illustration task driven by a need for an actual image typically included a linear single search. *the filler image selected from ready images.*

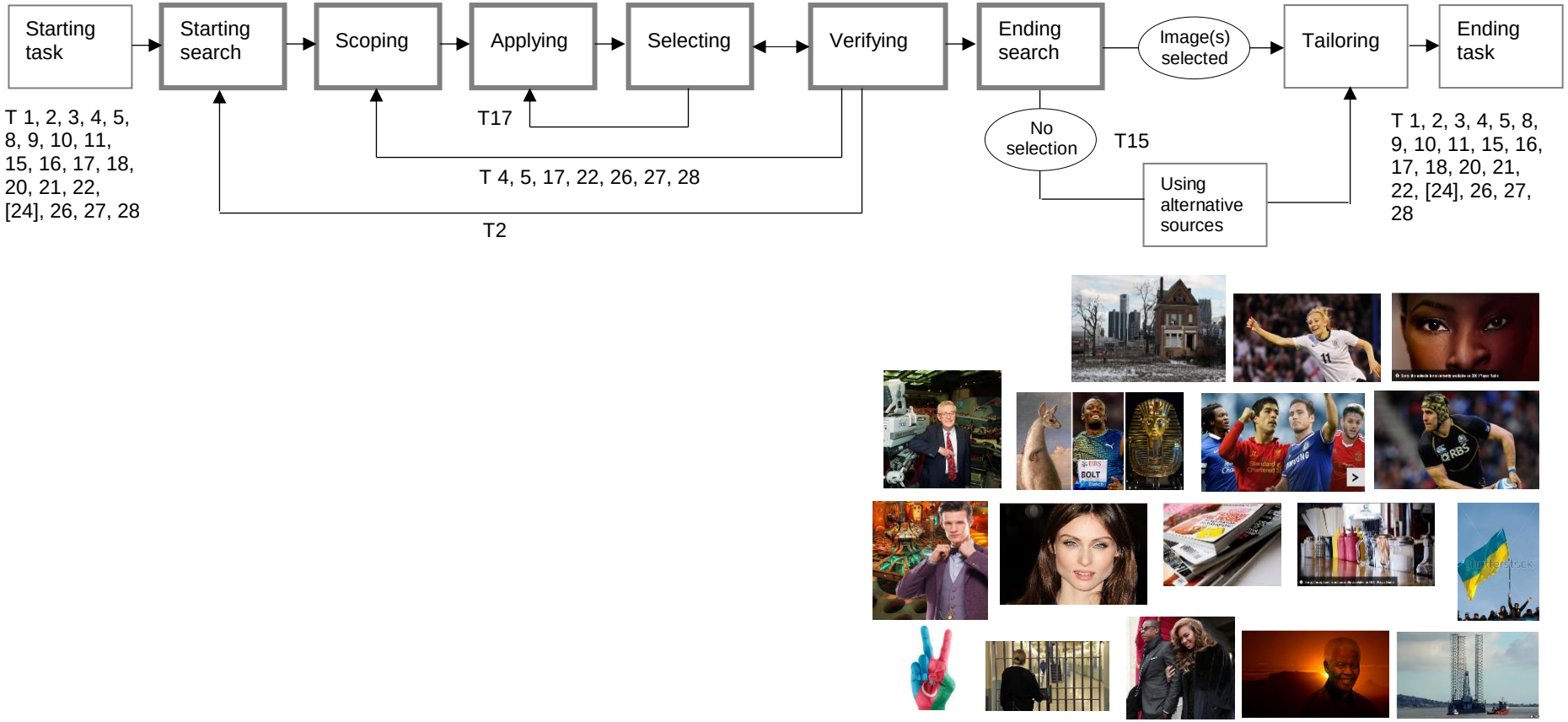


Figure 4- 20. Illustration tasks driven by a need for a ready image typically included complex multiple searches and iterations to the searching process.

4.6.5.1 Starting the illustration task

The illustration task began when the image user received the task either from a Content Producer (CP) on duty, or in some cases the Duty Editor. A typical goal of an illustration task was to provide an illustration to promote to readers a given piece of news content on the news homepage. The general requirement of illustrations was that they had to generate visual impact to attract readers' attention and encourage readers to discover the content. The discoverability was partially assumed by the function of the dominant image on the homepage (see Section 2.4.) that the illustrations were created for. This stage of the process was demonstrated through observable actions such as: user was observed opening an email with the task or checking the task spreadsheet where tasks had been allocated across the team.

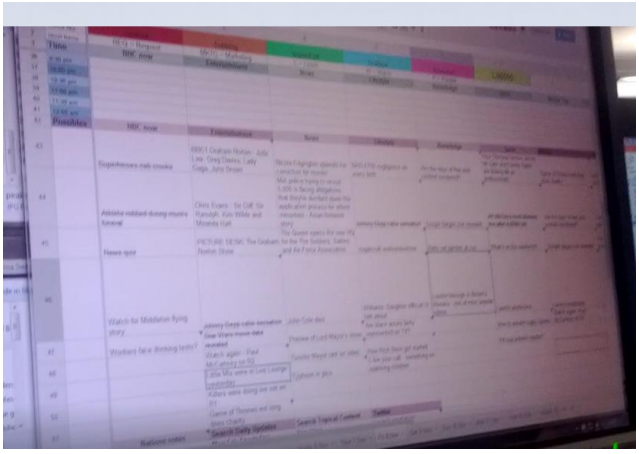


Figure 4- 21. P5 checking the spreadsheet with allocated tasks

The user then verbally acknowledged the task. For example, P5 said: "*OK, let's see what's next*", while opening an email from a CP on duty on that day [8th November 2013]. She was probed by the observer: "*Please tell me about what you're doing now*" "*I'm reading hmm… OK, just received this email* [looking at her screen and reading] *from X*. [CP's name] *OK, so, this is what I'm doing next* [pointing to the screen]". Image users read the information associated with the task which typically included the 6 task components described in Section 4.8.3. This phase was the most consistent of all task phases and there were no variations observed. Since all the tasks were search-based, this phase naturally led to the *starting search* phase.

4.6.5.2 Starting search

The starting search phase preceded any user interaction with the retrieval system and it was the stage when image professionals' needs were forming, while initial sets of selection criteria were developing. These findings match well with the description of the starting phase in Conniss et al.'s image seeking model (Conniss et al., 2000) and the *idea generation* stage in the illustration process model by Markkula and Sormunen (2000), despite the many differences between the studies in terms of the individual aims and research design that do not allow for direct comparison.

The image needs observed in this investigation were directly shaped by the work tasks, and their components, the context of use, e.g., the type of news story, page layout and the size of the illustration required (Westman and Oittinen, 2006); as well as the constraints related to the work environment, e.g., internal ethical guidelines, the tone of voice of the particular news service. Ideas were generated from the information associated with the task (the task components) and the image users were observed to follow up the link to the news content of the task (either already published on the BBC website - but not on the homepage or saved in CPS for publication). The page with the news content would typically show a text-based article or a short description related to a video clip that was the main news content.

It is important to note that the stages blended into each other smoothly rather than being clearly cut. For example, headline of the news content and the editorial section were the consistent components of tasks, and at the same time were essential for identifying of the subject of the news content. By the time the user entered the starting search phase, they had already some idea of the subject, and in some cases sufficient to scope and perform searches. This was true for a majority of breaking and spot news stories that required an actual image. For example, P3. read the headline of the breaking news in T7 and did not navigate to the content of the story but scoped his search to only actual images, selected an image resource, and used a specific search term with an aim to find an actual image related to this specific content. In most cases, users only skimmed the synopsis (short introductory paragraph) to re-confirm that they identified the subject correctly and proceeded with searches. In 3 cases, video clips were to be promoted on the homepage, but only in one case the participant watched a short fragment of the content related to her task (P5, T13). Participants explained that in-depth reading or watching of the video clips would take up too much of their time. It was also observed that in most cases the headlines provided enough information about the subject of the content for an illustration idea to emerge. A person, an object or an event (a proper name of) included in the headline was identified as the subject of the content, and the ideas for images were constructed around them. A common strategy for illustrating news content on homepages was to use images showing the subject of the news content. Further, the ideation would go to look for indicators whether an actual photograph or a ready photograph was needed. For example, in both T5 and in T7 *Usain Bolt* was identified as the subject of the content and searches. T7 was a breaking sport news story about Usain Bolt winning a race and required an actual image, while T5 was to promote a weekly news quiz that required a ready image of the sportsman. This distinction between the need for an actual image and a ready image predetermined how the search process was carried out.

If there was no specific proper name in the headline, image users resorted to other strategies to establish the subject of the content and generate the ideas for illustration. A commonly mentioned strategy was association of the generic concept with a specific instance of this concept. For example, if the content reported on the government's announcement, a person representing the government would be the search topic. P3 retrospectively referred to a task based on an article: *The Government takes a U-turn on the nursery ratio plans.* He read the synopsis of the article and associated the collective entity: *the government* with Nick Clegg who was part of the

announcement. Another example comes from the observation session with P4 who received the following task (T9):

> Headline: *Premiere League: Everton vs Liverpool*
>
> URL: http://www.bbc.co.uk/sport/football/24969016 [the official announcement of the match]
>
> Editorial section: Sport news promo
>
> To be used on: BBC now and BBC sport homepage
>
> Size: Super promo
>
> Published: next [the next update]

> *"No image obviously for this. This hasn't taken place yet. I've done this [type of promos] before so I have a clear idea of how I want to do it. It's an obvious one for a compo. Now, it's a matter of deciding who I want there [in the illustration] and finding good photos of them. I normally go for the captain of each team, or famous…star players … this is to build up the tension before this match …and I put them together in one image. But then again, I make sure it doesn't completely look like a real image because, as I said, this hasn't yet happened."*

To make these associations, the searchers used their knowledge of the given domain and were observed to consult external resources such as: Wikipedia, e.g., to confirm the names of the players playing for particular teams and in a given match (T9, T11). This showed that even when a topic of the original content was considered generic or abstract, there was a tendency to scope it to a specific instance, and typically to a known person whose name would be used as a search term.

The ideation phase was more intense in searches that did not lend themselves to be easily associated with any specific entity, e.g., a specific person. In T26, P9 needed an image to promote a news story about *life sentences*. He said,

> "*With this kind of story…. we could probably find a generic picture of a prison or a generic picture of a prisoner in a cell or someone in a prison. Because of the nature of the story, it's not particularly about an individual or a particular prison* [you'll be] *fine to go with something generic*."

When tasks related to future events such as T9, T11, or images did not exist for the topic of the content, e.g., the news quiz in T5, in the ideation phase, the user would typically come up with an idea for a composite image or a collage. Ideas for the image of the background and the object(s) would be developing at this stage. This would lead to the formulation of more than one query per task, and these queries would be pursued through separate searches within the single task. For example, when working on T27: *Nelson Mandela: Prisoner to President,* which was to promote reflective news content for the occasion of Mandela's funeral, P11 came up with an idea for a

composite image showing Mandela against South African Landscape. When probed on how he was going to proceed, P11 said: *"I need two images, an image of Mandela, a nice photo of him, where he doesn't look too young, so maybe something more recent… and a photo of South Africa, I mean, some image of South African landscape."*

At this stage, the assessment criteria were forming. In tasks requiring ready images, a critical object or person in the image could be named at this stage, while other criteria were still shaping. Sometimes it was easier for the user to express what they did not 'need' rather than what they needed. P7 explained, *"So the first thing I'm thinking is it's a radio drama, so on radio I never show people's faces because I like people* [audiences] *to imagine what the characters look like."*

In case of actual images, their actuality was the critical assessment criterion. Two tasks (T13 and 23) were dropped when actual images were not available. In case of T24 (Justin Bieber in Miami court for 'drunk road racing'), which was a rolling news story, a ready (filler) image was selected as a temporary solution before the actual images would be available in the image collection.

4.6.5.3 Scoping

Scoping was taking place nearly in parallel with starting search. The breadth of scope depended on how well the subject could be defined, how clear the need was and whether the users had already some strategy or best practice that they might have used before to illustrate similar content. Searches driven by a need for actual images had a narrow scope and focused on a specific person, location, event, time, a scenery in the location time. Scoping phase was very short in such searches and blended in with starting and application, when a narrow and specific query was formulated. A broader scoping to *"see what's out there"* (P1) was observed in vague needs T3, T26. A broad generic scope and some expectations in regard to what the implications would be in terms of further stages in the process: *"I'm prepared for sort of long, 'long-ish' browsing… until something catches my eye"* P2.

The most frequently observed strategy was to begin with a 'broad' search, in order to get inspired and "*see what's out there*" in the words of P1, and P4 below:

> P4: "*I tend to just be really, really broad with my searches. If you try and narrow it down too much - like if I typed in family watching television, I might get three images, but if I type in something really broad, like television or family or - then you get lots of things. So there's a lot of irrelevant things but I like to search really broad because then there's a chance that something I hadn't thought of would spring up and that might spark off another idea. Often I'll combine images to make something interesting*."
>
> P2: "*So some people can go, oh is there an image of someone - a child holding a balloon with a birthday cake in the background. You're not going to find that. But if you search for birthday party and then balloon. Or maybe you could draw the balloon and that's where your image editing comes into it*."

Narrowing of scope could also be quite subtle and expressed using language specific to a certain region. For example, P7 was tasked with promoting a new radio programme on the homepage (T16). Having read the title of the programme (headline) "*Dinner at the Homesick Restaurant"* and the synopsis: *"The truthful and universal scrapbook of the lives of the troubled Tull family of Baltimore."*, P7 scoped her search to US restaurants, and subsequently, used a search term: *diner*, in order to find out an image of a typical informal US restaurant.

In searches for ready images re-scoping occurred after initial searches brought too many results that were irrelevant. The re-scoping from broad to narrow was observed. For example, in T26 the initial search term was: prison, and then refined to UK prison, in T28: oil rig, refined to oil rig Scotland, and finally to: oil rig Dundee. In some cases, search feature [newest first] was applied. Re-scoping from narrow to broad was not observed.

4.6.5.4 Applying

Applying was the most observable phase in the searching process. It was demonstrated by participants choosing the resource and navigating to the chosen collection and using the search engine on the site: entering a search term, applying search features and pressing search button. The BBC participants in this study had access to three collections (Section 4.7.2) and the non-BBC image user used two image resources (Section 4.7.2). Based on their experience, users created certain assumptions about each of the collections in terms of "what they were good for". Participants were observed making conscious choices in terms of which collection they were going to use, depending on the task at hand. This choice was made based on their perceived 'strengths' of the collection, and weighing the costs against the benefits, e.g., the quality of results. For example, The BBC ELVIS was the first point of call for news images from reliable sources (e.g. Reuters, AP, MetPolice) and could be largely trusted for authenticity and almost real-time uploads of the latest images, whereas GettyImages was more often used to source images for non-breaking news. It was commonly the preferred resource for sports imagery and used for findings creative images (Shutterstock by P8).

In the observed sessions, the image professionals used short search terms (see Sections 4.6.4.3 and 4.6.4.4) such as people's names, which typically, were two-word expressions, e.g., "*Nelson Mandela*". The longest search terms consisted of three words, e.g., "*british magazines covers*", "*oil rig Dundee*". It was also observed that the image professionals used a limited number of search features. The one used most was the sort by 'newest first', in one case, sort by 'oldest first', and in another single case, the 'no people' filter in GettyImages was applied before searching. Boolean operators were not used. The image professionals admitted that they had no formal knowledge of information retrieval principles and the behaviour that they demonstrated in the sessions was typical of average information seekers (e.g., Jansen and Pooch, 2001; Spink et al., 1998). However, a comment from P7 showed that she was aware of Boolean logic but the assumptions she held about the available tools might have prevented her from applying these to search. Trying to find an image of Sophie Ellis-Bextor (T17) that would not show her performing in the BBC's show Strictly Come Dancing, P7 commented that she believed the systems she was

using was "*not a good tool, basically, and it doesn't respond to subtleties like '**not** in Strictly'; it doesn't understand that*."

Further probing about the use of search features, and tactics such as search term modification, showed that the participants were aware of several other search strategies. They explained (independently from each other) that they felt that the fast-paced environment of their work place, made them resort to only those strategies and tactics that they knew (from experience) would work best for them in a given situation. The participants felt that they would be wasting time on trying more advanced search features or applying different search tactic, and they were put off by the unpredictability of what could be achieved with each of these functions. P1 said that there was "*no time for trial and error*, *so I go for what works best for me*.' On a suggestion of a possibility of refining a search term, P7 commented, "*I wouldn't change the search term. Life's too short*." Instead, they frequently relied on their editing skills and chose images that could be further edited in PS software. Andrews (1996) explained that not using advanced search features, and not entering complex queries, was a behaviour typical of average web users, and he suggested that more automated functionality needed to be offered in IR systems to support these users. Clearly, this approach could be also beneficial in environments where work tasks need to be performed under strict time constraints, e.g., online journalism.

4.6.5.5 Selecting

The selecting phase began when the search results were returned and users started interacting with the retrieved images, in order to make a selection (see: Conniss et al., 2000). The results were presented in thumbnails (in BBC Elvis: 12 thumbnails per page in a grid layout, and on GettyImages website: 35 thumbnails per page on scrollable pages and a 'More images' CTA button[46] had to be clicked to reveal more results). When actual images were needed to complete the task, only the top images on the first result page were *scanned* for relevance. When ready images were required, the participants were typically observed viewing results on the first two pages on Gettyimages (about 70 images), and 3 – 6 pages on BBC ELVIS (72 images). Generally, the participants looked at fewer than 100 images per search, unlike in earlier studies, e.g., Jörgensen and Jörgensen (2005), Markkula and Sormunen (2000) that reported 100 images as the average number of viewed image results, and significantly fewer that in the study by Conniss et al. (2000) where the number was 500, and some participants were reported to look through all available images. Göker et al. (2016) reported that journalists in their study viewed many more images in a single session and no information overload was reported. In this study, the exception was T15, where P7 engaged in intensive browsing and looked through many more pages, as she was convinced that an image that she set herself out to find "*must be out there somewhere*."

Straightforward selections resulting from a single search were possible in tasks that required actual images. Such searches were narrowly scoped from the onset. If at least one actual image related to the illustration task was available, the selection was made and the searcher instantly

[46] CTA stands for Call-to-action button in the web design professional jargon.

moved on to verify the image. When the actual images were available, selections were made relatively quickly, and the reasons for this were as follows: the fact that actual images were displayed at top of search result pages (newest first sorting applied), there were usually only a small number of actual images available per search topic. This is where Göker et al. (2016) alert of inconsistency with Conniss et al.'s model and claim that image users, rather than in image searching, engage in information filtering to locate images strictly depicting the correct person, event and place.

As it will be presented in Section 4.8.6, the *actuality* of the image was observed to be the critical assessment criterion, while other criteria followed. In two tasks (T13 and T23), the required actual images were not available. In the case of T13 (Baby pandas at US zoo), P5 looked at the retrieved search results (12 images of pandas) and verified them one by one checking metadata and captions (Figure 4-22) While verifying the results, P5 was saying: *"Lots of general pandas. Will they* [the audience] *know? I'm thinking it'll be misleading if we had different pandas."*

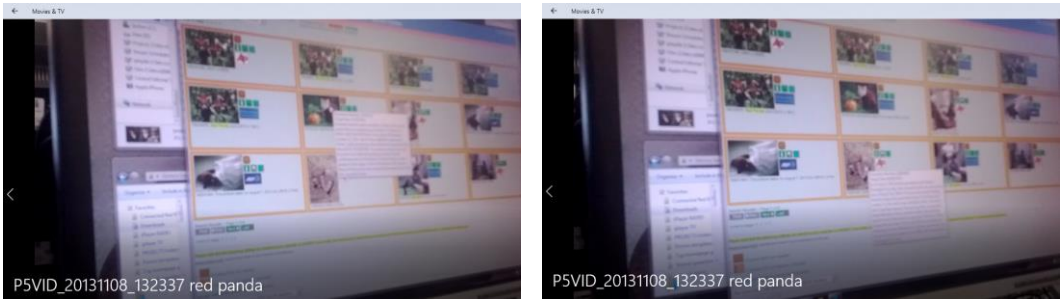


Figure 4- 22. Stills from the recording of the session with P5 verifying the images of red pandas

Finding the correct image was critical to complete this task. Having not found any actual images, she decided to end the search and drop the task. The participant could afford to drop the task because of a low newsworthiness of the content. This would not be possible in case of rolling news stories with a potential to generate high interest. While fnding an actual image to illustrate such stories is the ultimate aim, a ready image may be selected as a temporary filler. Such activity was observed in T24 (Justin Bieber in Miami court for 'drunk road racing', Figure 4-23), where initially, a ready image (A) had been used to illustrate this content on the homepage. This image was replaced by an actual image of the cars involved in the incident (B) – the only image available at the time of search, and only some time later with the actual image of Justin Bieber (C), when the image became available.



Figure 4- 23. These three images: filler (A), actual of the cars (B), and actual of the specific person (C) were used to illustrate the same news content T24.

P9 explained, *"If the story develops, obviously, you've got an opportunity later on to add new images. Because the promo is doing well, it will stay up for a long time, it warrants the extra effort to go in and update the image."* P9 kept checking if new images were coming through to ELVIS by performing searches using search term: 'justin bieber' [newest first], and was *monitoring* news on TV (Section 4.8.5.11). In about 30 minutes, P3 saw that the photo of Justin Bieber being broadcast on BBC news channel. He searched for this image (in a known-item search, using the same search term) and made the final update on the homepage using this photograph. P9 verified the photograph and said it was important for him to know the image was coming from Miami Police files as this confirmed the authenticity of the photograph.

In contrast, vague needs typically lead to broad searches, as observed in other studies, e.g., Conniss et al. (2000) and Göker et al. (2016). As reported (e.g., Westman and Oittinen, 2006, and others), *browsing* was the main strategy used to locate suitable images. The initial browsing involved a quick visual scanning to assess the boundaries of the searches. These led to the immediate rescoping of the search and using a more specific search term. For example, searching in T2 began with a vague image need and the initial broad check-search was carried out. Having entered the search term: "women's football" in GettyImages P1 commented, "let's see what we have here". This initial search was a reconnaissance of what was available and the image professionals were open to find inspiration from the results, or hoped for a *chance* discovery of suitable images, in a manner similar to serendipitous encounters described in Erdelez (1999) and Erdelez et al. (2016). P1 explained, "*So, while browsing sometimes you can come up with some pretty good ideas that you'd never thought of, of ways of representing it. So, that's generally if I'm browsing*." P1 was not satisfied with too many results showing American soccer. He refined the search term to "women's football England".

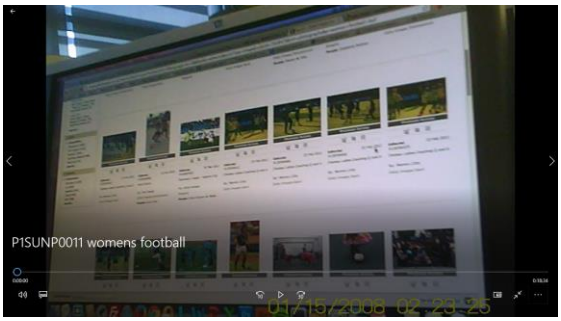


Figure 4- 24. P1 browsing through the search results

Still dissatisfied with *"too generic"* results, he decided to re-think the original idea and connect the topic of the illustration task to a specific football player.

He decided to search for an image of Toni Duggan. Hooking the content to a specific person was a common illustration tactic, and it had an immediate effect on image searching. The need was now for an image of a specific person, and P1 said he had some idea of the image he wanted to find: the *critical* person, on a neutral background. He browsed through the results and finally, decided to select an image that he could tailor easily (the critical person was present, in the full body shot, not clustered against other people, and on a blurry background).

When searches returned too many irrelevancies, some participants were clearly disappointed and frustrated. They expressed their frustration by referring to their browsing experience as: *"ploughing"* and *"trawling"*. Overload with irrelevant results is known to cause the feeling of frustration (e.g., Beaudoin, 2009). At this point in the image searching process, image users typically had to decide whether to keep browsing or to select a partially relevant image from the available results and work on it in Photoshop. Selecting an acceptable image involved a judgement on the time and effort needed to tailor the image. Ultimately, images that included the critical person (object) and were seen as the easiest to tailor, as described in Section 4.8.6.2, were selected. If the images showed a specific person, the one with the facial expression that best suited the mood of the news content, was selected.

Previously, Greisdorf (2000) and Markkula and Sormunen (2000) reported that relevance judgments of images could involve multiple sessions and that the final image selections were typically made from pre-selected sets of candidate images. To be selected, an image would have to be better on at least one attribute over other images. In this study, 5 selections were made in such a stepped process.

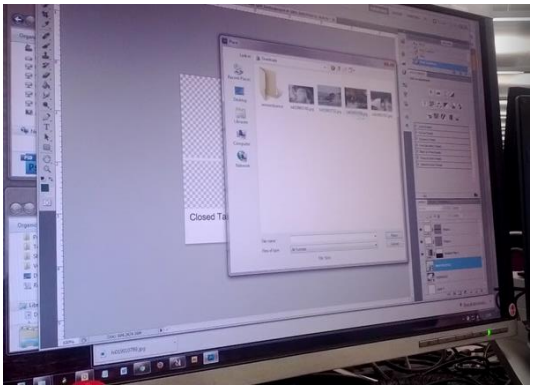


Figure 4- 25. P5 pre-selected candidate images

The participants tended to carry in their memory the original idea of the image that they had generated at the onset of the search task (as the temporal prototypes described in Greisdorf and O'Connor (2002) and were matching images to it.

In those cases, where a subset of images was pre-selected, the images in the subsets were topically relevant and of similar technical quality. The images were usually inspected in enlarged view and the final selection from the subset involved a comparison of the images on the level of detail, for example, the visibility of the face, the facial expression, the pose and gestures. The facial expression was considered crucial to conveying the mood of the news content. Figure 4-26 shows two 'candidate' images of Usain Bolt. Image B was selected over Image A because of the pose ("towards the viewer"), better visibility of his face, and the neutrality of the background.



Figure 4- 26. Two choices in T5: Image B was selected over image A. because of the pose ("towards the viewer"), better visibility of his face, and the neutrality of the background

In most cases, images that were selected would be the closest match to the original image in mind, or those that were the easiest to tailor to the original needs. The selection criteria are described in Section 4.8.6.

When a composite image was to be created as the final illustration, there were multiple search topics were formulated within one illustration task. For example, in T27 (Figure 4-27 Nelson Mandela, below), there were two search tasks performed and completed. The goal of Search task one was to obtain a photograph of Nelson Mandela (Query, and search term: *mandela*), as the foreground object, and a background image, for which the initial query was South African landscape (a search term: *south africa landscape*), which proved to be too broad to make a selection from. This search task was satisfied with a query for the Table Mountain that was believed to be a recognisable landmark in South African landscape (search term: *table mountain*).



Figure 4- 27. Images selected in illustration task 27 for the composite illustration

The images selected in the two separate search tasks within T27 were edited in PS software and combined in one illustration. The tailoring phase is described in Section 4.8.8.

Time constraints most frequently led to non-exhaustive searches for ready images, where the participants commented that they had no time to carry on searching. They selected the most acceptable images that they had seen. In one case (T15), selecting was not successful. P7 had a very specific image in mind of the photograph she needed. Although she re-scoped her query and applied a series of search terms from broad (e.g., women's magazines) to narrow ones ('Country Life'), she could not find an image matching the visual representation she had in mind. When the search failed, other resources were used. She took a photograph by herself and completed the task.



Figure 4- 28. Image taken by P7. after exhaustive but unsuccessful search

This study shows that in tasks requiring actual images, image users engaged in activities inconsistent with those originally modelled by Conniss et al. (2000). Göker et al. (2016) described those as information filtering for specific *correct* images. However, in tasks based on ready images, the applying phase was just as static as described by Conniss et al. (2000), where a subset of images was judged as relevant based on a set of more or less precisely pre-defined criteria. Göker et al. (2016) saw this behaviour demonstrated by non-journalistic creative professionals who also made use of ready imagery.

4.6.5.6 Verifying

Verifying of images was not included in the image searching process model proposed by Conniss et al. (2000), although, it was earlier recognised as a stage in Ellis et al.'s model of information seeking (Ellis, 1993). Verifying is considered an important activity in image seeking in print journalism (e.g., Westman and Oittinen, 2006). Göker et al. (2016, p. 19) found that using correct (accurate) images (i.e., "*the final image must show the correct person, event, place*") is important in journalism but do not provide any information on how verifying is actually carried out. This study (Study I.) uncovered that verifying was a required stage before the final image selection could be made. As shown in the examples in Section 4.8.5.5, selecting and verifying phases were intertwined. The image professionals verified images they considered for selection by reading the textual description of images: e.g. caption and metadata. This was observed particularly in searches for actual images. The reason being that the content was based on breaking news which were developing while being reported and the image users had no previous knowledge of these fresh events they could tap on to verify images otherwise. P5., while she was searching for images to illustrate T14 (Philippines hit by year's strongest storm), used 'philippines' as the search term and 'newest first' sorting option. She picked an image from the results, and read the captions to

check whether Typhoon Haiyan was 'mentioned' and the date in the caption was correct. The example of P5 is used to present the typical steps [an image has caught her eye]:

> "*This is the scale of it. You see the trees? The boats? Water coming in. Immediately clear what's going on.*" She previews it on the same page, reads the captions to verify the image shows the 'right' typhoon; saves it to her computer (creates a folder on her computer: typhoon). She now goes back to the results, an image catches her attention. She previews picture 2, reads the captions *"Just checking the dates*, *and it clearly says Haiyan*" and she saves it.

In searches for ready images, e.g., in T27 Nelson Mandela, T10 Dr Who, T22 Beyoncé and Jay-Z, the image users applied their own knowledge of the person/object in the retrieved images. In other cases, the participants verified the names by reading metadata. In T9 and T11, P4 was observed using Wikipedia as an external point of reference to verify that he had images of the required people whose *faces* he had not been familiar with. P4 commented,

> "*It definitely helps to know what you're talking about and know the face of the person. I mean if I don't know the person I will cross-refer elsewhere, check elsewhere because even metadata can be wrong sometimes*."

The image creation date was used for verification. The image professional picked one or two images at random from the results and verified the date:

> "*This is where you can see how old they* [images] *are. So out of date, stuff like that 2004 - can't really be putting a picture up from 2004, it's not representative and you'd be amazed how many people know where images are taken or where they're from*."

He refined his search by using the 'newest first' sorting option. Most frequently, the verification occurred when a specific image caught the participant's eye, and before he/she has decided to include the image in a candidate image set for the final selection.

It was important to verify not only the content, date, but also the source of the original image (e.g. Miami Police, MetPolice), particularly in searches for 'actual' images, where the image was selected to closely relate to the news content, and also in cases, where the image user did not have enough expertise in the subject domain (e.g. football). Clearly, the image professionals felt they had a responsibility for selecting and using authentic and verified visual information in illustrations, hence, an access to captions and metadata was essential for making selections.

Verifying was an important activity undertaken by the participants in this study. Therefore, it is proposed that Conniss et al.'s model should be updated to include this stage for accurate description of the behaviour of image users' in the online newsroom.

4.6.5.7 Iterating

In the model by Conniss et al. (2000) iterating is an activity that may occur at any stage in the searching process. In this study, iterating occurred in searches for ready imagery in the selecting

phase (see: Figure 4-20) when image users were presented with irrelevant or visually unsatisfying search results. The most frequent iterations included: re-scoping of searches that were demonstrated through refinement or modification of search terms. For example, a modifier location was added to the original search term as in: oil rig > Scotland oil rig > Dundee oil rig. In other cases, a generic query was scoped to a specific instance as in: South Africa landscape > Table Mountain. When P7 was unable to find relevant images of Sophie Ellis-Bextor using the BBC search engine, she changed the resource while using the same search term. In T2., P1 was dissatisfied with the search results for women's football and England women's football, and decided to *re-think* his original idea for how to illustrate the content, and came up with a new query. He resorted to the strategy where a generic concept is associated with a specific person, and searched for an image of Tony Dugan.

4.6.5.8 Ending search

The ending search phase was the final one in the searching process and typically, at this stage, the image users were observed saving the final selection they made. In the illustration task process model proposed by Markkula and Sormunen (2000) this stage also ended the illustration process (*selecting images for publication*). However, ending search did not end the illustration task. In one case, P7 working on T15 (women's magazines) did not make a selection from search results. She dropped the search but did not leave the task uncompleted. After an exhaustive but unsuccessful search in both collections, P7. took a photograph of 'a pile of magazines' and used it to illustrate the content in the task. This investigation extended beyond the ending search phase, to seek further understanding of image needs from the editing techniques applied to images before publication.

4.6.5.9 Tailoring

Before illustrations were uploaded to the CPS system for approval (by a senior team member), and cued for publication, they were edited in PS software. The degree to which images were editorially treated varied. Only minimal edits such as minimal cropping of the background to fit the template were carried out on actual images because the integrity of actual images had to be maintained (as per BBC editorial guidelines and GettyImages policy).

Significant editing was performed on ready images. The applied techniques included: cropping of images to change the type of photographic shot and to remove irrelevant objects or people from the frame, tilting, extending of the background, and blurring of the background. This was particularly observed when image professionals selected acceptable (rather than best) images and resorted to their editing skills to create illustrations that matched more closely to their '*ideal*' image.

Some participants set off to make a composite image or a collage (T 5, 9, 10, 11, 27), and in the tailoring phase, the elements of different images were put together into a single illustration. For example, the two images selected in T27 (Nelson Mandela and Table Mountain) required heavy editing to be put together. The *background* image was significantly cropped, rescaled, and zoom

was on the landmark. The edits in object image (*Mandela*) included: isolating the person from the original photograph, resizing, changing opacity. The two images were layered, the object (Mandela) was positioned to the right within the frame and a colourising effect was applied. Similarly, in tasks 9 and 10 the people of interest were isolated from their original photographs, cropped for a change of shot (whole figure to a waist-up shot), positioned on the new background, tilted to fit in the frame.

Section 4.8.8 will explain in more detail how images were tailored in terms of technique used and the visual effect achieved in the final illustrations.

4.6.5.10 Ending task

In total 28 tasks were observed and 26 tasks were completed and reached the ending task phase. Searches in three tasks: T13, T15 and T23 did not retrieve images that suited the needs of the image users. T13 and 23 were dropped after the verification phase, while T15 was completed with an image taken by P7. For all completed tasks, the ending task stage involved saving the created illustration on a shared drive in shared folders accessible to all members of the team, and uploading it to CPS.



Figure 4- 29. The illustration for T10 uploaded to the CPS

Before it was published on the BBC Homepage, the saved photograph had to be approved of by a senior member of the team. In his interview session, P10 who was a Duty Editor said that the approval process usually was “very quick” and involved a visual examination of the photograph. The primary aim of this examination was to identify if illustrations queued for publication complied with the BBC standards and guidelines (S&Gs) for images. If there was no breach of S&Gs, illustrations were assessed for *“their intuitive match to the headline”*. He said that he had a strong trust in the high standards and skills of the members of the editorial team, so normally he did not question the choices but would if he thought an illustration was not up to standards, for example, if a wrong person was depicted in the frame, the picture was out of focus and not clear (if not a CCTV image), if there were wrong proportions: too small object within the frame.

4.6.5.11 Other: monitoring

Interestingly, the illustration task process for tasks requiring actual photos included a stage that resembles of the *monitoring* feature included in Ellis et al.’s model (Ellis et al., 1993). In the model,

while *monitoring* users *switch on* and maintain their awareness of the current developments within the searched domain. To do so, users may follow formal sources of information e.g. journals, conferences as well as informal ones e.g. private contacts. In this study, monitoring was observed in illustration tasks based on rolling news for which actual images were not (yet) available and a filler image had to be used temporarily (T24 Justin Bieber in Figure 4-23). In the meantime, the image professional (P9) responsible for the task was monitoring TV news channels to check if new images of the incident had been broadcast. When asked if this was a usual practice, P9 said that the decision about monitoring would depend on the expected longevity of the news story.

> *"So, we just kept checking* [TV screen] *and then when the mug shots appeared – he* [Bieber] *looked so happy, as well - and we knew because the promo was doing well that it would stay up for a long time, that it warranted the extra effort to go in and update the image. It - what we want to do is just not look out of date."*

Another form of monitoring was also identified, which involved checking other news services to see the images they had already published on the same news story (P1, P9). This practice was also described in Göker et al. (2016, p. 17), who reported that picture editors would visit competitor news websites and use the published images as "*a starting point for their search."* While the use of actual images requires its own investigation, this finding indicates a need for a feature that would alert image users that *fresh* images related to their earlier searches have become available.

To sum up Section 4.8.5, the image searching process was an integral part of the illustrating task process. The illustration task was a shell for the search and generated the image needs that drove the searches. While many of the observed actions were identifiable with the phases in Conniss et al. model (2000), the verifying, present in Ellis et al.'s model (Ellis et al., 1993), appeared a very important phase in image searching in online journalism. It is strongly intertwined with the selecting phase and needs to be added for completeness of the model. Previously not investigated, the tailoring phase revealed much about the actual image needs of the image professionals in online journalism. The image users were observed applying their editing skills to improve images or create 'new' images so that they met the assessment criteria that were not met through search. Through tailoring, they achieved the required type of shot, background, or positioning of the object (person) within the frame. In other words, they tailored images to closely match their needs.

4.6.6 The image selection criteria

This Section discusses the findings specifically in relation to the image selection criteria used by the participants in this study to complete illustration tasks as required by Objective 4. The observed tasks were of two types: tasks that required actual images[47] from the events presented in the news content, or tasks that could be completed with 'ready' images sourced from online

[47] It is important to mention that in cases when actual images were not available, 'ready' images had to be used to illustrate breaking and spot news content.

collections. As described in Section 4.8.5.5, there were significant differences in the way actual images were selected and the selections made from collections of 'ready' images. Some of the previous studies that investigated the relevance judgement used pre-defined lists of criteria for users to evaluate. In this study, criteria were not supplied to the image users but emerged from data and the analysis of the images considered and selected in the observation sessions.

4.6.6.1 Criteria for selection of actual images used as the dominant image on a news homepage

9 illustration tasks (6, 7, 14, 12*, 13, 19, 23, 24, 25) required actual images. The participants to whom the tasks had been assigned identified the news stories in these tasks as either breaking news, spot news, or a story with a focus on a specific event (T19). All these tasks generated a need for an '*actual*' photograph. An actual photograph was typically described by participants as one that depicted a scene from the event at the centre of the news content including specific people/objects involved in this news story, was taken at that specific event, and was circulated by a verifiable source. The analysis of the selection process across the 9 tasks, showed that these characteristics were of equally important and critical in the selection process. Therefore, they were grouped under a single category: *actuality*. For example, in T13 (Red panda) and 23 (Blasphemy case) no images bearing the characteristics of actuality had been found and the tasks were dropped. In T24 (Justin Bieber), temporary solutions for illustration of the story had been used, until finally, a photo that met the three characteristics of actuality was found (Figure 4-23). A comparison of these characteristics with image selection criteria discussed in the literature (Choi and Rasmussen 2002; Conniss et al. 2000; Markkula and Sormunen, 2000; Westman and Oittinen, 2006), showed that the following criteria constituted the essence of actuality: a) topicality, b) *timeliness*, and c) credibility. These will be described below in relation to the selection of actual images. Visual aspects were considered of secondary importance but considered important when more than one actual image was available. Low complexity was also identified as a selection criterion for actual images.

a) Actuality (topicality, timeliness, credibility)

Topicality

Topicality, understood as the relevance to the search topic, was one of the essential criteria for selecting actual images. In searches for actual images, the topicality related to the whole image rather than its parts. If the news story was about Typhoon Haiyan in Philippines (T14), it was important that the selected images depicted scenes from locations in Philippines that had been hit by this particular typhoon, not any typhoon or a typhoon at any location. Topicality was assessed through the textual information attached to the image: metadata and captions. As mentioned in Section 4.8.4, participants did not begin searches for actual images with visual representations of the images (apart from the known-item search T24). A preference for images including people was observed, referred to as "human element" by P5 (and also by P9). As in previous studies, topicality was considered an essential image selection criterion but not sufficient

to make the final selection. It was complemented by two other criteria: *timeliness* and *credibility* presented below.

Timeliness

To ensure the actuality of images, the image users verified the date when photographs were taken. This was done by checking the metadata attached to images: photo created year/month/day. Initially, to capture the nature of this criterion, the existing time-related criteria described in the literature were considered: recency (e.g. Conniss et al., 2000; Westman and Oittinen, 2006), and time-frame (Choi and Rasmussen, 2002). However, neither was an ideal fit for the time-based relevance related to actuality that was observed in this study for the following reasons. Recency is described in the literature as being current and recent and demonstrated by selection of the latest images relevant to a given topic. Recency had been identified as an important relevance criterion in many previous studies. In this study, the image users applied the 'most recent first' sorting to search for actual images, however, this was due to the fact that actual images were typically needed to promote breaking or spot news that were being reported. For example, the search term Thatcher and sort newest first was expected to bring the photographs from Margaret Thatcher's funeral. However, actual images could be also used for illustrating news stories that were focussed on a specific news event but were not current news. P8 was working on a timeline of protests in Turkey and she selected several specific events within the timeframe of the protests (May – August 2013) to focus on. In the observed task (T19), she was looking for an actual image related to arrests of doctors at Gezi Park which occurred on a specific day. The protests had finished by the time she started writing the article, hence, the news was not current. She used a search term: 'Gezi Park protests doctors arrested' and did not use any sorting feature. Recency understood as being current or most recent did not capture the nature of actuality. Time-frame criterion proposed by Choi and Rasmussen (2002, p. 701) who conducted a research with historians was also considered. Time-frame was defined as *the time period of the picture appropriate for the problem area the user is studying*. Similarly, to journalists, historians were a group of image users for whom timing of photos was very important. Establishing the date of photographs helped them to understand the timeframe within the verbal description of texts they worked with. This use of image date differed from how journalists used it to verify the actuality of images.

The date of publication used as a criterion for text-based documents (Barry, 1994) was also considered. Its equivalent for images would be the date of distribution (when the image was uploaded to the collection). However, this date does not capture the requirement of *actuality.*

Gürsel (2016) who investigated the daily work of image brokers (image agencies) found that in some cases, it could take some time before images were made available to image users. Images come with a *timestamp*, which is the date when they were created. In the selection of actual images, it is important that the timestamp is the same as the time of the reported event. Selections of actual images were not made before the timestamp was verified. Göker at al. (2016, p. 16)

introduce *timeliness* of images when referring to fresh images taken at the scene of the event. Therefore, timeliness appears to capture the time-related aspect of actuality.

Credibility

The authenticity of images was of high importance and was verified by checking the textual information attached to images. The participants checked the metadata as well as the captions for the provenance of the photograph, i.e., the name of the source. The police files, e.g., MetPolice (P9 Acid attack retrospectively narrated image selection), Miami Police (T24) were always considered a trustworthy source of news images. See Verifying in Section 4.8.5.6.

b) The visual appearance of actual images

Selecting of 'actual' images was regarded by the image users as "quick" and "straightforward." The editorial work carried out on actual images was also minimal and usually included only slight cropping to fit the image to the shape of the template. This was because the integrity of 'actual' images had to be maintained, as they were used in a way similar to documentary photography (see Section 2.4.4). Previous studies (e.g., Conniss et al. 2000, Westman and Oittinen, 2006) into image selection reported that the high technical quality of images was considered an important criterion in image selection, however, these studies did not make a distinction between actual and ready images. In this study, it was observed that in the selection of actual images, the quality of images (e.g. resolution, sharpness, brightness) and their visual appearance were of secondary importance to actuality. P9 retrospectively commented on a task he had completed before the observation session,

> *"You'll get CCTV footage, or if there's a murder case, or - there was a story yesterday about a woman who'd been convicted of throwing acid in a friend's face. Sometimes, your pictures are very limited because there might be just one picture that the police have released. So, I think when it's news images, you accept that you're not always going to get the most perfect, pristine image but it's the best image, it's the most appropriate image you can get."*

The visual appearance of actual images was secondary in importance, however, not completely insignificant. In cases, when there were more than one actual image available, the visual features of those images, e.g., the composition, colours were the decisive criteria in the selection process. P9 explained how he had searched for actual images (Figure 4-30) to illustrate the Acid attack news story. The search returned two actual images, i.e., both images were topically relevant: each showed the actual people at the scene of the acid attack prior to the incident, and both images came from the same trusted source (MetPolice). Yet, he made a selection in favour of image A. based on the visual aspects of the image: a stronger focal point (better composition), larger (size) people in the frame.

A  B 

Figure 4- 30. Image A (left) was selected over image B (right), because of the visual aspects, "mainly composition".

P5, when selecting images in T14 (Typhoon Haiyan), considered several actual images before she made the final selection. Figure 4-31. shows an example of a candidate image (A) that she had pre-selected and then rejected in favour of image (B). She explained that both these images showed the scenes from Philippines affected by the Typhoon but image (A) lacked a strong focal point.

Figure 4- 31. Image A (left) was selected for the collage in T14 over image B (right), because of the visual aspects: a strong focal point.

c) Low visual complexity

Information conveyed in an image was an important selection criterion. Barthes (1973) claimed that images are superior to text because the message they convey can be read at a glance. Still, some images are easier to decode than others. Images that showed a person, object, etc. were preferred to those that were more abstract and visually complex. This criterion corresponds to the semantic value criterion described in Conniss et al. (2000), which refers to the factual aspect of the news subject.

For example, while searching for images to promote a breaking news article about Typhoon Haiyan, P5 found a satellite image of a typhoon. She checked that the image showed Typhoon Haiyan by reading the caption, and said that this image "*caught her eye because of the colours*". While she found this image visually interesting she did not use it for illustration as it was [visually] too complex and the audience would not immediately be able to understand it.

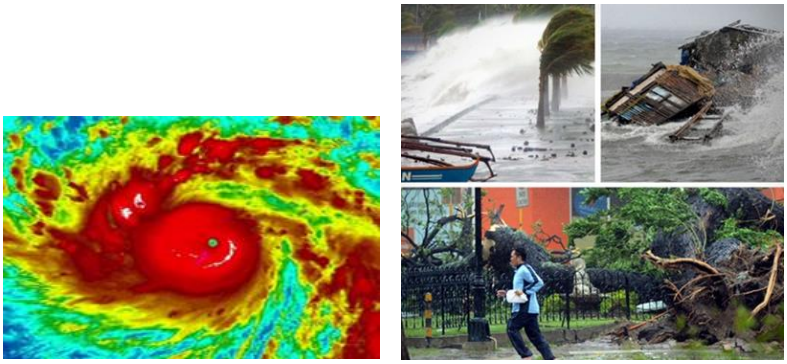


Figure 4- 32. Image A (left) was considered for T14 (Typhoon Haiyan) but eventually rejected as regarded to be "visually appealing but too complex" (P1). Instead illustration (right) was created

Instead, she selected three individual photographs and created a collage (Figure 4-32, Image B). The images used in the collage displayed a low visual complexity, i.e., each showed a limited number of objects. This made them clear and simple to interpret on the level of *ofness*. However, the collage still carried rich subjective information. (Image *ofness* and *aboutness* are discussed in Section 2.3.1.1). As explained by P1, she purposefully selected these three images, in order to show to the viewers, the strength of the typhoon, its destructive power, and the drama of people living in the affected area.

Göker et al. (2016, p.10) report that journalists in their study, typically used images used as informational props to the text. They tended to select images that had a small amount of '*ofness*' limited to one or two main objects: a specific person/ object, or place. This simple and clear objective content, however, still generated a wide range of subjective, complex and information rich interpretations of the depicted events.

This finding is also in line with practical editorial guidelines that recommend that journalists and editors should select simple images that can be quickly perceived (Zavoina and Davidson, 2002).

4.6.6.2 Criteria for selection of 'ready' images used as the dominant image on a news homepage

When image professionals were tasked with illustrating news content that did not require actual images to be selected – or such images were not (yet) available and the content had to be published – they sourced images from online collections of *ready* images. These images were not bespoke photographs, but were taken at a variety of events not related to the news content in the current task. This research showed that when image professionals selected ready images, the primary function of the image was to attract the attention of readers to news stories that these images promoted on the homepage, or to create a certain mood, e.g., nostalgia.

An initial analysis of findings showed that to make such selections, image professionals used 12 selection criteria. In further analysis, these criteria were grouped into three categories: a) the core criteria; b) the criteria for re-contextualisation, and c) the criteria for visual effect. As mentioned in the section above, while selecting 'actual' images, the relevance of the whole of the image was assessed, when selecting from 'ready' images, the image professionals often assessed their

suitability based on the relevance of parts of the image, or at the level of individual objects depicted in the image. The criteria used when selecting 'ready' images are described throughout the sections below, and examples of illustration tasks are provided.

a) The core criteria (topicality, recency, a 'human element', low visual complexity, technical quality)

This category included 4 criteria that had to be met for images to be considered relevant. The criteria were: topicality complemented with: *recency*, the presence (or absence) of the 'human element', and low visual complexity.

Topicality

Topicality was the most essential of the core criteria and the first one applied on ready images for a relevance assessment. Topical relevance of returned images was assessed by a visual inspection of images on the first search result page. For example, if the name of a specific person was used as a search term, at this initial stage, it was expected that all retrieved images would include this particular person (the same expectation was observed in case of specific objects, e.g., TARDIS in T10, oil rig Dundee in T28).

In some cases, to assess topical relevance, the image professionals relied on their own knowledge of the topic. For example, images of Dr Who and TARDIS required for the composite image in T10 were verified visually by P4. who knew Dr Who series. He searched for Dr Who and was able to pick out images of Matt Smith who played the character (11th Doctor) in the current series. In other cases, topical relevance of images that caught the attention of the image professional, was further assessed by the textual information: captions and metadata, attached to this image, and sometimes in external sources (e.g., Wikipedia, GoogleImages). For example, to ensure the required person was in the photograph, P4 checked the names of the people in the photos in the metadata attached to the images and compared the names and pictures with those published in Wikipedia.

Images that were not relevant in terms of topicality, were almost immediately identified within the search results. The presence of a large number of topically irrelevant images (in particular) on the first result page, resulted in *frustration* that discouraged the searchers from further exploration of the search results, and prompted them to take one or more of the "corrective" actions such as: refining the initial search term, or using a different image collection altogether. For example, several images of guitars were retrieved in response to search term: "magazines" submitted by P7 to the Gettyimages collection. The presence of these images within the results was not expected by the participant: "*Why guitars? It's ridiculous!*" [frustration], and prompted her to refine the search term (Figure 4-33).

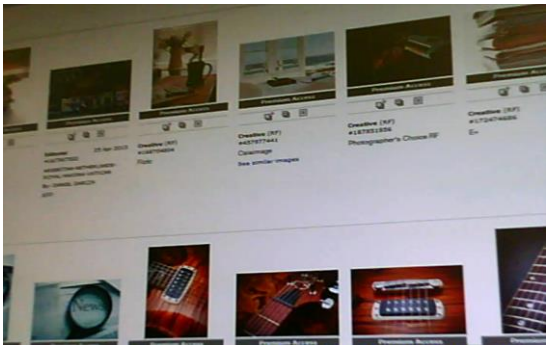


Figure 4- 33. "Why guitars? It's ridiculous!" a reaction of P7 to irrelevant results

It was observed that users were emotionally involved in searches and ineffective searches caused negative feelings. Earlier, Kuhlthau (1994) found that in the information searching process, searchers may experience a feeling of uncertainty. Beaudoin (2009), too, found that large numbers of irrelevant search results caused frustration and anxiety in image professionals (artists, art historians and architects) who were looking for images to complete their work tasks.

The findings regarding the importance and centrality of topicality to the relevance judgement as described above are consistent with those reported in earlier studies in print journalism (Markkula and Sormunen, 1998, 2000; Westman and Oittinen, 2006). Similarly, this study found that topicality while central to the relevance, was not sufficient for making the final selection. It worked in a set with other complementing criteria described below.

Recency

It was observed that in a majority of cases, the results were sorted in the most recent order, and only in one, the participant purposefully used "oldest first" filter. While in tasks based on breaking news "most recent" referred to images uploaded "*within the last few minutes"* (P7), in the case of generic images, recency typically covered a longer period of time. For example, while P4 was searching for images to illustrate a football story, he sorted the results in the "most recent first" order, to ensure he got images of the players in their latest sports *kits*.

> "*They have changed their kit last year, I think. So I'm going for the most recent first*." And in relation to T11 he was observed verify the timestamp to ensure that the photograph *"is not too old because they change their gear sometimes and it [the illustration] would look out of date".*

There was also a general expectation among the image professionals that recent photos would be of a higher technical quality than older photographs, due to the progress in photography and technology: *"They are now all of quite a good quality"* P2. *Recency* was identified as an important criterion for relevance judgement in most previous studies investigating image selection (e.g., Markkula and Sormunen, 2000; Westman and Oittinen, 2006).

The presence of a 'human element'

In this sample of artefacts, 18 images (including actual images) including people were purposefully selected. If a specific person was identified as the subject of a news story or the subject of news content could be related to a known person, the general rule was to search for and select an image of this person. The known person's face had to be clearly visible and in focus.

Some participants had a clear representation of the facial expression, posture, gestures, that they wanted to *see* in the sought images (See image needs in Section 4.8.4). After the images were judged topically relevant, the image users analysed the detail such as the person's eyes (e.g., open versus closed), and mouth (e.g., mid-speech or communicating some emotion). The participants did not express any clear preference for any type of gaze (direct or not looking at the viewer), the facial expression and hand gestures had to match the tone of the article.

Even if the subject of the news content could not be "hooked up" (P5) to any identifiable person, a preference for selecting images that included people was observed. P9 explained why he thought it was important to choose images that included people, or as he phrased it, a '*human element*':

> *"I think people [readers] engage when they see figures and faces and this is about… It could be easy to find a very generic picture of a prison from the outside but when you think about this - why is this debate happening? It's not about prison buildings."* Then he added, *"That's Pentonville. There's some pictures of prison buildings but again, you want people. You want the human element*."

A  B 

Figure 4- 34. Images considered in T26 (Prison life sentence), Image B was selected.

In T26, P9 pre-selected two candidate images (Figure 4-34) both with a "human element" present. Unlike in tasks related to a specific person, here it was important that the depicted person was unidentifiable. P9 explained when making the selection between these two images:

> "So, this is another option [image B.] because I would say she's not recognisable, really but it's not as strong an image, I would say, as the other one. [referring to image A] He is - and that is a prisoner. He's a bit more recognisable."

P9 considered the subject of the content to be a "*contentious issue*" and further explained,

> [referring to image B] "*So, that's a warden. You can't really recognise that warden but it wouldn't really matter if you could because she's a warden. So - and she's just stood*

outside - she's not implicated in anything, whereas if you could in any way recognise the prisoner, you're talking about someone serving a whole life sentence, that would - you'd be saying, this prisoner is - has committed an offence that has a whole life sentence term."

Conniss et al. (2000) identified an assessment criterion: Generality/anonymity that was applied to assess the suitability of images. The authors report that this criterion was used by image users in journalism when they were searching for images including unidentifiable people to illustrate sensitive subjects, e.g., bullying and children.

An exception to the preference for selecting images showing people were tasks that required images to promote fictional radio content. 2 tasks were observed T15 and 16 and in both cases the image user needed images that did not include people. While selecting an image in T16, P7 used 'no people' filter in GettyImages.



Figure 4- 35. 'No people' filter was used in T16

P7 explained her actions:

"*Obviously, if it's a drama and it's on radio, you're relying on the audience to come up with their own images. So, you don't want to provide any images of people because that's ruining their imagination*."

Low visual complexity

Although the literature for image practitioners (e.g.) recommended that editors should always aim to illustrate journalistic content with imagery that goes beyond the literal, the selections observed in this study were always made in favour of images showing lower semantic complexity. The image had to be understood at *a single glance* (P2). Most selected images depicted exactly the object/persons that were identified as the topic of the news content (or otherwise associated with the content). P3 retrospectively explained how he selected an image to an article: *Government u-turns on nursery ratio plans*. At the receipt of the task, he considered three ideas for illustrating the content: the nursery, a *u-turn*, and the government. He carried out two searches using the following search terms: nursery, and Nick Clegg (by association with the government). He selected one image per search (Figure 4-36) to consider.

A. 

B. 

Figure 4- 36. Images A and B were considered for (Government u-turns on nursery ratio plans) Image B was selected (example from interview with P3)

He searched for images of u-turn "*only for the purpose of your study*", to demonstrate that "*an image of a u-turn would be too abstract and confusing*", and made no selection.

For publication, he chose the image of Nick Clegg and referred to his final choice as "*the most typical way to illustrate such topic and the least visually interesting but also the easiest to understand in relation to this article, it's saying the government announced a decision*".

Readers are believed to understand such presentations without a need for deeper image analysis, as images in this function are not used to provoke deep analysis (Machin and Polzer, 2015). Griffin (2004) suggests that simple images that symbolically support the verbal text can be quickly perceived and generate immediate impact, while too complicated images, with too much detail, are less likely to work well online (Zavoina and Davidson, 2002).

Technical quality: high resolution and sharpness

Markkula and Sormunen (2000) and Westman and Oittinen (2006) found that technical quality of images, e.g., sharpness the photo, was generally considered an important criterion in image selection in journalism. P1 explained why an image that he spotted on a search result page would not be considered for selection:

> "*But there's things that you just look at straight away, for example, here, people are out of focus, they're blurred, tungsten lighting all over them, stuff like that. I'm looking at it from a Photo Editor's point of view*."

Participant in this study also confirmed that they searched for and selected images of the highest possible technical quality, and explained that tailoring was not equivalent to 'fixing' of images. Apart from the sharpness, the image resolution was considered a significant factor in selecting images. Since images were often cropped to focus on a detail, high-resolution images were also considered as most suitable for re-use.

b) The criteria for re-contextualisation

While 'actual' images had an intrinsic 'power' to attract readers' attention without a need for editorial treatment, more thought and creative skills had to be invested to create illustrations from ready images. These were not bespoke images, hence, the image professional worked with what was available to them. Such images were to be re-used in the context of the news story. Therefore, the images that met the core criteria for relevance were further assessed in terms of how easily they could be re-contextualised with or without editorial treatment. This research

showed that two aspects of images were considered important, when assessing the potential of an image to be re-used: i) the number of relevant people/objects in the image and whether they were clustered with other objects, and ii) the modality of the image background. In most cases, the image needed to be edited (e.g., cropped) to be re-used, e.g., tasks 2, 9, 22, in others, elements of several images were isolated and put together in a single composite illustration, e.g., T9.

The relevant person/object in the foreground and unclustered with other people/objects

In all but one of the observed tasks in this study[48], a single known person was identified as the search topic. In such tasks, the image had to include only this specific person (their face clearly visible) to be considered topically relevant. A further analysis of selected images shows that in the final selection process, the image users tended to select images that showed only the relevant person depicted clearly in the foreground, over images that showed this person *clustered* with other people. Clustering is described in Caple (2013). Figure 4-37. below shows an example of a selection made by P4 in T11.



Figure 4- 37. Candidate images in T11. Image A. shows the specific person clustered with other players, while Image B. unclustered

In T11, the aim was to create an illustration promoting an event that had not yet taken place. Kelly Brown was identified by P4 as the person representative of the Scottish rugby team, the search was initiated to find images of this player. Image A. showed Kelly Brown in the foreground and in action but clustered with other players. While P4 considered image A. to be visually more interesting and "dynamic", he selected image B. The people in the image depicted around Kelly Brown were not relevant to the news content and the search, moreover, P4 hypothesised that their presence in the image could bring on the context of this specific event at which the photograph had been taken. P4 said that even if he resorted to image editing "to get a more generic effect", it would be difficult for him to isolate the required person from the image because the faces of the players were so close to each other. Referring to the clustering, he said, *"this*

[48] If two people were the subject of search as in T22., both were required to be in the image.

doesn't leave me much room for a good crop". Photo B was selected as there were little ties with the original context, and the image could be tailored for visual effect rather than for de-contextualisation. In T9 (Premier League: Everton vs. Liverpool), P4 had the idea of creating a composite of elements of separate images. He was searching for separate images of four football players that he could easily isolate from the original images, in order to bring *them* in a single composite image. Another example of a selection made on the ease of re-use was observed in T2 and T17. In the latter case, (T17, Sophie Ellis-Bextor), a majority of images retrieved through BBC ELVIS collection showed Sophie Ellis-Bextor with her dance partner from Strictly Come-Dancing (a BBC TV show). The participant commented that these images were not relevant. She kept looking for images showing only Sophie Ellis-Bextor or showing her in the foreground and *unclustered* with other people (not close to other people, or not *overlapping* with other people), in order to be able to edit the image for re-use.

Low modality of the background

Images with blurry, monotone and unidentifiable background were preferred as the background did not carry additional information that could enable viewers to place the image in time or location of the event the photograph had been originally taken at. The need for a noise-free background was expressed already in the ideation stage of the process (e.g., P2, P4). Blurring tool was used on several images, e.g., T2 and T7, to increase the blur of the background. An alternative to a blurry background, was a monotone background, or 'creative' background. The latter was created by image professionals and the process involved isolating the main object(s) from their original image and layering them over another photograph (e.g., T27: Nelson Mandela) or a background created in PhotoShop (e.g. T9: Premier Ligue). The preference for a *neutral* background in ready images contrasted with the need for a fully-conceived background in actual images, and in photos used in image-nuclear news stories described in Caple (2013), as well as with the "no visible" background in thumbnails where the frame is usually filled in with the head/face of a specific person (Knox, 2009).

c) The criteria for the function-related visual effect

The participants in this Study used the following expressions when describing images that they were searching for "eye-catching", "visually standing out", "visually appealing", "attractive", "attention grabbing", "punchy", "compelling". These expressions resonate with those reported in previous studies (Markkula and Sormunen, 2000; Rössler et al., 2011; Westman and Oittinen, 2006). Literature for image practitioners suggests that this visual attractiveness in images is created on the level of content (e.g., Elbert's pyramid of visual impact) and goes beyond the literal listing of objects within the frame. Interestingly, the image professionals in this study believed that they were selecting and creating illustrations of "eye-catching" qualities, however, as already mentioned, they would typically choose images of low semantic complexity. Previous research did not go beyond reporting these effects and describing them as subjective aesthetic judgements. As noticed by Machin and Polzer (2015), these phrases describe the required visual effect rather than the specific features that create it. This study showed that image professionals

made a direct relation between visual image features and visual impact in illustrations. The visual features that the image professionals considered in images while making their final selection, included: i) a strong focal point (High salience), ii) the use of colour: saturated and bright colours for 'eye-catching' effect (High salience) and soft colours for mood (Low salience), iii) a contrasting background colour for framing (Framing), and iv) a large object in the frame. In cases, when image professional struggled with finding images that met these criteria through search, the required visual impact was achieved through tailoring of images in PhotoShop. Section 4.8.8 explains how images were tailored.

A strong focal point and central/right positioning of the object

In the selection process, there was a clear preference for images with a strong focal point (e.g., Figure 4-38), which was present in images showing the object (of interest) in the foreground, and clearly separated from the background (e.g. a sharp in focus object on a blurry background). If a person was the critical object, the images that were considered for selection typically showed no other people (especially faces) in focus. Some participants mentioned *the rule of thirds* as a guiding principle (P1, P3, P9), but some chose not to follow this rule in favour of a preference for large objects filling in the frame: "*I go off the rule of thirds a lot. I like the subject to be in at least two of the thirds"* (P5, P1).



Figure 4- 38. Example of images with a strong focal point and centric positioning

Much knowledge about the importance of and preferences in terms of composition was learned from the process of creating of composite images, where image professionals made their own decisions where to position the object within the frame.

The tendency was to place the main object either in the centre, or slightly to the right of the image. For example, P1, explained his decisions while creating the illustration for T6:

> "*So keeping the face visible in the top right hand corner and quite large and also I wanted to make sure that this* [background] *was legible too and make people be able to sort of see what it is*" (Figure 4-39.)



Figure 4- 39. A composite image created of two images to illustrate content in task 10

Photographers apply variety of photographic techniques, e.g., the use of depth, zooming in on a detail, to *help* the viewers notice or ignore certain details within the frame (Arnheim, 1970). It appears, that for the same reasons, image editors select photos with a strong focal point or when necessary, tailor images (e.g., crop them) to bring the required detail out to viewers' attention.

The use of colour: saturated and bright colours for 'eye-catching' effect, and soft colours for conveying mood of the news story

All selected photographs were full colour (no monochromatic images were searched for or selected). Saturated and bright colours in images were believed to play a significant role in attracting viewers' attention. In interviews, the participants said they normally selected *vivid* images with bright and 'crisp' colours or images. P10 explained, "*vibrant* [image] *that catches eye*" "*I think a brighter image just draws the eye more. It just captivates more. Whereas a dull image, I think, you could easily glance over."* The data from observations showed that in most tasks requiring a ready image, the participants were searching and selecting images with saturated and contrasting colours. While creating a composite in T10 (Figure 4-39), P4 explained "*We want to stand out, so: bright colours and a big picture of Matt Smith*." In a large majority of illustration tasks, colour saturation of selected images was further enhanced in PS software, while in composite images, colour levels were 'equalised' so that the components of the illustration would visually match well as one whole.

In the interviews, participants claimed that they would not use images with *soft* colours, the observational data showed that such images were used, too. In T4 (John Cole), which related to an obituary, P2 deliberately selected an image with unsaturated colours to evoke a feeling of nostalgia in viewers. P11 when working on T27 (Mandela) commented:

> *"You don't want to celebrate that - not immediately anyway. If you're doing a reflective piece on Nelson Mandela* [as the one in the observed task] *then you might want to bring up the colours a little bit and make him shine because that's when you're remembering him. It's not immediate, it's not bad news; it's the happy reflective thing. But if this was Nelson Mandela's obituary I'd be removing vibrance from that picture. I'd be making it a little bit greyer."*

Waist-up photographic shot

Findings from previous studies in print journalism report that when images of specific people are required, close-up photographs are typically selected (Markkula and Sormunen, 2000; Westman and Oittinen, 2006). Machin and Polzer (2015) also describe *portraits* of known people frequently being used as the frontpage dominant photo. Research into the use of thumbnails (Knox, 2007a; 2007b) shows that images used in this function are all extreme close-up images (face only). In this study, one participant (P7) explicitly expressed a need for a close-up image in the starting phase of the searching process. Others were observed rejecting images where the person in the image was "too far away" (long shot). The selected images that showed the specific person in the frame in a full-figure shot were typically cropped to a *waist-up* shot, including a head and shoulder shot and a close-up on face. P3 said, "*we usually need to crop big pictures down to see the peoples' faces and then perhaps you can - the user can connect more with the issue.*" Table 4-16. shows how images were changed in the tailoring process.

The salience (largeness) of the object in the frame

A preference for a single large object in the frame was expressed by some image users (P1, P5, P7) which corresponds to the 'salience of objects' criterion reported in Conniss et al. (2000). P1 said,

> *"Empty space is lost space to me unless it's used in a way that is clever. I might - for me I want to try and get things as filled as possible. You want faces as filled as possible. Not to the point where it's scary but to the point that you highlight things."*

Participants were observed using Photoshop to *zoom in* on the object within the frame of the image for salience and a stronger focal point. P7 stated, "*So we like to use images where there's an identifiable object within it. So, I look to see if there's a person or an object that you can zoom in on essentially*." Using a single large object in the frame also facilitated the legibility of the image on small devices.

4.8.7 Challenges

To meet Objective 5 (RQ5), the study had to identify the image users' needs (Section 4.8.4), the indicators of unmet or partially-met needs, and finally, to determine what challenges image users faced when searching for images to complete their work tasks. In this study, 28 search-based illustration tasks were observed. After ineffective searches, one of these tasks (T15) was completed with a photograph taken by the image user and two tasks (T13 and T23) requiring actual images, were dropped. In many other cases, users' needs were only partially met and image users reported making acceptable rather than best possible selections. They commented on their image choices: "*Ok, this will do*", "*I can't waste more time* [on searching]", "*Far from ideal … not ideal at all*". The indicators of unmet and partially met needs demonstrated primarily through intensive browsing. This involved scrolling through many result pages and revisiting already viewed pages. The image users were trying to spot the suitable images amongst the many irrelevant results displayed on search pages. As already mentioned, this led to much frustration and browsing was referred to as 'ploughing' or 'trawling' and associated with a 'waste of time'. The deadlines for task completion were very short, from about 10 minutes on emerging stories to approx. 30 minutes on non-breaking news content (e.g., TV/radio promotions). The image users did not feel that the available advanced search features would offer a quicker access to suitable images and could not afford losing time on *'experimenting*' with the filters. In consequence, the most observed scenario involved the use of simple keywords, most recent/oldest sorting, intensive browsing, (sometimes change of resource and repeating these steps), and intensive tailoring.

It was observed that the single steps required to perform a search task (especially when the same actions had to be performed on separate image retrieval systems) added unnecessary complexity to tasks, and increased the time spent on searches. Often the searches had to be finished 'prematurely' with an acceptable selection (and heavy edits), so that the task could be completed in time for publication. To compensate for ineffective searches, image users resorted to image tailoring. The extent of tailoring was another indicator of unmet or partially met needs. Section 4.8.8 explains how and why images were tailored.

To sum up, any proposed automation must aim to offer a quicker access to required images in a simple and predictable manner. The indicators of success will demonstrate through shorter and more focused browsing sessions, and decreased reliance on image tailoring.

4.8.8 Why and how images are tailored

Objective 6 (RQ2) set out for this study asked to establish how and why news images are tailored by image users in online journalism, and to what effect. Almost all ready images that were found by the image professionals were further edited in PS software before they were used as illustrations. The aim of the treatment performed on images was to bring the images closer to the *ideal* – a model image that image professionals had been typically constructed in their 'heads' before they began searching. In many observed cases it was not necessary that the whole image

was regarded relevant, but the relevance judgement could be made only on a smaller part of that image or an object, e.g., T11. Previous studies (e.g., Westman and Oittinen, 2006) claimed that unable to find the best images, image professionals in journalism often made *acceptable* selections in regard to their original image needs. However, these studies did not investigate how these 'acceptable' images were further used. This study showed that when a search for an ideal image was abandoned and a search for a partial fit to needs was carried out. Images that met the criteria for re-contextualisation were selected and tailored. Tailoring was not fixing of images but bringing the closer to the original image need. Image professionals could *afford* making "not perfect" selections because they were able to skilfully use Photoshop to edit and manipulate images to the required visual effect

The analysis of how images were tailored focused on images of specific people. This was the most consistent and dominant group of images identified in the set of artefacts collected in the observation sessions with image professionals.

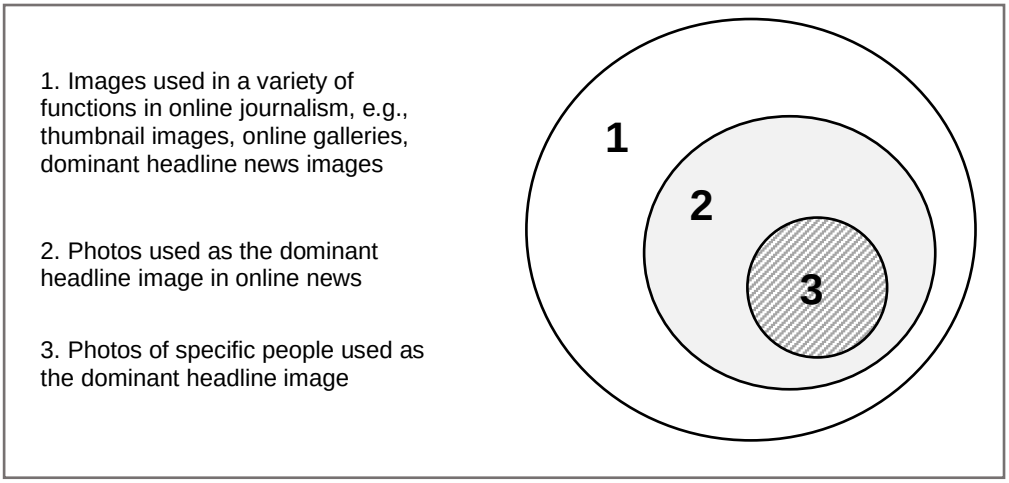
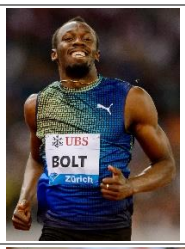


Figure 4- 40. A narrowed focus of the research to news headline images showing specific people

This subset of images emerged naturally since the image users were working on natural tasks and 14 illustrations out of 26 completed tasks included an image of a specific person. The key studies referred to in these thesis (Markkula and Sormunen, 2000) also report on the need for and frequent use of images showing identifiable people in journalistic content.

4.8.7.1 Tailoring techniques and achieved effects

Images of specific (identifiable) people were selected to complete 14 tasks (out of 26 completed tasks) observed in this study. These images were further tailored and published as headline images on news homepages. Table 4-16 shows the selected images and the illustrations made out of them, and provides the details of the applied photoshop techniques.

Task	Selected image(s)	Tailored illustration	Editorial techniques and effect
2			Cropping the 'irrelevant' person from the frame for decontextualising, cropping to change the photographic shot (waist-up), extending background to the left for better composition, positioning of the person to the right, blurring of the background
4			Cropping of the sides of the frame for decontextualising and fitting into the template, keeping the person in the centre for a strong focal point, cooling down the colours, slight blur to the background applied
5			Cropping of the sides of the frame to fit it into the template, keeping the person in the centre for a strong focal point, cropping to change the photographic shot (clearly waist-up)
7	 *		Cropping of the sides of the frame to fit it to the template, positioning the person to the right, cropping to zoom in and larger person in the frame, enhancing colour saturation
8			Cropping the image for change of shot (head and shoulders), positioning to the right, a large person in the frame
9	   		Isolating the person from the original background, cropping to change the shot (waist-up), tilting (Lukaku and Lalluna), removing elements (Suarez's hand) creating a blurry, unidentifiable background, creating a composite: layering the objects
10	 		Cropping the image of Dr Who for change of shot (waist-up), creating a background of the image of TARDIS, cropping to zoom in and fit it into the template, creating a composite: layering of the images, positioning the person to the right

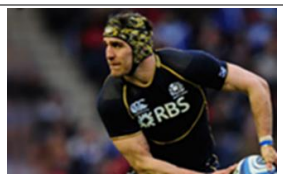
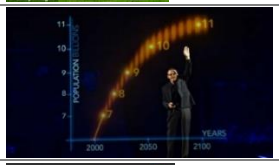
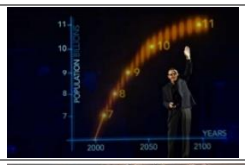
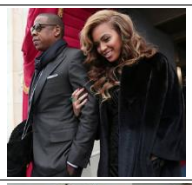
11			Cropping to change the photographic shot (waist-up), extending background to the left for better composition, positioning of the person to the right, blurring of the background
12			A crop around the photo and a tilt to the right to straighten it
17			Cropping to change the shot (close up on face) and large object in the frame
22			Cropping the image to remove the 'irrelevant' objects in the background from the frame for decontextualising
24			Cropping to zoom in (close up on face), changing the ordering of these two images, so that the enface portrait is positioned to the right of the collage frame
25			A slight crop to fit the image into the template
27	 		Cropping the image of Nelson Mandela for change of shot (head and shoulders), creating a background of the image of Table Mountain, increasing saturation, burning the sunlight, cropping it to zoom in and fit it into the template, creating a composite by layering of the images, positioning the person to the right, applying the colourising effect

Table 4- 16. The selected images and the illustrations made from them

a) Cropping for de-contextualisation and a change of the photographic shot

Rather than best matching to needs, frequently only acceptable selections were made. They used the software to bring to focus those elements of images that were considered relevant to the search, and to remove (crop off) from the image other elements considered irrelevant. This was a common practice for tasks that required a decontextualised image of a specific person/object, for example, tasks based on news events from which no images were available yet (e.g. upcoming

scheduled events, as an interim solution to illustrate breaking news stories). When time was a restrictive factor, and using the relevant parts of an image, or creating a composite image seemed to be the less time-consuming strategy when compared to continuing image search. Below are examples of typical illustration tasks, where final image selection was made based on the relevance of part rather than the whole image, and the irrelevant elements were cropped off. T11 (allocated to P4) was to illustrate news content promoting a rugby game scheduled for that afternoon. The image professional searched for images of Kelly Brown (newest first filter), the captain of one of the rugby teams playing in this particular game.



Figure 4- 41. Images A and B – the candidate images in T11, and Image C the final illustration after tailoring

Image A. (Figure 4-41.) was a potential candidate considered for this task, however, it was quickly dismissed. The main reason was that other identifiable players irrelevant to this particular search were present in the image. Their recognisable faces, as well as such details as the colours of their sport kits carried contextual information of a particular past game, not relevant to this task. The image professional considered cropping image A. to decontextualize it, however, judging the effort and time on task, he decided to continue browsing through the search results pages in search of a more suitable photo of Kelly Brown. Image B. (Figure 4-41) caught his attention. This photograph was a typical example of an image of a specific person (Kelly Brown) shown in an unidentifiable context (no other people/ objects, blurred background). This image was cropped to Image C. (Figure 4-41) and the type of shot was changed from the originally long shot to a waist (medium) shot, and the background was slightly extended to the left to enable the image to fit the landscape shape and size of the frame of the promo box.

To illustrate T2 (Figure 4-42.), an image of Toni Duggan was searched for. Image A was selected, and edited by cropping and background extension. In this case, cropping enabled the image professional to decontextualize the image by removing the other person shown in the image, and the irrelevant text of advertisement etc., to change the type of shot, from a long shot to a waist

(medium) shot, in order to bring a stronger focus on the specific person, her facial expression and gesture (Toni Duggan as a winner, successful footballer) relevant to the news story, and to fit the image to the shape and size of the frame. The background was slightly extended to the left, to give the image a visually better composition.

A  B 

Figure 4- 42. Image A was the final selection. Image B is the tailored illustration (T15)

Figure 4-43. shows cropping for change of the photographic shot carried out in order to zoom in on the person's face to enlarge the object and fill in the frame.



Figure 4- 43. An example of cropping for change of the photographic shot

b) The use of colour enhancement for modality and salience

By manipulating colours (warming up/cooling down/colourising) different effects were created in photographs. For example, colour and its vibrancy (saturation and brightness) were linked to mood in images. In the image of Usain Bolt used in T7 (Figure 4-44), the saturation of colours was enhanced to "*make the photo really stand out*."



Figure 4- 44. The saturation of colours was enhanced to make the photo stand out.

While working on the illustration in T27 based on the reflective news content about Nelson Mandela (Figure 4-27), P11, said:

> "*But if Nelson Mandela died I'd be removing vibrancy from that picture. I'd be making it a little bit greyer. You don't want to celebrate that - not immediately anyway. If you're doing a reflective piece on Nelson Mandela then you might want to bring up the colours a little bit and make him shine because that's when you're remembering him. It's not immediate, it's not bad news; it's the happy reflective thing*."

By colourising of the image, the final illustration in T27 conveyed low modality but gained high salience through the use of "a warm saturated colour that was standing out well on the white page background" P11.

c) Compositing and collaging

While in image selection there was a clear preference for images showing one person *unclustered* with other people or objects, sometimes the aim of tailoring was to bring several people into a single composite image. In T9., an image was required to promote matches in the upcoming premier league season. Another example of a task requiring a composite including several people was mentioned retrospectively by P2. and it was related to content promoting a scheduled political debate. Creating a composite to illustrate an upcoming event involves several searches for separate images of specific people involved in the event. For example, Figure 4-45. shows four images, each showing one football player, and each found in a separate search (using the name of the player and most recent first). These images were used to create the composite promotion headline image in Figure 4-46.



Figure 4- 45. These four photographs were used to create a single composite image in Fig. 4-46



Figure 4- 46. The final illustration created from images in Fig. 4-45

It was important to ensure that composite images were created in such a way that it was obvious they were not real images. P4 explained, "*But then again, I make sure it doesn't completely look like a real image because, as I said, this hasn't yet happened."*



Figure 4- 47. A collage created in T5 by P2, from three separate images

Collaging was another method applied in journalism that combined several images together. Figure 4-47 shows an example of a collage created in T5.

The objects used in composite images and collages were 'taken' from several images. The presentation of the first photo selected for the creative image would determine the needs and selection criteria applied on other images required to complete the task. When working on the collage (Figure 4-47), P2 initially found the image of the kangaroo (cropped out from the painting by Stubs), and the image of the mask of Tutankhamun. While searching for the image of Usain Bolt, he commented, *"I'm thinking of something that will match these in the frame. It will look similar when I crop it, it will match these two in terms of stature."*

4.8.9 The set of recurring image features identified in headline images of specific people

Table 4-17 below presents a compiled list of the recurring features identified in news headline images created for publication in Study I. The images are presented in Table 4-16.

Image description level	Visual resource	Features in a typical selected image	Features in a typical tailored image	Section
Visual content	The specific person identified as search topic (name used as search term)	The specific person was depicted in the selected image	The specific person was depicted in the image (in case of composites: all specific people were depicted)	4.7.6.2a
	Number of people in the foreground	One specific person was depicted in the foreground, separate from other people *(unclustered*) (one exception T22)	The specific person was depicted in the foreground (in case of composites: all specific people were depicted in the foreground)	4.7.6.2b
	Types of shot	A range of photographic shots were selected	All but one image were tailored to a waist-up shot (inclusive of head and shoulders, close-up on face shots)	4.7.6.2c
	Face visible: Profile or enface	No preference expressed	No preference expressed	4.7.6.2a
	Gaze: direct or side gaze	No preference expressed	No preference expressed	4.7.6.2a
	Framing:	Photographs of small and large objects in frame selected	A preference for a large object in the frame expressed and the effect achieved by zooming in	4.7.6.2c
	Positioning within the frame:	A preference for centre or right positioning expressed but mostly achieved through tailoring	The main object positioned in the centre or to the right (corrected through extended background to the left, compositing) For multiple people, at least one identifiable person positioned centrally or to the left	4.7.6.2c
	Use of colour:	Colour photography	Colour photography	4.7.6.2c
		Saturated or soft colours depending on image function mostly achieved through tailoring	Saturated or soft colours depending on image function, saturation increased or cooled down	4.7.6.2c
	Object – background, include:	The person in the foreground sharp and in focus	The person in the foreground sharp and in focus	4.7.6.2a
		Blurred/ monotone/ unidentifiable background	Blurred/ monotone/ unidentifiable background	4.7.6.2b
Technical quality	Resolution	Highest available	n/a	4.7.6.2a
	Sharpness	Sharp photos	n/a	4.7.6.2a
Non-visual features	Recency	Most recent	n/a	4.7.6.2a
	Metadata:	Provenance, date original image created, name of the specific person in the image	n/a	4.7.5.6

Table 4- 17. The set of features unique to news headline images of specific people identified in the images created by image professionals in Study I.

4.9 Study I: Validation Survey 1. with image experts

4.9.1 Introduction

Survey 1. was the final stage of Study I. It aimed to validate the recurrence of the pre-defined set of image features (Section 4.8.9, and reintroduced in Table 4-18. below) in 14 images (Table 4-19.) created by image professionals in the observation sessions (Section 4.2.6). The method was modelled on TREC studies (Voorhees and Harman, 2009) and involved three external image experts. The experts visually inspected the images and co-coded them for the presence of the features from the set. The results of this validation were used to enhance and solidify findings from Study I.

Observation sessions in Study 1. provided an artefact collection of illustrations created by participants for publication during the observation sessions in situ. While the naturalistic observations provided a unique opportunity to investigate image users' natural behaviour, the researcher had no control over the types of tasks performed by the users. Therefore, it was only in the data analysis that a distinct and dominant group of images emerged from among the collected artefacts. 14 images out of the 26 collected illustrations showed at least one specific (identifiable) person in the foreground. This finding was supported with qualitative findings from interviews and observations where participants expressed a general preference for images depicting people and explained that a popular strategy to illustrate news stories was to identify a specific person as a subject of the story (either from the headline, synopsis or through association) and search for an image of this person. Since this category of images was the most distinct and supported in the literature, it was decided that this investigation would further focus on images of identifiable people. These 14 illustrations of specific people were visually analysed by the researcher by means of the visual social semiotic (VSS) framework as described in Section 4.3.3. In the process of this analysis, a set of visual image features recurring across the analysed image sample was identified. The original set is presented in Table 4-17, Section 4.9.8, while a consolidated version of the set, including 11 features, is re-introduced in Table 4-18 below.

Feature #	Visual image features
1	The specific (identifiable) person/people related to the topic depicted in the image
2	The person/people depicted in the foreground
3	Shot from waist up
4	Face visible: frontal or profile shot
5	Gaze: direct or side gaze
6	The depicted person is 'large' in the frame
7	Positioned centrally or to the right within the frame
8	Colour image
9	Colour intensity: saturated or soft colours used
10	Blurry or monotone background
11	The person's face in focus (sharp)

Table 4- 18. A consolidated set of 11 visual image features unique to news headline images

This survey was designed to quantitatively validate the presence of 8 of these features in the sample of 14 illustrations created in observation sessions in Study I (Table 4-19).

The following 8 features: F1, F2, F3, F4, F7, F8, F10, F11, were presented for validation, while 2 features: F5 and F9, did not require validation (see: Section 4.9.4). Further, F6 had to be excluded from the survey, due to a potential for chance assessment, as explained in Section 4.9.6.

3 independent image experts visually analysed the illustrations and assessed them on the presence of the features from the recurring feature set. The percent agreement between the experts was calculated for each feature, each image and the whole sample, to determine the strength of the features across the set of illustrations. It was pre-defined that features found in at least 95% of the images would be qualified as the core features, those detected in at least 80% would be considered strongly relevant, while any feature below this threshold would be dismissed as weakly relevant and not included in the set of recurring features. An agreement of 90% between the co-raters and above was to be considered a high interrater agreement, while 75% is the minimal acceptable agreement for such a study to be valid (Guest et al., 2012; Stemler, 2004).

4.9.2 Sampling and ethical issues

Participants who were experts in images and photography were required for this study. The experts were recruited to code, independently from one another, the same set of 14 artefacts (images) collected during this investigation (Table 4-19.). In the coding process, they needed to use their professional judgement and expertise in imagery, in order to manually assess and identify visual features present in these images. To be considered for this study, candidates had to be adults (18 years of age and over) and in one of the following professions: a photographer, an image editor, an online journalist whose role included finding images for news content, or a doctoral student whose research activity focused on imagery, image retrieval and use. Although this survey was a quantitative study, the snowball sampling was used to sample participants. It is a method typically associated with qualitative studies, but it is also well-suited to sample participants from niche or hard to access populations such as professionals working with images (Denscombe, 2010). Potential candidates were identified and reached through a pool of contacts that the researcher had established through the university and professionally. Being modelled on TREC studies, this survey required three experts to participate. The participants' profiles are provided in Section 4.9.7.

4.9.2.1 Ethical issues

Prior to this study an approval from the Ethics Committee was obtained. Since it was an e-mail based survey, fewer ethical issues were expected to arise than in the case of the face-to-face sessions with image users in interviews and observations. Nevertheless, the researcher seriously considered any ethical implications that this study could have on participating experts and strictly adhered to the guidelines from the Ethics Committee at City, University of London (2015). The purpose of the research was clearly provided in the Call for Participation letter (Appendix B1.), and detailed in The Information for Participant (Appendix B2). The voluntary nature of the study and participant's right to withdraw at any point in the study without any implications were emphasised to candidates. Risks and benefits of the study, as well as the complaint procedure

were clearly explained. Further, to ensure that experts could make a fully informed decision about participation in this survey, each participant received a sample of the questionnaire that included one image (not from the survey) and a set of questions (Appendix B5). The approached experts were satisfied with the amount of time and effort required to complete a single task, and agreed to participate. All recruited participants were offered a phone call conversation with the researcher to go through the instructions and check the understanding of the consent form, and all used this offer. The consent forms had been signed and emailed back to the researcher before the surveys were sent out. Participants agreed to a 7-day period for the completion of the survey, and all returned the questionnaires in a timely manner.

4.9.3 Pilot survey

The aim of the pilot was to test the instrument and the questions. The study was piloted with a PhD student from City, University of London whose PhD work focused on image seeking and retrieval. The participant completed 14 tasks and was asked to keep a record of start and end time. She reported that it took her about 20 minutes to complete the questionnaire but found the questions to be quite complex. The feedback from the pilot session helped to significantly simplify the questionnaire, the wording and the format of questions. Subsequently, the final version of the questionnaire was shorter, less overwhelming and a participant-friendly language rather than research-centred style was used. For example, any references to syntax/syntactic features were removed and examples of features were added, to enable the experts to understand the instructions and questions.

4.9.4 The image set and the questionnaire

14 illustrations were used in this study. These illustrations had been created for publication online in the observation sessions with image users (Section 4.2.6). The researcher conducted an initial visual inspection of these images and found that they belong to a category of images depicting identifiable people. Table 4-19 lists the images used in the survey with the accompanying headline.

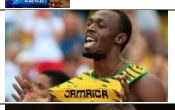
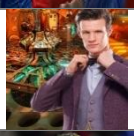
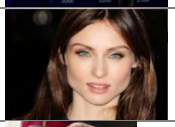
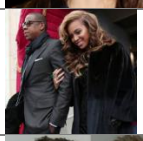
Task	Identifiable person	Final image
2	Tony Duggan	
4	John Cole	
5	Usain Bolt	
7	Usain Bolt	
8	Nick Clegg	
9	Luis Suarez, Romelu Lukaku, Adam Lallana, Frank Lampard	
10	Dr Who	
11	Kelly Brown	
12	Professor Hans Rosling	
17	Sophie Ellis-Bextor	
22	Beyonce and Jay-Z	
24	Justin Bieber	
25	Tim Peake	
27	Nelson Mandela	

Table 4- 19. Images used in the validation Survey 1. with image experts

The questionnaire (Table 4-20.) was distributed to three image experts who worked independently from one another. They used their expertise in imagery and made a judgement about the presence of the pre-defined image features in the set of 14 images provided by the researcher. The terminology was borrowed from the visual social semiotic framework (Appendix G). The questionnaire had a closed format where participants were asked to select one answer: a or b and indicate their choice in the box provided next to each question (Table 4-20).

No.	The image:	a OR b
1	a)shows a person (people) who can be identified and named e.g. Hillary Clinton, Eiffel Tower **OR** b) does not show any identifiable people	
2	a)shows the identifiable person (people) in the foreground **OR** b) does not show any identifiable people in the foreground	
3	a)shows the identifiable person (people) from waist up **OR** b) shows the whole figure of the identifiable person (people) (whole body, legs visible)	
4	In the image, a) the person's face is visible **OR** b)face is not visible	
5	a)shows the person large in the frame **OR** b) does not show the person large in the frame	
6	a)shows (at least) one identifiable person in the centre or to the right of the frame **OR** b) does not show any identifiable people in the centre or to the right of the frame	
7	a)Is a colour photograph **OR** b) black and white	
8	a)shows a realistic background that can be identified and named e.g. London, Etihad Stadium **OR** b) shows a blurry background that cannot be identified	
9	In the image, a)the person's face is in focus OR b) face is not in focus	

Table 4- 20. The questions used in Survey 1.

This quantitative fixed-choice questionnaire enabled to collect data for analysis and did not aim to affect participants' attitudes or views. An advantage of such questionnaires is that they typically produce consistent, precise and comparable data as identical sets of questions are posed to all participants in an identical order and manner. Involving a human *annotator* or multiple annotators is a common practice in evaluation studies of information retrieval systems: text-based (Voorhees and Harman, 2005), as well as image-based systems (e.g., Berg et al., 2005; Tsai et al., 2006). Most of these studies, however, tend to focus on measuring of the effectiveness of machine-based indexing (e.g., Berg et al., 2005), creating of a golden standard dataset (e.g., Tsai et al., 2006), or assessing the quality of indexing (e.g., Markey, 1994).

In the final version of the questionnaire, 8 features from the identified set (Table 4-18) were included in the validation study. The features that were not included were features 5, 6, and 9. It was decided that features 5 and 9 did not require to be validated. F5 (type of gaze), the user study participants had not expressed any preferences in terms of gaze types: direct or side gaze when selecting images for publication, therefore, images depicting both types of gaze would be included in the predictable image set. Similarly, F9 (colour intensity) did not need to be included since images with saturated colours and those with dominant soft colours were used to fulfil different roles on webpages, and both types would be included as relevant. Feature 6, as it will be explained below, was excluded from validation after the survey had been completed.

4.9.5 Data analysis

Responses from three experts were collected and collated in an Excel spreadsheet for each question and for each illustration used in the survey. Table 4-21 shows an example of collated

data for the illustration from T12 (Figure 4-48). The data in this study were analysed quantitatively. The responses were coded numerically: answer a) was assigned a numerical value: 1 (feature detected) and b) was assigned a value: 0 (feature not detected).



Figure 4- 48. Image used in T12.

Q	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	The specific (identifiable) person/people related to the topic depicted in the foreground	1	1	1	100%
2	The person/people depicted in the foreground	1	1	1	100%
3	Shot from waist up	0	0	0	100%
4	Face visible: frontal or profile shot	1	1	1	100%
5	The depicted person is 'large' in the frame	NOT VALIDATED			n/a
6	Positioned centrally or to the right within the frame	1	1	1	100%
7	Colour image	1	1	1	100%
8	Face of the person in focus	0	0	0	100%
9	Blurry or monotone background	0	1	1	66.7%
Total agreement					95.8%

Table 4- 21. Image experts' responses for the illustration in Figure 4-48.

The aim of measuring of the agreement between the experts was to determine how often they agreed on the detection of the 8-feature strong set. The *percent agreement*, a straightforward calculation suitable for a small number of raters (Stemler, 2004) was used to measure the inter-rater agreement in this study. It is based on the notion that majority (in this case at least 2 experts) is correct, while minority (1 expert) is incorrect in their judgement. The agreement for each image was calculated as a number of times the experts agreed in their judgement divided by the total number of judgements made, i.e. 8 judgements (see Table 4-21). Similarly, the agreement for the whole study was calculated as the mean of all individual judgements made. It is commonly understood that percent agreement does not take chance agreement into account, which may potentially lead to overestimated results. Hence, the higher interrater agreement achieved for a study, the more credible the results are. A percent agreement of 90% and above is considered a high interrater agreement (Guest et al., 2012; Stemler, 2004). Further, the frequency of features was calculated across the 14 images. The feature was detected when at least two experts agreed that it was present in the illustration.

4.9.6 Data quality assessment

When the surveys were returned to the researcher, a data quality check was conducted to establish completeness and validity of responses. All questionnaires were returned in a timely manner before the deadline for the survey completion. All experts answered all questions and all answers were valid, i.e., the experts used the letters a or b to mark their responses and all responses were provided in the designated spaces.

The data were considered complete, however, when asked in a short de-briefing session about their experience with the survey, Expert 2 said that she had struggled with question 5. (feature 6) that asked to assess the largeness of the object in the frame. She said that it was difficult for her to decide when an image was large or small. She said she used image in T12 (Figure 4-48) as a reference point for what would be a small object and corrected her previous answers in relation to this image. Expert 3. was explicitly asked, how he made the judgement of the object largeness. He said it was not obvious for him and that he went with his "*gut feeling rather than by any formula*". When the face was well visible and the person was "*filling in the frame*", he tended to indicate "large". Expert 1. was not available for a de-briefing session. This feedback indicated a high potential for chance and bias in the answers, hence, the researcher decided to exclude feature 6 from the validation (not from the set) and to consider exploring other measurement options for this feature in the future, e.g., a face-ism ratio (Lidwell et al., 2005 p.88)[49].

4.9.7 Image experts' profiles in Survey 1.

Three Image experts were required for this quantitative Survey 1. and included: an image editor with a 6-year professional experience, two photographers, one with an over 4-year and another with 6-year experience in their profession (Table 4-22). Their long professional experience and expertise were essential to this survey and the quality of data obtained through the survey.

Characteristics	E1	E2	E3
Image-related profession	Image editor	Photographer	Photographer
Years of experience	6	4+	6+

Table 4- 22. Image experts' profiles

For transparency, it is important to add that one of the experts (E1) had been known to the researcher in both personal and professional capacity prior to this survey. None of the experts had been involved in involved in this investigation at any other stage than this survey.

[49] Face-ism ratio is defined in Lidwell et al. (2005 p.88) as "*the ratio of face to body in an image that influences the way the person in the image is perceived."* Further, the authors explain that *"the face-ism ratio is calculated by dividing the distance from the top of the head to the bottom of the chin (head height) by the distance from the top of the head to the lowest visible part of the body (total visible height). An image without a face would have a face-ism ratio of 0.00, and an image with only a face would have a faceism ratio of 1.00.*"

4.9.8 Results of the validation survey 1.

Out of the original set of 11 visual features, 8 features were validated in this survey and the results of this validation are presented in Table 4-23 below.

Feature	Visual image features	Number of images in which the feature was detected (N=14)	Strength of the feature in the set
1	The specific (identifiable) person/people related to the topic depicted in the image	14 (100%)	**Core set**
2	The person/people depicted in the foreground	14 (100%)	
4	Face visible: frontal or profile shot	14 (100%)	
8	Colour image	14 (100%)	
7	Positioned centrally or to the right within frame	13 (92.8%)	**Strongly relevant**
3	Shot from waist up	12 (85.7%)	
10	Blurry or monotone background	12 (85.7%)	
11	The person's face in focus (sharp)	12 (85.7%)	
5	Gaze: direct or side gaze	Validation not required	n/a
6	The depicted person is 'large' in the frame	Not validated	
9	Colour intensity: saturated or soft colours used	Validation not required	

Table 4- 23. The results of the validation survey

The percent agreement was calculated for each response to a single feature, for each illustration, and for all study. The analysis shows that features 1, 2, 4 and 8 were detected in all images across the sample. F7 was present in 13 images, and features 3, 10 and 11 in 12 images. A high percent agreement of 97.6% between the experts was achieved. The core features in the set of recurring features were: the person relevant to the topic was present in the images in all cases, the person was depicted in the foreground, face visible, and all images colour images. The features identified as strongly relevant included: positioning of the person to the right or centrally, and the person shot from waist up, on a blurry or a monotone background, and their face shown in focus. For the future development of this investigation, it was important to validate the set of recurring features with external experts who work with visuals and use their expertise and experience to assess images. The key limitation of this survey was a small image set as the images had been collected from a qualitative study. The results, although validated, still could be only indicative of a trend, rather than conclusive. Therefore, a validation study (Study II) on a larger sample of images was designed to supplement these results. Survey 1. informed Study II in terms of the recruitment of experts, the design and distribution of the questionnaire, and effective analysis. However, due to a small sample of images used in this validation, these findings were considered as indicative of the trend in feature occurrence, but not conclusive.

4.9.9 A summary of results: Survey 1.

Survey 1. completes the research planned for Study I. in this investigation. It involved external experts and aimed to quantitatively validate the presence of 8 image features from the set of 11 features (Table 4-18) recurring in news images depicting specific people. This set was originally identified from data collected in observations (Section 4.2.6). In this survey, 4 out of 8 features were detected by the experts in all images in the tested sample of 14 news illustrations, and

further 4 features were present in over 80% of the images. The results came at a high percent agreement between the experts. The key limitation of this survey was a small image set (N=14) as the images had been collected from a qualitative study. The results, although validated, were regarded as indicative of a trend, rather than conclusive. To compensate for this, another survey with image experts was conducted on a larger set of images (Chapter 5, Study II). Survey 1 informed Study II in terms of the recruitment of experts, the design and distribution of the questionnaire, and effective analysis. F6 was excluded from this and the future validation studies, due to a potential for chance assessment, as explained in Section 4.9.6.

4.10 Study I. Discussion

Sections below discuss the findings of Study I in relation to the objectives set for this exploration (Table 4-1).

4.10.1 The who, the what, and the why of image selection and tailoring in online journalism

4.10.1.1 Creative image professionals and self-taught searchers in disintermediated environment (Objective 1)

Although image users in online newsroom select hundreds of images to complete their daily work tasks, this group of image users have remained outside the focus of interests of information behaviour researchers. This investigation aimed to fill in this gap in the knowledge. Through research, it has gained a thorough understanding of *who* the image users in online journalism are in terms of their professional skills and experience, their job roles and responsibilities (Objective 1). This information was gained from individual interviews with 12 image professionals working in online newsroom (Section 4.2.5) and a series of observations conducted in situ (Section 4.2.6). Except for a recent study carried out by Göker et al. (2016), who included two image users from news in their sample of 13 creative professionals, there has been no previous published work focused specifically on image users in online news context. Therefore, the findings from this study were compared and contrasted with those reported in the literature concerned with print journalism. This study found that the role of image users in online journalism differs from the role of the image editor in print journalism. Traditionally in print media, the main duties of image editors include image selection and editing with an emphasis on the latter (Ang, 2000; Kobré, 2008). Markkula and Sormunen (2000) and Westman and Oittinen (2006), reported that image editors in print media observed in their studies typically sourced images from image archives aided by *intermediaries* (e.g., archivists), and only in some cases, they would search for images as end-users. Since both these studies were conducted at the dawn of the internet era and digitalisation in media, they may not reflect the current situation. More recent literature (Caple, 2013; Gürsel, 2016) shows that images published in print media are selected by image editors mainly from commissioned shoots (e.g., in-house photographers and photojournalists), and from *syndicated* visual material from *image brokers* (image agencies), e.g. AP, Reuters, and only on very rare occasions retrieved by the editors from *stock image banks*.

In contrast, this investigation found that the image seeking process in the online newsroom is fully disintermediated. The disintermediation is a result of the digitalisation and the transition of journalism to the new medium. While the literature thoroughly describes the impact of digitalisation and the internet on the roles of journalists and their information gathering practices (e.g., Attfield and Dowell, 2003; Bradshaw, 2012; Fahmy, 2008; Fahmy et al., 2014; Hill and Lashmar, 2014; Magee 2006), image users in online news have not been included in these studies. This research project found that the role of the image professional in online news is a merge of an image editor's duties with those of an *intermediary*. They are responsible for generating illustration ideas, searching as end-users for images in online collections, e.g., GettyImages, googleimages, and finally, for tailoring the selected images to suit the context of use, e.g., the dominant photograph on the homepage.

Further, it has been found that image users in the online newsroom are creative image professionals, formally trained in using image editing software such as e.g., Adobe PhotoShop. Advanced skills in using this software to edit photos and create illustrations (collages, composites, drawings etc.) are a pre-requisite for the job. With experience and educational background in visual and creative domains, these users also demonstrated a good understanding of the various image functions on news pages. Furthermore, image users demonstrated a shared practice in how they tailored images for the function of the news headline image (Section 4.8.9), particularly, when they were creating composite images where they decided themselves about the content and the composition within the frame. This uncovered behaviour indicates that image users in online journalism discern between different functions of images on the news websites and have a clear understanding of the distinguishing features of images that best serve these functions.

Further findings also show that image professionals in online journalism share universal strategies for illustrating of headline news. The most frequently applied technique, as observed in Study I, was *hooking* the illustration idea to a specific person (who is the subject of the news article or can be associated with the subject). This resonates with the guidelines for image editors in non-academic sources (e.g., Ang, 2000; Lewis, 2005) that suggest using images depicting people to generate high visual impact on viewers. The image professionals are well aware of the attraction with faces innate to humans (Pascalis and Kelly, 2009), and whenever it was possible, they selected images with a "*human element*".

The image users in online news also show a good understanding of the requirements and limitations related to the current platforms that the content is published on. This was shown by comments about legibility of images on a variety of devices, particularly, on small screens.

Since all illustration tasks were search-based, these image professionals were also end-users of online image collections responsible for searching for and selecting images for the allocated tasks. While they proved to be competent and creative editors, these image professionals are self-taught searchers, who have gained their image searching skills on the job and through a *trial and error* process. Some previous personal experiences of using search engines such as e.g., google.com, was sufficient to get the role. The initial observations showed that they made a limited use of searching features and used short search terms. This behaviour is typical of novice

searchers (Tabatabai and Shore, 2005), who could be helped with appropriate formal training in the use of the available search tools. However, a more through observation showed that the image users use some established search strategies. For example, they typically begin with broad searches to establish what images is available in terms of relevance, they have a clear image in mind that they pursue in their searches, and access and use non-visual information about images to verify the authenticity of images. What they lack most, however, is time for exploring of the advanced search functionality offered in the available systems. They hold certain beliefs about the resources available to them in terms of what they are good at and how to use them, and are reluctant to try out available search features, e.g. filters because there is little guarantee of gaining access to more relevant results within a short time. When searches are not satisfying, they tend to immediately fall back on their creative editing skills to perform a range of edits (tailoring), from cropping, extending background to creating composite images.

These findings satisfy Objective 1, and indicate that there is a need for a more automated approach to image retrieval in online journalism. To best support this group of busy image professionals, an automated system needs to offer immediate access to images that the users need. An effective and efficient system would aim to reduce the amount of time and effort currently required to complete the most routine tasks based on ready images. To ensure that these users would consider trying out and using the proposed system, it must provide functionality that operates on criteria understood by the users and compatible with their needs, and consistently retrieves results matching those criteria.

4.10.1.2 Types of illustration tasks and image users' needs in online journalism (Objective 2)

In professional environments, it is the work tasks that trigger the information needs (Conniss et al., 2000). 28 real-life illustration tasks were observed in Study I. in situ and all tasks were search-based. A comparison of these tasks uncovered six basic components present across all illustration tasks performed in this study. These components include: 1) Headline (Title), 2) URL to news content, 3) Editorial section/ type of content 4) Size of image required, 5) Image use, e.g. headline image on the homepage, and 6) Deadline for publication. Tasks have been described previously in terms of difficulty, complexity, constraints and prescriptiveness, however, not at the level of components. It was uncovered that each of these six task elements was *used* by the image professionals to directly or indirectly make decisions about the search they were about to perform. This finding adds to the literature concerned with work-related tasks requiring searching for information, as well as has some important methodological value for the design of experimental studies into image searching in news. To be able to generate users' authentic information needs in experimental settings, tasks defined for experiments must simulate the real work tasks as closely as possible (Borlund, 2003). The six-component task model informed method design in Study III. (The 4 tasks pre-defined for this study were constructed around the six basic components, and the participants assessed the tasks as authentic and including enough information to work on (Section 4.8.3)

As proposed by Fidel (1997), illustration tasks are typically mapped on the continuum between data and object poles, and MacCay-Peet and Toms (2009) found in journalism and related areas, images are predominantly used for illustration. Conniss et al. (2000) found that journalists used images for illustration, as well as persuasive/emotive purpose. In this study, the image users at the BBC Online applied their own typology of illustration tasks based on the popularity of the news content and type of content (e.g., breaking news vs. general news story). They differentiated between *topical* and *non-topical* tasks (Section 4.8.3). However, another way to categorise illustration tasks emerged from the observations in situ in Study I. A dichotomous distinction between tasks that required actual images and those that could be fulfilled with ready images was observed (Section 4.8.3). This approach to illustration tasks has not been previously described in the literature, however, the differences in users' behaviour and image needs (Table 4-24) were evident, significant and sufficient to propose this categorisation for illustration tasks in online journalism.

Impact area	**Illustration task**	
	Actual image	**Ready image**
Illustration strategies (Ang, 2000; Kobré, 2008)	Finding an image *taken* at the event, showing the scene and people involved	Identifying a specific person related to the news content, the person to be the main object in the illustration
Image users' needs (Conniss et al., 2000; Westman, 2009; Göker et al., 2016; Markkula and Sormunen, 2000; Westman and Oittinen, 2006)	Specific: actual image	Clear and semi-specific: image in mind: a critical object and syntactic features may be pre-defined Required visual effect: attention-grabbing, vivid
Searching process (Conniss et al., 2000; Ellis et al., 1993; Markkula and Sormunen, 2000)	Starting > driven by specific needs for a correct image Selecting > image filtering inconsistent with Conniss et al. Monitoring > checking other info channels, while a filler image used Verifying > required Actual images unavailable > dropping task	Starting > driven by semi-specific or vague needs Verifying > required Partially met needs > image tailoring Unmet needs > Completing tasks with own images
Selection criteria (Conniss et al., 2000; Göker et al., 2016; Markkula and Sormunen, 2000; Westman and Oittinen, 2006)	Actuality criteria including: topicality, timeliness, credibility; Criteria related to the visual appearance of images are of secondary importance	Core criteria: topicality, recency, human element, low visual complexity, high technical quality; Criteria for re-use: the relevant person in the foreground and unclustered; low modality background; Criteria for visual effect: Strong focal point and central/right positioning; Use of colour palette: either saturated or pastel; Waist-up photographic shot, Object salience
Key challenges (Conniss et al., 2000; Göker et al., 2016)	Time constraints Unavailability of actual images	Time constraints Numerous irrelevant images
Tailoring This investigation	Minimal edits to fit the image in the frame	Tailoring of images (including radical changes and compositing) to meet the needs

Table 4- 24. The proposed distinction between "actual" and "ready" illustration tasks and how this distinction explains the differences in needs and behaviours of image users

The tasks requiring *ready* images are in focus of this investigation. As reported in previous studies, tasks shape the needs of image users. The task specifies how the image is going to be used, i.e., the image function. This study investigated the function of dominant headline images on news websites. The findings show that image professionals in online journalism have a shared understanding of this function and the images that are required for this function. They begin searches with an *image in mind*, as found in previous studies (e.g., Conniss et al., 2000; Göker, et al., 2016; Markkula and Sormunen, 2000). This internal representation of the image typically includes the critical object: a person (or an object) identified as the subject of the news content. Images of specific people are the most popular type of images sought for two reasons. Firstly, news is about people and people's actions (Caple, 2013), and secondly, image professionals have a shared illustration strategy that they apply to news content that does not explicitly relate to any specific person. They were observed to "hook" stories to people by association, e.g. football match to a football player (a star player, or the captain), the government's announcement to a specific politician. Once the relevant specific person had been identified, it was clear that more pre-defined image features were already pre-defined, too. The image users tended to start searches with an "image in mind" and were able to describe their needs in terms of concrete syntactic features. For example, a need for images with saturated versus soft colours could be defined based on the tone of the content. There was a need for a clear, neutral background, and in some cases, the image users already decided about the type of shot they required, e.g., a close-up photo. Referring to the mood of the news story, some participants were able to describe the specific facial expression that they required.

These findings allowed to meet Objective 2, and showed that the tasks, and more precisely the image function specified in the task, are the source of the image users' needs. Understanding of the function allows the users to create clear needs and when they start searches, many visual aspects of the required image are already pre-defined.

4.10.1.3 The updated illustration task process (Objective 3)

The observations of users performing natural tasks in real-time provided information about user behaviour at every stage of the illustration task process. The stages and the moves within these stages have been clearly described (Section 4.8.5) and contrasted with the existing literature.

In this investigation, the image searching process was understood as integral to the illustration task process. This is in line with the commonly accepted view that, unlike text-based information, finding images is rarely the end goal of image users in professional contexts (Conniss et al., 2000). For example, in journalism, image searching provides visuals to illustrate news content. Markkula and Sormunen's (2000, p. 274) model of the illustration process was used as the starting point for describing the stages within the illustration task process.

To describe the image searching activities, two existing models have been applied in this investigation: Conniss et al.'s image searching process model (Conniss et al., 2000), and the information seeking model by Ellis et al. (1993), as presented in Section 2.2.3.2 and Section

2.2.3.1 respectively. Both these models have been derived from Ellis's framework (Ellis, 1989) that, unlike the Ellis et al.'s framework (Ellis et al., 1993), does not include the *verifying* feature.

No previous study has combined these two models. For example, in their study with creative professionals, Göker et al. (2016) applied the theory of information foraging (Pirolli and Card, 1999), and Conniss et al.'s model (Conniss et al., 2000). Beaudoin (2009) who studies image seeking behaviour of artists, architects, and art historians tested the earlier Ellis's model (Ellis, 1989).

Combining these two frameworks (Conniss et al., 2000, and Ellis et al., 1993) in this investigation, has led to a more comprehensive description of image searching behaviour in online journalism that includes activities related to *verifying* of images for authenticity. The observed user behaviour resembled of the verifying feature in Ellis et al.'s model (Ellis et al., 1993). Applied to visual information, verifying included reading non-visual information attached to images and involved checking that correct people, event/incident, date, location, and image provenance were shown in images. These activities are reported to be an important and common practice in print journalism (Hung, 2005; 2012; Markkula and Sormunen, 2000; Westman and Oittinen, 2006), and medical professions (e.g., Conniss et al., 2000). To accurately capture this behaviour, the image searching model originally proposed by Conniss et al. (2000), has been updated with the *verifying* phase. To support users in verifying activities, a system must provide easy access to metadata and captions.

Straightforward selections resulting from a single search were possible in tasks that required actual images. Such searches are narrowly scoped from the onset, and selections can be made if at least one actual image is available that shows the correct person, place and event, and comes from a trusted source (e.g., news agency or police files). As 'newest first' sorting is applied, the most *actual* images are sought only within the first top results on page one. In some cases, actual images were not found, and in one case a filler image was used as a temporary solution. The image user began monitoring other news channels to get information about incoming images relevant to the reported event. This was the most efficient way for the image users to find out that fresh images had become available, while working on other tasks. Monitoring is not part of Conniss et al.'s model (Conniss et al., 2000) but it is a feature in Ellis et al.'s framework (Ellis et al., 1993). Considering this, Conniss et al.'s model (Conniss et al., 2000) does not capture well users' interactions with collections that are dynamically updated with new items. Göker et al. (2016) suggest that searching in such collections resembles information filtering more than image retrieval typically occurring in static collections.

In contrast, searching for ready images was consistent with Conniss et al.'s model (Conniss et al., 2000) except for the verifying stage (as mentioned above). As with the actual images, verifying was an integral part of the searching process and involved checking the metadata and captions for information about the person/ people, date, and location shown in images. Having access to this information was important for making the final selection.

Although it has been commonly agreed that searching for visual information serves a wider illustration task, the illustration process model proposed by Markkula and Sormunen (2000, p. 274) ends with image selection. Previous studies into image users' needs and behaviour in work-based settings (e.g., Conniss et al., 2000; Göker et al., 2016; Markkula and Sormunen, 2000; Westman and Oittinen, 2006) do not extend their investigation beyond image selection. While Göker et al. (2016) mention briefly that professionals in creative domains apply authoring tools such as Adobe Photoshop, to improve colouring, brightness, and contrast in selected images, their observations do not capture post-selection user activities. These studies agree that image users' needs are fluid and often change in response to viewed search results, while users tend to refine their searches and make acceptable selections when unable to find the 'best' matching image.

An exception to this, is work by Makri and Warwick (2010) who conducted a user research into the information needs and behaviour of architects. They report that these professionals carry out a substantial amount of post-selection image editing, including cropping, removing of background, layering of images, and collaging, and through these activities, they achieve the intended effect in the final illustrations.

Digital image tailoring is an everyday practice for professionals from many creative domains, e.g., advertising and media (Göker et al., 2016), art and design (Sasso, 2011), however, it remains a heavily under-researched area. Research into how images are actually used after they have been selected, could shed more light on the nature of image needs and how these needs are met in work environments (Westman, 2009).

In this investigation (Study I), the observed illustration task process was extended to include the image *tailoring* phase that chronologically precedes the task ending stage (Section 4.6.5). The investigation of user activities carried out on the selected images, revealed that image users in online journalism are determined to have their needs met. If their needs cannot be met through searching, they resort to their creative skills and achive the required effect through image tailoring (Section 4.8.8). This, in turn, shows that even though these users may frequently make only acceptable selections, their needs remain mostly unchanged throughout the illustration process.

While not reserved only to online journalists, image tailoring may be a field of practice particularly popular in the online newsroom. The reason may be that these image users are creative professionals and highly skilled users of image editing software, e.g., Adobe Photoshop (Section 4.6.2.2). If searching fails to deliver the 'best' match, they confidently apply their creative skills and manipulate the available images, in order to produce illustrations that closely meet their needs.

This leads to an evidence-based conclusion that post-selection image tailoring is an integral part of the illustration process in online journalism. Therefore, to accurately describe users' activities in the illustration task process, it is proposed that the model, originally proposed by Markkula and Sormunen (2000), is extended to include the image tailoring phase. Further, studies into image needs and image searching behaviour in other professions will benefit from extending

observations to include the post-selection use of images. The information about how images are actually used will shed more light on the real nature of image needs and how these needs are met in work environments.

To sum up, the observations in-situ provided rich and evidence-based knowledge about the image users' activities and behaviour within the illustration task process. For tasks requiring ready images, this process includes the following stages: task starting, search starting, scoping, applying, selecting, verifying, search ending, tailoring, and task ending. While most of the stages are consistent with Conniss et al.'s model (Conniss et al., 2000), verifying (originally from Ellis et al.'s model (1993)) and post-selection tailoring have been added based on observations from this study for completeness. These findings satisfy Objective 3 defined for this investigation.

4.10.1.4 Image selection criteria (Objective 4)

In line with findings reported in the literature, this investigation found that work tasks directly shaped the image relevance and selection criteria applied in the online newsroom. The criteria related directly to the image function and also to the type of images (actual versus ready images) required for the task at hand.

In case of actual images, a set of criteria referring to *actuality* of images was identified. This set included: topicality, timeliness, and credibility. None of these criteria could be compromised if an actual image was needed. The visual presentation of actual images was secondary in importance. However, it was the decisive selection criterion, if a search returned several images that met the actuality criteria. Markkula and Sormunen (2000) and Westman and Oittinen (2006) made a similar observation in regard to the secondary importance of the visual appearance of images selected in journalism. As they did not differentiate between tasks based on actual and ready photos, their findings are generalised to all images used in newspapers.

Referring to the classes of image use (Conniss et al., 2000), Göker et al. (2016, p. 14) claim that in journalism, images are selected mainly to illustrate the information in the document, and that illustrative *ofness* (a specific person/object taken at a specific event) is prioritised. While image attributes relating to the visual presentation (referred to as aesthetic aboutness) are desirable, they are often compromised because image editors work under much time pressure when illustrating emerging news stories. In contrast, other creative professionals (copywriters in advertisement, bloggers) in their study, tend to select images for visual impact and to improve the aesthetics of the documents.

Göker et al. (2016) assign these differences to the uniqueness of online journalism as a domain where image users work to extremely short deadlines, which, in turn, is the effect of *instantaneous reporting*, i.e., stories being published in real-time as they emerge (Pavlik, 2001). The behaviour of journalists described in Göker et al. (2016) is typical of image users working on tasks based on actual images. However, this is not a complete reflection of the reality of working in the online newsroom.

This study (Study I.) shows that most routine illustration tasks in online journalism (headline image) require *ready* images. When working on such tasks, image professionals typically require attractive, vivid, and eye-catching images. This indicates that they select *ready* photos for the emotive and persuasive purpose (Conniss et al., 2000). When selecting photographs for re-use, they apply a different set of criteria to those used in selections involving actual images. These resemble more of the *aesthetic* criteria applied by non-journalistic participants in Göker et al.'s study, and those reported in previous studied in print journalism (Conniss et al., 2000, Markkula and Sormunen, 2000; Westman and Oittinen, 2006).

Using the analytic tools and terminology of the visual social semiotics (VSS) framework (Kress and van Leeuwen, 2006), eleven criteria have been identified. The criteria were grouped in the following categories: a) the core criteria, b) the criteria for re-use, and c) the criteria for the function-related visual effect, as presented in Table 4-25.

Core criteria	Criteria for re-contextualisation	Criteria for function-related effect
Topicality Recency Presence of human element Low visual complexity High technical quality	Relevant person (object) in the foreground and *unclustered* Low modality of the background	Strong focal point and central/right object positioning in the frame Use of colours: saturated and soft Waist-up photographic shot Salience of the object (person)

Table 4- 25. The uncovered sets of selection criteria for ready images

The core criteria had to be met for an image to be considered for selection. These criteria were similar or a variance of the criteria applied in the selection of actual images. For example, both timeliness and recency related to the time when the image had been taken. Timeliness ensured relevance to the reported event, while recency related to the need for current images, from *the latest season*, as reported in Markkula and Sormunen (2000).

Typically, searches for ready images returned large numbers of results, therefore, the criteria for image re-contextualisation and those related to the visual effect were decisive in the selection. Images that were considered easy to re-use showed the person (or object) of interest in the foreground and unclustered with other people's faces. They bore the minimum of ties with their original context. The contextual ties were usually carried by the scenery, objects/people visible in the background. Therefore, images with the most neutral (e.g., blurry, monotone) background were selected.

As previously reported (e.g., Markkula and Sormunen, 2000; Göker et al., 2016), in this study, too, image users expressed the need for *eye-grabbing, attractive, vivid* imagery. In previous studies these phrases were considered too subjective to be further investigated. In this investigation, it was accepted that these expressions describe the visual effect in required images (Machin and Polzer, 2015) and that this effect relates directly to the function that the image will serve, e.g., headline image, thumbnail images (Knox, 2009), or image-nuclear news story (Caple, 2013). This study reached beyond the descriptions of the visual effect required in the headline image function and identified the concrete features responsible for this effect. These included: a

strong single focal point to draw readers' attention, the use of specific palette of colours depending on the tone of the news story, a photographic shot from waist-up including head and shoulders and close up on the face, and a preference for a large object/person in the frame.

It is important to say that the presented groupings are not ideal and not clearly cut. These criteria can be categorised in a different manner depending on the purpose. For example, a category: "the criteria for the use of images across platforms" emerged from this study. This category included the following criteria: low visual complexity, one person in the foreground and unclustered, low modality of the background, strong focal point, shot waits up, salience of the person/object. Although this category is important and unique to online journalism, it was not considered as directly relevant to this investigation. Another important criterion that emerged was "facial expression". It was typically mentioned by image users early in the searching process (needs generation) and could be one of the criteria deciding about the final selection. In this categorisation it is presented with the human element criterion. Had the affective image been within the scope of this investigation, facial expression would be an important criterion of its own merit.

4.10.1.5 Challenges and indicators of unmet needs (Objective 5)

In tasks that required actual images, the key challenge is unavailability of such images. Users have a clear expectation that actual images for their search topic must be displayed no top of the first search results page. Unavailability of actual images can result in tasks being dropped, or a temporary use of a filler image for tasks based on rolling news and of high newsworthiness and importance to readers. If this latter solution is chosen, the image users monitor other information channels (e.g., TV news channels), and competitor news services to learn when fresh images have become available. This investigation also finds, that *time* is another challenge in online journalism. This is a specifically serious issue when the task involves a rolling story and in situations when actual images are not yet available. In the latter case, image users monitor incoming assets on various information channels (TV, other news websites) to get alerted of fresh images. If they want to find images seen elsewhere, they need to repeat their original searches. Publication requires a sign off process. All these activities are disjointed and time-consuming. While these findings need to be researched further in an investigation focused on the use of actual images and in real-time reporting, the message is that the currently available systems are not designed to support image searching in an environment of instantaneous real-time reporting. This resonates with the findings reported in Göker et al. (2016).

In tasks requiring ready images, time was consistently reported as one of the main constraints. This corresponds to findings from studies in print journalism (Conniss et al., 2000; Markkula and Sormunen, 2000). In this study, *browsing* and *tailoring* were the activities in the illustration process that required most investment in terms of time and effort:

- using advanced search features (users reported on not using filters because this would take too much time),

- browsing through numerous irrelevant results (self-reported feeling of frustration when ploughing through large numbers of irrelevant result),
- heavy tailoring that compensated for ineffective searches.

Large numbers of irrelevant results cause much frustration. The participants typically use words such as "*ploughing*" to describe their browsing experience. Kuhlthau (1991) identified 'uncertainty' as an emotional state of searchers related to information searching and making decisions about the results. More recently, Beaudoin (2009) found that large numbers of irrelevant results caused frustration and anxiety in image users in art-related professions. Usually, such findings indicate a need for a sorting or filtering mechanisms. Beaudoin (2009) makes such a recommendation for in the conclusions to her research. The currently available image retrieval systems also those used in online journalism offer a number of advanced search features including various filters, e.g., by presence of people, by date. Yet, image users do not feel applying these features in their searches is worthwhile. On the contrary, the image users tend to perceive the use of filters as an additional effort and a waste of time because it was not clear to them how these filters worked, especially when applied together. Often the searches finish 'prematurely' with an acceptable selection (partially relevant) and radical tailoring techniques are applied to compensate for the ineffective searches (Section 4.10.1.6). Tailoring is a time-consuming and effortful activity but the image users have more confidence in their creative skills than in the effectiveness of searches. A direct access to images that meet users' needs without excessive tailoring will allow to save user effort and time without a need to compromise on the quality of images used in illustrations.

4.10.1.6 Tailoring as a remedy for ineffective searching (Objective 6)

This study found that unsatisfactory searches for ready images typically lead to tailoring of images in Photoshop software. While the core selection criteria (Table 4-25, detailed description in Section 4.6.6.2a) could not be compromised, the criteria in the two other categories (Table 4-25, detailed description in Section 4.6.6.2b and c) were sometimes not met through searching. As previously reported (Markkula and Sormunen, 2000; Westman and Oittinen, 2006), image users in journalism tended to make acceptable selections rather than carrying on searching for the best match to needs. In this study, it was observed that images were tailored before publication. Tailoring was not applied with an aim to fix image quality, but to 'bring' an image that meets the core criteria closer to the users' original needs and therefore, to compensate for partially effective searches. Typically, tailoring involved: blurring or removing of background for re-use, cropping image to achieve a strong focal point, changing of the photographic shot. Hence, the selections were acceptable in regard to the original needs, but best for tailoring (e.g., it was easy to isolate an unclustered object presented on a neutral background for re-use). Images were compared for how much work and time they would require: the less tailoring, the higher chances for selection. Relying on their strong creative skills, image users could afford making partially satisfying choices, however, tailoring was regarded as time and effort intense activity, especially, if it had to be carried out on routine tasks (e.g., government announcements).

When creating composite images, image users seemingly have a full *freedom* to create the new image as they wish in terms of the conceptual and perceivable content. Yet, the images they create follow the same visual trend as illustrations tailored from photos obtained through searches. The composites are intentionally created in a way that they include a finite set of image features, in order to produce a required visual effect. Arnheim, (1970) claimed that human perception is effortless despite the field of view being constantly filled in with detail, while noticing and paying attention require effort. When tailoring images, image professionals use a range of editing techniques to achieve a required visual effect, for example, by zooming on or isolating an object and making it look significant, in the same manner as photographers who apply variety of photographic techniques *help* the viewer notice or ignore certain details within the frame.

These findings provide strong evidence that tailoring is a purposeful activity driven by an intention of achieving a specific visual effect in the image. Image professionals in online journalism have a shared understanding of the image function (headline image) in terms of the finite set of image features that together produce the required effect.

To sum up, a finite set of selection criteria applied to selection of ready images have been identified, just as suggested by Barry (1994). The use of the VSS framework allows to name and interpret these criteria meaningfully and relate them to the specific function of the headline image in online journalism. The core criteria could not be compromised in searching. In contrast, the criteria for re-use and visual effects, if not met through search, they were achieved in tailoring. The less tailoring was required the higher potential for selection. These findings allowed to successfully meet Objective 6 defined for this investigation.

4.10.2 Proposed solution for predicting of relevance

Inspired by Barry's claim that professionals working on a specific type of search-based task apply a finite set of relevance criteria, Studies from visual semiotics (Caple, 2013; Knox 2009) indicating that image functions require images carrying distinct sets of image features. Study I investigated the function of dominant headline images in online news. The findings show the image users in online journalism have a shared understanding of this function demonstrated in their needs, assessment criteria and selections made, and finally, in image tailoring. A visual analysis of images (aided with the VSS tools) created in Study I. uncovered a set of 11 image features recurring in headline images, reintroduced in Table 4-26.

Feature #	Visual image features
1	The specific (identifiable) person/people related to the topic depicted in the image
2	The person/people depicted in the foreground
3	Shot from waist up
4	Face visible: frontal or profile shot
5	Gaze: direct or side gaze
6	The depicted person is 'large' in the frame
7	Positioned centrally or to the right within the frame
8	Colour image
9	Colour intensity: saturated or soft colours used
10	Blurry or monotone background
11	The person's face in focus (sharp)

Table 4- 26. The final set of image features recurring in news headline images

This study showed that image relevance involves a set of features. While single-feature filtering may be effective for retrieving text-based documents, image retrieval requires a *multi-feature* mechanism. The evidence supporting such approach comes from the analysis of the image users' needs, the image selection criteria, the reasons and the way images are tailored. The image needs are pre-defined early in the searching process on the level of conceptual and perceivable (syntax) content. Image users in online journalism tasked with illustrating headline news apply a shared set of criteria to select suitable images. Images found through searching that only partially meet the original needs, are further tailored in an image editing software, to suit these needs.

The proposed set of features, being rooted in image users' needs, may be a step forward to the process of automatically predicting relevance. Therefore, it is proposed that a filtering mechanism based on this feature set should be implemented for evaluation with users (Study III, Chapter 6). It is expected that the proposed system will reduce the amount of time and effort currently required to complete the most routine tasks based on ready images.

4.11 Strengths and limitations of Study I.

4.11.1 Interviews and observations

Through a study with users, the investigation aimed to answer two research questions as defined in Section 4.1, and this was achieved for a specific subset of illustration tasks, i.e., images depicting specific people. The research was conducted in the real work environment of twelve participants. During the study, the participants worked on real tasks, which gave the researcher a unique opportunity to observe their natural behaviour in regard to image selection and image tailoring processes. Since systems are built to support people at work, understanding of the natural user behaviour and their needs is fundamental to the development and design of systems, and this research was clearly successful in capturing such data. Yet, because the research was conducted *in situ*, the researcher had no control over the tasks that the participants were performing. The tasks naturally fell into a variety of categories; however, a significant majority was based on content that required an image depicting a specific person (14 illustrations of 26

completed tasks depicted an identifiable person/ people). Images depicting people were selected purposefully, since the image professionals believed that these images would generate more impact on readers. The analysis of the artefacts collected in observation sessions (Section 4.2.6) focused only on the illustrations showing specific (identifiable) people. Therefore, the data answered the research questions in regard to this subset of tasks. Only a minority of illustrations depicted other entities and concepts e.g., a generic object, a specific scene, location etc., and therefore, no conclusive findings could be drawn at this point.

4.11.2 Validation Survey 1. with image experts

Survey 1. with image experts successfully added an element of an independent image assessment to Study I. The percent agreement achieved between the experts was very high, which increased confidence in the findings concerning the set of recurring image features. However, this study was not free from limitations, of which the main one was the small sample of images available for assessment. To compensate for this, a study on a larger sample of images was designed (Study II.), and Survey 1. informed the design of this consecutive study in terms of the sampling process and technique, and questionnaire development. It was also decided that in Study IV (the final validation study), the experts would be asked to assess both the selected images (without edits) and the tailored illustrations, so that the effects of the tailoring process could be assessed by independent experts.

Percent agreement was used to calculate the agreement between the experts, which may be seen as a shortcoming of this study. This calculation does not account for chance. Still, it is recognised as a suitable approach for small scale studies such as this one and consecutive surveys in this investigation (Survey 2, Chapter 5, and Survey 3, Section 6.7). To eliminate errors and minimise the bias in judgement, several measures were undertaken. For example, any questions that required making a subjective judgement that could lead to chance judgement were removed (e.g., assessment of the largeness of the object with the frame). To ensure the questionnaire was not overwhelming in terms of time and effort required, the questions were simplified, and the experts were asked to carry out the assessment of images as they would normally do for work purposes.

4.12 Conclusions and next steps

Chapter 4 presented the research design and findings of Study I, that has opened this investigation. In the pursuit of the research objectives corresponding to RQ1 and RQ2, this study aimed to explore and understand the needs of image users in online journalism and how they select images with respect to these needs, and how and why they tailor images before publication. Online journalism is a relatively young domain within the creative industry and it makes an extensive use of imagery from online collections. The existing literature about online journalism focuses on the convergence and restructuring of the newsroom, the disintermediation of information gathering processes and the emphasis is on textual information. The selection and use of images in online journalism is a heavily under-researched area with only a handful of

publications, e.g., Göker et al. (2016). In order to extend the contours of the current research landscape, this investigation aims to provide knowledge about image seeking behaviour and needs of image users in online journalism. Therefore, this investigation opened with an extensive qualitative exploration of image users' experiences carried out in situ. The collected data were analysed in a systematic manner following the principles of thematic analysis (Boyatzis, 1998; Guest et al., 2012). The study contributes a thorough understanding of the following areas:

- the roles, environment, image resources and skills of image users in online journalism (Section 4.8.2), who are highly skilled image professionals and self-taught image searchers. They have a shared understanding of image functions, and resort to editing skills when struggling to locate required images through searching;
- a new typology of illustration tasks in the online newsroom (Section 4.8.3). An alternative way to categorise tasks has been proposed in this study, distinguishing between tasks that require actual images and those that can be completed with ready images. This typology appears to provide a plausible explanation for the differences in users' needs and image seeking behaviour in the online newsroom;
- image users' needs and how these needs are generated and shaped (Section 4.8.4), in relation to the type of task. For example, when ready images are required, the needs are more precise and the participants begin searching with mental representations of required images that are pre-defined on the conceptual and perceptual level of image description.
- image users' behaviour when carrying out search-based illustration tasks (Section 4.8.5). The image searching activities have been mapped to the phases in the image searching process model proposed by Conniss et al. (2000). Users' behaviour when searching for actual images was not always consistent with the model. This was especially evident in the selecting phase (the differences were previously observed in Göker et al. (2016) but the authors did not specify whether the differences occurred in any specific type of tasks). Activities observed in searches for ready images generally mapped consistently to the framework. Before selection could be made, actual, as well as ready images required verification. The model did not allow for mapping of behaviour associated with verifying of images. When analysed, users' activities resembled those described in Ellis et al.'s framework (Ellis et al., 1993). Conniss et al.'s model (Conniss et al., 2000) has been updated with *verifying*, in order to accurately reflect the behaviour of image professionals in online journalism who are concerned with authenticity and accuracy of published images;
- the criteria applied by the image users when selecting actual and ready images for the headline image function (Section 4.8.6) have been investigated. It has been uncovered that for actual images actuality comprising of: topicality, timeliness and credibility, was the core set of criteria that could not be compromised. The criteria used in selections of ready images have been grouped as follows: (1) the core set comprising of topicality as

the most important criterion and its satellite criteria, e.g., recency, low visual complexity; (2) criteria for re-use, and (3) criteria for visual effect. The novelty of this study is that it reached beyond the generic descriptions of criteria, and within each of the categories, concrete features that decided about the selections made in this study have been identified. For example, images with a photographic shot from waist-up (including head and shoulders shots and close up images) were selected to create the visual effect required in news headline images.

- the "how" and "why" of post-selection image tailoring (Section 4.8.9). It has been found that image users tailored images, in order to meet their original needs. The impact is twofold. Firstly, the illustration task process model by Markkula and Sormunen (2000) has been extended with the tailoring phase preceding publication. Secondly, trends in how images were tailored have been uncovered and a set of recurring visual features in illustrations was identified. The presence and recurrence of these features has been validated with external image experts (Survey 1, Section 4.9).

Further, the findings from Study I have implications on the subsequent studies within this investigation. To follow, is a quantitative validation survey with 3 independent image experts (Chapter 5) which aims to corroborate the set of image features identified in Study I. on a large set of images (N=100). The expectation is that these features will be identified in a large majority of the analysed images (at least 80%), and a high percent agreement (at least 90%) will be achieved between the image experts. Any irrelevant features will be removed from the set.

The set of recurring features will be applied as a search functionality in a prototype image retrieval system and evaluated in an experiment in Study III (Chapter 6), for the final RQ3 and objective 7 to be addressed. Additionally, the findings from Study I inform the design of the simulated work-task situation including the research instruments used in the experiment in Study III, as explained in Section 6.2.1.

To sum up, providing knowledge about the behaviour and needs of image users in online journalism, Study I contributes to the qualitative work on information behaviour. The research questions identified for this exploratory study have been answered and opportunities for improvements to image retrieval have been identified in a set of recurring visual features that will be validated and evaluated in the subsequent studies.

CHAPTER 5. Study II. – Validation survey 2. with image experts

5.1 Introduction

This study (validation survey 2.) was conducted in further pursuit of RQ2 (*How are images tailored in online journalism?*) and objective 6 (Table 1-1) This survey involved three independent image experts and was designed to validate the recurrence of eight visual image features in a set of 100 news headline images published online on the BBC homepage.

11 recurring features had been originally uncovered in observations in Study I. in a sample of 14 images, and 8 of these features were validated in Survey 1. The recurrence of these features indicates that there is a shared practice among image professionals in regard to what images they need, in order to illustrate online headline news content. It is hoped that this set may be the first step in the process of automatically predicting relevance.

However, being derived from a small sample of images, these findings are not regarded as conclusive. Survey 2. has been designed and integrated in this investigation to further validate the presence of the following 8 features: F1, F2, F3, F4, F7, F8, F10, F11 (Table 4-18), in a large set of images.

The hypothesis put forward for this survey is that, for the findings from Study I. to be considered valid, the 8 features presented for validation must be detected in at least 80% of images analysed in Study II. Additionally, this validation was driven by the following research questions: 1) *which of the eight visual features constitute the core subset of indispensable features for predicting of relevance?*; and 2) *which of the eight visual features are strongly relevant?*; and 3) *which of the visual features are weakly relevant or irrelevant?*

As in Survey 1, features detected in at least 95% of the image sample were considered *core* features, those detected in 80% - 94% were regarded as strongly relevant, while those present in less than 80% of the sample as weak or irrelevant. To be valid, the interrater agreement had to be higher than 75%, and an agreement above 90% would be considered high (Guest et al., 2012; Stamler, 2004).

The study was carried out in December 2015 and three independent image experts (Section 5.5) assessed a set of 100 images randomly selected from the BBC homepage editions published between January 2015 and November 2015 (Section 5.2.3).

5.2 Data collection

5.2.1 Sampling and ethical issues

To be able to participate in Study II, candidates had to meet the following two eligibility criteria: 1) to be an adult (over 18-year olds), and 2) to be working in one of the following professions: image editor, image researcher, online journalist (whose role included image editing), or photographer.

As with all studies in this investigation, candidates for image experts were *located* through the snowball sampling technique. This technique although not free from numerous limitations, is regarded suitable for reaching populations of professionals with a specific set of skills (Denscombe, 2010). An image editor who had participated in Study I. assisted the researcher in establishing initial contacts with potential candidates, then one of the candidates recommended other two professionals. These three candidates had not been known to the researcher prior to the study. The approached candidates met the eligibility criteria and agreed to take part in the research.

5.1.1.1 Ethical issues

An approval from the University's Ethics Committee was obtained prior to this study (Appendix G3) and the guidelines (City, University of London, 2015) were followed. All participants received the information pack (Appendix C2) detailing the purpose of this study and the roles of participants and the researcher. The voluntary nature of the study, withdrawal and complaint procedures were also clearly explained. All participants were required to read, sign and date two copies of the consent form prepared for this study (Appendix C3).

Like Survey 1. (Section 4.9.), this study did not require a face-to-face contact with the participants and all communication was carried out via email. The survey was also distributed via email. The participants could choose where and when they wanted to fill in the questionnaire. This minimised the potential for ethical issues to arise typical to studies that require contact in person. However, the sample of images used in this study (N=100) was much larger than in Survey 1. (N=13), which subsequently, meant that the amount of effort and time required from experts in this survey was significantly higher than in the previous survey. Indexing of images is considered a labour-intensive activity (Markey, 1994), and therefore, this study presented its own ethical implications for participants. Manually indexing of 100 images could lead to fatigue and frustration with the amount of work required to complete this study. There was a risk that the experts would withdraw from the study before completing it, or if they continue their engagement they would not be able to maintain the same level of engagement while manually indexing a large number of images. This could have adverse implications on the quality of the collected data. Several measures were taken to avoid these negative effects. First, a pilot study (Section 5.2.2) was carried out to ensure that all questions and instructions were clear and straightforward, and any potentially confusing parts of the survey were modified prior to the survey being sent out to the participating experts. Additionally, all experts were sent a sample of the questionnaire (one image and a set of questions not included in the questionnaire), to enable them to gauge the amount of work and time required to complete this study. Fatigue was highlighted as the risk in the information provided to the candidates. The voluntary character of the study was emphasised on, as well as the withdrawal without penalty procedure. It was believed that these measures would enable candidates to make a fully informed decision about participation in this survey.

Communication between the researcher and participants was carried out via email. Consent forms had been signed and emailed back to the researcher before the surveys were sent out.

Participating experts received Amazon vouchers as incentives and a thank you gesture for their time and effort.

5.2.2 Pilot study

Since the sample of images to be visually inspected was large (N=100) in this study, ensuring that the questionnaire was straightforward, clear, and as short as possible was particularly important. The pilot study helped to achieve this. The pilot study was conducted with a graduate in Photography. The aim of the pilot was to test and, if necessary, refine the questionnaire. The pilot questionnaire included 25 tasks and the participant was asked to keep a record of start and end time. The feedback showed that she had complete the set of tasks in approximately 35 minutes. She also reported that after the first few tasks, she was familiar with the questions and the ordering of the questions. Not having to concentrate on the content of the questions, speeded up the assessment process. The final version of the questionnaire sent out to the participants is available in Appendix C5.

5.2.3 The questionnaire and the image set

The method and questionnaire design was informed by the experience gained in Survey 1 (Study I, Section 4.9). As previously in Survey 1, in this study, too, 8 image features: F1, F2, F3, F4, F7, F8, F10, F11, out of the original set of 11 were included in the validation[50]. These features are re-introduced in Table 5-1 below.

#	**Visual image features**
1	The specific (identifiable) person/people related to the topic depicted in the image
2	The person/people depicted in the foreground
3	Shot from waist up
4	Face visible: frontal or profile shot
7	Positioned centrally or to the right within the frame
8	Colour image
10	Blurry or monotone background
11	The person's face in focus (sharp)

Table 5- 1. The eight features that were validated in this study

In this validation study, the experts answered a set of closed-end 8 questions (one question per feature), e.g., Q3. *Is the person depicted (shot) from waist up?* Y / N; Q.6 *Is it a colour image*? Y / N. Predefined values: Yes [Y] or No [N] were assigned to responses. The Expert used [Y] when she detected the given feature in the image, and [N] when the feature was not detected (see Table 5-2).

The final image set consisted of 100 photographs published on the BBC homepage between January and October 2015. The images were retrieved through the internet archive Wayback Machine (http://archive.org/web). 10 images from 1st to 10th of each month were selected (first image published that day as saved in the internet archive). This was done to cover a large range

[50] As explained in Section 4.9.6., features 5 and 9 did not require validation, while feature 6 was excluded from this study because there was a high potential that a manual assessment of feature 6. (largeness of the object within the frame) would produce chance judgement and lead to interrater error

of topics from different editorial sections. The images were selected and judged for inclusion by the researcher. Since the focus of the study was on images of specific people, only those images that depicted any one specific person in the foreground were included in the final sample of 100 images (Appendix C6.). The relevance assessment of each image was judged by the presence of eight features presented in Table 5-1

5.3 Data analysis

The analysis of the responses aimed to establish the interrater agreement and feature recurrence. The aim of measuring of the agreement between the experts was to determine how often they agreed on the detection of the 8-feature strong set. To measure the inter-rater agreement in this study, the *percent agreement*, a calculation suitable for a small number of raters was used (similarly to Survey 1.). It is based on a principle that a majority is correct while minority is incorrect in their judgement. The agreement for each image was calculated as a number of times the experts agreed in their judgement divided by the total number of judgements made, i.e. 8 judgements (see Table 5-2). Similarly, the agreement for the whole study was calculated as the mean of all individual judgements made. It is commonly understood that percent agreement does not take chance agreement into account, which may potentially lead to overestimated results. Hence, the higher interrater agreement achieved for a study, the more credible the results are. A percent agreement of 90% and above was considered a high interrater agreement, while 75% was the minimal acceptable agreement for a study (Guest et al., 2012).

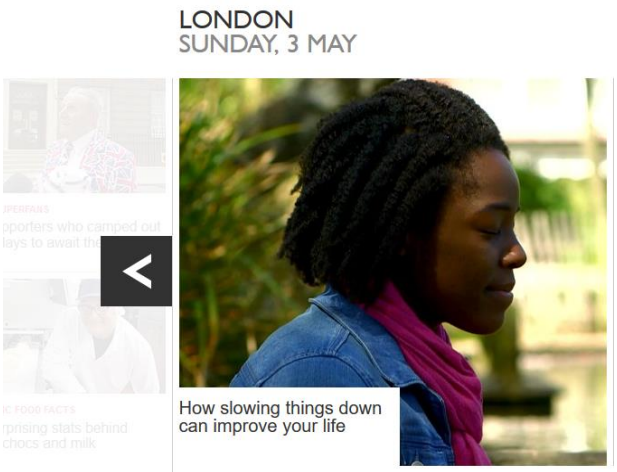


FIgure 5- 1. The "Great British Bake-Off" finalist Kimberley Wilson

Q	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	The specific (identifiable) person/people related to the topic depicted in the foreground	1	1	1	100%
2	The person/people depicted in the foreground	1	1	1	100%
3	Shot from waist up	1	1	1	100%
4	Face visible: frontal or profile shot	1	1	1	100%
5	Positioned centrally or to the right within the frame	1	1	1	100%
6	Colour image	1	1	1	100%
7	Face of the person in focus	1	1	0	66.7%
8	Blurry or monotone background	1	1	1	100%
Total agreement					95.8%

Table 5- 2. The results of image assessment carried out by three independent image experts on Image 47 presented in Figure 5-1

5.4 Data quality assessment

A data quality check was carried out on the returned surveys. This allowed the researcher to assess the completeness and validity of the collected data. Two questionnaires were returned in a timely manner within the deadlines agreed with the participants. Due to *"a particularly busy week at work",* expert 2. asked for extra time to be able to complete the work. The researcher checked with the expert whether it was the amount of work required to complete the survey that affected her schedule. The researcher also reminded the expert about the voluntary nature of the study. Expert 2 confirmed at this point that she had already completed almost half of the survey and was "*happy to continue*". A new deadline was agreed and the expert sent the complete questionnaire by then. All experts provided valid answers to all questions, i.e., the experts used the marking scheme y/n and the responses were provided in the designated spaces as per instructions.

5.5 Image experts' profiles

The Expert team in this study included three participants: a journalist with a 7+ years of experience in creating of online news content, a trained image editor who worked at an online news service for 6 years, and a qualified photographer with a 3-year experience in image research. None of the experts had been involved in involved in this investigation at any other stage than this survey.

Characteristics	E1	E2	E3
Image-related profession	Online journalist	Image editor	Photographer
Years of experience	**7+**	**6**	**3**

Table 5- 3. Image experts' profiles

The experts were tasked to manually inspect (*the same*) sample of 100 news images (see Section 5.2.3), and using their expertise in imagery, to assess each image for the presence of the features in the pre-defined set (see Table 5-1). They worked independently and in their own time. The experts were not involved in the selection of images for this study. The experts' professional experience in images was critical to participation in this study. It ensured that they would understand the questions correctly and be able to individually inspect images at the level of visual image features.

5.6 Results and discussion

The percent agreement was calculated for each of the 100 images as shown below in Table 5-4. For the whole study, an overall agreement of 98.20% was achieved. This is a high agreement, which ensures high confidence in the results of this validation study. Supported with the high agreement, the results demonstrate the *core* set of image features consists of 6 features (see Table 5-4, features 1, 2, 3, 4, 8, 11) that were detected in more than 95% of the analysed images. Nota bene, features 1 and 2 were used as prerequisite inclusion criteria for the images, hence a high recurrence was expected. In all images faces of the depicted people were visible and for 99% of images the faces were *in focus*. Only one image from the sample of 100 was unanimously identified as *black and white.* 97% images showed people from their *waist-up.* Two strongly relevant features were identified: in 93% of images the depicted person was positioned either centrally or to the right, and in 81% of images blurry or monotone background was detected by the experts.

No.	Visual image features	No of images where the feature was present out of 100	Strength of the feature in the set
1	One specific (identifiable) person depicted	100 (100%)	**Core set**
2	The person depicted in the foreground	100 (100%)	
4	Face visible: frontal or profile shot	100 (100%)	
8	Colour image	99 (99%)	
11	Face of the person in focus	99 (99%)	
3	Shot from waist up	97 (97%)	
7	Positioned centrally or to the right within the frame	93 (93%)	**Strongly relevant features**
10	Blurry or monotone background	81 (81%)	

Table 5- 4. The compiled results of the validation

Study II reveals prevalence of pre-defined features in a large image set. Previous studies in CBIR (e.g., Deselaers et al., 2008; John et al., 1994; Kaur et al., 2013) suggest that the use of sets of image features rather than of a single feature can ensure the effectiveness of image retrieval systems. In a qualitative user study (Study I.), a set of 11 image features recurring in images of specific people used in online journalism was identified. The aim of this Survey was to further quantitatively corroborate these findings. Three experts visually inspected a sample of 100 images and determined recurrence of 8 image features from the initial feature set of 11. The results demonstrated that 6 of the validated features were detected in at least 97% of all images, and therefore, constitute the *core* set of image features recurring in news images of specific people used online. F7 showed *a strong relevance* as it recurred in 93% of all images. F10 was detected in 81% of the image set. This result was on a borderline of strong relevance as defined for this study.

There were no irrelevant features detected in this study. A high confidence in the results of this study comes from the high interrater agreement of 98.20% that was achieved. It demonstrated that the experts with a *trained eye* for viewing images viewed and interpreted the images in a very similar manner, which, in turn, decreased the chances of a significant interrater error. Additionally, because the *percent agreement* does not account for chance, several measures were undertaken in order to further eliminate errors, i.e., the question in relation to F6 that involved a subjective judgement or interpretation of features was not included (see Section 4.9.6). Involving a human *annotator* or multiple annotators is a common practice in evaluation studies of systems for text-based, as well as image-based information. However, the focus of existing studies is on the effectiveness of machine-based indexing (e.g., Berg et al., 2005), creating of a golden standard dataset (e.g., Tsai et al., 2006), or measuring indexer consistency and indexing quality (e.g., Markey, 1994). This study uses the interrater agreement for predicting relevance based on the presence of a pre-defined set of image features. Study II. revealed prevalence of a set of 8 image features in a large image sample of 100 images and validated this feature set with image experts at a high percent agreement of 98.2%.

These results give a confidence in the findings from Study I. that uncovered that the image users in online journalism applied a finite and shared set of image selection criteria (Table 5-1) when tasked with illustrating headline news content. The visual analysis of a sample of 100 randomly selected headline images showed that the set was also present in a majority of these images (over 80%). This result allows the investigation to move forward to the next phase where the features can be implemented and tested with users for their effect on image retrieval (Study III, Chapter 6). Based on the results of this validation study, it was decided that to be included in the experimental set in Study III, images must carry all eight features validated in this survey.

5.7 Strengths and limitations of Study II

This study enabled the researcher to quantitatively validate a set of recurring image features in a large sample of images. A questionnaire based on close-ended yes/no questions was distributed

to participants via email and they could complete it at a time and in a place convenient to them. The method was tested in Survey 1. However, this study required participants to visually examine a large sample of images (N=100) and therefore, the study was labour-intensive and required much commitment from the experts in terms of effort and time. There was a chance that while the initial questions were answered with much engagement, some questions might have been answered 'automatically'. This could potentially lead to a chance assessment. However, it was also believed that the professional expertise would always allow the participant to identify a given feature as this was part of their skillset and professional roles.

The sample in this study was larger than in Survey 1 (N=13) but still much smaller than in a typical TREC study. Including a larger number of images would potentially increase the validity of the findings. However, asking the volunteer experts to inspect a larger number of images than the already included could be ethically problematic as it would increase the risks of fatigue and cognitive overload imposed on them.

The percent agreement was used in this study as the main calculation method for frequency and agreement. As already discussed in the context of the previous survey (Section 4.9), this method is suitable to small-scale studies such as the surveys in this investigation, however, it is important to remember that it does not account for chance. Therefore, efforts needed to be made to reduce any potential for bias. This was achieved through simplifying the questions and excluding any elements that could lead to chance assessments. As in Survey 1, feature 6 was not validated in this study due to potential for bias and errors, as described in Section 4.9.6.

Involving a larger number of experts could enhance the accuracy of the results, however, finding participants who are professionals to participate, proved to be difficult if not for personal recommendations.

The images were sourced through a third-party website which does not save pages regularly. The researcher strived to select images at random but some bias was possible. The researcher relied on her familiarity of the people in the images, checking the headline, and summary of the article but excluded images if she could not identify the person in the image.

Lessons learnt from this study had implications on the design of Study IV. This validation survey and Survey 1 showed email was an effective way to distribute the questionnaires and it was convenient for the experts and the researcher. Questions had to be kept simple and clear, and the close-end Yes/No questions proved to be easy to complete. When preparing research materials including images, it was important to minimise the loss of image quality that could occur due to the copy/paste action.

5.8 Progress to date and the next steps

This study with three image practitioners aimed to quantitatively demonstrate that a set of 8 visual image features recurred in most of analysed news images. Although, not free from weaknesses, this study confirmed that there existed a core set of 6 visual features and 2 strongly relevant

features that recurred in news images used online. The results were validated at a high percent agreement between the experts. It was expected that when applied as search functionality, these features would improve the effectiveness of retrieval of visually engaging images as required in online journalism.

So far, this investigation has addressed Goal 1 by uncovering the knowledge about the image users in online journalism and the human activities carried out within the illustration task process. The key findings include:

- identifying and describing the roles of image professionals in online journalism,
- the illustration tasks and how these tasks influence image users' needs,
- presenting the stages in the search-based illustration task process in online journalism and related it to the models proposed in the literature,
- identifying image selection criteria for ready images,
- establishing how and why news images are tailored by image users in online journalism, and to what effect,
- determining the challenges that image users face when they carry out the search-based illustration tasks,
- identifying a set of image features recurring in headline images and validated this feature set in a quantitative study with independent image experts.

This set of features, initially derived from images collected in the observations and then validated by external image experts in Survey I (small image sample N=13) and in Study II (large image sample N=100) has been proposed as the device for enhancement to the effectiveness and efficiency of image retrieval.

In the next steps, this set of features will be implemented as search functionality into an experimental prototype system. Its effect on image retrieval will be tested with image users in Study III. as presented and described in Chapter 6.

CHAPTER 6. STUDY III. – User evaluation & validation survey 3.

6.1 Introduction

Study III. is the final study and the pragmatic component of this mixed-methods investigation where the outputs of the exploratory inquiry (Study I.) have been implemented and evaluated with users for their effect on image retrieval (Figure 6-1).

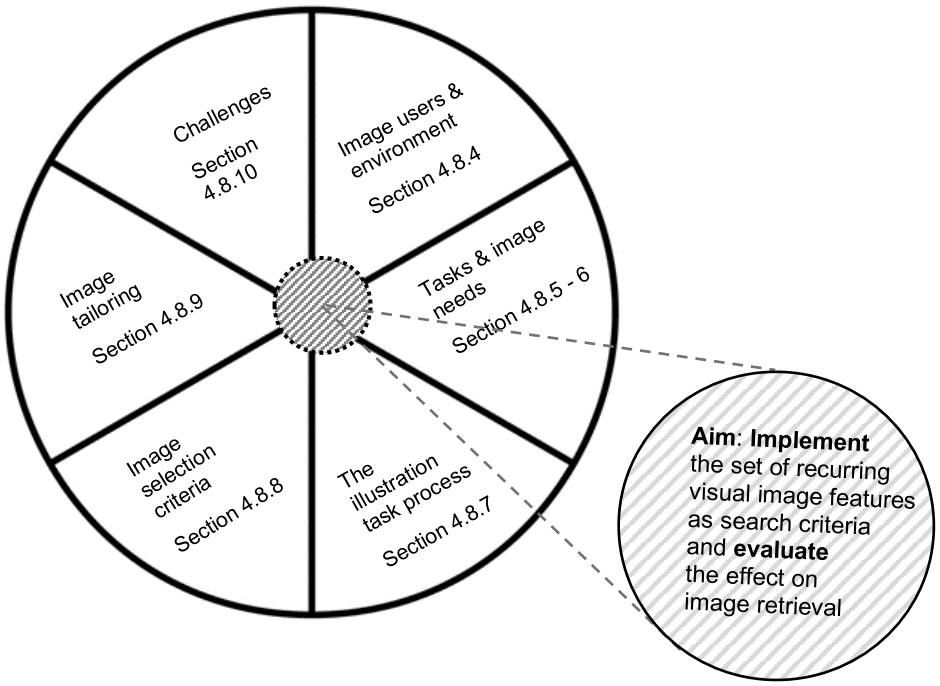


Figure 6- 1. A visual presentation of the research areas covered in the exploratory study and the aim of the evaluation in Study III.

The primary aim of Study III. is to address RQ 3 and Objective 7, associated with Goal 2 (re-introduced in Table 6-1 below).

Goal 2	Research question 3	Objective 7
To propose improvements to the way image professionals search large collections of images, in order to enable them to effectively select images that they need.	If applied, will the identified criteria improve the effectiveness and efficiency of image retrieval?	To implement the uncovered criteria in a prototype and to test their effect on the effectiveness and efficiency of image retrieval

Table 6- 1. Study III. has been designed to address Goal 2, Research question 3, and Objective 7 (originally introduced in Section 1.2)

To achieve this, a set of visual image features recurring in news headline images (Table 4-26) has been implemented as a multi-feature filtering mechanism (Section 6.2.2) and put forward for evaluation with image professionals in a within-subjects experimental design study (Section 6.2.4). To evaluate means to assess the work or value of an innovation or a service involving users in relation to their needs (Robson, 2000), therefore, the aim of this evaluation is to assess the effect that the proposed needs-based solution has on the behaviour of the users. The

hypothesis for this evaluation is that the proposed solution, being rooted in image users' needs, will support users in completing illustration tasks in an effective and efficient manner. The measures for effectiveness and efficiency used in this study have been informed by findings from Study I and are explained in Section 6.2.3. Unlike in Study I (Section 4.2.1), the participants in this evaluation have been recruited from several UK-based online news providers (Section 6.2.5). This supports the secondary aim of this evaluation, which is to ensure that the findings about image users' needs and behaviour reported in this thesis are derived from a wide variety of perspectives and are not skewed to a practice or preferences shared by professionals from a single setting. To further enhance the validity of the results, the images created in this study will be assessed by three independent image experts in Survey 3. (Section 6.7). These findings of Study III will have implications on predicting of relevance of images.

6.2 Data collection: user evaluation

6.2.1 The simulated work-task situation

In Study I, the image users were observed performing naturalistic tasks in-situ. This method choice was dictated by the exploratory nature of RQs 1 and 2, and the objectives set for the initial phase of this investigation. There are multiple benefits of such an approach, for example, it provides a unique opportunity to observe participants' actual behaviour in-situ. Similarly, a naturalistic evaluation allows to gain insights into users' natural behaviour and interaction with a new tool. Naturalistic experiments usually facilitate capturing of data over long period of time, and participants may accept the research condition as their new reality, which reduces the researcher effects on the data. However, for this approach to be effective, a fully working experimental system is required. An alternative approach is laboratory-based evaluation which typically involves participants in carrying out pre-defined tasks on prototyped systems. An issue of validity arises in regard to the authenticity of users' needs and engagement in response to pre-defined task in lab-based test sessions. To ensure that authentic needs arise, Borlund (2003) emphasises the importance of simulating an authentic work-task situation in experimental settings. She recommends involving *real* users for whom a given system is developed, and setting the controlled situation in a way that closely resembles of users' *real-world* environment. Further, Byström and Hansen (2005) suggest that to achieve a complete picture of a work-task situation, tasks must be considered within their wider context, and the knowledge about them needs to be acquired from real-life situations and work task cases.

In this investigation, a simulated work scenario situation was chosen as the most suitable approach. This was because the systems for evaluation (an experimental one and a baseline one) were developed as low-fidelity prototypes (Section 6.2.2), and the researcher had only a limited time of 60 minutes per session scheduled at participants' convenience. However, only professional image users from online journalism were purposefully sampled to participate in the experiment (Section 6.2.5 provides the details on sampling, and participants' profiles are presented in 6.5.1). The naturalistic observations in situ conducted in Study I. provided rich

insights about the natural environment (Section 4.7.4) and the structure and the basic components of illustration tasks in online journalism (Section 4.8.5.1). This information was used to model simulated illustration tasks used in this experiment. For each task, the scenario explained the role of the participant, provided the instruction and a 10-minute time limit to complete the task corresponding to the amount of time typically spent on a routine task (Section 4.2.6). It was expected that being modelled closely on the real tasks, these pre-defined tasks would generate authentic image needs and motivation for completing the test tasks. The tasks used in this study and the needs that arose in response to these tasks were assessed for authenticity by the participants (Section 6.4.1) An example of how the tasks were structured is presented below.

Task 1.

Scenario

[Participant's role] **In your role as image professional, you were given the illustration task described below.**

[Instruction] **Find and select an image (or images) to illustrate the following news article:**

[Illustration task]

HEADLINE: **Usain Bolt seals place in World Championship history**
[Editorial section: sport news
Information format: a text-based article]

Usain Bolt guided Jamaica to victory in the sprint relay to become the most successful athlete in the history of the World Championships.

[Timing] **Time on task that you can afford is up to 10 minutes.**

[Image availability] **You have already searched for *actual* images from the event but they are not available in the image collection that you have access to.**

[Search term] **You begin the image search with typing in a search term: *usain bolt***

[Instruction] **If needed, use PhotoShop software to do as much or as little editing as you think is required for publication of this image (images).**

The search topics for the four tasks were as follows (Table 6-2.):

Prototype	Task	Search topic	News genre
Filtered (F) set [experimental]	Task 1.	*Usain Bolt*	Sport
	Task 2.	*Angela Merkel*	World Politics
Unfiltered (U) set [baseline]	Task 3.	*David Cameron*	UK Politics
	Task 4.	*Sophie Ellis-Bextor*	Entertainment

Table 6- 2. The search topics for the four tasks used in this study

The search topics were the names of *specific* people who were commonly present in daily news relays at the time of the research. Two of them (Task 2 and Task 3) were well-known figures representing the world of politics (Angela Merkel and David Cameron), while two others (Tasks 1 and Task 4) were figures from other news genres: sport (Usain Bolt), and entertainment (Sophie Ellis-Bextor). These specific people were selected for their high-profile activities in their respective fields reported in news. The tasks were constructed so that general knowledge of the world affairs, rather than specialist expertise or interest, was sufficient to be able to perform the tasks. The tasks were purposefully generic and a constraint was added that *actual* photos from relevant events were not available. Just as Hung (2005; 2012) had earlier found, the findings from Study I. (Section 4.8.7) showed too, that when illustrating content related to a specific event, image editors first searched for actual images from that event. The tasks used in this experiment aimed to create motivation to search for *ready* images and to generate clear and semi-specific needs in the image users, as it was observed in Study I. (Section 4.8.6).

It is known that searching process is experienced differently by individuals (e.g., Kelly, 2009), therefore, measures were taken to reduce these differences and ensure that causality could be studied. Therefore, rather than on the complete illustration process, this experiment focused only on an isolated *slice* of the process (Figure 6-2.), as recommended in Kelly (2009),

> "[t]*he researcher may control what results are retrieved in response to a user's query or order in which search results are presented to users. The point is to isolate and study individual aspects of the research process rather than the entire process*".

This study was designed to evaluate the effect on image retrieval. Study I. revealed that activities associated with "wasting time" and frustration were browsing, referred to as 'ploughing' and 'trawling', and heavy tailoring of images for routine tasks. A proposed solution had to introduce improvements that would aid browsing and reduce a need for radical tailoring, therefore, this evaluation focused mainly on activities in these two stages of the illustration task process. Assumptions about the interaction prior to the selecting stage was made based on the findings from Study I. in terms of how the query was typically derived from the headline and tied to the person ('doer') in the news story, the way image search results were returned and displayed to users after the search button was pressed. Therefore, it was important that no new or atypical interaction or design elements were introduced in the tasks and research materials that could divert users' attention from the focus of the study. Figure 6-2. shows the *slice* of the process isolated for this study, and shows where the interaction with the image retrieval systems used in the experiment began and ended.

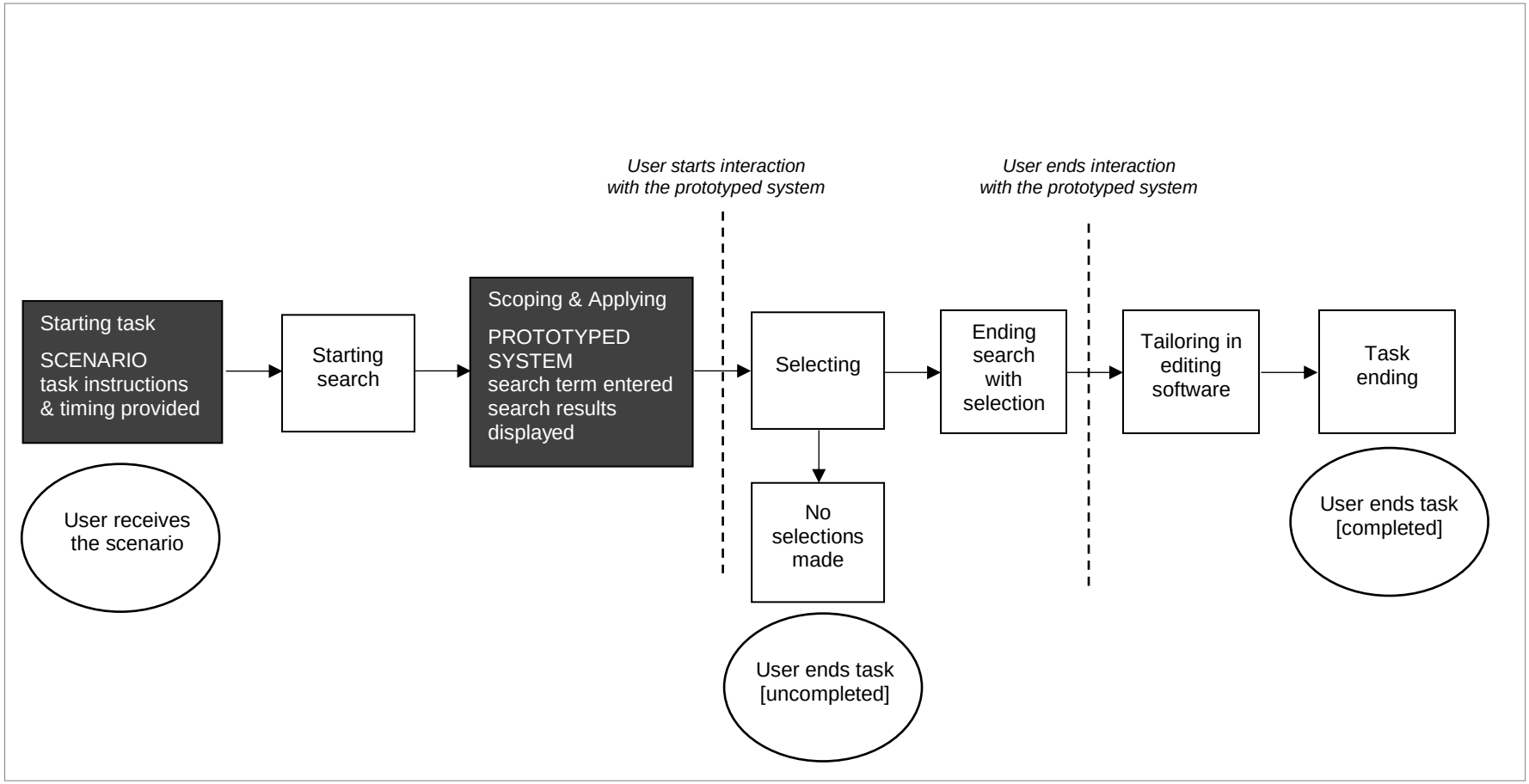


Figure 6- 2. The scope of the evaluation task in Study

Purely experimental studies are conducted in laboratories and Borlund (2003) suggests that the laboratory settings need to resemble the users' natural environment as closely as it is possible. This is done to aid raising of natural motivation to perform tasks and subsequently, generating of authentic information needs. This experimental study, although based on simulated tasks, was conducted in the natural work environments of participants. Previously, Hung (2005; 2012) conducted two experimental studies where he observed image editors performing pre-defined tasks in situ. In these studies, the tasks were performed on fully-functional commercial image retrieval systems because the aim of the study was to capture the moves and tactics that image users applied when searching for images. The benefits of conducting Study III. in the natural environment were numerous. For example, participants were presented with prototyped image retrieval systems but did not have to get used to the testing environment, the level of noise was typical to the space and participants could act as naturally as if they were doing their usual work. They could move about the office freely as they wished. While artificial settings of a lab can increase people's awareness of being observed and influence their behaviour and responses to tasks (Denscombe, 2010), it is believed that familiar settings may reduce the level of research-related stress. Organisational arrangements such as finding a suitable venue that could be adapted to this research when participants were available could be avoided. Initially, it had been proposed that a room at university would be booked but after consulting with the participants, a strong preference was expressed for holding the sessions at their workplaces. A golden mid-point was found between the purely lab-based experiments and their opposite naturalistic studies, and participants' preferences and convenience.

6.2.2 The systems used in the experiment

In the IIR tradition, experiments with users are a popular method used to evaluate information retrieval systems (Kelly, 2009). In HCI tradition a single system can be evaluated with users for usability (Sharp et al. 2007), however, in IIR, an evaluation experiment requires more than one system to establish whether a proposed solution has an effect on image retrieval. Two systems are usually used for comparison: the *experimental* system incorporating the identified *criteria* used as the stimulus in the study, and the *baseline* system aiming to represent "*participants' normal experiences*" (Kelly, 2009, p.46) on the systems they normally use to complete their image-based tasks. It is understood that people's interaction and expectations of systems are shaped by the tools they normally use (Xie, 1997), however, a direct comparison between users' experiences on an experimental system and those on any available commercial system would produce invalid results. This is due to the fact that commercial systems are fully-functional in terms of the available search features and functions they offer, the underlying algorithms, and user interface design, while the experimental systems are usually low-fidelity prototypes designed for the purpose of an experimental study. Furthermore, a commercial system provides access to a great number of

images (e.g. GettyImages currently contains an archive of over 50 million images[51]), whereas an experimental prototype operates on a closed image collection.

In this investigation, both systems were low-fidelity prototypes, created on flat pages in a MS Word document, in quality, comparable to a simple paper prototype but displayed on-screen. This allowed for scrolling of the image search result pages. Two topics (tasks) were assigned to each system. Task 1 and 2 were to be performed on the experimental prototype, while Tasks 3 and 4 on the baseline system. The tasks are presented in Table 6-2 above.

The prototypes contained 100 images per each individual topic. Göker et al. (2016) observed that image users in her study viewed many images in a single session, but approximately, 100 images were viewed in a single session by participants in Study I in this investigation, and in an ealier study conducted by Jörgensen and Jörgensen (2005) in professional settings. The findings from Study I, showed that image users in online journalism used a variety of online sources including licence-based commercial image collections such as GettyImages (gettyimages.co.uk). For a comparable user experience, the baseline and the experimental systems used in this experiment were modelled after a commercial search engine (GettyImages.co.uk) in the following manner. The prototypes were constructed as follows. For each topic, a task-specific search term, (e.g., Task 1. *Usain Bolt*) was entered on GettyImages image search system (gettyimages.co.uk) and search results were retrieved.

For the baseline system, the first 100 search results from GettyImages' pages were copied and pasted onto the search result pages in the prototype. The original ordering of the results was maintained. Two separate unfiltered sets of 100 images were created, one for Task 3. and another one for Task 4. These sets are further referred to as the *unfiltered (U)* sets, and the baseline system is referred to as the unfiltered system (U).

In contrast, for the experimental system, the *first* 100 images that met the 11 pre-defined experimental criteria (Table 4-26) were manually selected by the researcher, then copied and pasted onto the prototyped search result pages. A separate filtered set of 100 images was created for Task 1. and for Task 2. The ordering of the results was also decided by the researcher. Several ways to order images were considered, e.g., in the order they appeared originally in Getty images pages. In the final version of the prototype, the filtered images were sorted by the type of shot from waist up to head and shoulder shots to extreme close-up photographs. This was motivated by the distinct function of thumbnail images on news homepages related to their visual minimalism (Knox, 2009), and was a further attempt to understand whether the news headline image was clearly different from a photograph used as a thumbnail. The image sets for Tasks 1 and 2 are further referred to as *filtered (F)* images, and the experimental system as the filtered system.

For illustrative purposes, Figures 6-3. and 6-4. show how the images were typically ordered in the filtered and unfiltered sets. These images are not the actual screenshots of the prototyped systems. The complete prototype for T2 is included in Appendix D6.

[51] From an official site (http://www.gettyimages.co.uk/ultrapacks), other sources report over 80 million (e.g., Wikipedia).

Filtered T1 & T2



Figure 6- 3. A slice of the filtered set of images used in T1.

Unfiltered T3 & T4



Figure 6- 4. A slice of the filtered set of images used in T1.

In terms of UI design, both prototypes were equal in their visual presentation, i.e., in both systems, the search results were displayed on a plain, white background of standard word document pages with no visual design features. Both prototypes offered the same limited functionality – a scroll bar for navigating the result pages up and down. This minimised any bias that could rise from differences between visual or functional features.

To sum up, the baseline system was designed to display 100 *unfiltered* images in a way in which a typical currently available commercial system does. In contrast, the experimental system showed 100 images pre-filtered based on the presence of the 11 features identified in Study I. as recurring in headline images showing specific people (Table 4-26). It was expected that the pre-filtered images in the experimental system would be of high relevance to the image users tasked with illustrating news headline content in this experimental study.

6.2.3 Key measures: user effectiveness and efficiency, and system preference

The findings from Study I. (Chapter 4) are further proof that currently available image retrieval systems do not meet image users' needs. Two areas of user activity: selecting (browsing) and tailoring were associated with '*wasting*' time and disproportionate effort required to complete routine illustration tasks, and frustration with large numbers of irrelevant results. It was concluded that to offer improvement, the new solution would provide users with direct access to required images. This, in turn, would result in reduced effort and task duration. Therefore, the key measures in this experiment were associated with user effectiveness and efficiency, as defined in HCI tradition. For the purpose of this evaluation, the nominal definitions of these measures were constructed based on ISO usability standard (ISO, 1998), as follows:

> *Effectiveness:* the proposed system is effective if it helps users meet their image needs and complete illustration tasks (task completeness).
>
> *Efficiency:* the proposed system is efficient if it helps users complete their tasks using minimum resources: effort demonstrated in the steps leading to task completion, and time invested in the task.

In IIR studies, effectiveness typically relates to measures of system performance, efficiency – to time-based measures, while any self-reported evaluative feedback about users' attitudes and feelings, e.g., user satisfaction, is generally referred to as 'usability' (Kelly, 2009). In contrast, in HCI practice, effectiveness, efficiency and satisfaction are equally important dimensions of *usability* and it is recommended that all three must be included in usability research (Frøkjær et al., 2000, p.345). In usability evaluation studies, effectiveness is associated with task completion and accuracy, hence, its indicators include task completion/error rate. Efficiency typically focuses on task duration (or effort) and uses time-based measures (e.g., actual time, normalised time). User satisfaction is defined as "*freedom from discomfort, and positive attitudes of the user to the*

product" (ISO, 1998, p.2), and relies on self-reported user feedback about attitudes and feelings about the system and interactions (Kelly, 2009).

In order to make the actual measurements possible, operational measures were further defined for this evaluation (the nominal and operational measures used in this study are presented in Table 6-3. below).

Measure	Nominal measure	Operational measure	
		Observable	**Self-reported**
Effectiveness	The system is effective if it helps users meet their image needs and complete illustration tasks with no errors.	User is able to select an image (or images) from the presented set and complete the illustration task demonstrated as User presents the final illustration ready for publication.	User verbally announces task completion AND in the post-task questionnaire, user expresses satisfaction with the selection made above point 3 on Likert scale AND in the debriefing questionnaire, user makes positive qualitative comments about the selection process
Efficiency	The system is efficient if it helps users complete their tasks with minimum time, and effort demonstrated in low-intensity browsing of search results, and no or minimum of editorial work (tailoring) necessary to prepare the selected image(s) for publication.	User is able to make a *straightforward* selection (fewer steps taken to complete the task compared to baseline set, e.g., less scrolling up and down the page, less hesitation expressed) AND user is able to complete the task with no or minimum editorial work (less editorial work applied than necessary in baseline set)	In the post-task questionnaire, user expresses satisfaction with the perceived amount of work necessary to complete the task above point 3 on Likert scale AND In the post-task questionnaire, user expresses satisfaction with the perceived time spent on the task above point 3 on Likert scale AND in the debriefing questionnaire, user makes positive qualitative comments about the selection process
System preference	User's favourable attitude towards a system after an interaction with both the experimental system and the baseline system.	Not observable	While performing tasks, user expresses a preference for any one of the systems AND/OR In the debriefing questionnaire, user indicates his/her preference for one of the systems (image set), AND When comparing both systems, makes (more) positive qualitative comments about the preferred system

Table 6- 3. Nominal and operational measures of effectiveness, efficiency, and system preference, used as a coding scheme in the analysis process

IIR studies often rely on self-reporting to elicit evaluative data about effectiveness, efficiency, and user satisfaction. In HCI tradition, self-reporting is reserved for gauging of user attitudes and feelings about systems, and is associated with bias (e.g., inflation, acquiescence), while

measures of effectiveness and efficiency require observable objective indicators (Kelly, 2009). In this study, the operational measures were purposefully constructed to include both observable indicators, as well as self-reported user satisfaction. The operational measure of effectiveness was associated with task completion determined through observation, and self-reported user satisfaction with selected images, i.e., a completed task and user satisfaction with the selected image above point 3 on a 5-point Likert scale (Section 6.2.8.1 and Appendix D7) were regarded as a positive indicator of user effectiveness. The operational measure of efficiency was associated with the observed number of steps (actions) in the illustration task process (Section 6.2.8.1 and Appendix D7), combined with self-reported user satisfaction with the perceived time and perceived effort invested in the task. Ratings above point 3 on a 5-point Likert scale (Section 6.2.8.1 and Appendix D7) were interpreted as a positive indicator of user efficiency.

Although elicited through self-reporting, the measures of user satisfaction (with time, effort and image selections) applied in this study are valid and reliable. Research shows that referring to their work-based experience, professionals are able to predict time and effort required to complete a typical task in their discipline (e.g., Tobin and Grondin, 2015). Therefore, it is believed that all image professionals participating in this study (Section 6.5.1) had the required *frame of reference* and were able to make experience-based judgements about the selected images, and the time and effort that they invested in completing the test tasks.

Finally, since the experiment involved a comparison of two systems, where the baseline system imitated a typical commercial image search engine, a system preference measure was also introduced in this study. After they had been exposed to both systems, participants were asked an open question about their preference for any of the systems. These qualitative responses enabled the researcher to measure users' attitudes to the proposed solution for image retrieval, and compare it to the attitudes towards the baseline experience. Further, open-ended questions were asked to gain a deeper understanding of the preferences.

6.2.4 Within-subject design in the experiment

In comparative evaluations, it is important that all participants are exposed to both systems, the experimental one and the baseline one. However, experimental studies involving more than one system are prone to bias and ordering effect (Denscombe, 2010). To avoid experimental confounds, the researcher could choose one of the study design options: between-subject design where participants are randomly assigned to two groups and each group is exposed two only one experimental condition, or the alternative option, a within-subject design, where each participant interacts with the baseline and the experimental system(s) and feedbacks on their experiences with all conditions. To facilitate a comparison between the systems prototyped for this study, the latter design was chosen. Each participant was exposed to all experimental conditions, i.e., each participant interacted with prototype U (Unfiltered images – baseline) and prototype F (Filtered images – experimental).

To control for order effects and to increase the chance that results are due to experimental treatments and conditions and impact of tasks (regardless of whether they are variables of interest or not), system rotation was applied. (Table 6-2. presents the tasks.) Task 1 and 2 were associated with the filtered set of images (the experimental prototype F), while Tasks 3 and 4 with the unfiltered baseline prototype (U). Participants were recruited into two groups A and B (participants' profiles are presented in Section 6.5.1). Those in Group A performed the tasks in the following order: the filtered set (F:T1,2) followed by the unfiltered set (U:T3,4), while those in Group B began with U:3,4 followed by F:1,2. See Table 6-4. below.

Participants	Prototype & task order	
Group A (P1 – P5)	Prototype F: tasks 1, 2	Prototype U: tasks 3, 4
Group B (P6 – P10)	Prototype U: tasks 3, 4	Prototype F: tasks 1, 2

Table 6- 4. The rotating order of tasks in Group A and B.

In this study, only rotation of prototypes was applied, while rotation of topics was not used. It is understood that some topics may be easier than others, which may potentially affect users' task performance and the results. However, this type of research design would require a significantly larger group of participants to be recruited (Kelly, 2009). Recruiting a larger number of participants was not possible for several reasons. Some image professionals did not get approval from their managers to participate in the study as they worked in busy and highly competitive environments, while others were not available for a session during the timescales defined for this experiment. To eliminate topic-related interference, the topics in each set: F and U were carefully chosen. All topics related to well-known. Each set comprised of topics related to: 1 political figure + 1 non-political figure. The tasks were equal in terms of complexity and typicality. The scenarios and task instructions applied universally to all tasks.

6.2.5 Sampling

The experimental within-subject design of this study required sampling participants into two groups equal in size. An assumption was made about the participants in both groups in terms of their characteristics, e.g., all are equally skilled in image searching and image editing. This allowed for a random assignment of participants to the study group A or B. As the potential users of the system under evaluation, image professionals working in online journalism were identified as the target population. As recommended in Borlund (2003), it was important to recruit real users (rather than proxy users) as they had the required experience and abilities to evaluate the prposition. A non-probabilistic sampling technique known as snowball sampling or referral sampling (Patton, 1990) was used to locate and recruit participants for this experiment. This type of sampling is appropriate for sampling of small number of participants for small-scale experimental studies (Robson, 2000). It is effective in reaching niche populations of professionals with a specialist set of skills, such as the image users in online journalism required in this study. However, as observed in Study I, it may also result in a biased subset of the target population. Contrary to the researcher's intentions, in Study I, this sampling technique produced a convenience sample of participants representing a single organisation (Section 4.7.3), which

could have skewed the results to the reality of and practices shared by image users from the specific news service. To avoid this effect in Study III, conscious efforts were made to locate candidates from a variety of online news providers. In the course of this investigation, the researcher had established contacts with professionals from a number of UK-based online news services (apart from the BBC). She sent an email to these contacts to spread information about the experiment within their organisation. The candidates who expressed interest in the study by responding to the email, further received the Information for Participants (Appendix D2). 10 participants of whom 5 were randomly assigned to Group A, and further 5 to Group B, were included in the final sample. Participants' profiles are presented in Section 6.5.1.

6.2.6 Ethics

An ethical approval from the University's Research Ethics Committee was obtained prior to this study on 4th April 2016 (see Appendix H4). The approval process ensured that the research was designed ethically, i.e., participants were able to make informed consent about participation prior to the study, confidentiality was ensured, and identifiable personal data were stored securely. Further, to ensure that the integrity of this experimental study was not compromised, the guidelines described in the University's ethics forms and guidance documents (City University, 2013) were strictly adhered to. The Information pack sent to potential participants included detailed information about the aim of this study, participants' role and contribution, information about timescales, research methods to be used in this project, confidentiality, data protection and storage, benefits and risks involved, withdrawal and complaint procedure were explained. The researcher also sought consent from participants to video-record the user sessions. The participants were informed about the rationale behind the video recordings as a data backup for analysis, and that the videos would capture the screen of participants' computers and their voices, but not their faces. Participants could decide whether they wanted to consent to being video or only audio recoded, and alternative data collection techniques were suggested, for example, thorough note taking, saving screen grabs of their screens. As per the University's guidelines, all personal data and raw data in any format (notes, artefacts and video recordings) collected during this study were kept securely in a locked cabinet and all computer files were password protected. The participants were assured about the importance of confidentiality in this study and told that if they required, they would be given access to recordings of their individual sessions and any contentious sections or all data would be removed from the study. They were also re-assured that there was no right or wrong way to complete the tasks, because the experiment had not been designed to test them or their skills in image selection, but aimed to evaluate the systems used in the sessions. The withdrawal procedure at any time for any reason and without being penalised was also clearly explained.

This detailed information about the study was provided to enable participants to make informed consent about participation in this experiment. Prior to the individual sessions, all participants read and signed two copies of the Consent Form (Appendix D4) created following the University Ethics Committee guidelines. The consent forms further demonstrated the Researcher's

commitment to confidentiality and data protection, and provided information about how the data would be collected, stored and disseminated. If any adjustments or exceptions were required by participants, these were noted on their consent form and adhered to by the researcher. Incentives of £40 worth vouchers were offered to participants as a way to express the gratitude for their time and contribution.

6.2.7 Pilot study

The primary aim of this pilot study was to test the initial version of the text of the scenarios, tasks, and questions in the post-test questionnaire, as well as navigability and the ease of use of the prototypes. The pilot participant was a blogger who owned and edited her own blog about celebrity news. Her role included finding and editing images for publication. The pilot participant was assigned to Group A. She first completed tasks 1 and 2 on the experimental prototype, and then tasks 3 and 4 on the baseline system.

While no major changes were introduced after the pilot, the feedback from the pilot experiment was used to make small refinements to the text of the scenarios.

6.2.8 Task-based observation sessions

Task-based observations were the main method used to establish how the proposed solution worked for the users. The observations were structured around pre-defined observational categories concerning users' behaviours and activities within the stages of the illustration task process supported by the prototypes: starting task, starting search, selecting, ending search, tailoring, ending task. These categories were developed based on the updated illustration task process as presented in Section 4.8.7, modelled on image seeking process by Conniss et al. (2000) and Ellis et al. (1993), and findings from Study I. specific to online journalism. An *observation schedule* (Appendix D8) was used in the sessions, as suggested in Pickard (2007) and Robson (2000), where the observer noted each occurrence of these categories in the order they occurred. Pickard (2007) points that while using a pre-defined list in observations helps to attend to the items in focus of the research, such a list can also be limiting. To ensure that new, unexpected activities and behaviours could be captured, the observation schedule included an item 'others'. With analysis in mind, the pre-defined observable items were also the a priori codes applied in the analysis (Section 6.3).

6.2.8.1 Protocol

Prior to the observation sessions, each participant set up the laptop with the prototypes as their working station. The participant performed the tasks in the order corresponding to the group they had been assigned to (Table 6-4.). The researcher sat next to the participant in order to have a full visibility of the laptop screen. The participants communicated when they were ready to begin the task and the researcher set up the agreed 10-minute count down for each task for time-keeping. In this study, the *spontaneous self-reporting* protocol (Kelly, 2009) was used during the sessions. It is an alternative technique to the think-aloud protocol (used in Study I.) for capturing

qualitative information about participants' thought and decision processes. While the think-aloud protocol was used in Study I, the motivations for the tasks were coming from real life and real-time tasks, the participants' need were natural and motivation for engaging in the tasks was authentic.

In Study III, the experiment was trying to stimulate authentic needs and motivations. It was felt that the think-aloud protocol would introduce an additional element of artificial experimental condition, and potentially lead to over-rationalising the decisions and actions. In the spontaneous reporting, the participants could choose when they wanted to narrate their actions, and were given post-task questionnaires immediately after each task to reflect on the tasks and the selections they made. There was time (min. 10 minutes) allocated at the end of each individual session for further discussion. This technique allowed to focus on the task and does not disturb the natural flow of activities. There was time allocated after each session for qualitative open-ended feedback on the tasks.

Additionally, 5-point Likert scales were used to collect participant's opinions related to the effectiveness and efficiency of the tested system. At the end of the session, the participants were asked so state which system they preferred and based on their experience, how different the systems were. The whole evaluation lasted 60 minutes. Images used and created by the participants were collected for visual analysis.

6.2.8.2 Mode and timing of sessions and task

Each individual session was designed to last up to 60 minutes and each participant was asked to perform 4 tasks within this time (Table 6-2.). The timing of sessions and the number of tasks were based on recommendations from the literature (e.g., Kelly, 2009), as well as on the findings from observations sessions in Study I, where participants were observed to perform up to 4 tasks in an hour and on average, a participant would take up to 10 minutes to complete a task with talk-aloud protocol (see Section 4.2.6). The task-based experiment aimed to stimulate realistic information needs, hence, realistic and typical timelines were applied. While it was important to gain as much input from participants as possible within the time allowed for sessions, asking participants to perform too many tasks would result in fatigue. This, subsequently, would lead to disengagement from tasks and result in poor quality data. Importantly, when planning the timings of sessions and number of tasks, participants' well-being was also taken into consideration. The researcher had an ethical and moral responsibility for the participants' well-being and committed herself to a *no-harm* principle (Section 6.2.6).

6.3 Data analysis and integration

The aim of the analysis was to establish the effect of the implemented image filtering on how image users selected and tailored photos for headline news content. The observations produced data sets in two formats: textual data from observations which included a record of participants' actions made by the researcher during the sessions, transcripts of the commentaries made by participants during the sessions, Likert scales ratings of users' satisfaction and preferences; and

visual data comprising of a set of images created by the participants in the sessions. In preparation for the analysis, the textual data were entered in a spreadsheet and labelled by participant no. & task ID creating individual *cases*. Images were also numbered and each linked to the appropriate case to retain the connections between the data.

The observational data were entered into a spreadsheet in the following manner:

- the data from the sessions with participants in group A were kept separately from the data obtained from group B,
- within each group, the data were entered by tasks and then by participant number, i.e., in Group A: T1: P1 – P5, and in Group B: T1: P6 – 10.

First, the data from each task were analysed separately within these two groups. This allowed for comparing of the data sets collected from the individual tasks, pairs of tasks within a single system, and then finally, across the groups, as shown in Figure 6-5.

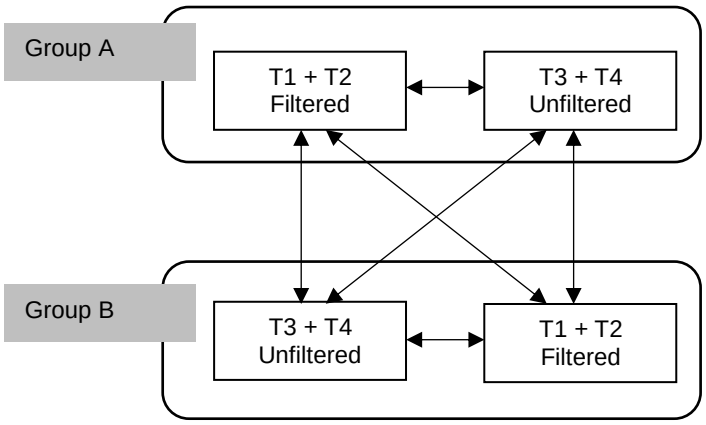


Figure 6- 5. A visual presentation of the analysis process

In the initial analysis, the observational data were coded with a priori codes corresponding to the stages and actions in the illustration task process observed in Study I. (based on previous work of Conniss et al. (2000), Ellis et al. (1993), and Markkula and Sormunen (2000)). Table 6-5. presents the coding scheme for the observed actions used in this study.

Stage in the Illustration task process (CATEGORY)	Activity (CODE)	Example of action coded (definition)
1. Starting task	Acknowledging the task Familiarising with the task (components)	Verbal acknowledgement of the particular task Verbal expression of intention to work on the particular task Reading information associated with the task
2. Staring search	Ideation (image in mind)	Mentioning (unprompted or probed) ideas, e.g., I need…, This requires…
3. Scoping (Not supported)	Selecting the strategy Selecting the source Formulating the query (re-formulating)	An intention to scope
4. Applying (Not supported)	Interacting with the IR system (capture the use of search features)	An intention to apply
5. Selecting	Browsing (through results in) thumbnails Enlarging Assessing the results Selecting an image OR Selecting a set	Browsing, scanning the results in thumbnails, Scrolling up > down Scrolling down > up (revisiting pages) Commenting on specific images Opening results to view enlarged image Selecting an image, or selecting candidate images
6. Verifying (Not supported)	Image verified for authenticity	An intention to verify the image
7. Ending search	Final selection made OR Selection not made	Final selection made and saved OR The task ended with no selection – communicated verbally, AND/OR moving on to another task
8. Tailoring	Image manipulation techniques applied	Image opened in editing software Editing techniques applied: specify: a…. b…. c…. n….
9. Ending task	Illustration created OR Illustration not created	Final selection made and saved OR The task ended with no selection – communicated verbally AND/OR moving on to another task
10. Iterating (Not supported)	Change in the process Interruptions/ distractions	An intention to carry out
11. Other	Any other activity mentioned by participants	An intention to carry out any other action

Table 6- 5. The initial coding system applied on the observational data from the experiment in Study III. Although not all steps were supported by the prototypes, they were all subject to coding.

During the coding activity, some themes emerged from the data and new codes were created to describe them. For example, a code 'LEARNING' was introduced to capture the participants' initial experience with the prototype.

New themes emerged from the analysis of users' browsing behaviour on the experimental system. While the code: BROWSING THUMBNAILS was a good *fit* for the behaviour observed on the baseline system, it was too *generic* to accurately describe the interactions on the experimental

system (filtered sets). New codes were added based on the stages of browsing proposed in Bates (2007), as follows:

4 Selecting

4.1 Browsing through results in thumbnails:

a – glimpsing a scene

b – homing on a section visually or physically

c – examining item(s) of interest: *visually inspecting details, e.g. facial expression, pose, gestures*

d – physically or conceptually acquiring or abandoning of examined item(s)

These codes allowed to capture the behaviours observed on the experimental system, and to show how different it was from the interactions with the baseline system (unfiltered images). The final coding scheme is attached in Appendix D8.

The data from the spontaneous narrative and any qualitative responses and comments made after each task and in the post-test questionnaire were transcribed for analysis. The qualitative narrative provided the reasoning for the actions and decisions made. In general, the participants made the qualitative comments in relation to a specific image or image set, a particular task or stage in the task, or one of or both systems. Therefore, it was important to maintain the link between these data and their original *cases*. Further, three a priori thematic categories: satisfaction [TIME/ EFFORT/ CHOICE], dissatisfaction [TIME/ EFFORT/ CHOICE], and preference [FILTERED / UNFILTERED set] were used to describe the qualitative comments.

Numeric data were collected from ratings of preferences, and satisfaction with time and effort invested in the task completion. These were expressed using Likert scales. The ratings were averaged and compared for the two systems. A rating above point 3 was assumed to be indicative of a positive effect.

The images collected in the experiment were copied to a MS Word document and numbered (Appendix D10). These numbers were used to link the users' qualitative comments and data from observations with appropriate images. In the initial analysis, this set of images was assessed for quality, i.e., the completeness of the set, any repeated selections, etc. (Section 6.4.2). The researcher also created counts for the visual features included in the experimental filter to establish presence/ absence of these feature, and their frequency across the set. To ensure validity of results of visual analysis, such analysis is typically performed by more than one person. For example, in studies conducted by Caple (2013), and Caple and Knox (2012), two researchers analysed the images collected from online galleries independently from each other and blind to the results of the other person involved. In this investigation, a validation survey with three image experts was designed to gain an independent expert assessment of the images. This final survey and its results are described in Section 6.7.

In order to achieve *"a coherent picture or account built of elements from a variety of data"* (Bazeley, 2018, p.93), the analysis of the data was carried out in a complementary manner. The themes, categories and issues from the observational data were complemented with the results of Likert scales ratings and those of the image analysis in the final discussion.

6.4 Data quality assessment

6.4.1 Tasks *authenticity* and task completion rate

An initial analysis of the tasks and responses was carried out with an aim to establish the quality of data obtained from this study. All participants attempted all tasks in the order appropriate to the group they had been assigned to, and all tasks were completed, i.e., each participant created a single illustration for each individual task. As a result, 40 illustrations were created and collected by the researcher for the analysis.

Image needs and motivations for searching are generated in response to work tasks (e.g., Conniss et al., 2000). In experimental conditions where participants work on pre-prepared tasks, it may be difficult to generate realistic image needs, which will affect the quality of data and findings. Therefore, conscious efforts were made to create the simulated work task situation so that it would resmble the natural one as closley as possible. To ensure that their authenticity, the tasks were constructed based on the knowledge about the real-life tasks gained in Study I. as described in Section 4.8.5.

To establish the degree of the *authenticity* of these tasks, the participants were asked to assess on a 5-point Likert scale (where 1 was equivalent to "strongly disagree", 3 – the neutral point, and 5 to "strongly agree") how similar each task was to those they would normally work on in real-life situations. Table 6-6 below shows the actual responses.

System	Task	1	2	3	4	5
Filtered	**T1**	0	0	0	3	7
	T2	0	0	0	4	6
Unfiltered	**T3**	0	0	0	4	6
	T4	0	0	0	3	7

Table 6- 6. Typicality of tasks: the number of participants for each rating on the scale, where 1 was 'strongly disagree', and 5 was 'strongly agree'.

No one graded any task below point 4 (agree). The participants agreed or strongly agreed that all four study tasks were similar to the tasks they routinely performed at work. The qualitative feedback and the scale measurement are a good indicator that the created tasks were realistic and similar to the typical illustration tasks performed by the image users in this study. This indicates that there is a reason to believe that realistic image needs and motivation for search were present in this study, which adds to the validity of the results.

The participants who assessed the tasks at point 4 (agree) were probed further for an explanation. Most participants related their assessment to the news editorial sections that they usually worked in, or to their own interests. For example, P9 usually worked on sport and entertainment more

frequently than on subjects related to politics, therefore, he marked Task 2 and 3. at point 4 on the scale. Qualitative responses provided further confirmation of typicality of the tasks. P8 agreed that the tasks were *"very typical of what I do most days"*. P2 commented on Task 1:

> "*Typical, definitely sort of content we would publish on regular basis. I've done this sort of content before*."

The participants also reacted to the instructions that came with tasks. Having read the instructions for T1, P3 said:

> "*This is good, because we see such descriptions […] That's good it says we don't have images from the event, so we… I need to look for a generic* [photo] *that isn't going to look too closely tied to another event.*"

Similarly, P2 commented on Scenario 1: "plenty to work on". Only one participant (P9) said that he would also like to have access to the actual article, which is typically possible in real-life tasks.

6.4.2 Collected artefacts

The set of artefacts collected in this study (Appendix D10.) consisted of 40 final illustrations (numbered 1- 40) created in the tasks: 20 images from the experimental (filtered) system (10 in T1: Usain Bolt, and 10 in T2: Angela Merkel), and 20 from the baseline (unfiltered) system (10 in

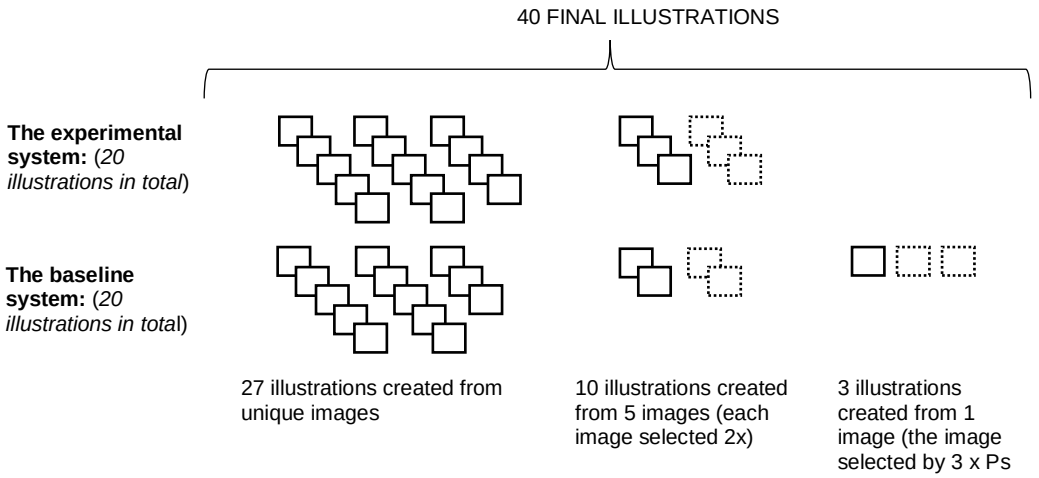


Figure 6- 6. The content of the artefact set collected in Study III.

T3: David Cameron and 10 in T4: Sophie Ellis-Bextor). These 40 illustrations were made of 33 individual photos. The discrepancy between the number of the selected images (33) and the created illustrations (40) results from *repeated* selections: 5 of the images were selected on two occasions by different participants, and 1 image was selected by 3 different participants. This is presented visually in Figure 6-6 below.

The *repeated* selections (Table 6-7) were analysed against the participants' profiles to inspect whether there was any dependency between the choices made and the participants place of employment. If identified, such a relation could indicate some trend or practice specific to a given organisation, a factor that would have to be taken into account in a further interpretation of the

data. This initial analysis showed, however, that the participants who had selected the same images worked at different news organisations, and there were not any obvious links between them, to provide an explanation to this behaviour.

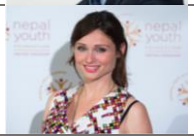
System/ Task	Selected original images	Used	Participants	
			Group A (F>U)	Group B (U>F)
F/T1		The original image (no edits) in Illustration 21; tailored in Illustration 5	P2	P1
		Tailored in Illustrations 25 and 33 **The original was not used without edits, included in the Artefact set as Image 50**	-	P7, P9
F/T2		The original image in Illustration 14, tailored in Illustration 6	P2, P4	-
U/T3		The original image in Illustration 23, tailored in Illustrations 11 and 39	P6, P3	P10
		The original image in Illustration 3, tailored in Illustration 7	P2	P1
U/T4		The original image in Illustration 4, tailored in Illustration 36	P6	P9

Table 6- 7. The repeated selections across the tasks and groups

A further analysis focused on the distribution of these participants in Groups A and B, to investigate whether the ordering of the tasks or the tasks themselves could influence their choices (the Participants in Group A. began the experiment with the filtered system, tasks T1 and T2 and moved on to the unfiltered system, T3 and T4, while Group B. began with the unfiltered baseline system: T3, T4 > T1, T2). This analysis showed that an equal number of repeated selections was made in both groups (3 in each group), and one of these selections involved three participants of whom 2 were from Group B and 1 from Group A. Further, it was also observed that although some participants selected the same images, they tailored them differently for the final effect. Figure 6-7. below shows Image 3. that was used by P6 without editing (in its original copy), but tailored when selected by P3. and P10.



Image 3. used by P6 as the “original” image, i.e., without editing



Used by P3. cropped to “cut out the person visible in the background”



Used by P10. cropped to eliminate the background

Figure 6- 7. Figure 6- 7. Image 3. was used by P6 without editing (in its original copy), but tailored when selected by P3. and P10.

Further, 12 “original” images that had been used to create the final illustrations were also included in the artefact set and numbered 41 – 52. In the analysis, these images were compared and contrasted with the final illustrations created from them, in order to identify the changes in their visual presentation resulting from editorial treatment. Table 6-8 below provides details about the original images and the corresponding illustrations, and tasks, and participants that used them.

Original image no.	Illustration no.	System/task	Participants	
			Group A (F>U)	**Group B (U>F)**
41	8	U/4	P2	-
42	12	U/4	P3	-
43	16	U/4	P4	-
44	25, 33	F/1	-	P7/ P9
45	26	F/2	-	P7
46	27	U/3	-	P7
47	28	U/4	-	P7
48	29	F/1	-	P8
49	30	F/2	-	P8
50	32	U/4	-	P8
51	37	F/1	-	P10
52	40	U/4	-	P10

Table 6- 8. Original images and the corresponding illustrations, and tasks, and participants that used them.

It was observed that 8 participants tailored at least one image. 2 participants (P1 and P5) working at different organisations did not carry out any tailoring work on the selected images.

The inspection of the selected images, complete illustrations, and the ways the images were tailored in relation to the participants’ characteristics showed that the image choices made by the participants in this experiment were based on their image needs, illustration strategies and the qualities of images provided in the prototyped systems (Filtered and Unfiltered), and were not influenced by the tasks, task ordering, or participants’ profiles.

This initial quality check posed some questions for further analysis: *why images selected from the baseline system (especially in T4) were edited more frequently? What edits were carried out on the selected images? What visual effects were achieved? Why did some participants choose not to tailor images?* Explanations to these questions are provided in sections to follow with a confidence that there was no bias related to the structure of tasks or recruitment.

6.4.3 The prototypes

On the initial interaction with the prototypes, (in Group A – Task 1, and in Group B – Task 3), an element of learning was observed: all participants familiarised themselves with the functionality of the prototype before engaging into any 'sense-making' of the results themselves. Unprompted, most participants commented: "*So, these are the search results/ the results of my search*." (P2, P3), "*When I choose an image, I can copy it over to Photoshop, correct?*" (P6), "*So, I'm choosing from these images*. *I can copy an image to Photoshop if I need to?*" (P8). P4. clicked on one of the images on page 1, and commented, *"Just checking what I can do here."* The researcher also checked if those who did not comment knew what they could do. P9., said, "Yes, I find something I like and select, then if I want to, I can copy it to Photoshop."

In the following step, the participants were observed scrolling down the pages and looking at the results. No further comments about the functionality or UI of the prototypes were made. The learning and understanding of how the prototype worked was quick, which may be a proof that the system was easy to use and intuitional. It offered typical and predictable functionality, although limited when compared with a fully-operational system. This further ensures that the image selections made in this experiment were not influenced by the design of the prototypes and the UI was not distracting the participants from working on the tasks.

6.5 Demographics of the sample and the study environment

6.5.1 Participants' profiles

10 participants took part in this project. All participants were image professionals and worked for online news services based in the UK. 2 participants worked at the BBC, 2 at the Financial Times, 1 at Haymarket, 1 at MirrorOnline, 1 at Unilad, and 2 were freelance image researchers working on contracts at an image collection sourcing journalistic images to online news providers. These Participants were randomly assigned to two groups: Group A and Group B, in the order in which they returned the signed consent form to the researcher. The final set up of both groups is presented in Table 6-9.

Group/ Prototype	Participant	Gender	Organisation	Experience in image editing in years
Group A.	**Pilot**	F	Freelance blogger	3
Group A. Prototypes: F > U	**P1**	F	Freelance*	10
	P2	F	BBC	6
	P3	M	BBC	10+
	P4	M	Financial Times	10+
	P5	F	Haymarket	10+
Group B. Prototypes: U > F	**P6**	M	Freelance*	4
	P7	F	Financial Times	10+
	P8	M	Unilad	7
	P9	M	BBC	10+
	P10	F	Mirror Online	6

*Table 6- 9. Participants' profiles * freelancers on a contract at a UK-based news provider, chose not to disclose the organisation*

6.5.2 Study environment

All the individual sessions (including the pilot session) were conducted at the participants' workplaces. This choice of the venue had several benefits for the study, as well as it was the most convenient arrangement for the participants who were busy professionals. The offices were already set up for them to work in, the natural level of noise, table set up, access to the external hardware, e.g., one participant was using a mouse, another a drawing tablet, height of chairs and tables, the environmental elements that could create an artificial situation and stress related to a testing condition, if not eliminated, were significantly reduced. Familiarity with the environment, people around, the only test like element were the tasks. This made the simulation as close to the natural one as possible. Such set up is normally difficult to achieve in experimental lab-based studies but should be aimed at because it stimulates the generation of the actual information needs (Borlund, 2003).

6.6 Results of the experiment

This section reports the results of the user evaluation of the effect that the proposed solution had on image retrieval. The measures defined for this evaluation were described in Section 6.2.3 (Table 6-3), and include: effectiveness, efficiency and system preference.

6.6.1 The indicators of improved effectiveness

The measure of effectiveness was associated with observable task completion and self-reported user satisfaction with selected images. 100% task completion rate was achieved for both the experimental and baseline systems. Users were more satisfied with selections they made from the experimental sets than with those from the baseline sets, regardless of the order in which they tested the systems (Section 6.6.1.3). The level of users' satisfaction with selections was directly related to how well their image needs were met through searching. Sections below describe the image needs that arose in response to the test tasks in the familiarising phase (Section 6.6.1.1) and in the selection phase (Section 6.6.1.2).

6.6.1.1 Image needs identified in this study

As described in Section 6.2.1 the participants in this study were given a set of 4 pre-defined illustration tasks. Constructed around the basic task components[52] (Section 4.8.5), the tasks were expected to generate authentic needs for *ready* news headline images showing specific people.

Having familiarised themselves with the scenario of a given task, the participants were observed to naturally transition into the idea generation that initiates the searching phase (Section 4.8.7). This information was deduced from the comments of the participants who spontaneously narrated their thinking processes, decisions and motives for their actions. For example, having read the scenario for T4, P1 said, "*So, it's a promotion of something that has not yet happened. It's going to be a very generic photo of her* [Sophie Ellis-Bextor]." After reading the T3 scenario, P3 defined

[52] A URL was not included as the news content was not real.

his need as follows, "*That's good it says we don't have images from the event, so I need to look for a generic that isn't going to look too closely tied to another event*." This type of generic needs had been observed earlier in Study I. and based on the faceted model of image needs proposed by Westman (2009 p.70), can be described as *semi-specific* and *clear* (Section 4.8.6.4).

At this stage, most participants had some visual representation of the images they needed. This was expected and corresponds to the findings from earlier studies with image users, e.g., Frost (2001), Greisdorf and O'Connor (2002), including the findings from Study I. in this investigation (Section 4.8.6.4). P3 explained that it was natural for him to begin a task with an *image in mind* and referring to an image frame in the homepage template, he said, *"That's how we work […] we see a gap and we fill the gap with an image. I'd always take a few seconds to think what I imagine would look good in that gap."*

Other participants also provided some description of the image they would be looking for. Having read T2, P1 said, *"I'm already thinking of pictures; some pictures are coming to my mind. I'm thinking of Merkel looking apprehensive, not smiling."* In T1, most participants seemed to pick up on the phrase in the headline: *"left in cold",* and a need for images of Angela Merkel looking serious was common across the sample. P10 said, "*I want her to look grumpy and 'left in the cold'*". P2 commented, "*I'm looking for sort of "matter of fact" but not too grumpy, not mid-speech*". In T1 (Usain Bolt), the image users expressed a need for images showing the athlete as "*victorious and fun*" (P8, similarly, P2, P3, P9). In T3 (David Cameron), the wording: *"modern and compassionate"* generated a need for images of the PM looking "*adamant, trying to be in control, stiff-lipped* "(P2 and similarly P1), and *"looking compassionate"* (P10). P8 said, *"The sort of standard image of him jumps to my mind here. He is sort of talking, clenched fists."*

In this Study, it was observed that the mood (e.g., serious in T2 and T3, entertainment and fun in T1 and T4) decoded from the headline and synopsis played an important role in the initial shaping of the image needs, and a majority of the image users appeared to need images that would convey the mood of the story. P9 partly explained this, *"politicians have a particular message to communicate and the same message should be communicated in the image. The image should not undermine what they* [the politicians] *said*". Although, fewer explicit references to the mood had been made, this type of presentation of the specific person had been observed in Study I, too.

Earlier Machin and Polzer (2015) also suggested that it was typical for the headline image in print newspapers to use images of specific people in this non-literal, symbolic manner. For example, a large public event would be typically represented by a close-up of a known person. Their facial expression would communicate the mood of the news content. Conniss et al. (2000, p.107) referred to such assessment criteria as *image tone*. A somewhat exception to this practice was P7 who, while working on T3, said, *"Modern and compassionate, these words caught my attention and I'll be looking for something "opposite" to what he* [Cameron] *says."* She believed an image contrasting with the headline would draw more attention from readers. This instance showed that image choices could be influenced by the views promoted by the news service that the image

user worked at, previously mentioned in Markkula and Sormunen (2000). N.B. this difference in the practice was not observed in Study I, where all participants but one, were sampled from a single organisation.

At this point in the task, the participants were referring to the visual effects that they wanted to achieve in the illustrations. Needs for visually engaging images that would *create drama*, *catch* [viewers'] *attention* were typically expressed. Such needs for eye-catching, attractive, vibrant images had also been observed in studies with print journalists, e.g., Markkula and Sormunen (2000) and Westman and Oittinen (2006). In the former study, the authors concluded that the descriptions referred to aesthetics and were too subjective to be further investigated. However, Machin and Polzer (2015) rightly pointed to the fact that such descriptions refer to the final visual effects in images and therefore are insufficient in detail from the perspective of studies, such as this investigation, that aim to understand what exact visual features create the required effects.

Some participants provided detailed descriptions of the 'images in their minds', which included direct references to syntactic image features, e.g., the type of photographic shot, the type of and colours in the background, largeness of the object in the frame.

> P9 *"So immediately before I even look at them all, I'm thinking something that is close, like head and shoulders because it's an interview, and you're learning something about her. As if you're looking at her and she is telling you something."*
>
> P4 *"Head and shoulders picture of Usain Bolt with a flag behind him, doing his poses, smiling. That'd be what I'm after."*
>
> P3 *"I already have an image in mind, Him celebrating with a flag over his shoulders. I want something that is pretty full frame".*
>
> P3 *"My initial thought is that I want a picture of Angela Markel slightly too closely cropped because it creates drama. I want her to look serious, looking down because it suggests she's under pressure as opposed to looking up where she would look victorious or hopeful. That's the image I'll be looking for".*
>
> P3 *"Cameron looking slightly troubled, not with the UK flag. I'll be looking for blue background because he is conservative."*

The pre-defined tasks enabled the participants to generate image ideas in a way that closely resembled the *starting search* phase in Conniss et al.'s model (Conniss et al., 2000) and the activities observed in the natural tasks in-situ in Study I. of this PhD investigation (Section 4.8.7.2).

The needs generated through the pre-defined tasks corresponded to the natural needs of image users who carried out real-life illustration tasks in situ in Study I. described in Section 4.8.6.4. The characteristics of the observed image needs in terms of the type (semi-specific and clear), the final effect (eye-catching) and image features (see: the Examples above) were shared across the sample, although the participants in this Study worked at different online news services (e.g., BBC, FT, Haymarket, Mirror, Unilad). This increases the confidence in the authenticity of the pre-

defined tasks and subsequently, the authenticity of the resulting needs. The latter, according to Borlund (2003), are a necessary element of the *simulated work task situation* that ensures validity of an experiment.

Furthermore, all participants appeared to be able to interpret the tasks in a similar way in respect to the mood conveyed in the text: the headlines and the synopsis. The participants' narrative had a sufficient depth to reveal the relationship between the subject (specific person) and the mood of the news story and the needs for a ready but *eye-catching* image of the specific person identified as the subject of the news content. Machin and Polzer (2015), refer to this use of images as non-literal, symbolic portrait. In the taxonomy of image functions proposed by Marsh and White (2003), such images have little relation to the text but engage the viewers' attention and direct them to the content they are published with. While these findings fall beyond the scope of this investigation, they further confirm that image users in online journalism have a good understanding of image functions and how images serve these functions, and that the type of image emerging from this investigation is a type *recognised* in the literature.

6.6.1.2 Image selection criteria in regard to visual features

A further analysis of the data focused directly on the selection criteria applied by the participants in this experiment. A priori codes based on the findings from Study I. were applied in the analysis. It was found that the image selection criteria identified in Study III. corresponded well to those that emerged from the observations in situ in Study I. (Section 4.8.8.2). One-person shots were preferred and this one person had to be the specific person (related to the task). Images showing more people in the foreground or in the background were dismissed as irrelevant. All participants expressed their dissatisfaction with very few 'single shots' to choose from in the unfiltered sets in T3 and T4. For example, P3 said: "*I just need to find a nice single shot of her* [Sophie Ellis-Bextor], *a nice close-up photo.*" In one instance in T3, P5 selected an image of two people as she claimed that both people were relevant to the news content. This behaviour was similar to Image 22 in Study I. where two people Beyonce and Jay-Z were considered as subject of the news article and both were included in the image, and Image 8 promoting the premier league matches where four key players were placed in a composite image (Section 4.8.9.1c).

Images with a neutral background were looked for and selected. There was also a general disatisfaction with too many photos that had *fully-conceived* (realistic) backgrounds that *"would confuse the narrative"* (P4). While selecting images in T4, P8 commented, *"Background is busy. This one is nice but you have the signage behind her and it's obvious where she is."* Having completed T3, P9. commented, *"I was trying to find something neutral enough, it's the background obviously. If it depicts him in a particular place there is an implication that it's happened there*". P3 said, "*Something like that would work well. Cameras showing press activity behind him but it's neutral enough and he is still in focus*". Generally, a blurry unrecognisable background was considered as neutral, but so were backgrounds showing locations "usual" for the specific person in the image. For example, 10 Downing Street (the door, building) were perceived as "almost generic" for the Prime Minister. P9 said, "*He* [PM] *is there every day, so it's quite neutral*."

Removing *irrelevant* people from the frame by cropping the image, or isolating the *relevant* person from the original background, was applied to neutralise images [P2]. In T1, images with a flag in the background were considered for selection by some participants. A flag is a powerful symbolic element that evokes emotions and memories in viewers (Davis, 1992) and additionally, when spread behind the person in the image creates a *neutral* background (covers elements that could cotextualise the image to any specific event). P3 explained, *"*[a] *flag would make a neutral background as it does not show a lot of detail otherwise*."

Profile and enface shots were selected by different participants across the tasks. *P3 said, "I'll go for this one becasue it's an action shot his hands are in the right position, he looks celebratory, and he is facing the right direction. You can see the relief and pride."* While others chose images were the person was facing the camera. Similarly, both, images including direct and side gaze were selected. P9 commneted on his selection in T3, "*He looks like he is telling something, he is looking straight into the camera, so he's delivering a message*". P2 on the other hand preferred side gaze: "*There are quite a few where he is looking away. I wouldn't have to do much to any of these images.*"

Colours were important in the selection process, and as in Study I, images with saturated and soft colours were selected for different reasons. Most references to saturated colours were made in T1 and T4. In T1, images with bright colours were looked for to illustrate the sport news content and convey the feeling of *victory*. Similarly, the entertainment genre in T4 was associated with vibrant colours. In contrast, in T2 and T3, images with "natural", "pale", and "cold" colours were selected to reflect the serious mood (tone) of the news content. When selecting the image of Angela Merkel in T2, P9 explained, "*she is outside in the cold, a pervasive look into the future*." Some of the selections in T2 are presented in Figure 6-8.



Figure 6- 8. Selections made in T2 by P1, P5, and P9.

The largeness of the object in the frame was important. Some participants specifically metioned that they wanted images were the object would be filling in the frame, while rejecting images where the object was too small. P1 when selecting an image in T4, commented: "She is too small in there", similarly, in T4, P8 said: "She is quite small in the frame", and P9 said, "OK, that's too far away". P3. explained that having a large object in the frame is a technique to create drama, and also images showing large objects work well on small devices. This was a shared preference demonstrated in the choices of head and shoulder shots. In this study, central positioning was preferred. The technical quality and sharpness were also frequently mentioned as important in the real-life selection, and the poor quality of images used in the prototypes was noticed (the loss

in quality was a result of the copying and pasting process applied when the prototypes were constructed).

Finally, from the unfiltered set, images that could be easily tailored were selected. There was a preference for a single person shots. If those were unavailable, then shots of the person with other people had to be considered. Those that were selected showed the person unclustered with others for easy tailoring (e.g., cropping the image around the relevant person or isoltaing the person from the image).

The selection criteria identified in this study correspond closely to those that emerged from the real-life observations in situ (c.f. Section 4.8.8.2). This adds to the validity and soundness of these findings, and further shows there are clear trends in how images are selected for the function of the dominant image in online journalism.

6.6.1.3 Higher satisfaction with selections made from the experimental system

When selecting images from the experimental sets, the participants (regardless of system ordering), expressed a general satisfaction with the choices their were offered. Some (P7, P9) commented unprompted that these sets included more images than the unfiltered sets. For example, referring to the filtered sets, P9 commented in the post-test questionnaire that she had "*more images to choose from, I felt*" (P9). P5 said that she encountered no challenges when selecting images from the filtered sets. On the other hand, the baseline sets were perceived as containing *'too many not relevant'* (P10) images, and some participants expressed their frustration with the choices available saying that the choice was limited, P6 said that she felt there were fewer images to choose from. Referring to Task 4, P9 said that *"there was such a limited choice. This was the only obvious choice available and no, I'm not satisfied"*.

In the post-task questionnaire, the participants responded to the following statement: "*I am satisfied with the selection I've made in this task*." by rating their satisfaction on a 5-point Likert scale where 1 was strongly disagree, 3 was a neutral point, and 5 was strongly agree with the statement. The collated rating revealed that overall there was a lower satisfaction with selections made from the baseline system, where five participants rated their satisfaction at point 3 (four participants) and one participant was strongly dissatisfied with the selection that she had made. P1 in T4 said, "*I'm choosing this one it isn't ideal. It isn't close enough* [referring to the photographic shot]." P7 pointed to an image in T3 and said, "*this one is the only one that is vaguely relevant*." In contrast, the satisfaction with selections made from the experimental sets was rated at points 4 and 5. Figure 6-9 provides the summary of the results mapped on the Likert scale (all individual ratings are provided in Appendix D9).

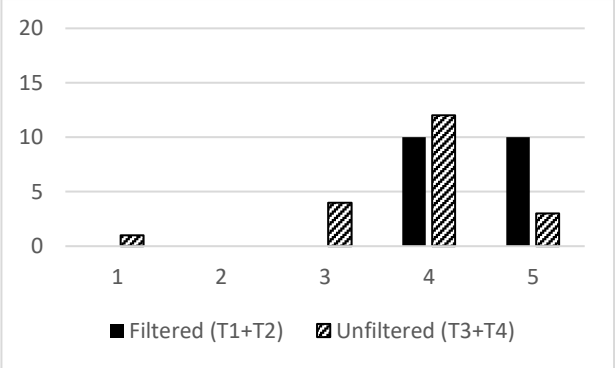


Figure 6- 9 Satisfaction with the selection made from Filtered and Unfiltered sets (1 – strongly disagree and 5 – strongly agree)

A lower satisfaction with the selection was also related to the extent of tailoring necessary for completion of the task. The participants who did not tailor images were generally more satisfied with the images they selected. P5. said, "*No, this is it. I don't think I have to do anything more*". Having selected an image in T2, P3 commented: "*I'd have it exactly as it is it's a perfect crop for what I want.*" Other comments were: "*I'm happy with this image/ with my choice*." Therefore, the extent of tailoring and the final effects were inspected in relation to the type of system (filtered vs. unfiltered) and ordering of the tasks.

6.6.2 The indicators of improved efficiency

In this study, the measure of efficiency was associated with the observed number of steps (actions) in the illustration task process, combined with self-reported user satisfaction with the perceived time and perceived effort invested in the task. User actions (type of, number of, order of actions) carried out to complete the tasks using images selected from the experimental system were compared to the steps taken when completing tasks with the baseline system (Section 6.6.2.1). The comparison resulted in observable evidence in favour of the proposed solution under evaluation. Users were more satisfied with time and effort they invested in the tasks carried out using the experimental system than with those using the baseline system, regardless of the order in which they tested the systems (Section 6.6.2.2).

6.6.2.1 The observed effect of the implemented criteria on users' behaviour

a. The observed effect on users' browsing behaviour

As defined in Study I. (and in the earlier study by Conniss et al. 2000) *Selecting* phase begins when the image user is presented with the search results and engages into browsing of the retrieved images, in order to make a selection. The typical observable actions include: browsing the results in thumbnails, navigating through the search result pages (e.g., scrolling), visually inspecting retrieved images by looking at them, enlarging, reading captions (Hung, 2005, 2012), while the cognitive processes involved in these actions include: the assessment of the results and applying relevance criteria, weighting the criteria and if necessary, compromising image needs, if necessary (Conniss et al., 2000). The participants in this study were selecting images from two

systems: the experimental system F (Filtered images), and the baseline system U (Unfiltered images). The analysis of their actions aimed to identify differences and similarities in relation to the tasks (T) and systems, as well as to task ordering. As noted in Section 6.4.3, in the initial tasks (in Group A – T1), and in Group B –T3), an element of learning was observed, before the participants engaged into the *'sense-making'* of the search results. When presented with the initial prototype, they usually tried to assess the available functionality, for example, P1 said "S*o, I can select an image from here and then I can copy it to Photoshop, right?"* P9 clicked on one of the images on page 1, and commented, *"Just checking what I can do",* while P7 commented that it would be good if she could also enlarge the images to see more of the detail. The researcher also checked if those who did not comment unprompted knew what they could do. P3., said, *"Absolutely obvious, I find something I like and select, then if I want to, I can copy it to Photoshop."* The briefness of the observed learning and the fact that no other comments regarding the functionality or design of the prototypes were made in the sessions gave the researcher confidence to believe that the prototypes were intuitive and easy to use and their functionality and UI design did not distract the participants from performing the tasks. In the following step, the participants were observed scrolling down the pages to make selections.

The participants behaved differently when selecting from the experimental (F), and from the baseline (U) systems. A slight difference was also observed between T1 and T2 within the F system, but not between T3 and T4 in the U system. There were no differences observed in how selections were made resulting from the system ordering. However, it was observed that the participants in Group A. (F > U), expressed more negative comments about the unfiltered image sets in T3 and T4., and made more comparative comments in favour of the filtered image sets. Figure 6-10 shows the common differences between the interaction with the experimental (F) system and the user activity on the baseline (U) system.

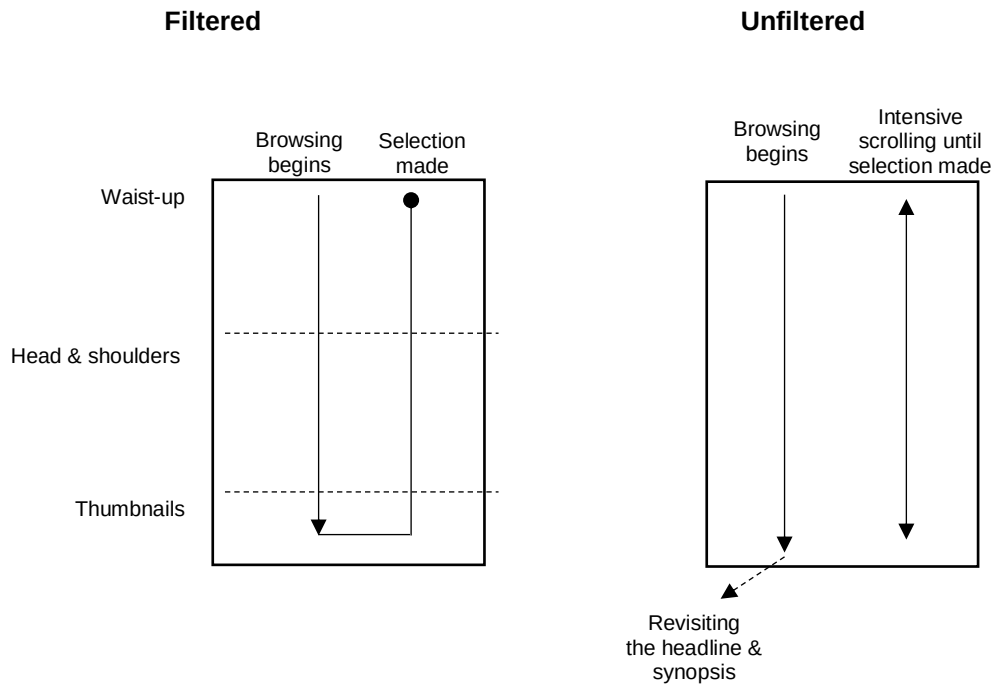


Figure 6- 10 The observed user behaviour when browsing the filtered (left) and unfiltered (right) sets.

When presented with the unfiltered results in the baseline prototype (U), the participants began browsing by filtering out the irrelevant results and trying to locate the images they considered relevant. From the onset, the participants commented on the many irrelevant images included in the unfiltered sets. Referring to the results on page 1 in T3 (U), showing David Cameron on holidays, all participants agreed these images were *unsuitable* and *too casual*. P1 commented, "*obviously these are completely inappropriate. Nothing to do with the article*." Images that included other people who were not mentioned in the news story, or were taken at identifiable locations, or at identifiable events were referred to as *"too specific"*. For example, P3 said, "*His wife is not part of the story…. These are from some specific meeting and these people are irrelevant*." When presented with the results in T4, P1 commented, "*Again very specific photos… from some promotional event. These are from her album promotion, I think…none of these, she is too small here*", and P7 said, "*all these* [photos] *are particular to some event, pictures showing her with someone else are not relevant*". Photographs showed too strong ties with the original context were generally considered irrelevant.

The activity of locating of the relevant images involved an assessment of the image background. P8 explained, *"I'm not even looking at her* [Sophie Ellis-Bextor, T4]. *I'm looking at the background, at what is behind her"*, and so did P2, *"I don't know what these balloons are for. I worry about what is in the background"*. P9 when carrying out T4., narrated:

> *"OK that's too far away, so I won't have any of those, that's a party, so I won't have any of those, that's her and her husband. Hmmm…"* [pause, scrolling back up and down again] *"I'll probably go for this one, the only one zoomed in, I don't want to cut any of these. This one is a nice pose but I'm looking at the background. It'd be pain to cut it out because of the contrast whereas this one is pretty easy".*

They were looking with an *editor's eye* on the results to identify images that would be easy to tailor. P3 said, *"If I can't find an image I want, I'll need to pick up a red carpet image and remove the background completely. That* [points to an image]. *But I wouldn't want the background because I don't know what the W is for. The pose is really great. I'd have to isolate* [cut out] *her from there".* Not being able to find an image matching her needs, P2 was trying to select one that could be easily tailored to her needs: "*I want something smily but not too close to anyone so I can crop her out on her own. It'd be easier if there was a nice head and shoulders shot of her."*

The participants described the images available in T4 as *"typical celebrity shots"* from parties, specific events, and showing the person of interest with other people. These features made the images "*too specific*" to be re-used easily. Therefore, there was much debating of how to tailor these images by e.g., cropping, isolating the person from the original background. For example, P8 said, *"This one might work if we cropped her here. I'm just looking how to crop it. Something like this would be really nice but here is stuff going on behind her, which is distracting".* All participants were observed to scroll down to the last page and back to the top several times. P7 scrolled quickly to look only at images that showed head and shoulders shots.

The intensive scrolling and the feeling of frustration at the many irrelevant results in the unfiltered system were reminiscent of those observed in Study I. (Section 4.8.7.5), as well as described in earlier studies e.g., Beaudoin (2009). This did not come as surprise, because the baseline prototype simulated the functionality of a typical commercial system, in terms of the results, ordering, and the layout. Frustration with the irrelevant results was particularly clearly expressed by participants in Group A, who had first interacted with the filtered sets. When presented with images in T3., P1. commented, *"This is a hard one, these images are too specific. Maybe this one but there is someone in the background. We don't normally edit news images. I'm finding this one [selection] difficult, the images are too specific".* P1 made similar comments in T4. When probed about what in her view made images *"specific"*, she explained, "*the background, the places, events. It's only about her* [Sophie Ellis-Bextor] *so other people are irrelevant and distracting.*"

Some intensive scrolling from top to the last page of the prototype was observed. The participants scrolled between the pages to revisit images that had caught their attention and compare which one would be the more suitable choice. Although a staged selection had been observed in Study I and in previous studies (e.g., Markkula and Sormunen, 2000; Westman and Oittinen, 2006), in this experiment, the participants did not save candidate images. Such activity could eliminate the additional scrolling for comparison but the participants did not show intention to pre-save images. The reason could be the testing condition, the limited functionality of the prototype, and a small image set. This behaviour was not followed up in this study. Further, two participants (P1, P9) stopped the browsing to re-read the headline and synopsis in T3. P1 found an image she thought would be a potential choice but she was not sure whether there was any location mentioned in the news story.

The so-far described findings have revealed that while all participants managed to choose images from the baseline system, they often felt that their choices were "*the only obvious choice available*" (P9). The participants were referring to images in the unfiltered sets as *irrelevant, inapproriate*, and *too specific*. Generally, images that were regarded as not relevant were those that showed the specific person (at the centre of the task) in a company of other people not mentioned in the news content, in a location that could be identifiable, or could hint on a specific event. A considerable level of frustration with the many irrelevant results was observed. This feeling was expressed more strongly by participants in Group A who had already interacted with the filtered system (F). When browsing through the unfiltered results, the participants were observed selecting images that only partly matched their original needs and with an intention to tailor them in Photoshop to these needs.

The browsing behaviour observed on the filtered system differed considerably from the interactions on the unfiltered system described above (Figure 6-10). From the initial comments made by the participants, it was clear that the first *glimpse* of the results in T1 and T2. gave the participants confidence that they were presented with topically relevant images and other assessment criteria could be immediately put into work. From the beginning, the participants

commented: *"I'm looking at the face, clear features. She looks sort of dismissive"* (P2). When he saw the search result pages for T1 (Usain Bolt), P8 immediately commented: "*OK. I'm already looking at his expression, a celebratory expression on his face*". Similarly other participants were able to engage in the scanning of images for detail. P4 said that he was looking at "*the shape of his* [Usain Bolt's] *mouth, direction of his eyes, and a tilt of his head*." Others mentioned looking for "*a victorious facial expression, no mid-speech open mouth*" at a very beginning of the selection process. Working slowly down the pages, they inspected nearly every image in detail. While browsing, P1 was commenting on the images: "*He looks happy here. This one is rather boring, not as nice as the other one, predictable.*" P4 was assessing the facial features of Usain Bolt: "*This is quite nice, these two – his eyes look a bit "mental", here you can't recognise the detail in his face*". In T2, P3 immediately moved on into the selection on the level of detail and, unprompted, he was describing the images he was looking at:

> *"So, in this one, she looks up.* [Pointing to another image] *In this one, she looks defeated. This would work quite well.* [Pointing to another image] *She is quite straight-faced here.* [Pointing to another image] *That's too aggressive.* [Pointing to another image] *This one looks too vague, her whole body-language…. Her gesture, her face is quite neutral: you're saying I'm in trouble, but I'm fine. She looks quite in control actually.* [Pointing to another image] *whereas in this one she looks quite sinister, she looks angry.* [Pointing to another image] *That's disappointed school teacher's face.* [Pointing to another image] *In this one she looks confident,* [Pointing to another image] *this one she looks a bit down, a bit bitten."*

Typically, selections were made quickly, and usually on the "way back" to the top of the prototype. P1 said "*I think this one but I'll look at these, too*." She scrolled down to the first row of thumbnails and swiftly back up to the image that had first caught her attention, and she made the selection. Judging by the comments they made about the images in the filtered systme, the participants were able to immediately immerse deeply in the search activity and focus on the depicted person's facial expression, gaze, profile versus enface shot, posture, gestures and hands positioning. The in-depth inspection of the images and slow movements, contrasted with the intensive repetitive scrolling across the pages observed in tasks carried out on the baseline prototype, where the initial activity was filtering and submersing the irrelevancies to locate the relevant images. In the post-test questionnaire, P1 said that when selecting images from the experimental sets, she

"*could focus on the colours, face, and facial expression"*. In these sets the selections were made quickly.

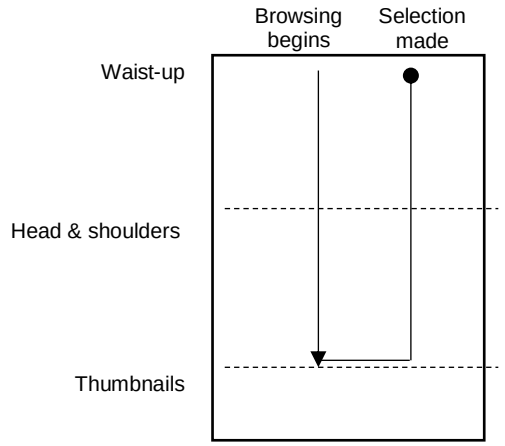


Figure 6- 11 Typical users' behaviour in Task 2., the participants did not scroll down

Interestingly, in Task 2., the participant did not go to inspect thumbnail images. When they scrolled down to the page with thumbnails, they typically began scrolling up again. Unprompted, P2 explained, "these are too closely cropped for how we are going to use the image". Figure 6-11 illustrates this behaviour. This indicated that the way the images were sorted in the filtered system (from waist up to extreme close-up photos as used in thumbnail images) was understood by the participants from the initial browsing activity in T1. and carried over to T2. Unprompted, P2 explained, "*These are all quite closely cropped, probably we want sort of head and shoulders, so I'll go back up*." The 'head and shoulders' shot was the typical shot mentioned by the participants in the ideation phase and in the selecting phase. This agrees with the findings of Study I. which show that extreme close-up photos of specific people are not used in the headline news image function. These close-ups are, however, effectively used as thumbnails on news websites and serve as "*graphical summaries of the articles*" (Knox, 2007b; Woodruff et al. 2001). P9 commented, "*these are naturally too close. He is an athlete, so you want to put his body*." Only P3 had the idea of a closely cropped image of Angela Merkel in T2 and briefly looked at the thumbnail images. He said, "even with a tightly cropped image and a facial expression you can tell much" but he selected a head and shoulders shot of Merkel. In the experimental system, the thumbnail images seemed to be the cut off point for browsing and allowed the participants to concentrate on the results closer to the top. In unfiltered results sets there was no obvious sorting of images applied, and the scrolling and browsing was carried out across all the available results, which required more effort and time. Generally, the participants were satisfied with the selections they made from the filtered sets and these selections required little editorial work. Editing was mentioned only in the context of how the image (from the filtered set) would fit into the frame of the template the participants would normally use.

To sum up, the participants' interactions with the experimental system showed that the filtering allowed them to immerse in browsing at a level of greater detail skipping the step in which users

would need to filter relevant results by supressing the irrelevant ones. This visibly eliminated the feeling of frustration with irrelevancies observed in T3 and T4. Provided with topically relevant results, the participants were able to immediately apply other complementary selection criteria to assess the search results.

b. The observed effect on the intensity of image tailoring

20 illustrations were created through tailoring in PhotoShop (PS) software. The final illustrations are shown in Table 6-10. Twelve of these illustrations were selected from the baseline system, while 8 from the experimental system. A closer inspection of the collected data showed that in the filtered sets: 30% of the images of Angela Merkel and 50% of the images of Usain Bolt were edited. In the unfiltered set, 40% of the images of David Cameron and Sophie 80% were edited. Figure 6-12. shows these differences.

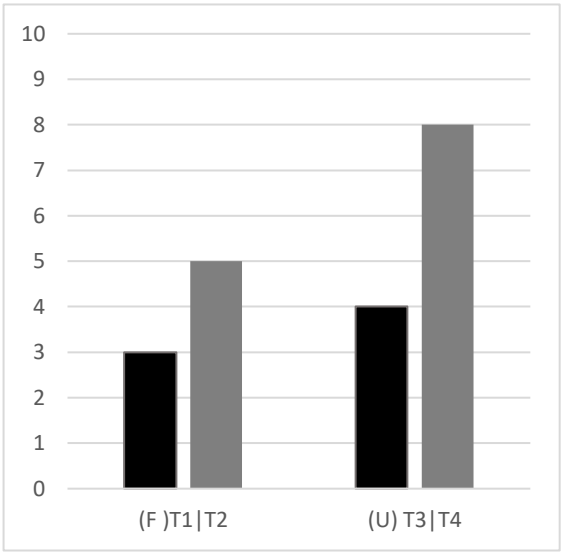


Figure 6- 12 In the filtered sets: 30% of the images in T2 and 50% of the images in T1 were edited. In the unfiltered set, 40% of the images T3 and 80% in T4 were edited.

This result corresponded to the general expectation that images selected from the unfiltered sets would require tailoring while those from the pre-filtered sets could be used with minimum or no editorial intervention. Therefore, in its next step, the analysis focused on the types of editorial techniques applied to the images and the final effects achieved through tailoring. The complete Artefact set (Section 6.4.2): the final illustrations (1-40) and the original images (41-52) were visually inspected and compared. The results showed that the editorial treatment applied to the 12 images from the baseline system was much more radical when compared to the edits applied to the images sourced from the experimental system.

In the experimental system (F), cropping was the only technique applied to images and it was carried out for the following reasons:

- to “keep subject full in frame” positioning of the person to the centre or right,
- to change the shape of the image to fit the usual template (e.g. Figure 6-13),
- to remove elements of background for a single focal point.



Figure 6- 13 The image of Usain Bolt in the frame that P10 normally worked with

While only small editorial work, e.g., fitting them to the frame, was performed on the images selected from the system F, a more radical tailoring was carried out on the images selected from the baseline system U. The following techniques were typically applied to change the presentation of images in the unfiltered sets: cropping and/or blurring of the background or removing of the background. Cropping was carried out with an aim to achieve one or more of the following effects in a single image:

- remove other people from the image,
- remove elements of background for a single focal point,
- change the shot from below waist to waist up (including two-button shot),
- change the shape of the image to fit the usual template.

Blurring of the background or removing of the background altogether were performed to *decontextualise* images (neutralise the settings) from the original context that the images had been taken at. In T4, P3 initially expressed an intention to *isolate* the person [Sophie Ellis-Bextor] from the original background but decided that this would take him too long and instead resorted to cropping and blurring of the background.

Table 6-10. below provides examples of 6 of the original images, the final illustrations made from them, and the details of the editorial techniques applied to achieve the final effect.

System	Selected image	Final image	Editorial treatment
F/T1			**Cropped** to fit in the template shape
F/T2			**Cropped** to fit to the template shape and remove objects from the background for a single focal point
U/T3			**Cropped** to eliminate other people visible in the background
U/T4			**Cropped** to eliminate other people visible in the background, and to change the type of shot **Background blurred** to further remove elements of the original context: objects and/or people
			
			**Removing background** isolating the person from the background to decontextualise

Table 6- 10. Examples of image tailoring and the achieved visual effects

The final analysis showed that typically images after tailoring showed one specific (identifiable) person (F1) in the foreground (F2), their face visible: frontal or profile shot (F3) and in focus (F11). All images were colour images (F4), the person in the image was presented in a waist-up shot (F3), positioned centrally or to the right within the frame (F7), and on either a blurry or monotone background (F10). These findings have been corroborated in a survey carried out in Survey 3. (Section 6.7) in which three independent image experts visually inspected the artefacts (Table 6-11) collected in this experiment.

	Participants testing in Filtered > Unfiltered order					Participants testing in Unfiltered > Filtered order				
Task	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
T1										
T2										
T3										
T4										

Table 6- 11. All (40) final illustrations created in Study III.

6.6.2.2 Users' self-reported satisfaction and preferences for the experimental system

a. Higher satisfaction with the perceived time and effort spent on tasks performed on the experimental system

All participants completed the tasks within the given time limit of 10 minutes. The real task completion time was not measured in this study because participants were involved in a narrative process. Some participants intensively narrated their actions, others would stop interacting with the image sets to spontaneously express their opinions about some particular images and the choices they had. Hence, the satisfaction with the perceived time spent on the task was rated rather than the actual time-on-task. In the post-task questionnaire, the participants were asked to rate their experience by agreeing or disagreeing the folowing statement: "*I am satisfied with the amount of time it took me to complete this task.*" A 5-point Likert scale was used for this rating, where 1 was strongly disagree, 3 was the neutral point and 5 was strongly agree with the statement. On average a higher satisfaction (Figure 6-14) was expressed for the tasks performed on the experimental system regardless of the task ordering.

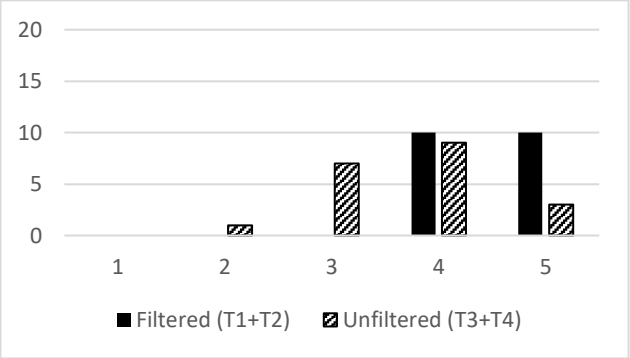


Figure 6- 14. Satisfaction with the time invested in the tasks in Filtered and Unfiltered sets (1 – strongly disagree and 5 – strongly agree)

Further, participants rated their satisfaction with the perceived effort, a measure associated with efficiency. The statement used for this rating was: "*I am satisfied with the amount of effort it took me to complete the task*." A 5-point Likert scale was used, where 1 was strongly disagree, 3 was the neutral point and 5 was strongly agree with the statement. The overall ratings showed that the satisfaction with the perceived effort invested in tasks was higher for the experimental image system (Tasks 1 and 2), than for the baseline system (Tasks 3 and 4). This is shown in Figure 6-15.

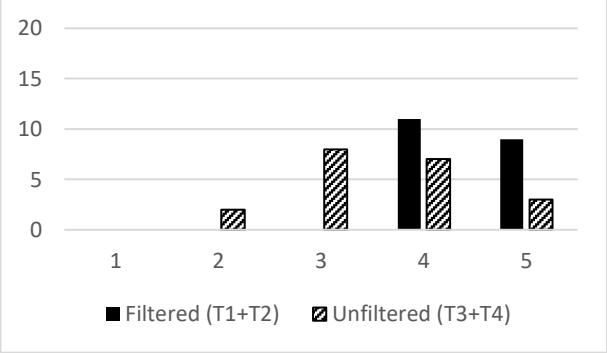


Figure 6- 15. Satisfaction with the effort invested in the task completion in Filtered and Unfiltered sets (1 – strongly disagree and 5 – strongly agree)

Satisfaction with the baseline system was significantly lower, and directly related to the extent of the editorial work carried out on the images.

These results showed that the participants expressed a higher satisfaction with the experimental system regarding perceived time and effort, which can be interpreted as a positive effect of the filtering on the efficiency of image retrieval as perceived by the image users.

6.6.3 Users' preference for the experimental system that offered relevant images

In the post-test questionnaire, the participants were asked to compare the systems and image choices they were offered in the tasks. The participants commented in favour of the experimental prototype providing a variety of arguments. One of them was having more relevant images to choose from was. For example, when asked what he thought about sets in T1 and T2, P1 said, "*felt more choice*". P10 said "*in T2 there were more images, you could go on and on*". P7 said that "*These two* (T1 and T2) *offered more relevant images to choose from, while the other two sets included more images that were irrelevant to the articles. It was difficult to illustrate those two stories. It felt there was bigger selection of pictures for these two* [tasks] (T1 and T2)." The perceived larger choice of relevant images also gave an impression that there was a larger number of images included in the experimental sets. In relation to T2, P9 asked, "*There was more [photos] in that one, wasn't there? More to select from... There were just more to look at. Yes, it felt like that … It looked tidier, too."* Further, P9 said that the experience on the filtered sets reminded him of when he used to edit *sets* for [print] magazines and to select images for re-use from syndicated[53] content or commissioned photo shoots. He explained, "*So, basically, you know, someone from, say, Coronation Street gets pictures taken for the front [page], and they pick up the four they like to use, and we get to picksome from the rest of them, so we want to pick as many of the nice ones as you can, you know, and you end up looking at something like that*." This comment implied that the filtered system provided direct access to relevant images and allowed the image users' to focus on the detail to make the best selection. However, it also pointed to the

[53] Syndicated – pre-selected content purchased for use by a newspaper or another media company, syndicated content is produced by an outside source.

fact that many of the images in the experimental sets had been taken at one event and were visually very similar. Figure 6-16. shows a snapshot of the result page of prototype for T2.

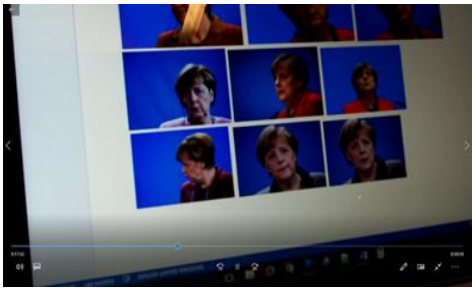


Figure 6- 16. A screenshot from the session with P2. searching for an image of Angela Merkel and commenting on how similar the images were

This problem was mentioned by two other participants. Referring to images in T2 (Angela Merkel), P2 explicitly said that *"a lot of them are very similar so it'd be easy to get lost in them and not make a decision."* This echoes the concept of the *choice paradox* introduced by Schwartz (2005) who claims that too many choices may lead to inability to choose. Therefore, other ways of sorting and presenting of the returned images must be researched to suport effective selection making. P10 also thought that there were more choices in the pre-filtered sets but suggested that she would like images from the same event to be grouped together: *"all images from the same event, and if they fit into this "special portrait", could be sort of grouped, sort of… you'd see one image, maybe the best one… I don't know… basically, you'd see one of these images and then you could decide if you'd like to see the rest* [in the group]. *Maybe this way you could get to browse through many more images*."

Some participants related their preference for the filtered sets to the fact that the selected images required less or no editing. For example, P9 said, "[There were] *quite a few choices for Merkel. I didn't have to edit these* [Merkel and Bolt]. *These were quite good shots as they were. It was difficult for Cameron."* P3 commented, "*The hardest one was Sophie (T4) because the images weren't great. That was the one where I had to do the most amount of work, while for others not much work was required*." P1 noticed that in T1 and T2 there were more *waist up* and *one-person* images, and said, "*This is better. While these* [T3 and T4] *were more full body images*."

Two participants (P1 and P2) recognised that the filtered images were pre-prepared for the experiment. P2 commented, "*Task 1 and 2 very very easy. I could tell there were some human intervention from the speed I picked the Usain Bolt one*." Pointing to the filtered sets, P1 said, "*The image choice was great in relation to the articles,… but not to be mistaken for visually attractive, these are the most USEFUL images.*

6.6.4 Additional findings

Study I. showed that image users in online journalism verified images that they considered for selection. They typically used textual information attached to those images, e.g., metadata and captions (Section 4.8.7.6). This activity was not supported in the low-fidelity prototypes used in

this experiment. The selection was made based entirely on the visual inspection of images in the search results. Nevertheless, several situations when the image users would benefit from verifying considered images were observed. For example, when selecting an image in T4, P1 said, "*I'm choosing this one and I hope* this 'W' [in the background] *is* [a promotion] *for her album but if not than it will be embarrassing*". While browsing through the images in the same task, P7 said, "*I don't know if she is pregnant now*. *What is this logo?"* When selecting an image in T3, P5 was unsure to who is in the image next to David Cameron: "*George Osborne would be relevant he is the budget man, but is it him in the background? I can't really tell*." Having access to captions providing information about the event at which the photos were taken and to metadata specifying the date and people depicted in the images would enable the image users to make informed selections as in real-life situations.

6.6.5 A summary of findings from the experiment

Table 6-12 summarises the key findings from the experiment in Study III.

RQ/ Objective	Key findings
RQ3. If applied, will the identified criteria improve the effectiveness and efficiency of image retrieval? **Obj. 7. To test the effect of the proposed criteria on image retrieval.**	Both systems enabled the users to complete the tasks, Positive effect of the proposed solution (filtered system) on image retrieval was observed. It demonstrated through changes in user behaviour in browsing and tailoring. System F enabled the users to: - immediately engage in examining of the results on a level of detail such as facial expression, gestures, pose, and make straightforward selections, - use the selected images with no or minimal editorial treatment, while radical tailoring was carried out on images from the baseline system, - the images sourced from the baseline system were deliberately tailored to include the features applied as the experimental criteria, - users self-reported higher satisfaction and general preference for the experimental system in regard to choices presented in the filtered sets, the perceived time and effort invested in the tasks.

Table 6- 12. A summary of findings from the experiment (Study III.)

6.7 Study III: Validation Survey 3. with image experts

6.7.1 Introduction

The experimental study with image users showed that the proposed filtering mechanism based on a set of recurring image features (Table 6-1) had a positive effect on image retrieval. One of the indicators of improvement was that the pre-defined set of visual features was present in the final illustrations created by image users in the experiment, and that images that had not originally included these features were deliberately tailored to include them. This finding was derived from participants' qualitative comments and an initial image analysis carried out by the researcher on the final illustrations. To enhance the validity of this outcome, Survey 3. with three independent image experts followed the experiment. It was designed to quantitatively validate the presence of

and the frequency of the pre-defined features across the set of the 40 final illustrations created in the experiment.

To achieve this, three independent image experts visually analysed the illustrations and assessed them on the presence of 8 features: F1, F2, F3, F4, F7, F8, F10, F11, from the recurring set of 11 features (Table 4-18). The percent agreement between the experts was calculated for each feature, each image and the whole sample, to determine the strength of these features in the set.

The features found in at least 95% of the images would qualify as the core image features, those detected in at least 80% would be considered strongly relevant, while any feature below this threshold would be dismissed as weakly relevant and would not be included in the final set of recurring features. As suggested in the literature (Guest et al., 2012), in studies involving co-raters such as this one, a minimum percent agreement of 75% had to be achieved between the experts for the study to be considered valid, while an agreement above 90% would ensure high confidence in the results.

6.7.2 Sampling and ethical issues

As in the previous surveys, candidates for image experts were *located* through the snowball sampling technique. The first candidate was identified from the pool of contacts that the researcher had established throughout the duration of this investigation, and she was contacted via email. The person spread the word about this research to her contacts and three more individuals expressed interest in participation. All those candidates were sent an invitation letter (Appendix E1) and later the Participant's Info pack (Appendix E2). The candidate who had established the contacts was accepted for the pilot study (Section 6.7.3) as she was the only one known to the researcher in person. This eliminated any potential impact that a personal relation could have on the results. Other three candidates were not known to the researcher prior to the study. As in the previous surveys, candidates had to meet 2 eligibility criteria: to be an adult (over 18 years old) and working in one of the following professions: image editor, image researcher, online journalist (whose role included image editing), or photographer. The approached candidates met these criteria, agreed to participate and were accepted to take part in the survey. Section 6.7.7 presents the participants' profiles in more detail.

6.7.2.1 Ethical issues

As with previous studies, an approval from the City University's Ethics Committee was sought and obtained prior to this study (Appendix F5) and the guidelines (City University, 2015) were adhered to strictly. The Information Pack (Appendix E2) detailing the purpose of this study and consent forms were sent to the participants via email. The researcher met all participants in person to collect the signed consent forms. The voluntary nature of the study, withdrawal and complaint procedures were explained. Each participant was also shown a sample of the questionnaire (a set of questions and one illustration – not included in the questionnaire). This enabled them to gauge the amount of work and time required for completion of the study and to make an informed decision about participation in this survey All participants confirmed they

understood the aim of this survey, their role in the expert team, and agreed to continue their voluntary involvement. Further communication was carried out via email: the questionnaire was distributed to the experts and returned to the researcher via email. The participants could choose where and when they wanted to fill in the questionnaire, hence, the researcher had no responsibility for creating a research space. This minimised the potential for ethical issues to arise typical to user sessions (as in Studies I and III). All participating experts received incentives as a *thank you* gesture for their contribution in terms of time and effort.

6.7.3 Pilot study

The pilot study was conducted with one participant, a graduate in visual arts and communication. Research data were not collected from this pilot as its aim was to test the format of the questions, the length of the questionnaire, and the potential effect that the ordering of the images could have on the results. This survey included illustrations that had been created from the same original image (Table 6-7). It was important that each image was assessed individually rather than in comparison with another similar image. The feedback from the participant allowed to make some minor changes to the questions in terms of wording. The pilot session showed that the participant realised that some of the images were similar. Unprompted, she commented, "*Have I done this picture before, or a similar one?*" She tried to find the image in the set, she located it and said, "*It's this one. OK, slightly different* ", and she continued with the tasks. In the post-questionnaire debriefing, when asked about her remarks and actions in regard to the similar images, she said, "*I noticed some of the images repeated, or were similar rather, I didn't know why, but I, to be honest with you, I couldn't be bothered* [checking] *as I wanted to get the survey done*". This indicated that when filling in the questionnaire remotely, the participants might be naturally inclined to compare similar images and make comparative assessments. This could not be totally prevented, as in the words of the pilot expert, "*I'm very visual, I have a good photographic memory, once I see something, it sticks in my mind for long, especially, if it's faces*". The researcher made effort to reduce any bias that could result from such intentional or unintentional comparison by adding an explicit instruction to the questionnaire asking the experts to assess images on an individual basis. It was also noticed that task instructions were read only for Image Task 1. In the following tasks, the pilot participant went directly to answer the image assessment questions, therefore, it was important that the tasks instructions were universally applicable to all image tasks.

6.7.4 The image set and the questionnaire

The image set presented for validation in this final survey consisted of the 40 illustrations that had been created by the participants in the experiment. The images are presented in Table 6-11.

The questionnaire design was informed by the experience gained in previous surveys Survey 1. (Study I, Section 4.9) and Survey 2. (Study II, Chapter 5). The amount of effort and time required from experts in this survey was lower than in Study II. However, since image assessment may be

an intense and mundane activity, a risk of potential withdrawal of experts was high. The intense work could lead to fatigue, which in turn, could impact negatively on the quality of data. Therefore, it was important to keep the questionnaire as short as possible, to make sure the questions and instructions were clear and applicable to all images in the same manner.

As in the previous surveys (Survey 1 and 2), the relevance assessment of each image was judged by the presence of 8 features out of the original set of 11 recurring features, originally presented in Section 4.8.11. The validated features are re-introduced in Table 6-13.

F	Visual image features
1	The specific (identifiable) person/people related to the topic depicted in the image
2	The person/people depicted in the foreground
3	Shot from waist up
4	Face visible: frontal or profile shot
7	Positioned centrally or to the right within the frame
8	Colour image
10	Blurry or monotone background
11	The person's face in focus (sharp)

Table 6- 13. The set of 8 recurring image features to be validated in Survey 3.

As previously explained (Survey 1. and 2) features 5 and 9 from the original feature set (Section 4.8.11) did not require validation, while feature 6 (largeness of the object within the frame) was excluded from the manual image analyses in this investigation because there was a high potential that such assessment of this feature could produce chance judgement and lead to interrater error (see: Section 4.3.7). In this validation study, the experts answered a set of 8 Yes/No questions (one question per feature), e.g., Q.6 Is it a colour image? Y / N. Predefined values: Yes [Y] or No [N] were assigned to responses. The expert marked a Yes answer when she detected the given feature in the image, and No answer when the feature was not detected. The question related to feature 3 had a multiple-choice format:

> **Q3.** Is the person in the image shown:
>
> **Mark one answer:**
> a) From waist-up (Feature 3.)?
> b) From knees-up or whole figure?

This detail in regard to the type of the photographic shot was required to trace the changes made to images in the tailoring process. The questionnaire is included in Appendix E5.

6.7.5 Data analysis

As in Surveys 1 and 2, the aim of the analysis in this study was to establish the presence and the recurrence of the 8 features across the image set and measure the agreement between the participating experts. The aim of measuring of the agreement between the experts was to determine how often they agreed on the detection of the 8-feature strong set. To measure the inter-rater agreement in this study, the *percent agreement*, a calculation suitable for a small number of raters was used. The method for calculating the percent agreement replicates the method used in Surveys 1 and 2., and had been described in Chapter 4, Sections 4.9 and in

Chapter 5. In brief, the principle of majority was applied to determine the agreement between the three experts for each question. The ideal agreement between three experts had a value of 100%, and an agreement between 2 experts was 66.7%. At least 2 experts had to provide the same response to a question for the response to be accepted as a valid agreement. The agreement for the whole study was calculated as the mean of all individual judgements made. A percent agreement of 90% and above is typically considered a high interrater agreement, while 75% was the minimal acceptable agreement for a study (e.g., Guest et al., 2012). An example of how agreement was calculated for Illustration 39 (Figure 6-17) is presented in Table 6-14. below.



Figure 6- 17. The image of David Cameron (Illustration 39, Task 3) tailored by P10

Q	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	The specific (identifiable) person/people related to the topic depicted in the foreground	1	1	1	100%
2	The person/people depicted in the foreground	1	1	1	100%
3	Shot from waist up	1	1	1	100%
4	Face visible: frontal or profile shot	1	1	1	100%
5	Positioned centrally or to the right within the frame	1	1	1	100%
6	Colour image	1	1	1	100%
7	Face of the person in focus	1	1	0	66.7%
8	Blurry or monotone background	1	1	1	100%
Total agreement					95.8%

Table 6- 14. The results of the visual assessment carried out by the experts on Image 39 in Figure 6-17.

As in the previous surveys, a feature with a recurrence of at least 95% would qualify as a core feature. Any feature recurring in between 80% and 94% of the analysed images would be considered as strongly relevant. Features detected in less than 80% of the images would be regarded as weakly relevant or irrelevant. According to the literature (e.g., Guest et al., 2012; Stemler, 2004), a minimum 75% overall agreement between the participating experts would have to be achieved for this study to be considered valid, while an agreement of 90% and above would be considered a high interrater agreement and would ensure a high confidence in the results.

The image set presented for validation in this final survey consisted of the 40 illustrations that had been created by the participants in the experiment (Table 6-11). 20 of these illustrations had been

created from images selected from filtered sets in Task 1 and Task 2, and 20 from unfiltered images in Tasks 3 and 4. (The sets and tasks are described in Section 6.2.1). It may be argued that the images selected from the experimental sets would by definition include the 8 image features, as they had been pre-filtered based on these features for use in the prototype. This could subsequently skew the results of the analysis towards the pre-defined feature set. Therefore, the analysis in this Study was carried out in two stages: first, on the experts' responses for the complete set of 40 illustrations created in all tasks, and separately, for the subset of the 20 illustrations created from the baseline system in the experiment. The results of this survey will be reported for the whole set of images N=40, and for the subset of 20 (n=20) in Table 6-16.

6.7.6 Data quality assessment

All experts returned the questionnaires within the deadlines agreed with them and within the timeframe allowed for this study. An initial analysis of the questionnaires was carried out to establish the completeness and validity of the data. This quality check showed that all questions had been answered and 24 valid responses for each of the 40 images were produced. This totalled to 960 valid responses. A response was considered valid when a yes or no answer was marked, the mark was legible (a cross, a tick, or Y or N), and it was possible to establish which question the mark related to, i.e., the mark was placed within a space provided for the response. This initial check gave the researcher confidence in the quality of the collected data in terms of the completeness and validity.

6.7.7 Image experts' profiles

The expert team in this study included image professionals with long careers in photography and visual arts. As shown in Table 6-15, Expert 1. was a photographer, visual artists and art exhibition curator, experts 2 and 3 were photographers with over 15-year-long experience in the profession. The experts were not involved in this investigation in other capacities. The experts' professional experience in images was critical to participation in this study. It ensured that they would understand the questions correctly and be able to individually inspect images at the level of visual image features. None of the experts had been involved in involved in this investigation at any other stage than this survey.

Characteristic	**E1**	**E2**	**E3**
Image-related profession	Photographer/ curator	Photographer	Photographer/ film maker
Years of experience	**8+**	**15+**	**15+**

Table 6- 15. The profiles the image experts participating in Survey 3.

The experts were tasked to manually inspect (*the same*) sample of 40 illustrations in total (see Table 6-11), and use their expertise in imagery to assess each image for the presence of 8 pre-defined features from the set (see Table 6-13). They worked independently from each other and from the researcher, in their own time and location.

6.7.8 Results of Survey 3.

The results below reveal the composition of the set of recurring image features as determined by the image experts through a visual analysis of the illustrations collected in the experiment.

Table 6-16 below shows the results for the subset of 20 images selected from the unfiltered image set (baseline system) in the experiment, and separately for the whole set of 40 images.

No.	Visual image features	Number of images where the feature was present out of n		Strength of the feature in the set
		n=20	N=40	
1	One specific (identifiable) person depicted	100%	100%	**Core set**
2	The person depicted in the foreground	100%	100%	
4	Face visible: frontal or profile shot	100%	100%	
8	Colour image	100%	100%	
3	Shot from waist up	95%	97.5%	
7	Positioned centrally or to the right within the frame	85%	93%	**Strongly relevant**
10	Blurry or monotone background	80%	87.5%	
11	Face of the person in focus	80%	85%	

Table 6- 16. The feature frequency in the 20 illustrations from the baseline system, and the whole set of 40 illustrations created in the experiment.

The analysis showed that 5 features (of the 8 validated features) were detected by the image experts in at least 95% of the illustrations in the subset of 20, and at least 97.5% of the whole set, which by the standards set out for this investigation qualifies them as the core features in the recurring feature set. The core features included:

F1 *The specific (identifiable) person/people related to the topic [is] depicted in the image*

F2 *The person/people [is] depicted in the foreground*

F3 *Shot from waist up*

F4 *Face visible: frontal or profile shot*

F8 *Colour image*

Three remaining features were detected in at least 80% of the analysed illustrations, in both, the subset and the whole set. These features were classified as strongly relevant:

F7 *Positioned centrally or to the right within the frame*

F10 *Blurry or monotone background*

F11 *The person's face in focus (sharp)*

F10 and F11 were detected at the lower end of the strong relevance in the subset, as well as in the whole set (Table 6-16). The poor detection of F11, could be explained by the fact that the sharpness and quality of the illustrations was considerably affected in the *copying and pasting* activity in the experiment and when the images were again copied to the template of the survey questionnaire. The recurrence of F10 (type of background: blurry/monotone) is particularly low in the subset of the 20 illustrations from the baseline system, where 4 images were judged by the

experts as not showing blurry or monotone background. An explanation to this was sought in the qualitative data from the experiment, and the feedback from participants on the selections made in Tasks 3 and 4 (the baseline system). Most participants commented on the limited choices they had in the unfiltered sets, referring particularly to the background of available images. The images were considered as being too specific because of the details visible in the background, e.g., discernible people's faces, locations. Many participants expressed a need for a *neutral* background. Therefore, it is fair to say that from the onset, the image choice offered in the unfiltered sets was poor in regard to F10. Some participants, while unable to find required images, resorted to tailoring techniques and cropped the image to remove unwanted detailed, or blurred the background, or more radically, removed the original background altogether. In contrast, neither comments about background nor modifications to images were made when the participants were choosing images from the experimental system. Interestingly, however, Illustration 29 (Figure 6-18) showing Usain Bolt holding a flag, was unanimously judged by the experts as not including F10. This illustration had been created by P9 in Task 1 from an image selected from a filtered set.



Figure 6- 18. Image of Usain Bolt (Image 29, Task 1) selected by P8

This result revealed the different understanding of what constitutes the image background made by the researcher, the participant in the experiment, and the experts. The researcher had included this image in the filtered set perceiving the flag held by Usain Bolt as part of the main object and considering the blurry scene behind it as the background. Similarly, P9, after he had selected this image, he commented that the flag made the image neutral as it did not show much detail in the background. Yet, the Image experts in this validation study agreed that the background was not blurry/ monotone (F10). This result shows that image users hold different definitions of the image background and its boundaries. These must be explored further in future studies, to ensure that all image users in online journalism tasks with illustrating news headline stories get access to relevant images.

An overall agreement of 98.6% was achieved (Appendix E7.) between the Image experts for the sample of 40 illustrations, and 97.9% for the subset. According to the literature (e.g., Guest et al., 2012), an interrater agreement above 90% ensures confidence in the results of a validation study.

6.7.9 A summary of results: Survey 3.

This study allowed to validate the conclusions from the experiment that illustrations created for the function of the main news headline image carry 8 pre-defined image features. In Table 6-17

below, these results are compared with the results of the previous validation surveys carried out in this investigation (Survey 1 and Survey 2).

No.	Visual image features	Number of images where the feature was present in each Survey (S) in n images			
		S1 N=14	**S2 N=10**	**S3 n=20**	**S3 N=40**
1	One specific (identifiable) person depicted	100%	100%	100%	100%
2	The person depicted in the foreground	100%	100%	100%	100%
3	Shot from waist up	85.7%	97%	95%	97.5%
4	Face visible: frontal or profile shot	100%	100%	100%	100%
7	Positioned centrally or to the right within the frame	92.8%	93%	85%	93%
8	Colour image	100%	99%	100%	100%
10	Blurry or monotone background	85.7%	81%	80%	87.5%
11	Face of the person in focus	85.7%	99%	80%	85%
	Agreement	97.6%	98.2%	97.9%	98.6%

Table 6- 17. The results of the validation surveys conducted in this investigation: Survey 1, Survey 2, Survey 3 (n=20 subset), Survey 3 (N=40, the whole set)

In this investigation, the set of recurring image features originally identified in Study I has been validated in three rounds of surveys with 3 independent image experts in each round. The image experts were image professionals professionally who assessed images in their paid roles. In the 3 rounds, 154 news illustrations have been analysed and these include: 14 images in Survey 1, 100 in Survey 2, and 40 in this final survey. Illustrations used in Surveys 1 and 2 were published on the BBC news homepage, while those assessed in Survey 3. were created for the purpose of the experiment with professional image users working in online journalism. These compiled results show that there is a clear trend in how the image users in online journalism select and create news illustrations for the function of the main news headline image, and that a typical image used in this function will carry a set of 8 pre-defined image features (Table 6-13) of which the core features are: Features 1, 2, 4 and 8. These are complemented with strongly relevant features: F3, 7, 10 and 11. This trend resonates with Barry's statement (Barry, 1994) that a given group of users with a given task will apply the same set of relevance criteria. Uncovering of these criteria has implications on predicting of relevance of results as it was observed in the experiment. This, however, does not mean the set is already exhausted, as features 5, 6, and 9 from the original set had not been validated. More granularity could be introduced in differentiating for example, whether the direct or side gaze would be more suitable for some type of image function or type of news content. Additionally, this survey allowed the researcher to retrospectively assess the quality of the images included in the experimental prototype (F). The images had been manually pre-filtered by the researcher and as this study revealed this process was not free from subjective image judgements. For example, as the case of Image 29 (Figure 6-18) the researcher's interpretation of what makes the image background contrasted with the understanding of the background held by the Image experts in this survey. In the Visual Social Semiotics framework, the background is attributed to the visual resource of modality (realness). The terminology offered in VSS is not always clear. For example, the feedback from the image

experts showed that terms such as: fully-visible, fully-conceived, blurry, non-realistic, monotone in relation to background were not understood in the same manner by all experts. The participants in the experiment used terminology such as: neutral versus too specific. Caple (2013) suggested that the dimension of context in images can be mapped on a continuum between a non-discernible context and fully distinguishable environment. This points to a need for a further research into the descriptive terminology and how images and image features are described by image professionals, for example, *what is a realistic, fully-conceived, identifiable background, versus monotone, blurry, neutral background? Is an object held by the person (e.g., a flag) in the image part of the person or the background?*

6.8 Study III. Discussion and conclusion

Study III, consisting of a user evaluation study (Sections 4.2 – 4.6) and a supporting validation Survey (Section 6.7), has successfully addressed RQ3. and Objective 7 (Table 1-1). Its output is a practical contribution with an important implication for system design. The study showed that the implemented needs-based device allowed to predict image relevance and enabled image users to directly access *most useful* images for the function, and complete illustration tasks in an effective and efficient manner.

For the purpose of this evaluation, two systems were prototyped for comparison: a baseline system containing unfiltered images and simulating a typical commercial system, and an experimental system that included images manually pre-filtered by the researcher according to the recurring image features. The proposition was tested in a within-subjects experimental study with 10 image professionals from some major UK-based online news providers. A hypothesis was put forward that this feature set, being rooted in image users' needs, would have positive effect on image retrieval. The evidence of how the proposed solution influenced image retrieval was sought in observable and self-reported data. A comparison carried out on the data collected from the task-based observations allowed to identify commonalities and differences in users' behaviours and interactions with search results on the baseline and experimental systems. The results of this experiment show that while both systems enabled the participants to complete the tasks, there were significant differences observed in how the participants interacted with the two systems used in the experiment, as well as in the way that they tailored images retrieved from each of these systems in terms of techniques, aims and intensity of tailoring.

One of the key differences in the participants' behaviour was the way in which they interacted with the filtered and unfiltered images. When presented with the unfiltered sets (T3 and T4), the image users engaged in activities that can be mapped to the model of browsing proposed in Bates (2007). A typical interaction with the results began with (*1) glimpsing* of the whole available scene and trying to understand what was available by *(2) visually homing on parts of pages.* Then the participants were observed filtering the relevant results and *supressing* the irrelevancies. When a relevant image was identified, they would move on to (*3) examining the item(s) of interest, and then, to (4) physically or conceptually acquiring or abandoning of examined item(s).*

Post-selection, most of the images from unfiltered sets were given a radical editorial treatment, which included: a change of shot, blurring or removal of the background. After completing the tasks (T3 and T4), participants generally expressed a lower satisfaction with the selections, as well as with the perceived effort and time they had to invest in the tasks.

On the other hand, the experimental system in Tasks 1 and 2 allowed the image users to understand at a glimpse that the presented set of results was topically relevant to their needs and they were immediately able to examine the items on the level of detail such as: the facial expression, gestures, gaze of the person in the image. The selections were straightforward, and the images selected from the filtered sets were perceived as *ready* for re-use, therefore, they did not require radical editorial work. The participants' self-reported satisfaction with the selections, the perceived time and effort was higher than for the unfiltered sets. No doubts were expressed about whether they would be able to select an image, the question was which one was the most suitable: where the person looked e.g., *adequately* victorious (T1) or apprehensive enough (T2) to reflect the mood of the story. This is a finding that indicates a positive change for users brought by the proposed search feature. Back and Oppenheim (2001) claim that when the user becomes more confident that their information need can be addressed, the cognitive load is reduced.

In contrast, in the baseline system, the participants began their selection with browsing through irrelevant images, which was accompanied by dissatisfaction and frustration. Kuhlthau (1991), found that anxiety is a feeling that occurs in the searching process when searchers' needs and expectations are not met. Beaudoin (2009) studied image users from creative domains and observed that too many random images caused frustration. Similarly, in Study I, frustration was observed when image users had to *plough* and *trawl* through many irrelevant results and had to decide when to stop searching and put their editing skills into action to create an illustration from what was available to them, as in P1's put it "*we just made the best of what we had*" (Study I, Section 4.8.10). When selecting images from unfiltered sets, the participants were observed to reach a decisive point where a choice between carrying on searching and starting tailoring had to be made. This behaviour was reminiscent of Study I when the participants had been observed interacting with commercial image retrieval systems and faced the always present dilemma when to stop searching and begin tailoring, in order to complete tasks in a timely manner.

In the experimental system, searchers did not have to make such decisions. Once the image with the most suitable facial expression had been selected, further effort was given to fitting the image to the frame they would normally work with. Typically, this would involve a slight crop of the image but no major changes to the integrity of the photograph would be made. This indicates a positive change in how the image users browsed the results with a greater confidence and were able to make the final selection in fewer steps and maintain the integrity of the original photograph. The integrity of images is an important aspect in journalism (Section 2.4.4) and current policies of image providers do not allow changes to be made to news images (GettyImages. 2016). Since tailoring is not always permitted, it is even more important that image retrieval systems provide

direct and quick access to suitable images that require only minimal adjustments before they are published.

It seemed that the sorting applied in the filtered sets by visual richness at one end of the prototype and visual minimalism characteristic to thumbnail images (Knox, 2007a; 2009) at the other end proved easy to grasp *at a glance* and aided the navigation of the prototype. This saved time and less scrolling activity between search result pages was observed in the filtered sets. The participants were able to focus on the pages showing the photographs that they needed for the function of the headline image. This further showed an in-depth understanding of the function of the headline image shared by the image professionals from the various organisations, and subsequently, proved that the images serving this function are visually distinct from photos used in thumbnails.

Participants' preferences were clearly towards the experimental system. Some users struggled with naming the differences, others could see the visual similarities and shared visual features across the images in the filtered sets. Being able to immediately concentrate on the detail was considered important when selecting images of politicians. A majority of the photographs showing celebrities and sports people show them in a company of other people at specific events. Such shots do not meet the needs of image users in online journalism. The filtering according to the recurring features appeared to effectively address this issue. P9 compared the filtered sets to the pre-selected images that he used to work with when in print magazine, which were *"tidier and of good quality",* and offered more choice. There was a clear preference towards the proposed solution that was seen as effective in providing access to images *USEFUL* for the function specified in the task.

Finally, the positive effect was observed in the way the participants had tailored the images. The image analysis showed that a majority of the illustrations created from the baseline sets carried the features from the pre-defined set of recurring features (Table 4-26). If an image had not originally carried some of the features, it was tailored to include them. This trend in images selection and tailoring confirms that the dominant photo is a distinct function fulfilled with images carrying a distinct set of 11 visual features (Table 4-26). The features, uncovered in a study with image professionals (Study I, Chapter 4), correspond to the authentic needs of this specific group of image users.

To sum up, this experiment showed that the image choices made by image editors for headline news content could be successfully predicted by the set of 11 features presented in Table 4-26. The experimental image sets pre-filtered to include these features (Section 6.2.2), enabled the image professionals to meet their needs more effectively and efficiently than the sets simulating a typical large commercial system.

This proves that the design of information systems should be based on an understanding of users' needs and work-related tasks that they carry out. Since different jobs involve different activities and tasks, Fidel (2006) suggests, there is a need for domain-specific information systems (Fidel, 2006).

Many HCI research studies measure the usability of specialist information systems using a task completion rate and user satisfaction with improved UIs, but very few studies include AB/BA comparative task-based evaluation with large commercial systems. This, according to Conniss et al. (2000), may be due to the complexity of the design of comparative evaluations. Instead, some of these studies rely on users' retrospective feedback about their usual experiences with traditional systems (e.g., Emanuel, 2011; de Matos et al., 2013). Still, these studies provide valid evidence that information retrieval systems scaled to the needs of specialist end-users, effectively and efficiently provide users with access to required information.

This further corresponds with the results of IIR studies concerned with the performance of tailor-made information systems. For example, a study by Anderson et al. (2000) focused on the performance of a specialist toxicity database TRACE and a large, hence, believed to be more comprehensive, resource. The focused resource developed with the input of human indexers demonstrated better precision and superior recall, when compared to the commercial database used in the study.

Regarding the choices offered to users in the evaluated systems, some participants believed that the filtered sets included more images that the unfiltered sets, while others thought that in T2 (Angela Merkel) there were too many images that looked too similar. P2 said that this could lead to making no choice at all. This may be explained with the paradox of choice, a concept introduced by Barry Schwartz (2005) who discusses this phenomenon in the context of shopping choices made by customers and claims that although a large amount of choice is commonly associated with welfare and freedom, too much choice brings negative feelings and can lead to *paralysis*. For image collections, images are commodities accessible to users within the terms and conditions of the licence (Gürsel, 2016). Therefore, helping users to access required images and supporting them in making choices must be in the interest of image providers. Further, categorisation and clustering of images to support effective choice-making must be further investigated.

6.9 Strengths and limitations of Study III.

6.9.1 The experiment

The strengths of this study include the following features:

- The set of recurring features employed in this experiment as the criteria for the improvement of image retrieval had been uncovered from a qualitative study with image professionals, unlike many published studies driven by current technological possibilities and in which user testing comes after the concept has been developed.
- The methodology:
    - the experiment sessions were conducted in situ, the simulated work task situation was carefully replicated, based on the knowledge from the user study, in terms of the

structure of and the number of tasks, the timing of sessions, etc. This is believed to arise authentic needs and motivation to complete the tasks.

- The within-subject design of the study, recruitment in groups and prototype rotation, to eliminate the bias and ordering effect.
- The participants in this study were sampled from various online news services, unlike in Study I.
- Tasks were modelled on natural tasks and included the basic task components identified in Study I. Participants reported that sufficient information to search and create the illustrations was provided.
- Transparency about the research processes and how it was carried out was ensured. The report included all *voices* with quotations, including the ones that were contrary to the mainstream opinions and the outliers.
- The experiment focused on a slice of the illustration process rather than the whole process, as recommended in Kelly (2009). This eliminated potential for bias caused by actions that were not under direct investigation.
- Validating the recurrence of the features with three independent image experts in Survey 3.

The identified limitations of Study III. include:

- The low-fidelity of the prototypes:
  - Limited functionality not supporting verifying although it had been identified as an important step in the illustration process. The advantage of the simplicity of the prototype ensured that participants were not distracted by design elements of the user interface.
  - Images were manually selected by the researcher for the experimental system. The selected images from the filtered system were validated with experts.
  - The original quality of the images copied and pasted across the system was not retained. Images in the prototype were of lower quality than those normally available through commercial systems. This was explained to the participants.
- Methodology:
  - The system rotation was used to reduce bias from fatigue and learning, the small sample of people did not allow for additional rotation of topics. Kelly (2009) suggests that preceding topics may influence how the topic that follows are perceived.
  - Compromising between a think aloud and spontaneous reporting as a narrative technique, although worked well, there was a risk that some participants may remain quiet throughout the task – indication of concentration and those were

- A larger and more varied sample could enhance the soundness of the results.

6.9.2 Survey 3.

All in all, an outline of a typical news headline image emerged, and can be defined by 8 image features validated in this study.

- The method has been tried out and piloted throughout this investigation (Survey 1, 2 and this final validation). A consistency was maintained in regard to: the eligibility criteria for image experts, sampling technique, the way the questionnaires were constructed, distributed and collected. The questions were clear and simple in format to ensure that the cognitive load related to the assessment of the images was manageable and the risk of fatigue was reduced to a minimum.
- It was possible to refer to the data collected in Study III and compare the experts' judgements with the feedback from the image users who had created the illustrations used in this survey. This enabled the researcher to identify the differences between the interpretations of the image features made by the image users and the experts, and provide some explanation to how the assessments were made.
- Although the results of the three surveys could not be directly compared, due to differences in the number of images, questions etc., a general trend across the studies was uncovered, no anomalies were observed and a high percent agreement was achieved for this and other surveys.
- Additionally, this survey also allowed the researcher to retrospectively assess the quality of the images included by the researcher in the experimental prototype.

The identified limitations to this study include:

- Some illustrations used in this study were created from the same original image (repeated selections). The pilot study showed that there was a possibility that the image users could make comparative judgements. Comparing of images was not the aim of this survey, hence, clear instructions were included in the questionnaire stating that each image had to be assessed individually. Such instructions could reduce intentional comparison but not the unintentional. As the pilot participant mentioned, being an image professional, she had a great visual memory for images.
- As previously mentioned, the percent agreement does not account for chance judgement. The potential for chance judgments was reduced by: ensuring that all experts involved in this study were image professionals with an expertise in imagery, the question (F6) that would potentially produce chance judgement was excluded from this survey. The percent agreement is recognised in the literature as a method suitable to small studies such as this survey. Involving a larger number of experts was considered as a way to enhance the accuracy of the results, however, finding image professionals willing to participate proved to be difficult. On the other hand, using three experts and the percent agreement

consistently across all surveys in this investigation allowed for a straightforward comparison of all results of these studies and identification of trends and anomalies.

- Although the study was modelled on TREC methodology, the sample of images used in this survey was relatively small (40 images) but the results were compared with the previous studies and in total, the sample consisted of 153 images.
- The results of 3 surveys were compiled for comparison but direct comparison could not be made as the questions in the surveys differed in how they were formulated. Although based on the same features and aiming to achieve the same goal – establish the frequency and occurrence. This was because the study was organic in nature and the methods were informed by previous studies, lessons were learnt and necessary adjustments were made. Additionally, Survey 1 and Survey 3. were used as a method for co-coding of the visual data.
- Finally, not all features from the original set of 11 features were validated. Feature 6 (the largeness of the object within the frame) was excluded as it was thought to produce chance judgements.

These limitations need to be taken into consideration when interpreting the results of this study. The set may be not complete and was evaluated and validated only for the entity of specific people.

CHAPTER 7. CONCLUSIONS

7.1 Summary of the thesis

This investigation was driven by two diverse aims, to make theoretical contributions to knowledge, as well as to inform system design. The goals were defined as follows:

> *Goal 1.* To investigate the image seeking and selection process in online journalism.
>
> *Goal 2.* To propose improvements to the way image professionals search large collections of images, in order to enable them to effectively select images that they need.

Goal 1 (corresponding objectives: 1 – 6) was achieved through a qualitative study with image professionals in situ (Study I, Chapter 4). The methods used included interviews and observations in situ on real-life tasks, which allowed to capture natural behaviour. As aimed, the research has gained an increased understanding and knowledge of who the image users are, how and why they seek for, select and use visuals sourced from large image collections.

From within the broad narrative, a trend in how headline images were selected and tailored emerged, and a set of visual features unique to this image function was identified. The recurrence of this set was further corroborated by independent experts in a visual analysis of a large sample of images sourced from the BBC homepage (Study II, Chapter 5). The feature set was proposed as the *criteria* for improvement to image retrieval.

To achieve Goal 2 (corresponding objective: 7), the criteria were implemented as a multi-feature filtering mechanism for evaluation with image professionals working in online journalism (Study III, Chapter 6) The evaluation showed that the proposed solution effectively supported image professionals in meeting their needs and facilitated straightforward access to the "*most useful*" photos for the function of headline image. This indicates that a meaningful relationship between concrete visual image features and image functions (here: the headline image on the news homepage) has been successfully uncovered. It is expected that this function-based mechanism may be a step forward to the process of automatically predicting relevance.

7.2 Contributions to research and implications for system design

Being the first qualitative research that focuses solely on image searching and use in online journalism, this thesis makes several theoretical and practical contributions to research with implications on system design. The key contributions of this investigation include:

- unique insights about image professionals in online journalism, in regard to how they search for, select and use images from large online collections;
- a description of the structure of a typical illustration task,
- a dichotomous classification of illustration tasks related to users' needs for actual images, and for ready images,
- a validated image seeking process model originally proposed by Conniss et al. (2000), updated with a verifying phase from Ellis et al.'s model (Ellis et al., 1993),
- a validated illustration task process model proposed by Markkula and Sormunen (2000), extended with the image tailoring phase,
- a set of 11 visual features that recur in headline images and can be used to predict relevance, which has led to the development of a practical device for improvement to image retrieval. The device was evaluated with users in the final study and positive impact was observed.

What follows is a discussion of the value of the contributions made by this investigation to the current understanding of the needs and behaviour of image users in fully disintermediated environments such as the online newsroom.

The exploratory study (Study I) that included naturalistic observations in situ, brought several important findings about the needs and behaviour of image users in online journalism. Firstly, the study provides a detailed description of image professionals in online journalism, in terms of their skillset, areas of expertise, image needs and searching strategies. It shows that these image users are, in the first place, creative professionals who have a good understanding of how images function on news web pages. They demonstrate shared illustration strategies to achieve visual effects appropriate to the communicative image function. In the disintermediated environment of the online newsroom, they are also the end-users of image retrieval systems. They are self-taught but confident searchers, as previously found by Göker et al. (2016). They consciously target resources, begin searching with clear pre-defined needs, and are able to describe the visual presentation of required images on the level of the critical object, as well as perceptual features. On one hand, their image needs are currently not effectively supported by the systems they use, on the other, they do not compromise their needs that relate directly to their understanding of communicative image functions. By adding information about this 'new' group of users and their

needs, this thesis makes an important contribution to the existing body of knowledge about information behaviour.

By determining of the structure of a typical illustration task in online journalism, this investigation makes a methodological contribution. Six basic task components: the URL, the headline, the editorial section, the deadline for publication, the size, the image use, have been identified. This task structure can be useful for researchers designing tasks for experimental studies into image searching in online journalism. To ensure the validity of research, it is important that test tasks are modelled on real tasks and include all the elements of an authentic task (Borlund, 2003). The uncovered task structure has been validated in Study III. The four tasks used in the experiemnt had been constructed to include these components. The test tasks were perecieved by participants as *authentic* and provided enough information to initiate image searching.

Further, this thesis proposes a new categorisation for illustration tasks in online journalism based on a dichotomous distinction between tasks that require *actual* images and those that can be fulfilled with *ready* images. It is a typology that emerged naturally from the analysis of the data. The observed differences in users' behaviour and image needs were evident, significant and sufficient to propose this new typology. Differentiating between tasks requiring actual versus ready images has not been previously proposed or researched. Most previous studies apply the task typology proposed by Fidel (1997) or refer to Conniss et al.'s classification of image use (Conniss et al., 2000). However, the former does not account for images that neither carry information nor are used for purely illustrative reasons, which may leave many news headline images unclassified. The latter does not provide sufficient explanation to the contrasting differences in image needs and behaviour of image users in online journalism. In online journalism, actual images are published instantaneously to illustrate events that are developing in real-time. When searching for actual images, users apply different strategies and criteria to those used in searches for ready images. Therefore, the proposed dichotomous task typology, provides meaningful explanation to the observed differences in the needs and behaviour of image users in the online newsroom. When designing systems, this differentiation needs to be taken into account to enable users to locate the type of images required to complete a given task.

The thesis makes another contribution to research by validating and updating Conniss et al.'s image searching model (Conniss et al., 2000), so that it accurately reflects the behaviour of image professionals in online journalism. While in searches for ready images, user behaviour generally mapped well to the framework, in searches for actual images, some disparities between the observed behaviour and the definition of the *selecting* phase were uncovered (as previously noted in Göker et al. (2016), however, without reference to the type of images). This led to broadening of the definition of this phase in the updated model. Further, it was observed that verifying of image authenticity and accuracy was an activity critical to making image selection decisions. This behaviour fitted the description of the verifying feature in Ellis et al.'s model of information seeking (Ellis et al., 1993). Subsequently, Conniss et al.'s model (Conniss et al., 2000) has been updated to include the verifying phase from Ellis et al.'s framework (Ellis et al., 1993). These findings bear

implications on system design: to effectively support image users in online journalism, systems must ensure that users are able to verify news images.

Further, this study placed image seeking within the context of a wider illustration task. A model of the illustration task process by Markkula and Sormunen (2000) was used as a frame of reference for mapping user behaviour. The major limitation of this model is that it proposes that the illustration process ends with image selection. An alternative approach was adopted in this investigation, in order to capture information about post-selection activities. It was found that image users intensively tailored images before publication, and there was a clear pattern in how images were tailored. These findings improve the current understanding of how images are used after they have been selected. It is an important contribution to an under-researched area of image use. Further, it is proposed that the illustration task process model must be extended to include the tailoring phase, which has methodological implications for design of observations of image users.

Finally, uncovering of the patterns in image needs and image tailoring led to the identification of the set of eleven visual features recurring in news headline images. The set was then implemented as a multi-feature filtering mechanism and tested with users in Study III. Figure 7-1 provides a simplified visual presentation of the principles of the proposed multi-feature predictive system. The proposed approach to predicting of relevance based on a set of recurring syntactic features is novel and has not been previously researched. The implemented solution had a positive effect on image users' behaviour indicating increased effectiveness and efficiency of image retrieval.

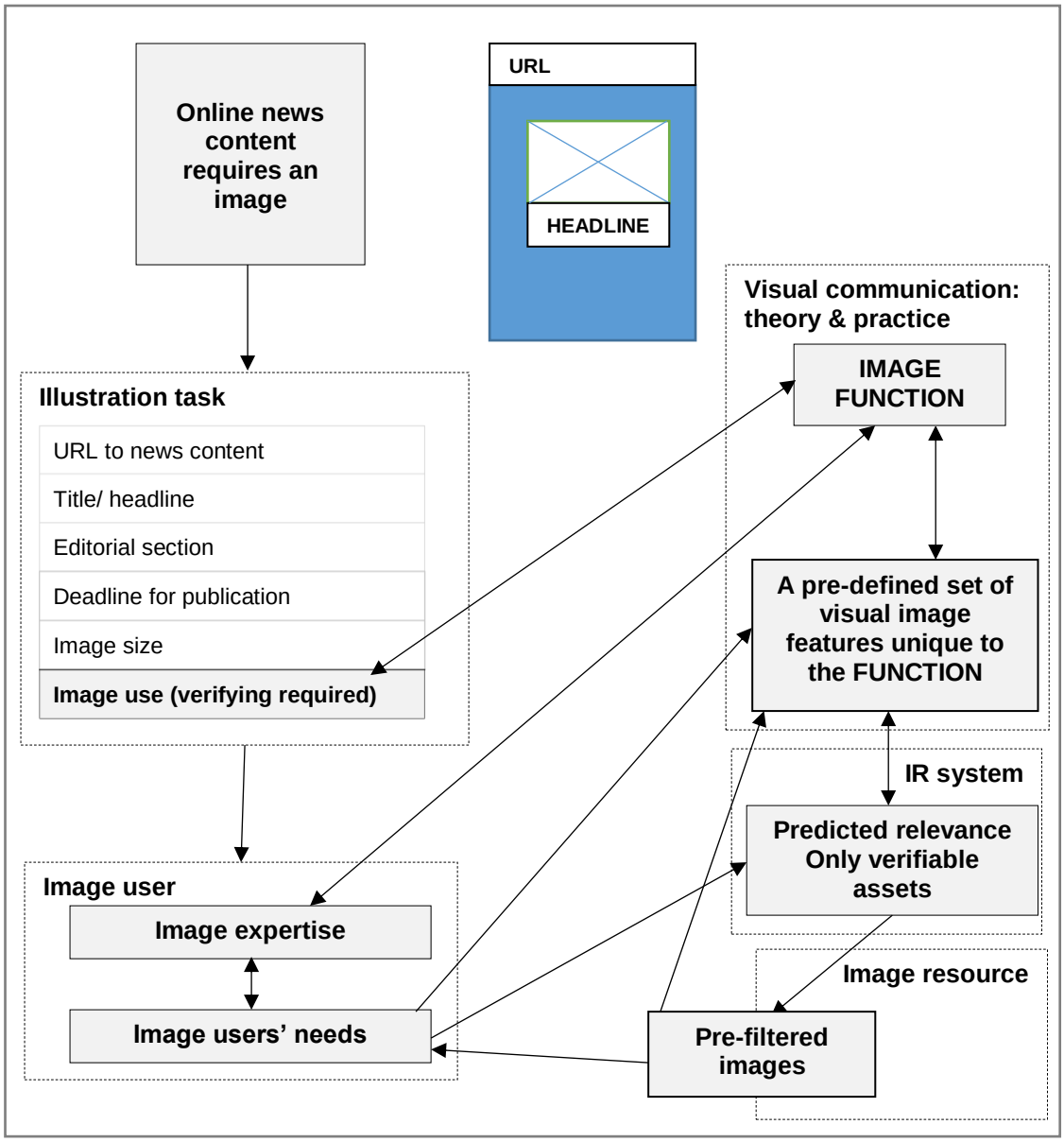


Figure 7- 1. A model of the proposed and evaluated multi-feature predictive system.

7.3 Recommendations for image retrieval design

The system designer must:

- gain a good understanding of the authentic needs and behaviour of the image users, through an exploratory in-situ study;
- have an in-depth understanding of the image functions for which the users require images. The functional approach to images is an alternative to subject-related or aesthetics-based image analyses. The image function requires images that carry an identifiable and finite set of image features.

The system must:

- support image retrieval rather than be a *copy* of document retrieval. The key aspects that discern image retrieval is that image users' needs are pre-defined on multiple levels of image description including the visual presentation, and relate to sets of visual features rather than to a single feature;
- allow users to save time and effort. This can be achieved by ensuring straightforward access to images that meet users' needs. Targeted searching must be supported through a *push* functionality that offers subsets of results pre-filtered strictly to image users' needs;
- aggregate the available collections under a single UI. This will eliminate the need for conducting separate searches on the different available systems. If implemented, such a global access to images would have a positive effect on efficiency of retrieval, although it may not be a realistic option due to the differences in the collections' structures, as well as due to the fact that visual assets providers are competitors on the market;
- allow for straightforward on-screen verification of image authenticity and accuracy by providing access to information about the authorship, date of image creation, event (location, people), and source in order to effectively support image users in online journalism;
- alert users of freshly uploaded images for searches that they have carried out. This will eliminate the need for active monitoring of other information channels (e.g., TV), in order to establish whether new images have become available;
- present similar images in categories (the valid categories must be determined for any specific type of image, function, use). This will eliminate the confusion and the feeling of being unable to make a decision due to too many similar images in the results.

7.4 Directions for further research

This investigation has now reached its finale, but opportunities for further research are plenty. The research landscape of image use and retrieval must be explored further and at a greater level of detail.

Future research may focus on the following areas:

- a similar study to uncover sets of features for other image functions which image users share an understanding of, including other than specific person entities, e.g. objects, locations, and differentiating between news sub-domains: political hard news versus light news;
- investigating a variety of sorting options for the search results, an optimal number of displayed results;

- validating the other VSS features, e.g., using face-ism ratio for largeness (Lidwell et al., 2005, p.88, and Footnote 44 in this thesis), distinguishing between types of gaze;
- applying other social semiotic frameworks for extracting features related to affect or aesthetic presentation of images, e.g., Caple's balance network (Caple, 2013);
- implementing the proposed solution into a high-fidelity prototype where measures of actual time on task will be possible to establish the actual time saving versus the perceived time invested in the tasks;
- extending the inquiry to audiences and investigating whether images selected through such an approach meet the expectations of audiences with a view to inform automated journalism;
- conducting a similar research to identify image functions and corresponding feature sets in other contemporary creative domains, e.g. advertising, e-publishing, and education;
- investigating how image users who may not have editing skills can benefit from a syntactic-feature filtering mechanism;

7.5 Concluding remarks

Image professionals in online journalism select images to news content in order to attract viewers' attention to important information. "*The reader sees before he ever reads and many may never read if there's nothing interesting to see*", claims John Loengard (2010), highlighting the importance of the role of image users in the online newsroom. Therefore, improving the way images are accessed in online journalism, will have far-reaching implications. Evidence from this investigation shows that image users have a shared understanding of image functions on news webpages. They purposefully select images that carry a specific set of visual features unique to the specific image function that they are working on. It is important to understand that images that do not include the set of features will not serve the function to its full potential. Arnheim (1970, p.27) *strategy of thought may be hampered at its very foundation when the visual range of the situation to be contemplated is incorrectly chosen. For example, the visual aid* […] *offered by an illustration may be severely impaired simply because the size and range of the portrayed objects are inappropriate for the function. An inadequate percept may upset the whole ensuing train of thought.*

Content-based system works on low-level features and it is essential that any research aspiring to inform the design of automated retrieval provides insights on the appropriate level of abstractness. This investigation reached beyond the generic descriptions of visual effects, directly to the low-level image features. The identified features are detectable (or soon will be) to currently available systems that make use of advanced computer vision, however, they have not yet been implemented as multi-feature filters for image retrieval with a purpose to support a specific group of image users carrying out a specific type of illustration task.

CHAPTER 8. Personal reflection

This project has now reached its long-awaited finale. Overall, it has been an enriching and enjoyable experience, but at times, a challenging personal journey for me. For several reasons, the process has taken much longer than I had initially envisaged and planned for. In the initial phase, I struggled with drawing the boundaries for this investigation. As mentioned several times throughout this thesis, the needs and behaviour of image professionals in online journalism had not been previously studied, despite the extensive use of imagery in online journalism. Now, almost six years onwards, this thesis still remains novel in this respect with one exception, the study carried out by Göker et al. (2016) who included a small number of image users from online journalism in their sample of creative professionals.

Given the scarcity of research in this area, I initially found it hard to scope this investigation so that it would produce solid findings and make original contributions to the existing knowledge, as well as could be achieved singlehandedly and within the allowed timeframes.

As the starting point, I reviewed the literature into image seeking in general and in print journalism (e.g., Conniss et al., 2000; Markkula and Sormunen, 2000; Westman and Oittinen, 2006), which enabled me to define a scope for my investigation and identify several frameworks for describing the needs and behaviour of image users participating in this investigation. Since my research also aimed to address the ineffectiveness of current image retrieval systems, special attention was given to sections and findings that addressed the design and development of systems. The review of the available studies in print media revealed *dead ends* in terms of findings that could potentially inform the design of CBIR systems. In most previous studies, news images were assessed in terms of aesthetic values and visual effects that they carried, which were then deemed too subjective to be further investigated. In search for an alternative approach to news images, I extended the literature review to the domains of visual semiotics, discourse and communication studies. The research of Helen Caple (e.g., Caple, 2013) and John S. Knox (e.g., Knox, 2007a; 2007b; 2009) provided examples of an effective use of the visual social semiotics framework for interpretation of images on the level of syntax. This led me back to the information studies, particularly, the work of Barry (1994), and Rafferty and Hidderley (2005) who proposed the use of VSS for manual indexing of visuals. Finally, the exact goals and research questions, and analytic tools were defined for this investigation.

The depth of insights in Study I. would not have been achieved if not for the combination of the interviews and observations in situ. In the interviews, image users described the images they looked for as attractive, standing out, attention grabbing, vivid, rarely going beyond the description of the required visual effect. These qualities – although confirm the findings of previous studies, are not useful to CBIR that operates on low-level features. It was only in the observations that a clear trend in image selection and tailoring emerged. This allowed me to identify the exact visual features required in headline images.

It was an interesting experience to begin the project at the high level of conceptual frameworks and work my way down to the lowest level of specificity. This micro-analytic approach and the focus on concrete image features was necessary if the findings were to be useful to CBIR. Rudolph Arnheim (1970, p.238) – albeit in a slightly different context – points to the importance of adjusting the degree of generality appropriately to a given situation and situations when inspecting objects for specific features is necessary.

> "*The level of abstractness is not chosen arbitrarily but depends […] on the degree of generality appropriate to a given situation. If there are mice in the house, a cat is needed, no matter which one; but if Yoshi is wanted, no other cat may do. There is a difference in seeing a suitcase as "something" obstructing passage and examining its features when one considers purchasing it*."

In this investigation, applying this microscopic perspective to image analysis was motivated by the requirements of CBIR, and enabled me to reach beyond the surface of the visual effect that earlier studies (in print) had not managed to achieve.

Scoping of the research was not the only obstacle in this investigation. Further delays occurred in the recruitment process, particularly in Study I. and Study III. To be able to collect natural and authentic data, I decided to recruit only 'active' image professionals rather than proxy participants (e.g. journalism students). While this is one of the strengths of this investigation, finding participants and convincing them to take part in the studies proved very difficult. Image professionals have busy schedules, their work requires being continuously cognitively-engaged throughout the day, hence, any time *out of office* is very precious to them. Some were not willing to share the tricks of the trade, as the news services compete *fiercely* for readership. Others openly asked for a usual hourly rate and travel expenses to be covered for participation. As a result, and contrary to my intentions, all participants but one in Study I. were BBC staff to whom I had access through work. In subsequent studies, higher incentives were offered as a 'thank you' gesture for participants' time.

Finally, some unanticipated and unpleasant family and health-related events have also had effect on the length of this investigation.

Luckily, I was not alone in this process, I had support from my supervisors and the external advisor. The continuous guidance, insightful feedback, and kindness of my first supervisor, Dr Andrew MacFarlane has been invaluable. In the times of *crisis*, he brought me back on track and encouraged me to carry on and complete this research.

In my view, Study I. is the *strongest* one within this investigation, methodologically and in terms of its outcomes. It is a stand-alone study that provides a wealth of qualitative data from natural observations in situ. While Study II. involved independent image experts, it suffers from several limitations since the images used in the survey had been selected solely by the researcher (myself). Involving other relevant people in the selection process was not attempted mainly due to lack of time and the already mentioned hardships with accessing relevant people. Upon

reflection, Study III. was an ambitious project that aimed to test the proposed solution. It delivered several ‘wow’ moments, of which one was the uncovered significant change in the behaviour of image users when presented with the filtered results. Nevertheless, I felt that the study was also limited because of the way the images had been pre-select for the experimental sets. This involved manual pre-filtering carried out by the researcher (myself), while ideally, (had I had the required skills), a higher fidelity application could have been used on live data to automatically pre-filter the images for these sets.

There were many exciting moments in the process. These included the opportunity to observe professional image users in situ, and to work with image experts. The research required from me to step into several roles, the one of the research designer, the interviewer, observer, experimenter, as well as the data analyst. I acquired strong abilities to see the broad picture of the researched problem, as well as to focus on the detail of individual experiences.

Some of my most enjoyable memories of the PhD process are connected to the conference attendance and being able to present this work to researchers, scholars and industry professionals at various events, both locally, at City, University of London, at British Computer Society, and internationally, at CoLIS’9 (The University of Uppsala, Sweden) and ISIC 2016 (The University of Zadar, Croatia). As to future plans, I am planning a journal publication of the results of this thesis.

REFERENCES

abcNews (2012) *Controversial Magazine Covers*. [online] Available at: http://abcnews.go.com/International/photos/pharrell-cover-controversial-magazine-covers-16328228/image-16328306 [Accessed: 3 March 2018].

Adobe (2018). Adobe Sensei [online] Available at: https://www.adobe.com/uk/sensei.html [Accessed: 31 October 2018].

Aksoy, Y., Oh, T-H., Paris, S., Pollefeys, M., and Matusik, W. (2018). Semantic soft segmentation. *ACM Trans. Graph*. 37[4] pp. 72:1 – 72:13. https://doi.org/10.1145/3197517.3201275

Albertson, D. (2015) Visual information seeking. *Journal of the Association for Information Science and Technology,* 66 (6), pp. 1091-1105.

Alfano, M. and Lenzitti, B. (2009) A Web Search Methodology for Different User Typologies. *International Conference on Computer Systems and Technologies* - CompSysTech'09.

Al-Maskari, A. and Sanderson, M. (2011) The effect of user characteristics on search effectiveness in information retrieval. *Information Processing and Management* 47, pp. 719–729.

Anderson, C. (2007) *The long tail: how endless choice is creating unlimited demand*. New York: Random House.

Anderson, C., Copestake, P. and Robinson, L. (2000) A specialist toxicity database (TRACE) is more effective than its larger, commercially available counterparts. *Toxicology*, 151, pp. 37-43. doi: 10.1016/S0300-483X(00)00264-X

André P., Cutrell E., Tan D.S., and Smith G. (2009) Designing Novel Image Search Interfaces by Understanding Unique Characteristics and Usage. In: Gross T. et al. (eds) *Human-Computer Interaction – INTERACT 2009*. *Lecture Notes in Computer Science,* 5727. Springer, Berlin, Heidelberg.

Andrews, W. (1996) Search engines gain tools for sifting content on the fly. *Web Week*, 2(11), pp. 41–42.

Ang, T., (2000) *Picture editing*. 2nd ed. Oxford: Focal.

Arant, M.D. and Anderson, J.Q. (2001) Newspaper Online Editions Support Traditional Standards. *Newspaper Research Journal* 22(4), pp. 57–69.

Armitage, L. and Enser, P.G.B. (1997) Analysis of user need in image archives. *Journal of Information Science*, 23(4), pp. 287 – 299.

Arnheim, R. (1970) *Visual Thinking*. London: Faber and Faber.

Associated Press (2014) *AP severs ties with photographer who altered work* [online] Available at: https://www.ap.org/ap-in-the-news/2014/ap-severs-ties-with-photographer-who-altered-work [Accessed: 22 March 2018]

Associated Press (2018) *News values and principles*. *Fabrications.* [online] Available at: https://www.ap.org/about/news-values-and-principles/ [Accessed: 22 March 2018]

Attfield, S. and Dowell, J. (2003) Information seeking and use by newspaper journalists, *Journal of Documentation*, 59 Iss: 2, pp.187 – 204.

Aula A, Khan RM and Guan Z. (2010) How does search behavior change as search becomes more difficult? In: *Proceedings of the SIGCHI conference on human factors in computing systems,* Atlanta, GA, 10–15 April 2010, pp. 35–44. New York: ACM.

Back, J. and Oppenheim, C. (2001) A model of cognitive load for IR: implications for user relevance feedback interaction. *Information Research*, 6(2): Workshop Paper 2.

Banister, P., Burman, E., Parker, I., Taylor, M. and Tindall, C. (1994) *Qualitative methods in psychology: A research guide.* Buckingham: Open University Press.

Barnhurst, K.G. and Nerone, J., (2001) *The form of news. A history.* New York, London: The Guilford Press.

Barry, C.L. (1994) User-defined relevance criteria: An exploratory study. *Journal of the American Society for Information Science*, 45(3), pp. 149–159, April 1994.

Barry, C. L., and Schamber, L. (1998) Users' criteria for relevance evaluation: a cross-situational comparison. *Information Processing and Management*, 34, pp. 219–236.

Barthes, R. (1973) *Mythologies*. London: Granada.

Bates, M. J. (2002) Toward an Integrated Model of Information Seeking and Searching. Fourth international Conference on Information Needs, Seeking and Use in Different Contexts, Keynote Address. Lisbon, Portugal, September 11, 2002. *New Review of Information Behaviour Research*, 3, pp. 1-15.

Bates, Marcia J. (2007) What is browsing—really? A model drawing from behavioural science research. *Information Research,* 12(4), paper 330. [online] Available at http://InformationR.net/ir/12-4/paper330.html [Accessed: 3 March 2018).

Batley, S., (1988) Visual information retrieval: Browsing strategies in pictorial databases. *Online Information 88, Proceedings of 12th International Online Information Meeting*, pp. 373-381.

Bazeley, P. (2018) *Integrating analyses in mixed-methods research*. London: Sage.

Beard, D. (1991) Computer human interaction for image information systems. *Journal of the American Society for Information Science and Technology,* 42(8), pp. 600-608.

Beaudoin, J. E. (2009) *An investigation of image users across professions: a framework of their image needs, retrieval and use*. A doctoral thesis submitted to the Faculty of Drexel University

[online] Available at: https://pdfs.semanticscholar.org/2d91/99ef11fa2ef9a302b43db87ce73dbbd990ec.pdf [Accessed 22 March 2018].

Beaudoin, J.E. (2014) A framework of image use among archaeologists, architects, art historians and artists. *The Journal of Documentation*. 70(1), pp. 119-147. doi:10.1108/JD-12-2012-0157.

Becker, K. E. (2003) Photojournalism and the tabloid press. In: Wells, L. (ed) *The photography reader*. London: Routledge.

Bednarek, M. and Caple, H. (2010) Playing with environmental stories in the news: Good or bad practice? *Discourse & Communication,* 4(1), pp. 5–31.

Belkin, N. J. (1980). Anomalous state of knowledge for information retrieval. *Canadian Journal of Information Science*, 5, 133-143.

Berg, T.L., Berg, A.C., Edwards, J., Maire, M., White, R., Teh, Y-W., Learned-Miller, E., and Forsyth, D.A. (2005) Who's in the picture. In: Saul, L. K., et al. (eds), *NIPS*, Cambridge, MA, MIT Press.

Bergman, M. (2008) Introduction: whither mixed methods? In: Bergman M. (ed.) (2008) *Advances in mixed methods research*. Thousand Oaks, CA: Sage.

Black, J.A. and Champion, D. J. (1976) *Methods and issues in social research.* New York: Wiley.

Borlund, P. (2003) The IIR evaluation model: a framework for evaluation of interactive information retrieval systems. *Information Research*, 8(3), paper no. 152 [Available at: http://informationr.net/ir/8-3/paper152.html].

Bowen, C.J. and Thompson, R. (2013) *The grammar of shot*. 3rd ed. Abingdon: Focal Press.

Boyatzis, R.E. (1998) *Transforming qualitative information: Thematic analysis and code development*. Thousand Oaks, CA: Sage.

Bradshaw, P. (2012) *The Newsroom of the 21st Century* [online] https://leanpub.com/21stcenturynewsroom [Accessed 9th February 2015].

Braun, V. and Clarke, V. (2006) Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3 (2), pp. 77-101.

Brinck, T., Gergle, D. and Wood, S.D. (2002) *Usability for the web: designing websites that work*. Academic Press: San Diego, CA.

British Computer Society (s.d.) Bespoke vs. off-the-shelf software. BCS Publishing and editorial: Hardware, software, and games. [online] Available at: https://www.bcs.org/content/conwebdoc/2767 [Accessed: 1 October 2018]

Bryman, A, (2001) *Social Research Methods*. Oxford: Oxford University Press.

Bryman, A. (2007). Barriers to integrating quantitative and qualitative research. *Journal of Mixed Methods Research*, 1, pp. 8-22.

Bucher, H-J. and Schumacher, P. (2006) The relevance of attention for selecting news content. An eye-tracking study on attention patterns in the reception of print and online media. *Communications* 31(3), pp. 347–368. doi: 10.1515/COMMUN.2006.022

Buerger, T. A. (2010) Model of relevance for reuse-driven media retrieval. In: *Proceedings of the 12th international workshop of the multimedia metadata community, the 2nd workshop focusing on semantic multimedia database technologies* (SMDT2010), Saarbrucken, 1–3 December 2010, pp. 41–54. Germany: CEUR-WS.

Burman, E. (1994) Feminist approach. In: Banister, P., Burman, E., Parker, I., Taylor, M. and Tindall, C. (1994) *Qualitative methods in psychology: A research guide.* Buckingham: Open University Press.

Burns, B. (ed.) (1992) *Percepts, concepts and categories: the representation and processing of information.* New York: Elsevier Academic Publishers.

Byström, K. and Hansen, P. (2005) Conceptual framework for tasks in information studies. *Journal of the American Society for Information Science & Technology*, 56(10), pp. 1050-1061.

Byström, K. and Järvelin, K. (1995) Task complexity affects information seeking and use. *Information Processing & Management*, 31(2), pp. 191-213.

Caple, H. (2013) *Photojournalism. A social semiotic approach*. Palgrave Macmillan, New York.

Caple H. and Bednarek, M. (2010) Double-take: unpacking the play in the image-nuclear news story. *Visual Communication*, 9(2) pp. 211-229.

Caple, H. and Knox, J.S., (2012) Online news galleries, photojournalism and the photo essay. *Visual Communication* 11(2) pp. 207–236.

Caple, H. and Knox, J.S., (2015) A framework for the multimodal analysis of online news galleries. *Social Semiotics* 25(3) pp. 292–321.

Case, D. (ed.) (2012) *Looking for information: a survey of research on information seeking, needs, and behaviour*. 3rd ed. Library and Information Science. Bingley: Emerald Group Publishing Ltd.

Castells, M. (2000, 1996) *The Rise of Network Society*. Oxford and Malden, Mass.: Blackwell Publishers.

Chang, S-J, and Rice, R.E. (1993) Browsing: A Multidimensional Framework. *Annual Review of Information Science and Technology* (ARIST), 28 pp. 231-76.

Chen, C.H. (ed.) (2015) *Handbook of Pattern Recognition and Computer Vision*. 5th ed. New Jersey, London: World Scientific.

Chen, H.L. and Rasmussen, E.M. (1999) Intellectual access to images, *Library Trends*, 48(2), pp. 291-302.

Cheuk Wai-yi, B. (1998) An information seeking and using process model in the workplace: a constructivist approach, *Asian Libraries*, 7(12), pp. 375 – 390.

Chin, M. (2018). *Adobe adds cool AI feature*. Mashable UK. [online] Available at: https://mashable.com/2018/01/23/adobe-adds-cool-ai-feature/?europe=true#fz2v8NSxOaqo [Accessed: 31 October 2018].

Choi, Y. (2010). Effects of contextual factors on image searching on the web. *Journal of the American Society for Information Science and Technology*, 61(10), pp. 2011-2028.

Choi, Y. (2013) Analysis of image search queries on the web: Query modification patterns and semantic attributes. *Journal of the American Society for Information Science and Technology*, 64(7), pp. 1423–1441.

Choi, Y., and Rasmussen, E. M. (2002) User's relevance criteria in image retrieval in American history. *Information Processing and Management*, 38(5), 695-726.

Chowdhury, G.G. (2010) *Introduction to modern information retrieval*. 3rd ed. London: Facet Publishing.

Chu, C.M. (1999). Literary critics at work and their information needs: a research-phases model. *Library and Information Science Research*, 21(2), pp. 247-273.

Chua, A. Y. K., Razikin, K., and Goh, D.H. (2010) Social tags as news event detectors. *Journal of Information Science*, 37(1), pp. 3-18.

Chung, E.K, and Yoon, J.W. (2011) Image needs in the context of image use: An exploratory study. *Journal of Information Science* 37(2), pp. 163–177.

City University, London (2013) Research Ethics. [online] Available at: www.city.ac.uk/acdev/academic_framework/re/research_ethics.html [Accessed 3 April 2013]

City, University of London (2015) Research Ethics. [online] Available at: www.city.ac.uk/research/research-and-enterprise/research-ethics [Accessed 18 May 2015]

Clarke, B. (2004) From Grub Street to Fleet Street: An Illustrated History of English Newspapers to 1899. England: Ashgate Publishing Limited.

Clarke, R. (2010) Cataloguing and classification for art and design school libraries: challenges and considerations. In: Gluibizzi, A. and Glassman, P. (eds) (2010) *Handbook of Art and Design Librarianship for Higher Education.* London: Facet Publishing Ltd.

Clough, P. and Sanderson, M. (2006), User Experiments with the Eurovision Cross-Language Image Retrieval System. Journal of the American Society for Information Science and Technology (JASIST) Special Topic Section on Multilingual Information Systems, 57(5), pp. 697 - 708.

Conniss, C., Ashford, J.A, Graham, M.E. (2000) *Information seeking behaviour in image retrieval. Visor I final report.* Library and Information Commission Research Report 95. Newcastle: University of Northumbria.

Cooke, L. (2003) Information acceleration and visual trends in print, television, and web news sources. *Technical Communication Quarterly,* 12(2), pp. 155–81.

Corbin, J., and Strauss, A. (2008). *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory.* (3rd ed.). Thousand Oaks, CA: Sage.

Corridoni, J., Del Bimbo, A., and Pala, P. (1999) Image retrieval by color semantics. *Multimedia Syst 7* (3), pp. 175-183.

Creswell, J. W., and Tashakkori, A. (2007). Developing publishable mixed methods manuscripts. *Journal of Mixed Methods Research*, 1, pp. 107-111.

Dake, D. (2005, 2011) *Aesthetics theory*. In: Smith, K.L., Moriarty, S., Kenney, K., and Barbatsis, G. (eds) (2005 (2011)) *Handbook of Visual Communication: Theory, Methods, and Media. I: Aesthetics.* New York: Routledge.

Datta, R., et al. (2006) Studying aesthetics in photographic images using a computational approach. In Proc. of ECCV.

Davis, J. F. (1992) Power of images: creating the myths of our time. *Media & Values,* 57. [online] Available from: http://www.medialit.org/reading-room/power-images-creating-myths-our-time [Accessed 10 June 2018].

Denscombe, M. (2010) *The good research guide: for small-scale social research projects* (4th edition) Maidenhead: Open University Press.

Denzin, N. and Lincoln, Y. (2005) *The Sage handbook of qualitative research*. Sage, Thousand Oaks.

Dervin, B. (1983) *An overview of sense-making research: concepts, methods and results to date*. Seattle: School of Communications, University of Washington.

Dervin, B., and Nilan, M. (1986). *Information needs and uses*. In M. E. Williams (Ed.), *Annual Review of Information Science and Technology* (ARIST), 21, pp. 3-33.

Deselaers, T., Keysers, D., and Ney, H., (2008). Features for image retrieval: an experimental comparison. *Information Retrieval* 11(2), pp. 77-107.

Dredge, S. (2014). Social media, journalism and wars: ‘Authenticity has replaced authority'. *The Guardian.* Wed. 5 November 2014. [online] Available at: https://www.theguardian.com/technology/2014/nov/05/social-media-journalism-wars-authenticity [Accessed 31 October 2018].

Driscoll, J (1994). Reflective Practice for Practise. *Senior Nurse*, 13(7), pp. 47-50.

Eakins, J.P., Briggs, P., and Burford, B. (2004) Image retrieval interfaces: a user perspective. *Lecture Notes in Computer Science*, 3115, 628 – 637.

Eayrs, C. B. and Ellis, N. (1990) Charity Advertising: For or Against People with a Mental Handicap? *British Journal of Social Psychology*, 29: 349–60.

Ellis, D. (1989). A behavioural approach to information retrieval system design. *Journal of Documentation*, 45(3), 171–212.

Ellis, D., Cox, D., and Hall, K., (1993) A Comparison of the Information Seeking Patterns of Researchers in the Physical and Social Sciences. *Journal of Documentation*, 49 (4), pp. 356-369, https://doi.org/10.1108/eb026919

Ellis, D., Ford, N., and Furner J. (1998). In search of the unknown user: Indexing and hypertext and the World Wide Web. *Journal of Documentation*, 54(1), pp. 28–47.

Elsweiler, D. and I. Ruthven, I. (2007) Towards task-based personal information management evaluations. In: Proceedings of the 30th ACM Conference on Research and Development in Information Retrieval (SIGIR '03), Amsterdam, The Netherlands, 2007, pp. 22–30.

Emanuel, J. (2011). Usability of the VuFind next-generation online catalog. *Information Technology and Library*, March 2011, pp. 44 – 52.

Emmett, A. 2010. *Too graphic*. AJR Features online [online] available at: http://ajrarchive.org/Article.asp?id=4858 [Accessed: 1 September 2015]

Enser, P.G.B., (1993) Query analysis in a visual information retrieval context. *Journal of Document and Text Management*, 1(1), pp. 25 – 52.

Enser, P.G.B. and Sandom, C. (2002) Retrieval of archival moving imagery — CBIR outside the frame? In: *International Conference on Image and Video Retrieval*. Springer LNCS 2383. DOI: 10.1007/3-540-45479-9_22. 2.4, 5.4.2

Enser, P.G.B., and Sandom, C. (2003) Towards a Comprehensive Survey of the Semantic Gap in Visual Image Retrieval. *Proceedings of Int. Conference on Image and Video Retrieval*, LNCS, Springer 27-28 (2003) 279–287.

Erdelez, S. (1997) Information encountering: a conceptual framework for accidental information discovery. In P. Vakkari, R. Savolainen, and B. Dervin (eds.), *Information seeking in context: Proceedings of international conference on research in information needs, seeking, and use in different contexts* (pp. 412-421). London: Taylor Graham.

Erdelez, S., Heinström, J., Makri, S., Björneborn, L., Beheshti, J., Toms, E. and Agarwal, N. K. (2016), Research perspectives on serendipity and information encountering. *Proc. Assoc. Info. Sci. Tech*., 53: pp. 1–5. doi:10.1002/pra2.2016.14505301011

Eriksen, T. H. (2001) *Tyranny of the Moment. Fast and Slow Time in the Information Age*. London: Pluto Press.

Evans, H. (1997) *Pictures on a page: photojournalism, Graphics and Picture Editing*. London: Pimlico.

ExtremeTech (2015) Facial recognition app. [online] Available at: https://www.facebook.com/facialrecognitionapp [Accessed on 23 March 2018]

Fahmy, S. (2008) How online journalists rank importance of news skills. *Newspaper Research Journal,* 29(2), pp. 23-39.

Fahmy, S., Bock, A.M, and Wanta, W. (2014) *Visual Communication Theory and Research. A Mass Communication Perspective.* London: Palgrave Macmillan.

Fanta, A. (2017). *Putting Europe's Robots on the Map: Automated journalism in news agencies.* Reuters Institute Fellowship Paper. Oxford: University of Oxford

Fidel, R. (1991) Searchers' selection of search keys: III. Searching styles. *Journal of The American Society for Information Science*, 42(7) pp. 515 – 527.

Fidel, R. (1994) Human-Centered Indexing. *Journal of The American Society for Information Science*, 45(8) pp. 572-576.

Fidel, R. (1997) The image retrieval task: implications for the design and evaluation of image databases. *The New Review of Hypermedia and Multimedia*, 3, pp. 181 – 199.

Fidel, R. (2006) An ecological approach to the design of information systems. *Bulletin of the Association for Information Science and Technology*, 33(1), pp. 6-8.

Fidel, R. (2012) *Human information interaction: An ecological approach to information behavior.* Cambridge, MA: MIT.

Fielding, N., and Fielding, J. (1986). *Linking data.* London, England: SAGE.

Firestone, W.A. (1993) Alternative arguments for generalising from data as applied to qualitative research. *Educational Researcher*, 22(4), pp. 16 – 23.

Fisher, K.E., Erdelez, S., and McKechnie, L.E.F. (2009) *Theories of information behaviour*. ASIST Monograph Series. Medford: ASIST, Information Today, Inc.

Flickr (homepage): www.flickr.com

Ford, N., Miller, D., Moss, N. (2002) Web search strategies and retrieval effectiveness: an empirical study. *Journal of Documentation*, 58(1), pp. 30-48.

Frankowska-Takhari, S., MacFarlane, A., Göker, A. and Stumpf, S. (2016) *Identifying components of real-life illustration tasks in online journalism for use in simulated work task scenarios.* Poster presented at ISIC 2016 Conference, Zadar.

Frankowska-Takhari, S., MacFarlane, A., Göker, A. and Stumpf, S. (2017). Selecting and tailoring of images for visual impact in online journalism. *Information Research*, 22(1), CoLIS paper 1619. Retrieved from http://InformationR.net/ir/22-1/colis/colis1619.html

Froehlich, T. J. (1994) Relevance reconsidered—Towards an agenda for the 21st century: Introduction to special topic on relevance research. *Journal of the American Society for Information Science, Special: relevance research archive*, 45 (3), pp. 124-134.

Frost, C. (2001) The role of mental models in a multi-modal image search. *ASIST 2001: Proceedings of the 64th ASIST Annual Meeting*. 38, pp. 52-57.

Frøkjær, E., Hertzum, M., and Hornbæk, K. (2000) Measuring usability: Are effectiveness, efficiency, and satisfaction really correlated? In T. Turner, G. Szwillus, M. Czerwinski, F. Paternò, and S. Pemberton (Eds.), *Conference proceedings* (pp. 345-352). New York, NY: ACM Press.

Galtung, J. and Ruge, M. (1965) The structure of foreign news: the presentation of the Congo, Cuba and Cyprus crises in four Norwegian newspapers. *Journal of International Peace Research* 1, pp. 64–91.

Gao, X.P. and Xin, J.H. (2006) Investigation of human's emotional responses on colors. *COLOR research and application*. 31 2006 411– 417

Garcia, M. R. and Stark, P. (1991). *Eyes on the news*. St. Petersburg, FL: Poynter Institute.

Gervais, T. (2010) Witness to War: The Uses of Photography in the Illustrated Press, 1855-1904. *Journal of Visual Culture,* 9(3), pp. *370-384.*

Goodfellow, I., Bengio, Y., and Courville, A. (2016) Deep learning. MIT Press. [online] Available at: www.deeplearningbook.org [Accessed 31 October 2018].

Goodman, N. (1978) *Ways of worldmaking*. London: Hackett Publishing Co.

Goodrum, A. (2005) I can't tell you what I want, but I'll know it when I see it: Terminological disconnects in digital image reference*. Reference & User Services Quarterly*, 45(1), pp. 46-53.

Goodrum, A. and Spink, A. (2001) Image searching on the Excite Web search engine. *Information Processing and Management* 37 (2), pp. 295-311

Gorman, G. E., Clayton, P. R., Shep, S. J., and Clayton, A. (2005) *Qualitative Research for the Information Professional*: *A Practical Handbook*. 2nd ed. London: Facet Publishing.

Göker, A. and Davis, J. (eds) (2009) *Information retrieval. Searching in the 21st century*. London: Wiley.

Göker, A., Butterworth, R., MacFarlane, A., Ahmed, T.S. and Stumpf, S. (2016). Expeditions through image jungles: The commercial use of image libraries in an online environment. *Journal of Documentation*, 72(1), 5-23. doi: 10.1108/JD-01-2014-0019

Grbich, C. (2007) *Qualitative Data Analysis: An Introduction*. London: Sage Publications Ltd.

Grbich, C. (2013) *Qualitative Data Analysis: An Introduction*. (2nd ed.) London: Sage Publications Ltd.

Greisdorf, H. (2000) *Relevance thresholds: a conjunctive/disjunctive model of enduser cognition as an evaluative process.* Denton, TX., University of North Texas.

Greisdorf, H. and O'Connor, B. (2002) Modelling what users see when they look at images: a cognitive viewpoint, *Journal of Documentation*, 58(1), pp. 6-29, doi: 10.1108/00220410210425386.

Griffin, M. (2004). Picturing America's 'War on Terrorism' in Afghanistan and Iraq: Photographic motifs as news frames. *Journalism*, 5(4), 381-402.

Griffiths, J. R. and Brophy, P. (2005) Student Searching Behavior and the Web: Use of Academic Resources and Google. *Library Trends* 53, 539-554.

Grix, J. (2010) *The Foundations of Research* (Palgrave Research Skills). 2nd ed. London: Palgrave Macmillan.

Guest, G. S., MacQueen, K. M. and Namey, E. E. (2012) *Applied thematic analysis*. Thousand Oaks, CA: Sage.

Gürsel, Z. D. (2016) *Image Brokers: Visualizing World News in the Age of Digital Circulation*. Oakland: University of California Press.

Hamid, R. A. and Thom, J. A. (2017) Effects of relevance criteria and subjective factors on web image searching behaviour. *DNFA Iskandar. Journal of Information Science* 43(6), pp. 786-800,

Han, H. and Wolfram, D. (2016) An exploration of search session patterns in an image-based digital library. *Journal of Information Science* 42(4) pp. 477–491.

Hansen, P. (1999). User Interface design for IR Interaction. A Task-oriented approach. COLIS 3, Dubrovnik, 1999.

Harcup, T. and O'Neill, D. (2001) What Is News? Galtung and Ruge revisited. 12 Dec 2001. *Journalism Studies*, 2(2), pp. 261–280.

Harding, J. (2013) *Qualitative data analysis from start to finish*. London: SAGE Publications

Harley, D., Henke, J., Lawrence, S., Miller, I., Perciali, I., and Nasatir, D. (2006) *Use and users of digital resources: a focus on undergraduate education in the humanities and social sciences.* Center for Studies in Higher Education (CSHE), University of California, Berkeley. [online] Available at: https://cshe.berkeley.edu/sites/default/files/publications/2006-04-05_cshe-digital-resources-study.pdf [Accessed: 02 June 2018].

Harman, J. (1986) Reuters: a survey of end-user searching. *Aslib Proceedings*, 38[1], pp.35-42, https://doi.org/10.1108/eb050996

Harrison, C. (2003) Visual social semiotics: understanding how still images make meaning. *Technical COMMUNICATION* 50, Number 1, pp.46-60, February 2003.

Heidorn, P.B. (1999) Image retrieval as linguistic and non-linguistic visual model matching. *Library Trends*, 48(2), pp. 303 – 325.

Hermans, L., Vergeer, M., and D'Haenens, L., (2009) Internet in the Daily Life of Journalists: Explaining the use of the Internet by Work-Related Characteristics and Professional Opinions. *Journal of Computer-mediated Communication.* 15 (1), pp. 138–157.

Hernandez, D. (1994) *Qualitative Representation of Spatial Knowledge,* Lecture Notes in Artificial Intelligence, 804. Springer-Verlag, Berlin, 1994.

Hernández-Gracidas, C.A., Sucar, L.E., and Montes-y-Gómez, M. (2013) Improving image retrieval by using spatial relations. *Multimed Tools Appl* (2013) 62:479–505.

Hill, S. and Lashmar, P. (2014) *The essential guide to online journalism*. London: Sage Publications Ltd.

Holderness, M., Pöppelmann, B.H., and Klehm, M. (2011) *The right thing. An authors' rights handbook for journalists.* Brussels: International Federation of Journalists.

Hollander, B.A. (2001) Influence of front page photographs on single-copy sales in three daily newspapers. *Newspaper Research Journal*. 22, No.3, pp.86 – 88, Summer 2001.

Hollink, L., Schreiber, A.T., Wielinga, B.J., Worring, M. (2004) *Classification* of user image descriptions. *International Journal of Human-computer Studies*, 61(5), pp. 601-626.

Holmqvist, K., Holsanova, J. and Holmberg, N. (2005) The effect of photos and information graphics on newspaper reading. In: *European Conference on Eye Movement Research*, ECEM 13. Bern: Schweiz.

Howe, K. R., and Eisenhardt, M. (1990). Standards for qualitative (and quantitative) research: A prolegomenon. *Educational Researcher*, 19(4), pp. 2-9.

Hung, T. Y., (2005). Search moves and tactics for image retrieval in the field of journalism: A pilot study. *Journal of Education Media and Library Sciences*, 42(30), pp. 329–346.

Hung, T.Y. (2012). An analysis of photo editors' query formulations for image retrieval. *Journal of Librarianship and Information Studies*, 4(1), pp. 13–16.

Hurley, G. D. and McDougall, A. (1971) *Visual impact in print.* Chicago: Visual Impact.

Ingwersen, P. and Järvelin, K. (2005) *The turn: integration of information seeking and retrieval in contex*t. Dordrecht, The Netherlands: Springer.

Instagram (homepage): www.instagram.com

International Standards Office (1998) *Ergonomic requirements for office work with visual display terminals (VDTs): Part II, Guidance on Usability* (ISO 9241-11:1998).

Jackson, P. and Moulinier, I. (2007) Natural Language Processing for Online Applications: Text retrieval, extraction and categorization. 2nd revised ed. *Natural Language Processing 5*. Amsterdam: John Benjamin Publishing Company.

Jaimes, A. and Chang, S. (2000) A conceptual framework for indexing visual information at multiple levels. *ISandT/SPIE Internet Imaging*, p. 3964, San Jose, CA

Jaimes, A., Sebe, N., and Gatica-Perez, D. (2006) Human-centered computing: a multimedia perspective. In: *Proceedings of the ACM International Conference on Multimedia* (Special Session on Human-Centered Multimedia).

Jansen, B. J. and Pooch, U. (2001) Web user studies: a review and framework for future work. *Journal of the American Society of Information Science and Technology*, 52(3), pp. 235–246.

Jansen, B. J., Spink, A. and Saracevic, T. (2000) Real life, real users, and real needs: a study and analysis of user queries on the web. *Information Processing & Management*, 36, pp. 207-227

Jewitt, C. and Oyama, R. (2001) Visual meaning: a social semiotic approach. In: van Leeuwen, T. and Jewitt, C. (eds.) (2001), *Handbook of visual analysis*. London, UK: Sage Publications, pp. 134–156.

John, G. H., Kohavi, R. and Peger, K. (1994) Irrelevant features and the subset selection problem. *Proceedings of the 11th International Conference on Machine Learning*, pp. 121-129.

Johnston, J.M. and Pennypacker, H.S. (1980) *Strategies and tactics of human behavioral research.* Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Jörgensen, C. (1998) Attributes of images in describing tasks. *Information Processing and Management* 34(2/3), pp. 161-174.

Jörgensen, C. (1999) Access to pictorial material: a review of current research and future prospects. *Computers and the Humanities*, 33(4), pp. 293-318.

Jörgensen, C. and Jörgensen, P. (2005) Image querying by image professionals. *Journal of the American Society of Information Science and Technology,* 56(2), pp. 1346-1359.

Jupp, V. (ed.) (2006) *The Sage dictionary of social research methods*. London: SAGE Publications.

Kaliciak, L. (2013) *Hybrid models for combination of visual and textual features in context-based image retrieval*. Available from OpenAIR@RGU. [online]. Available from: http://openair.rgu.ac.uk [Accessed: 25 September 2015].

Kalish, S.E. and Edom, C.C. (1951) Picture editing. New York, Rinehart.

Karpathy, A. and Li, F-F. (2015). Deep visual-semantic alignments for generating image descriptions. In: *Proceedings of CVPR 2015*, Boston, 7-12 June 2015, edited by Kristen Grauman, Eric Learned-Miller, Antonio Torralba, and Andrew Zisserman.

Kaur, A., Kumar Banga, V., and Kaur, N. (2013) Color and texture-based image retrieval: a proposed method. *International Journal of Research in Engineering and Technology*, 02(11), pp. 498-501

Keister, L.H. (1994) User types and queries: impact on image access systems. In: Fidel R. et al. (eds.) (1994) *Challenges in Indexing Electronic Text and Images*. pp 7--22.

Keith, W. (1977) *The English newspaper: an illustrated history to 1900*. London: Springwood.

Kelly, D. (2009) Methods for evaluating interactive information retrieval systems with users. Foundations and Trends in Information Retrieval, 3(1-2), pp. 1-224.

Kerlinger, F.N. (1964) *Foundations of behavioral research*. New York: Holt, Rinehart & Winston.

King D. (1997) The commissar vanishes. London: Metropolitan Books

Knobloch, S., Hastall, M., Zillmann, D., and Callison, C. (2003) Imagery effects on the selective reading of internet newsmagazines. *Communication Research,* 30(1) 3-29.

Kobré, K. (1980) *Photojournalism*. *The professionals' approach*. Somerville, MA: Curtin and London.

Kobré, K. (2008) *Photojournalism*. *The professionals' approach*. London: Focal Press.

Koch, C. (2004). Consciousness: introduction. In: Gazzaniga, M.S. (ed.) *The cognitive neurosciences.* (3rd ed.). Cambridge, MA: MIT.

*Knox, J. S. (2007a) Visual-verbal communication on online newspaper home pages. *Visual Communication*, 6(1), pp. 19–53.

Knox, J. S. (2007b) Visual minimalism in hard news: thumbnail faces on the smh online home page*. Social Semiotics*, 19(2), pp. 165-189.

Knox, J. S. (2009) Punctuating the home page: image as language in an online newspaper. *Discourse & Communication*, 3(2) pp. 145–172 DOI: 10.1177/1750481309102450

Konkova, E., Göker, A.S., Butterworth, R. and MacFarlane, A. (2014). Social tagging: exploring the image, the tags, and the game. *Knowledge Organization*, 41(1), pp. 57-65.

Kress, A.G. and Leeuwen, T. van (1996; 2006) *Reading images: The grammar of visual design*. London, UK: Routledge.

Kroski, E. (2006) The hive mind: folksonomies and user-based tagging. InfoTangle, Jan 12, 2006. [online] Available at: http://web20bp.com/13z2a6019/wp-content/uploads/2013/03/The-Hive-Mind-Folksonomies-2005.pdf [Accessed 1 November 2018].

Kuhlthau, C.C., (1991) Inside the search process: information seeking from the user's perspective. *Journal of the American Society for Information Science*. 42(5) pp.361-371.

Kuhlthau, C.C. (1994), *Seeking meaning: a process approach to library and information services*. Norwood, NJ: Ablex.

Koren, L. (2010) *Which aesthetics do you mean? Ten definitions*. Point Reyes, California: Imperfect Publishing.

Küpper, N. (1990). Research into newspaper reading behaviour. Recording of visual reading activity. [online] Available at: www.editorial-design.com/leseforschung/Eyetrackstudy.pdf [Accessed 25 September 2015].

Laine-Hernandez, M. and Westman, S. (2006) Image semantics in the description and categorisation of journalistic photographs. *69th Annual Meeting of the American Society for Information Science and Technology* (ASIST), Austin (US), 3-8 November 2006.

Laine-Hernandez, M. and Westman, S. (2010) Comparison of categorisation criteria across image genres. *Science and Technology*, 47(1), pp 1–12.

Lakoff, G. (1987) *Women, fire and dangerous things: what categories reveal about the mind*. University of Chicago Press.

Leeuwen van, T., and Jewitt. C. (eds) (2001) *Handbook of visual analysis.* London, UK: Sage Publications, pp. 134–156.

Lemke, J. (1990) *Talking science: language, learning and values*. Norwood, NJ: Ablex Publishing Corporation.

Lester, P.M. (1991) *Photojournalism: an ethical approach*. Hillsdale, NJ: Lawrence Erlbaum Associates

Levin, D. M., (1993) *Modernity and the hegemony of vision*. London: University of California Press.

Lewis, G. (2005) *Photojournalism: content and technique*. Madison, WI: Brown and Benchmark.

Lidwell, W., Holden, K., and Butler, J. (2005) *Universal Principles of Design. 125 Ways to Enhance Usability, Influence Perception, Increase Appeal, Make Better Design Decisions, and Teach through Design.* Beverly Massachusets: Rockport Publishers.

Lincoln, Y.S. (1995) Emerging criteria for quality in qualitative and interpretive research. *Qualitative Inquiry* 1, pp. 275–289.

Lincoln, Y. S., and Guba, E. G. (1985). *Naturalistic enquiry*. Beverly Hills, CA: Sage.

Loengard, J. (2010) *The role of the photo editor. 5 September 2010. [online] Available at:* http://monroegallery.blogspot.co.uk/2010/09/john-loengard-role-of-picture-editor.html [Accessed 23 March 2018).

Long, T. and Johnson, M. (2000). Rigour, reliability and validity research. *Clinical Effectiveness in Nursing*, 4(1), pp.30–37.

MacFarlane, A. (2016). Knowledge organisation and its role in multimedia information retrieval. *Knowledge Organization*, 43(3), pp. 180-183.

Machin, D. and Niblock, S., (2006) *News production: theory and practice*. New edition. New York and Oxon: Routledge.

Machin, D. and Polzer, L. (2015) *Visual journalism. Journalism: reflections and practice.* London: Palgrave.

Magee, M.C. (2006) The roles of journalists in online newsrooms. Online News Association [online] Available at: http://blogimg.ohmynews.com/attach/752/1260732429.pdf [Accessed 12 June 2018].

Makri, S., Blandford, A. and Cox, A. L. (2008) Investigating the information-seeking behaviour of academic lawyers: From Ellis's model to design. *Information Processing and Management* 44, pp. 613–634.

Makri, S. and Warwick, C. (2010) Information for inspiration: understanding architects' information seeking and use behaviors to inform design. *The Journal of the American Society for Information Science and Technology* 61(9), pp. 1745–1770.

Mallonee, L. (2015). Infamously altered photos, before and after their edits. Wired. [online] Available at: https://www.wired.com/2015/07/bronx-documentary-center-infamously-altered-photos-edits/ [Accessed: 20 September 2018].

Marchionini, G. (1995). *Information seeking in electronic environment*. Cambridge, UK: Cambridge University Press.

Markey, K. (1994) Interindexer consistency tests: a literature review and report of a test of consistency in indexing visual materials. *Library and information science research,* 6.

Markkula, M. and Sormunen, E. (2000) End-user searching challenges indexing practices in the digital newspaper photo archive. *Information Retrieval*, 1, 259-285 (2000).

Marsh, E.E. and White, M.D. (2003) A taxonomy of relationships between images and texts. *Journal of Documentation* 59(6), pp. 647–72.

Maslow, A. H. (1943). A theory of human motivation. *Psychological Review,* 50(4), 370- 96.

Maslow, A. H. (1954). *Motivation and personality*. New York: Harper and Row.

de Matos, P., Cham, J.A., Cao, H., Alcántara, R., Rowland, F., Lopez, R., and Steinbeck, C. (2013). The Enzyme Portal: a case study in applying user-centred design methods in bioinformatics. *BMC Bioinformatics,* 14(103). https://doi.org/10.1186/1471-2105-14-103

Matusiak, K. K. (2006) Towards user-centered indexing in digital image collections. *OCLC Systems & Services: International digital library perspectives*, 22 (4), pp.283-298, https://doi.org/10.1108/10650750610706998

Mazdak, A. (2014) Don't get held back. BCS Publishing and editorial, Leaders. [online] Available at: https://www.bcs.org/content/conWebDoc/52299 [Accessed: 1 October 2018].

Maxwell, J. A. (2005) Qualitative research design, an interactive approach (2nd ed.). Thousand Oaks, CA: Sage Publications.

Maxwell, J. A. (2013). Qualitative research design, an interactive approach (3rd ed.). Thousand Oaks, CA: Sage Publications.

McCay-Peet, L. and Toms, E. (2009) Image use within the work task model: Images as information and illustration. *The Journal of the American Society for Information Science and Technology,* 60(12), pp. 2416–2429.

McDonald, S. and Tait, J. 2003. Search strategies in content-based image retrieval. *Proceedings of the 26th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval* (pp. 80–87). NewYork: ACM Press.

McDougall, A. and Hampton, V. J. (1991) *Picture editing and layout: A guide to better visual communication.* Columbia: Vision Press.

Miles, M. B. and Huberman, A. M. (1984). *Qualitative data analysis*. London: Sage.

Mitchell, W. J. T. (1994) *Picture theory: essays on verbal and visual representation*. Chicago, University of Chicago Press.

Montagne, R. 2006. *Reuters retracts altered Beirut photo*. August 08, 2006 [online] Available at: http://www.npr.org/templates/story/story.php?storyId=5625098 [Accessed: 3 March December 2018)

Montgomery, A. (2011) BBC launches redesigned homepage. *Design Week* [online] (Sep 21, 2011).

Morgan, D. (2008) Snowball sampling. In: Given, L., (ed.) *The SAGE encyclopedia of qualitative research methods*. Thousand Oaks: SAGE Publications Inc.

Morse, J.M. (2000) Determining sample size. *Qualitative Health Research*, 10(1), pp. 3-5, 2000 Sage Publications, Inc.

Morse, J.M. (2015) Issues in qualitatively-driven mixed-method designs: walking through a mixed-methods project. In: Hesse-Biber, S. and Johnson, B. (eds) (2015) *The oxford handbook of mixed and multimethod research*, New York: Oxford University Press.

Morse, J.M. and Niehaus, L. (2009) *Mixed Method Design: Principles and Procedures*. Walnut Creek, CA, USA: Left Coast Press Inc.

Morton, J. (2007) Facing the future. *American Journalism Review,* 68.

Moses, L. (2017) The Washington Post's robot reporter has published 850 articles in the past year. Digiday, modern newsroom. [online] Available at: https://digiday.com/media/washington-posts-robot-reporter-published-500-articles-last-year/ [Accessed: 22 March 2018]

Moshfeghi, Y., Triantafillou, P. and Pollick, F. E. (2016) Understanding information need: an fMRI study. In: *39th International ACM SIGIR Conference on Research and Development in Information Retrieval*, Pisa, Italy, 17-21 July 2016, pp. 335-344.

Mubin O., Stevens C. J., Shahid S., Mahmud A. A., Dong J.-J. (2013). A review of the applicability of robots in education. *Technol. Educ. Learn*. 1, 209–215. 10.2316/Journal.209.2013.1.209-0015

Mulvey, L. (1975) Visual pleasure and narrative cinema. *Screen,* 16(3), pp. 6–18, https://doi.org/10.1093/screen/16.3.6.

Newton, J. (2001) *The burden of visual truth: the role of photojournalism in mediating reality*. Mahwah, NJ: Lawrence Erlbaum.

Nielsen, J. and Tahir, M. (2001) *Homepage usability: 50 websites deconstructed*. New Riders Publishing, Upper Saddle River, NJ.

Obrador, P. (2008) Region based image appeal metric for consumer photos. In Proc of IEEE Intl. Workshop MMSP.

Obrador, P. and Moroney, N. (2009) Low level features for image appeal measurement, Proc. SPIE, 7242, 72420T.

Obrador, P., Anguera, X., de Oliveira, R., and Oliver, N. (2009) The role of tags and image aesthetic in social image search. *WSM'09*, October 23, 2009, Bejing, China.

Ofcom (2017). News consumption in the UK: 2016 [online] Available at: https://www.ofcom.org.uk/__data/assets/pdf_file/0016/103570/news-consumption-uk-2016.pdf [Accessed: 23 March 2018]

Onwuegbuzie, A. J., Burke Johnson, R., and Collins, K. M. T., (2011). Assessing legitimation in mixed research: a new framework. *Quality & Quantity*, 45(6), pp 1253–1271 DOI 10.1007/s11135-009-9289-9

Ou, L.C., Luo, M.R., Woodcock, A., and Wright, A. (2004) A study of colour emotion and colour preference. Part I: colour emotions for single colours. *COLOR research and application*. 29 (2004) 232–240

Outing, S. and Ruel, L. (2004) What we saw through their eyes. [online] Available at: http://www.math.unipd.it/~massimo/corsi/tecweb2/Eyetrack-III.pdf [Accessed 23 March 2018]

Ørnager, S. (1995) The newspaper image database: empirical supported analysis of users' typology and word association clusters. *SIGIR'95* Seattle WA USA'C) 1995 AChI.

Panovsky, E. (1955, 1987) *Meaning in the visual arts*. Phoenix: University of Chicago Press.

Patton, M.Q. (1990) *Qualitative evaluation and research methods*. Beverly Hills, CA: Sage.

Patton, M.Q. (2002) *Qualitative evaluation and research methods*. 3rd edition. Sage Publications, Inc.

Pascalis, O. and Kelly, D.J. (2009) The origins of face processing in humans: phylogeny and ontogeny. *Perspectives on Psychological Science,* 4(2).

Pavlik, J.V. (2001) *Journalism and new media*. New York: Columbia University Press.

Peters, J.W. (2010) *On The Economist's cover, only a part of the picture*. [online] Available at: https://mediadecoder.blogs.nytimes.com/2010/07/05/on-the-economists-cover-only-a-part-of-the-picture/ [Accessed: 18 March 2018].

Pickard, A. J. (2007) *Research methods in information*. 2nd ed. London Facet Publishing.

Pirolli, P. and Card, S. 1995. Information foraging in information access environments. *Proceedings o*f CHI*.

Pirolli, P. and Card, S. (1999) Information foraging. *Psychological Review*, 106(4).

Plano Clark, V.L. and Creswell, J.W. (2008) *The mixed methods reader*. Thousand Oaks: Sage Publications.

Pouyanfar, S., Sadiq, S., Yan, Y., Tian, H., Tao, Y., Presa Reyes, M., Shyu, M-L., Chen, S-C., and Iyengar, S. S. (2018). A Survey on Deep Learning: algorithms, techniques, and applications. *ACM Comput. Surv.,* 51[5]. DOI: https://doi.org/10.1145/3234150

Pu, H. (2005). A comparative analysis of web image and textual queries. *Online Information Review,* 29(5), pp. 457–467.

Quinn, S. and Lamble, S. (2007) *Online newsgathering: research and reporting for journalism*. London: Focal Press.

Quinn S., Stark P. and Edmonds R. (2007) *Eyetracking the News.* The Poynter Institute.

Rafferty, P. and Hidderley, R. (2005) *Indexing Multimedia and Creative Works*. Ashgate, Aldershot.

Rafferty, P. and Hidderley, R. (2007) Flickr and democratic indexing: dialogic approaches to indexing. *Aslib Proceedings: New Information Perspectives*, 59, pp. 397-410.

Rambaree, K. (2007). Bringing rigour in qualitative social research: the use of a CAQDAS. *University of Mauritius Research Journal*, 13.

Reisner, A.E. (1992) The news conference: How daily newspaper editors construct the front page. *Journalism & Mass Communication Quarterly,* 69(4), pp. 971–986.

Robertson, S.E. and Hancock-Beaulieu, M.M. (1992) On the evaluation of IR systems. *Information Processing and Management*, 28(4), pp. 457– 466.

Robson, C. (2000) *Small-scale evaluation: principles and practice*. London: Sage Publishing, Ltd.

Rodden, K., Basalaj, W., Sinclair, D. and Wood, K. (2001). Does organisation by similarity assist image browsing? *ACM Conference on Human Factors in Computing Systems*, pp. 190–197. Seattle, WA: ACM

Rogers, S. (2003) Truth and meaning in pictorial space. Chapter 13. In: Hecht, H., Schwartz, R. and Atherton, M. *Looking into Pictures: An Interdisciplinary Approach to Pictorial Space*. MIT.

Rothstein, A., 1974. *Photojournalism*. New York: Amphoto.

Rössler, P., Bomhoff, J., Haschke, J.F., Kersten, J., and Müller, R. (2011) Selection and impact of press photography: an empirical study on the basis of photo news factors. *Communications* (Sankt Augustin) (0341-2059), 36 (4), p. 415.

Russell, S.J. and Norvig, P. (2016). *Artificial intelligence: a modern approach*. Malaysia: Pearson Education Limited.

Ruthven, I. and Kelly, D. (eds.) (2011) *Interactive information seeking, behaviour and retrieval.* London: Facet Publishing Ltd.

Salter, W.J. (1988) *Human factors in knowledge acquisition*. In: Helander, M. (ed.), *Handbook of human-computer interaction*. Amsterdam: North-Holland.

Sandom, C.J. and Enser, P.G.B. (2001) Virami—Visual information retrieval for archival moving imagery. In: *Proceedings of the International Cultural Heritage Meeting*. Milan, Italy: Archives & Museum Informatics.

Sandywell, B. (2011) *Dictionary of visual discourse: a dialectical lexicon of terms*. 6th ed. Farnham, Surrey: Ashgate.

Saracevic, T. (1975). Relevance: a review of and a framework for thinking on the notion of information science. *Journal of the American Society for Information Science*, 26, pp. 321-343.

Sasso, F. (2011) *Abduzeedo inspiration, a guide for designers*. Berkeley: Pearson Education.

Schamber, L., Eisenberg, M.B., and Nilan, M.S. (1990). A re-examination of relevance: Toward a dynamic, situational definition. *Information Processing and Management,* 26, pp. 755–775.

Schiffanella, R., Redi, M., and Aiello, L. M. (2015) An image is worth more than a thousand favorites: surfacing the hidden beauty of Flickr pictures. *Proceedings of the Ninth International AAAI Conference on Web and Social Media.* Cornell University Library.

Schwartz, B. (2005) *The paradox of choice: Why More Is Less*. New York: Harper – Perennial.

Schwartz, B. (2016) *Google now displays image thumbnails next to search snippets for food-related queries*. [online] Search Engine Land. Available at: https://searchengineland.com/google-now-displays-image-thumbnails-next-search-snippets-food-related-queries-250641 [Accessed: 30 October 2018].

Sedghi, S., Sanderson, M., Clough, P. (2011) Medical image resources used by health care professionals, *Aslib Proceedings*, 63(6), pp. 570-585, https://doi.org/10.1108/00012531111187225

Searle, A. (1999) *Introducing research and data in psychology: A guide to methods and analysis*. Perspectives in Research. London: Routledge.

Sharp, H., Rogers, Y., and Preece, J. *Interaction design: beyond human-computer interaction*, 2nd ed. Wiley, Chichester, UK, 2007.

Shatford, S. (1986) Analyzing the subject of a picture: a theoretical approach. *Cataloging and Classification Quarterly*, 6(3), pp. 39–62.

Shatford-Layne, S. (1994) Some issues in the indexing of images. *The Journal of the American Society for Information Science and Technology,* 45(8), pp. 583 – 8.

Siapera, E. (2012) *Understanding new media*. London: Sage Publications Ltd.

Smeulders, A. W., Worring, M.M., Gupta, A. and Jain, R. (2000) Content-based image retrieval at the end of the early years, IEEE Trans. Pattern Anal. Machine Intell., 22 no.12, pp1349-1380.

Snopes.com (2016) *Squeaky wheels get the Greece* [online] Available at: https://www.snopes.com/anti-trump-protesters-destroy-america/ [Accessed: 3 March 2018].

Sontag, S. (1975) *On photography*. London. Penquin.

Solli, M. and Lenz, R. (2008) Color emotions for image classification and retrieval, 2008, *Proc. ISandTs 4th European Conference on Colour in Graphics, Imaging, and Vision*, CGIV 2008, pp. 367-371.

Solli, M. (2009) *Topics in content-based image retrieval. Fonts and color emotions.* LinkÄoping studies in science and technology Thesis No. 1397, Department of Science and Technology, NorrkÄoping.

Spink, A., Wilson, T., Ellis, D., and Ford, N. (1998) Modeling users' successive searches in digital environments. *D-Lib Magazine*, April.

Stemler, S. E., (2004) A comparison of consensus, consistency, and measurement approaches to estimating interrater reliability. *Practical Assessment, Research and Evaluation*, 1(4).

Sterling, C. (ed.) (2009) *Encyclopedia of journalism*. London: Sage Publications Ltd.

Su, J., Vasconcellos Vargas, D., and Kouichi, S. (2018). One pixel attack for fooling deep neural networks. Cornell University. [online] Available at: https://arxiv.org/abs/1710.08864 [Accessed: 31 October 2018].

Suh, B., Ling, H., Bederson, B. B., and Jacobs, D.W. (2003) Automatic thumbnail cropping and its effectiveness. *Proceedings of the 16th annual ACM symposium on User interface software and technology*. UIST '03, Vancouver, Canada — November 02 - 05, 2003, pp. 95-104.

Sulleyman, A. () Google uses AI to pick out users' most boring photos. *The Independent.* [online] Available at: https://www.independent.co.uk/life-style/gadgets-and-tech/news/google-ai-photos-boring-recommend-remove-artificial-intelligence-a7773916.html [Accessed 31 October 2018].

Sundt, C. L. (2002) The image users and the search for images. In: Baca, M. *Introduction to Art Image Access*: *Tools, Standards, and Strategies*. Los Angeles, CA: Getty Research Institute.

Swant, M. (2018). Getty Images is using Artificial Intelligence to help newsrooms choose better photos. *AdWeek, Emerging Tech*. [online] Available at: https://www.adweek.com/digital/getty-

images-is-using-artificial-intelligence-to-help-newsrooms-choose-better-photos/ [Accessed: 31 October 2018]

Tabatabai, D. T. and Shore, B.M. (2005) How experts and novices search the Web? *Library and Information Science Research,* 27, pp. 222–248.

Tahir, M.A.; Fei Yan; Koniusz, P.; Awais, M.; Barnard, M.; Mikolajczyk, K.; Bouridane, A.; Kittler, J. (2013) A robust and scalable visual category and action recognition system using kernel discriminant analysis with spectral regression. *Multimedia, IEEE Transactions*, 15(7), pp. 1653 – 1664.

Taylor, R. S. (1968) Question-negotiation and information seeking in libraries. *College and Research Libraries*, 29, pp. 178-194.

Techemergence (2017) Examples of Artificial Intelligence in Education [online] Available at: https://www.techemergence.com/examples-of-artificial-intelligence-in-education/ [Accessed: 3 March 2018).

The BBC (2018) *Stills photographs and images: guidance in full*. [online] Available at: http://www.bbc.co.uk/editorialguidelines/guidance/stills/guidance-full [Accessed: 3 March 2018].

The Guardian (2015) *No 10 ridiculed after adding poppy to David Cameron Facebook picture*. [online] Available at: https://www.theguardian.com/politics/2015/nov/02/poppy-photoshopped-david-cameron-facebook-picture [Accessed: 3 March 2018].

The Guradian (2017) [online] Available at: [Accessed: 3 March 2018].

The New Yorker (2014*) Yevgeny Khaldei's wartime photographs* [online] Available at: https://www.newyorker.com/culture/photo-booth/yevgeny-khaldeis-wartime-photographs [Accessed: 3 March 2018).

The New York Times (2010*) On The Economist's cover, only a part of the picture*. Available at: https://mediadecoder.blogs.nytimes.com/2010/07/05/on-the-economists-cover-only-a-part-of-the-picture/ [Accessed: 3 March 2018).

The Telegraph (2012) *BBC News uses 'Iraq photo to illustrate Syrian massacre'*. [online] Available at: https://www.telegraph.co.uk/culture/tvandradio/bbc/9293620/BBC-News-uses-Iraq-photo-to-illustrate-Syrian-massacre.html [Accessed: 3 March 2018].

Thompson, S., and Reilly, M. (2017) A picture is worth a thousand words: reverse image lookup and digital library assessment. *Journal of the Association for Information Science and Technology*, 68(9), pp. 2264-2266.

Thurstun, J. (2004) Teaching and learning the reading of homepages. *Prospect*, 19(2), pp. 56 – 80.

Tindall, C. (1994) Issues of evaluation. In: Banister, P., Burman, E., Parker, I., Taylor, M. and Tindall, C. (1994) *Qualitative methods in psychology: A research guide.* Buckingham: Open University Press.

Tobin, G.A and Begley, C.M. (2004). Methodological rigour within a qualitative framework. *Journal of Advanced Nursing*, 48(4), pp.388-396.

Tobin, S., and Grondin, S. (2015). Prior task experience affects temporal prediction and estimation. *Frontiers in Psychology*, 6, 916. http://doi.org/10.3389/fpsyg.2015.00916.

Toms, E.G. (2011) *Task-based information seeking and retrieval.* Chapter 3. In: Ruthven, I. and Kelly, D. (eds.) (2011) *Interactive information seeking, behaviour and retrieval.* London: Facet Publishing Ltd.

Toms, E.G. and O'Brien, H.L. (2008) Understanding the information and communication technology needs of the e-humanist. *Journal of Documentation*, 64(1), pp. 102 – 130.

Tsai, C-F., McGarry, K., and Tait, J. (2006) Qualitative evaluation of automatic assignment of keywords to images. *Information Processing and Management*, 42(1), pp. 136–154

Turetzky, P. (1998) *Time*. London: Routledge.

Twitter (homepage): www.twitter.com

Ul-Qayyum, Z., A., Cohn, G. and Klippel, A. (2010) Psychophysical evaluation for a qualitative semantic image categorisation and retrieval approach. *Trends in Applied Intelligent Systems. 23rd International conference on Industrial Engineering and Other Applications of Applied Intelligent Systems*. IEA/AIE 2010. Cordoba. Spain. June 2010. Proceedings, Part III.

Urban Dictionary (2010). *Spam tagging* (top definition). [online] Available at: https://www.urbandictionary.com/define.php?term=Spam%20Tagging [Accessed 31 October 2018]

Utt, S. H. and Pasternack, S. (2003). Front page design: Some trends continue. *Newspaper Research Journal*, 24(3), pp. 48–61.

Vailaya, A, Figueiredo, M. A. T., Jain, A.K., and Zhang, H-J (2001) Image Classification for Content-Based Indexing. *IEEE Transactions on Image Processing*, 10(1).

Vakkari, P. (1999). Task complexity, problem structure and information actions: Integrating studies on information seeking and retrieval. *Information Processing & Management*, 35(6), 819-837.

Vakkari, P. and Hakala, N. (2000) Changes in relevance criteria and problem stages in task performance. *Journal of Documentation*, 56(5), pp. 540 – 562

Valenza E., Simion F., Macchi Cassia V., and Umiltà C. (1996). Face preference at birth. J. Exp. Psychol. Hum. 22, 892–903. DOI 10.1037/0096-1523.22.4.892

Van Leeuwen, T. and Jewitt, C. (eds.) (2001) *Handbook of visual analysis*. London, UK: Sage Publications.

Vobič, I. and Trivundža, T. (2015) The tyranny of the empty frame: reluctance to use citizen-produced photographs in online journalism. *Journal of Journalism Practice,* 9(4).

Vogt, W. P., Vogt, E. R., Gardner, D.C. and Haeffle, L. M. (2014) *Selecting the right analyses for your data: Quantitative, qualitative, and mixed methods*. New York: The Guilford Press.

Voorhees, E.M. and Harman, D.K. (eds.) *TREC. Experiment and evaluation in information retrieval*. Cambridge, MA: Digital Libraries and Electronic Publishing, MIT Press.

Wang, P. (2012) *Information behaviour and seeking*. In: Ruthven, I. and Kelly, D. (eds.) (2011) *Interactive information seeking, behaviour and retrieval.* London: Facet Publishing Ltd.

Wang, P. and White, M.D. (1999) A cognitive model of document use during a research project. Study II. Decisions at the reading and citing stages. *Journal of the American Society for Information Science*, 50(2), 1999, 98–114.

Wanta, W. (1988) The effects of dominant photographs: an agenda-setting experiment. *Journalism Quarterly*, 65, 107–111.

Warwick, K. (2012) *Artificial intelligence, the basics*. London and New York: Routledgde.

Waybackmachine Internet Archive (2015) BBC Online homepage as launched on 21st December 1996 [online] available http://web.archive.org/web/19961221203254/http://www0.bbc.co.uk/ [Accessed on 9 August 2015).

Weinberger, D. (2007) *Everything is miscellaneous: the power of the new digital disorder*. New York: Holt.

Westman, S. (2009) *Image users' needs and searching behaviour*. In: Göker, A. and Davis, J. (eds) (2009) *Information retrieval. Searching in the 21st century*. London: Wiley

Westman, S. (2011) *Journalistic image access: description, categorization and searching*. Doctoral Dissertation 87/2011. Aalto University publication series.

Westman, S., Laine-Hernandez, and Oittinen, P. (2010) Development and evaluation of a multifaceted magazine image categorisation model*. Journal of the American Society for Information Science and Technology*. 62(2), pp. 295-313.

Westman, S., Lustila, A., and Oittinen, P. (2008) Search strategies in multimodal image retrieval. *IIiX'08, Information Interaction in Context*, 2008, pp. 11 – 20. London, UK.

Westman, S. and Oittinen, P. (2006) Image retrieval by end-users and intermediaries in a journalistic work context. *IIiX'06 Information Interaction in Context,* 2006, pp. 102 – 110. Copenhagen Denmark.

Wilson, T. D. (1981). On user studies and information needs. *Journal of Documentation*, 362, pp. 3-15.

Wilson, T.D. (1999) Models in information behaviour research. *Journal of Documentation*, 55(3) pp. 249 – 270.

Wilson, T.D. (2016) A general theory of human information behaviour. *Proceedings of ISIC: the information behaviour conference*, Zadar, Croatia, 20-23 September 2016: Part 1.

Wilson, T.D. and Walsh, C. (1996) *Information behaviour: an interdisciplinary perspective.* (British Library Research and Innovation Report No. 10). Sheffield, UK: University of Sheffield, Department of Information Studies.

Wired.com (2016) *How photos fuel the spread of fake news*. [online] Available at: https://www.wired.com/2016/12/photos-fuel-spread-fake-news/ [Accessed: 3 March 2018].

Wise, S. (1987) A framework for discussing ethical issues in feminist research. In: *Writing feminist biography, 2: Using life histories, Studies in sexual poltics,* 19. Manchester: University of Manchester.

Wollen, P. (2003) *Fire and Ice*. In: Wells, L. (ed.) (2003) *The Photography Reader*. London: Routledge.

Woodruff, A., Faulring, A., Rosenholtz, R., Morrison, J.B., and Pirolli, P. (2001) Using thumbnails to search the web. *Proceedings of CHI 2001.*

Xie, H. I. (1997) Planned and situated aspects in interactive IR: Patterns of user interactive intentions and information seeking strategies. *Proceedings of the ASIS Annual Meeting*, 34, pp. 101 – 110.

Xu, Y. C. and Chen, Z. (2006) Relevance judgment: What do information users consider beyond topicality? *J Am Soc Inf Sci Tec* 57(7), pp. 961–973.

Yin, R. K. (2006). Mixed methods research: are the methods genuinely integrated or merely parallel? *Research in the Schools,* 13(1), pp. 41-47.

Yuan, J., Wu, Y., and Yang, M. (2007) Discovery of collocation patterns: from visual words to visual phrases. *IEEE Conference on Computer Vision and Pattern Recognition*, CVPR'07, 1–8, 2007.

Zavoina, S. C. and Davidson, J. H. (2002). *Digital photojournalism*. Boston: Allyn and Bacon.

Zelizer, B. (2005) Journalism through the Camera's Eye. In: Allan, S. (ed.) *Journalism: Critical Issues*. Maidenhead: Open University Press.

Zhao, W.R., Chellapa, P. J., Phillips, P.J., and Rosenfeld, A. (2003) Face recognition: a literature survey. *ACM Computing Surveys*, 35(4), December 2003, pp. 399–458.

Zhang, J., Chenxia Wu Deng Cai (2012) Search web images using objects, backgrounds and conditions. *MM'12*, October 29–November 2, 2012, Nara, Japan.

Appendices

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Appendix A. Study I: Interviews & observations

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A1 Invitation to participate



Dear X,

My name is Sylwia Frankowska-Takhari and I am a PhD student at City University London (School of Informatics). I have been investigating how image professionals search for and select images to news stories with an aim to inform the development and design of future image search engines.
Currently, I am looking for professional image editors /content producers whose job is to select images to news content published online, and who would like to tell me about their work.

Kind regards,
Sylwia Frankowska-Takhari

A2 Information for participants



PARTICIPANT INFORMATION SHEET

Dear Participant,

Before you decide whether you would like to take part in this research, it is important that you understand why it is being done and what will be expected from you. Please take time to read the following information carefully, and feel free to discuss it with others if you wish. Please do not hesitate to contact me if there is anything that is unclear or if you would like more information.

Kind regards,
Sylwia Frankowska-Takhari

Title of study: Image Selection Process in Online Journalism

1. What is the purpose of the study?

The aim of my study is to investigate the image selection process with a particular focus on how professionals in the field of journalism select images to content, what criteria they use, and when they are satisfied with their final decisions. It is true that much research has already been done in this field but this study has a slightly different take on the subject, and explores it from a user-orientated and multidisciplinary perspective.

2. Why have I been invited?

As you are a professional image editor/ content producer, I'd like to invite you to participate in my research. I am aiming to recruit up to 16 participants who professionally select images to online news content. Below you will find more information on what you should expect as Participant and how you will be rewarded for your time and effort.

3. Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part you will be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time and without giving a reason.
Participation in the project is voluntary, and you can choose to participate in part or all of the project. You can withdraw at any stage of the project without being penalised or disadvantaged in any way. You may choose not to answer questions which you feel are too personal or intrusive.

4. Incentives

Your participation in the research will be much appreciated and to thank you for your time and contribution I would like to offer you incentives: a £10 Amazon voucher per session.

5. What do I have to do, and what will happen if I take part?

First, you will be asked to sign a consent form and fill in an entry questionnaire sent to you via email. Completing this questionnaire will take you about 15 minutes. You will then be invited to take part in two face-to-face sessions - ideally in your work place – but this can be discussed individually.

In the first session you will take part in a depth interview to provide me with information about your professional background, your role and responsibilities. This part will take about 60 minutes.
In the second session I will observe you at work and take notes of events significant to the project, for example: I will be interested in observing how you begin searching for images and how you make a decision on the final selection. This part of the research will take about 60 minutes. You may choose to have both sessions on one or two separate days, but both sessions must be scheduled between October 2013 and January 2014.
You may also be asked to collect some artifacts (examples of content and images that you selected for the content) from your work to further inform the research but this will be discussed individually in your sessions.

6. What are the possible disadvantages and risks of taking part?

Participating in the research should not be a negative experience for you. If for any reason you feel you do not want to answer a question or participate in an activity please speak directly to the researcher.

7. What are the possible benefits of taking part?

If you wish, I will keep you informed about the findings from my study. In particular, you may find it useful to learn how image consumers evaluated your image choices, and what their real image needs and expectations are. Such findings may directly benefit you in your role: provide you with feedback on your current work, and enable you to make informed selections of images based on actual needs of image users.

8. What will happen when the research study stops?

During the study the data will be de-identified and kept safe in a locked filing cabinet at the BBC's premises, and on a password protected laptop, and individual files. When the research study stops, all the raw data will be destroyed.

9. Will my taking part in the study be kept confidential?

During the research I will be collecting data about you and your work via a questionnaire, note-taking, audio and video recording. All these data will be de-identified from the beginning. You will be referred to as Participant no. X in my data collection tools (e.g. a spread sheet with raw data), and in any publication/ summary, and the final thesis. Only I and my supervisors will have access to the raw data and the recordings. All the raw data will be kept safe in a locked filing cabinet, and electronic data will be password-protected. At the end of the study the data will be destroyed and/or deleted.

10. What will happen to results of the research study?

The findings from this research will be published and included in the final PhD thesis. All personal or identifiable data collected will be de-identified.
If you are interested in the findings, please tick the box below and I will make sure that you will receive a copy of any publication/summary of the results.
☐ Yes, I'd like to receive a copy of any publication/ summary of the results.

11. What will happen if I don't want to carry on with the study?

You can withdraw from the study at any time during the research without giving a reason.

12. What if there is a problem?

If you would like to complain about any aspect of the study, City University London has established a complaints procedure via the Secretary to the University's Senate Research Ethics Committee. To complain about the study, you need to phone 020 7040 3040. You can then ask to speak to the Secretary to Senate Research Ethics Committee and inform them that the name of the project is:

Image Selection Process in Online Journalism

You could also write to the Secretary at:
Anna Ramberg
Secretary to Senate Research Ethics Committee
Research Office, E214
City University London
Northampton Square
London
EC1V 0HB
Email: [redacted]

13. Who has reviewed the study?

This study has been approved by City University London, School of Informatics Research Ethics Committee

Further information and contact details

First Supervisor:
Dr Andy MacFarlane
Centre for Information Science
Room A304
City University London
Northampton Square
London
EC1V 0HB
Email:

Thank you for taking the time to read this information sheet.

A3 Schedule: interviews and observations

Participant no.	News service	Interview	Observation
1	BBC Online	5th November 2013	22nd November 2013
2	BBC Online	5th November 2013	8th November 2013
3	BBC Online	22nd November 2013	17th April 2013 (pilot)
4	BBC Online	8th November 2013	22nd November 2013
5	BBC Online	5th November 2013	8th November 2013
6	BBC Online	8th November 2013	-
7	BBC Online	22nd November 2013	24th January 2014
8	Non-BBC	1st December 2013	23rd December 2013
9	BBC Online	16th December 2013	24th January 2014
10	BBC Online	22nd November 2013	-
11	BBC Online	16th December 2013	16th December 2013
12	BBC Online	16th December 2013	16th December 2013

A4 Consent form

CITY UNIVERSITY LONDON

EST 1894

INFORMED CONSENT FORM

Title of Study: *The role of intermediaries in image retrieval in online journalism* [a working title]

Please initial box

1.	I agree to take part in the above City University London research project. I have had the project explained to me, and I have read the participant information sheet, which I may keep for my records. I understand this will involve: • being interviewed by the researcher • being observed in my workplace • allowing the interview to be audiotaped • completing questionnaires asking me about my role • using a computer to perform my work tasks while being observed	
2.	This information will be held and processed for the following purpose(s): I understand that any information I provide is confidential, and that no information that could lead to the identification of any individual will be disclosed in any reports on the project, or to any other party. No identifiable personal data will be published. The identifiable data will not be shared with any other organisation.	
3.	I understand that my participation is voluntary, that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being penalized or disadvantaged in any way.	
4.	I agree to City University London recording and processing this information about me. I understand that this information will be used only for the purpose(s) set out in this statement and my consent is conditional on the University complying with its duties and obligations under the Data Protection Act 1998.	
5.	I agree to take part in the above study.	

_____ _____ _____

Name of Participant Signature Date

_____ _____ _____

Name of Researcher Signature Date

A5 Entry questionnaire

Dear Participant,

Thank you for agreeing to participate in this questionnaire. It should take you about 5 minutes and no more than 10 minutes to fill in this questionnaire. There are no mandatory questions - you may decide what questions you want to answer and what questions to skip - but please try to answer as many questions as you can. The provided information will be kept confidential and will be used only for the purpose of the report where it will be anonymised.

1. What is your current job title?
2. Please list your key responsibilities:

3. Years of experience in this role - Please tick as appropriate:
    - 1 – 5
    - 6 – 10
    - 11 – 15
    - 15+

4. Is your educational background related to this role?
    - No, please, explain:
    - Yes, please, explain:

5. Please list all tools (software) that you use to do your job:

6. Where do you source images from? Please tick all options that apply:
    - An internal image library
    - Online image libraries e.g. iStock, GettyImages, GoogleImages
    - Your own images
    - Social media e.g. Flickr, Twitter
    - Other sources, please specify:

7. Have you had formal training in image editing?
    - No, please, explain:
    - Yes, please, explain:

8. Have you had any formal training in image searching?
    - No, please explain:
    - Yes, please, explain:

A6 Topic guide & codes

Research with image editors: Topic Guide (Interviews)
Participant no.: Date: Location:
Facilitator: Sylwia Frankowska-Takhari
Introduction (about 10 – 15 minutes)

1. Welcome to the session: thank you for coming in, introductions, helping the participants feel comfortable by engaging him/her in a small talk.
2. Information about the research (the Information Pack): number and structure of sessions, emphasising on the fact that they should act as naturally as possible, they have the right to withdraw at any time, and they will inform the researcher about any incident or confidential data that must not be included in the report.
3. Signing the consent forms: explaining how the data will be collected and recorded (audio recording, taking screenshots and still images during the sessions), confidentiality, data protection, and data storage.

Session 1. Interview (max. 45 minutes)
In this part of the session I'd like you to answer a few questions about your role as image editor, and explain to me in more detail some of your actions that I observed earlier.

Topic 1	**About your profession**
Q1	What is your role?
Probes	*What are your duties and responsibilities: routine ones and 'special' ones?* *What excites you about your role?*
Q2	What expertise (e.g. domain, creative etc.) and skills do you use in your job?
Probes	*What skills do you need to do your job?* *How/when do you use them?*
Topic 2	**Illustration task**
Q1	What types of tasks do you normally work on?
Probes	*How do you normally receive a task? How do the tasks differ? Who is involved?* *How do you begin? What do you aim to achieve?*
Q2	Approximately, how long do you take to complete a task?
Q3	How do you find/source images?
Topic 3	**Image searching and selection**
Q1	What images do you normally look for?
Probes	*How do you know what to look for? What images do you typically need?*
Q2	How do you normally search for images?
Q3	Thinking of an illustration task that you recently completed, please tell me how you searched for the image and how you made the selection.
Probes	*How did you begin? How did you search? How did you end? Was it a typical task? Why/ why not?*
Topic 4	**Image needs & selection criteria**
Q1	What do you look for in images?
Probes	*What are your criteria for selection? What is important in or about the image?*
Q2	How do you make the selections?
Probes	Please tell me about the visual aspects of images that are important when you make selections.
Topic 5	**Challenges**
Q1	What are the challenges when searching for and selecting images that you encounter?
Probes	*Do you always find suitable images? What happens if not?*

Wrapping-up of the session (about 5 minutes)
Is there anything else that you'd like to add, or feel that we have not covered, or should have covered in this interview:

[RESEARCHER'S SUMMARY OF THE SESSION]

Topics [segments]
Topic 1: The job role (of an image professional in online journalism) Topic 2: Illustration tasks and image needs Topic 3: Illustration task process Topic 4: Image selection criteria Topic 5: Challenges

An initial list of codes exported from Atlas.ti

Code-Filter: All

HU: **Coding**
File: **[C:\Users\Admin\Documents\PhD\RESEARCH\CODING\Coding.hpr7]**
Edited by: **Super**
Date/Time: **2014-03-12 12:16:30**

abstract concepts	**image function**	**service/homepage**
actual images	**image in mind**	**social media**
alternative images	**image expertise**	**soft colours**
attention grabbing	**image searching process [**	**sport events**
audience	**starting search, scoping,**	**staged selection**
breaking news	**applying, selecting, ending]**	**starting task**
broad searches	**image size**	**stock images**
browsing	**image sourcing**	**subject news story**
colour (attracts the eye)	**image use**	**time per task**
colour (mood)	**images of people**	**time pressure**
composites	**ineffective retrieval**	**time/date photo taken**
collages	**irrelevant results**	**trust**
creative skills	**juxtaposition**	**uniqueness**
creative opportunities	**levels and colour balance**	**unmet needs**
creative profession	**limited availability (of images)**	**update (homepage)**
critical object	**resolution**	**unavailability (of images)**
dont's in image editing	**meaning (in images)**	**verifying**
dos of image editing	**narrow searches**	**viewing images**
dropped task	**needs**	**visible editing**
duties	**news providers reputation**	**visual effect**
dynamic	**news story**	**visual features [syntax: colour,**
editorial guidelines	**overused images**	**focal point, gaze, positioning-**
editing skills	**paid images**	**in-frame,]**
ending task	**photoshop use**	**vivid colour**
editing technique (specify)	**poor image choice**	**web page templates**
enlarging	**pre-planning**	**QUOTE [tag]**
example	**promoting news content**	**EXAMPLE [tag]**
experience	**readers' reactions**	
fixed shapes	**ready images**	
flipping images	**resources**	
generic story	**searching/editing dilemma**	
genre	**scheduled events**	
hard to illustrate	**search features**	
headline images	**selecting news stories**	
IE team	**selection criterion**	
image content		

A7 Interview with P7 (coded)

Transcript – the interview with Participant 7

Transcript (P7)	Category > code
---------- Consent forms signed & dated----------	
Researcher: Please, could you tell me about your role in the Central Editorial Team and what it involves? [Topic 1]	**Service >** Homepage
P7: Okay. So, my role is assistant content producer. So much like the other people in this team, I work on the homepage. So, we curate user journeys across BBC Online. So, we create promotions for upcoming TV and radio programmes or events, football matches, etc. and also choose imagery for news on BBC homepage. So, we choose imagery, if there's a programme like *Strictly Come Dancing*, we come up with a plan to promote it, or a big news story, we also publicise things like that.	**Image function** > promote **Image function** > publicise **Profession>** qualifications
Researcher: What skills do you need to do your job and how did you acquire these skills? [Topic 1] In terms of my background, I worked at a political communications company for six months. Then I got a job at [redacted] working as a content and commissioning editor. So I commissioned writers and bloggers in politics basically, so ascertaining views on various issues, and I subedited. Then later on I moved up here to take this job. So on homepage I'm quite aware of news and what's going on and I help bring more of an editorial eye. I'm very used to how important images are and how for most users writing is the secondary thing; they look at the image then decide if they'll read the rest. So I'm very used to having to select standout images to draw people in.	**Creative skills>** importance of images **Image use**> attracting viewers' attention **Vis effect**
Researcher: What is it that makes a standout image? [Topic 2]	**Vis effect** **Syntax** > focal point
I, in my head, think the BBC is quite - aspires - the home page aspires to be like Time magazine. That's how I set the bar. So with their iconic images of like the Afghan girl and things like that; I think that's the kind of bold, striking images, one point of focus. That's how I measure personally whether or not it's a good image; I kind of think along those editorial lines, quite stylized images, bold images. We're most pleased when they're vivid images; when they could be in Time magazine.	**Vis effect**
Researcher: And how easy, or difficult, is it to find such images? [Topic 2, 5]	**Actual images** **Programme assets** **Creative images**
P7: The dream scenario is a story that has an image which is why news is normally quite good because you obviously have live images and some programmes are normally good because you have set stills. It gets a bit harder when you're looking at more generic stories.	**Content type** > breaking news > programmes > generic stories
Researcher: And could you explain this a bit more, when is it easy and when is it difficult to find images?	
Breaking news is normally the easy, the easiest. For example, I did Philippines this morning. You either have the image or not. But if it's a story about maybe class or it's a survey so it's not breaking news, it's something slightly more lifestyle-orientated, that then becomes more difficult. But that's when you have the most creative images I guess. Because the image isn't obvious and for those stories it may involve creating an image as opposed to finding something off an agency. So it gives the most opportunity to be artistic. Here at the BBC I think the editorial image is better than the creative image is, our aim here is to always make everything look as real as possible and anything that shows somebody who's not real or it's a model shot or its staged, it does just look really fake and it can sort of look cheap I suppose. Whereas where I worked previously was more tabloidy so there wasn't as much attention to I guess images that looked obviously like they were fake or modelled and things like that, stock images. So I've kind of had experience of using stock images and that's been fine and here it's not really as fine. So that's the struggle. Because it also depends on the agencies you use. We use Getty here and I used a	**Content type** > breaking news > [EXAMPLE] **Content type** > subject story > creative images > creative opportunities **Illustration strategy** > composite image **Profession** > creative

different agency in my old job. At the end of the day if the images aren't there or they look awful, then what can you do. **Researcher: And what is the purpose of the main image on the homepage?** It's normally seen as an addition to the text I suppose. There's no point in repeating in the text what you've got in the image, I don't think. It's a case of maybe making it more accessible. So like if there is an article about inflation, I'm sure a lot of people see the word inflation and think I'm not even really sure what that is, but the image is of food and money coming out of a purse and a woman looking distressed, and you think what's that all about. So it's a different way of accessing the story rather than being a literal illustration of the text. So especially when looking at a lifestyle story and you're looking at something like birth. We maybe would choose - go a bit outside the box and choose a father looking really stressed and that kind of being the focus rather than the mother in the hospital bed. So we maybe would look at the story in a different way and would approach the image in a different angle, but we wouldn't do something too crazy. We tend not to do anything that's too metaphorical but to do something literal I think is considered boring or easy. Obviously, there are exceptions i.e. news stories, like again Philippines where it's always very obvious.	**Image type** > editorial images > stock images **Resources** **Image use** > attracting viewers' attention > non-literal > access to story **Illustration strategy** [EXAMPLE] **Image use** > low-complexity > non-literal **Content type** > breaking news **Actual images** **Image use** > literal
Researcher: And what aspects of images do you pay attention to when you select images? [Topic 4] **P7:** Okay. So for home page I - if it's a news story you just begin to look through things and the first thing that's in my mind with a news story is looking for - if it's a human story, for example the Philippines, you're obviously looking to make sure there's no dead bodies, there's no blood, there's nothing that looks like it's undetermined. So if it looks like somebody might be getting fatally injured but you can't be sure, then you wouldn't use it if you don't know the outcome. For anything that looks like it could distress an audience, which is hard because obviously you've got measure that with the truth of the story and it's a bad story. So you don't want to use an image that looks disproportionately positive because that's a lie. But you certainly would rule out very quickly the blood, the death, anything that looked from a normal eye that it would cause maybe offence. Then the second thing I would look at is, thinking about our frame, it's best to use solo images of maybe just one person or a couple of people; shots don't look as good if you can't easily identify the object.	**Actual images** **Editorial guidelines** **Content** > distressing content **Vis effect** **Syntax** > single shot > person as object > identifiable object
Researcher: Is what you are describing a general practice here in the team, or your own individual preference? [Topic 4] **P7:** I think it's a general rule for everyone. It's also my own preference; I think it looks stronger. So, we like to use images where there's an identifiable object within it. So I look to see if there's a person or an object that you can zoom in on essentially. So those are my first ports of call. Anything as well with colour I like. Again, the Philippines I suppose is a good example because most of the images are just of the landscape as opposed to being of one person, so the colours are the same because it's sort of the dull colours, destruction, there's no real - there's often no standout point of focus in an image like that which makes it more difficult.	> identifiable object **Illustration strategy** > zooming **Syntax** > colours > focal point **Actual images** **Content** > images of landscapes **Syntax** > focal point > single shot

Researcher: Please, could you explain this a bit more? Why is this "*more difficult*"? [Topic 4]	**Image use** > attracting viewers' attention
P7: Difficult because I think that you are less likely to engage with an image if you don't know what you're looking at. So you're looking at an image of just an area of destruction and it's quite an undefinable area of a town that's now a wreck, that's fine but there's nothing to latch your eye onto, so it's quite easy to just glaze over it. I think it's much better to have one house or one person or a demolished school or something like that so you can get more of a point of focus.	**Syntax** > focal point > single shot
Researcher: Thinking of an illustration task that you recently completed, please tell me how you searched for the image and how you made the selection. [Topic 3]	[EXAMPLE]
P7: I can give you an example of something I just did today which will be more helpful. So it is a promo for a new mystery drama about a man who works in insurance and he met a woman and they conspired to murder somebody. So the first thing I'm thinking is it's a radio drama, so on radio we never show people's faces because we like people to imagine what the characters look like. I thought as the story was very people-centric rather than place-centric it needed to be of people rather than of a location and there wasn't any listed location so I couldn't default to a train track or a city centre; there wasn't that information.	**Content type>** radio drama promo **Illustration strategy** > no faces **Illustration strategy** > human element **Image in mind**
So then I thought right well I obviously can't show murder anyway so the obvious latch for me was the insurance element and I thought - I quite often, well 99 per cent of the time, I know exactly what I want before I search. I put it in my head, together in my head, yeah.	**Needs** > concept > person
Researcher: How do you do this, can you explain? [Topic 2. , Topic 3.]	**Starting Scoping**
P7: It just happens instantly. So I knew exactly from reading that, because it always happens obviously in five seconds, you work it all out. There was assessing - I guess it may be laziness, you try and identify the easiest possible option. So in that instance, as I said, murder couldn't really do aside from being really conceptual and I didn't really know where I'd go with that. So it seemed like under deadline, we've got a lot to do, what looked like the easiest option would be to go with the man and do something with the man. That also happened I think, and I hope, to be probably the strongest option; I think that probably was the right call. But right, what I want is a man holding a briefcase walking and we won't see his face, we see the suit and tie, he'll be walking with a briefcase. Because to me that sums up insurance, it sums up city man; he's going somewhere so it shows intent. We don't know enough about the woman to do anything like that. So it's an accurate portrayal and it's a strong image. It's one man, it's one object, briefcase. So that should just be quite an easy striking image.	**Time pressure** **Least time/effort** **Image in mind** > critical objects **Needs** > no face **Vis effect** **Syntax** > single shot **Image in mind**
Then you try searching for that and it's like - yeah you do have in your head this very simple composition that you think must be there and it just never is.	**Unmet needs**
Research: And how did you search for it? [Topic 3]	**Searching strategy**
So, it actually was quite a long search. I tried 'man briefcase', 'man' and 'briefcase'. I began to say okay, if I can't get that and I'm looking at these 50 images, what can I try and put together but then if I've had to do a lot of work to an image I'd have to think twice. What I'm quite bad at doing is going for something totally different. Once I have that idea in my head I have been known to sit there and just going through every image. And eventually, I did find something; it was very, very similar, a cut-off holding a newspaper with a briefcase. So that was kind of the process.	**Searching/editing dilemma** **Needs** > modifying
Researcher: How many images are you normally prepared to look through when you're searching?	**Selecting** > viewing images > inspecting
P7: Too many. But I look through them really quickly. I think that's because I know what I want so I don't look at images and think oh that might work; I think no, that's not it, no that's not it, where's this image. Then maybe if I really can't then I'll go back and think right, will this work, will this work, and then I'm a bit more methodical. But initially I'm like a bull in a china shop; I just plough through them. I find about four or five and just kind of open them and then	[QUOTE: browsing = 'ploughing'] **Staged-selection** > compare

minimise them and then go through them again. Normally when I go through them - say I had five - I think I did have five shortlisted…I can click into Getty so a preview image comes up in a separate window and then I can just minimise that. So I have five small windows. Normally when I go back there's immediately one that I think that's rubbish, why did I even think that was a good one. So that always happens. So I would really quickly scan through them. I compare them altogether. I then usually go for the one that was the first one I saw. That often happens that way that you pick the first one you saw.	**Resource** **Selecting** > pre-view/ enlarge
Researcher: How long did that take you to complete the task with 'the man and briefcase'? [Topic 3]	**Ready image** > time per task
P7: Longer than it should. More than half-an-hour. Should have been no longer than 20 minutes. But that happens, if you're searching for a creative image like that. If it's something newsy it's normally much less because you have limited options. To be truthful, you don't really need to use your head that much because you know - like the Philippines, it's not like you need to work out what kind of image, it's just a case of finding one. So that's normally quicker than being presented with an article and having to work out what to do with it. You just hear the Philippines and off you go. As long as you get the right image, you're fine.	Breaking news Subject story **Actual image** > time per task
Researcher: "The right image?"	
P7: Yeah, the image of the affected area, the aftermath of the storm and the extent of the destruction.	**Actual image >** actuality
Researcher: In your opinion, why it's so difficult to find images that you need? [Topic 5]	
P7: You have to go through an awful lot of images to find what you want. You try and second-guess what might bring up the best results. Often it's sod's law when you do find one it's under something quite bizarre. So that's the struggle really and I think maybe it's a struggle if you do have an idea of what you want because you are less likely to compromise and you're less likely to think actually that will work fine. Yeah. I'm quite bad at going okay, new plan, because I don't know, maybe I get fixated or maybe I just think that's the best, that's going to work, and I just don't want to have to do something I don't think is as good. That's probably unfair because of what we said, that you come up with an image and then you feel disappointed if you can't find it, but that's probably my internal barometer of success.	**Challenge** > numerous irrelevant results > ineffective retrieval > pre-defined needs > not ready to compromise
Researcher: I'm mindful of the time and we've been talking for nearly an hour now. Thank you so much for this interview. I really appreciate your input and contribution.	
P7: No problem. I hope I was helpful.	
END OF TRANSCRIPT	

A8 Participants observation sheet & codes

Researcher: Sylwia Frankowska-Takhari
Participant's no.:
Date:

I. Pre-observation questions

From the task:

- *Original title & URL:*
- *Breaking news? Yes /No If no, specify:*
- *Editorial section:*
- *Live content: Yes / No*
- *To be published:*
- *Promo size*
- *Other:*

[Questions begin]

1 Who generated this task?
2 At this stage, do you what image (images) you may need?
3 What is your idea for the final illustration?
4 What challenges (if any) do you think you may face when searching for the image?

Please proceed as usual, and whenever possible, please tell me what you are doing and thinking.

II. Observation and '*Think aloud*' protocol

On the Timeline make a record of the actions when they occur and the order that they occur in.
Record every instance of search & search terms. Collect the Artefacts.
Observe the following actions & record any verbal explanations around them:
[Prior to interaction with the search engine: starting the task, starting the search and scoping]

A. Familiarising with the task:
B. Familiarising with the content:
   - Does the editor read the content? e.g.: the whole article? The title and the first paragraph? Or related content to get a deeper understanding of the subject matter?
   - Does the editor consult anyone on the subject area? Who with? What is being discussed? What is the result of the consultation?
C. Pre-search 'ideas' that the editor has of the image that he/she will be looking for:
   - What does the editor 'know' about the image that he/she is looking for?

e.g. what tool/ source may be best to deliver the best results?

- Does the editor mention an "image in mind"?
- What assessment criteria does the editor mention?
- Has the editor scoped the search broad or narrow?

[Applying]

D. Search tools:
   - Tool(s) used: …….

E. Search strategies:
   - Search term:
   - Search features:

[Selecting]

F. Search result page(s)
   - Scanning through the results, in thumbnails? Grid/ list view? How many on a page (ca.), how many pages? E.g. only a few top ones, only the first page?
   - Saving potential 'candidates' to view later, opening them in new tab/window for viewing later & comparison
G. Interruptions/ distractions:
   - Was the process interrupted? Why? What was the effect? How was the process restarted?
H. Selection
   - How many potential candidates (images) were selected for the final review? What were their characteristics and features?
   - What selection criteria were used?
   - Which criteria were decisive in this case?
I. Final selection
   - What actions were taken to help the final selection? E.g.: placing in the template, etc.

- What image features were compared? Which ones were decisive?
- Has the final selection been made?

[Ending search]

J. Saving the selected image
- Does the image require editing before it can be published?

[Tailoring]

K. Editing
- Was the final image processed (e.g. in photoshop) before it was published? Why?
- What editing techniques were applied?

[Finalising the task]

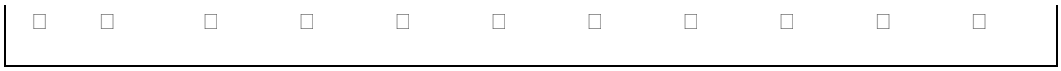
L. Publishing
- What are the actions related to publication?

III. Post-observation questions

1. Was this image selection process usual/unusual in any way when compared to how you normally search for images? Why?
2. What were the challenges in this task?
3. What helped you to make the final selection?
4. What image features did you pay attention to and which ones were decisive for the final selection?
5. What is the role of the selected image in relation to this particular content?
   - To inform
   - To illustrate the content
   - To attract attention
   - Other, please specify: ……

[Write down any observed actions in the task process]

Participant X.



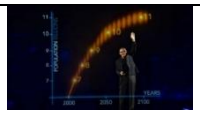
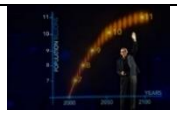
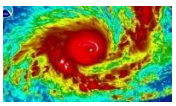
Task begins **Task ends**

The coding scheme

Source	Stages of illustration task	Activities associated with the stages (CODES)	Examples of observable action or evidence from *Talk-aloud* protocol
Markkula and Sormunen 2000 (Illustration process)	**Illustration task [received]**	◊ Acknowledging the task ◊ Accepting the task ◊ Familiarising with the task (components)	◊ Verbal acknowledgement of the particular task ◊ Verbal expression of intention to work on the particular task ◊ Reading information associated with the task
Conniss et al. 2000 (Image searching process model)	**Starting [search]**	◊ Familiarising with the content ◊ Ideation (criteria)	◊ Opening (on-screen) and reading task-related content ◊ Mentioning (unprompted or probed) ideas, e.g., I need, this requires…
	Scoping	◊ Selecting the strategy ◊ Selecting the source ◊ Formulating the query (re-formulating)	◊ Selecting image source and navigating to an image collection ◊ Mentioning (unprompted or probed) I'm looking for….
	Applying	◊ Interacting with the IR system (capture the use of search features)	◊ Entering a search term ◊ Using search features: ◊ Pressing search
	Selecting (moves and tactics in Hung, 2005)	◊ Browsing through results ◊ Assessing the results (enlarging, captions) ◊ Selecting an image OR Selecting a set	◊ Browsing, scanning the results in thumbnails, ◊ Scrolling up/ down ◊ Opening some results to view enlarged image ◊ Selecting candidate images
	Iterating	◊ Changing the approach, e.g., search query modification, etc. ◊ Interruptions/ distractions	◊ Entering search term 2, 3… ◊ Navigating to image collection 2, 3… ◊ Asking for break ◊ Participant observed being engaged in an activity not related to research, e.g., reading emails
	Ending [search]	◊ Final selection made (OR not made)	◊ Final selection made and saved OR ◊ The task ended with no selection – communicated verbally AND/OR moving on to another task
Ellis et al. 1993 (Information searching model)	**Verifying**	◊ Image verified for authenticity	◊ Image textual description or metadata consulted
This investigation & Makri et al. (2010)	**Tailoring**	◊ Image manipulation techniques applied	◊ Image opened in editing software (e.g. photoshop) ◊ Editing techniques applied: 1…. 2…. 3…. n….
	Other	◊ Specify….	◊ Specify

A9 Illustration tasks in Study I.

P	Task	Headline	Selected images	Considered images	Final illustration
1	**T1**	**Detroit: Six ways 'shrinking' cities try to survive**		  	
	T2	**A new £2.4m grassroots scheme to find a new football star**			
	T3	**BBC Radio 4 Off the Page: The Dark Side**		-	
2	**T4**	**BBC's John Cole dies aged 85**		-	
	T5	**7-day news quiz**	  		
3	**T6**	**Baroness Thatcher's funeral: as it happens**		-	
	T7	**Usain Bolt seals place in World Championship history**			
	T8	**Government u-turns on nursery ratio plans**			

4	**T9**	**Premier League: Everton vs Liverpool**		-	
	T10	**Doctor Who – 50 years of memories**	 	-	
	T11	**Australia v Scotland**			
5	**T12**	**Don't Panic - The Truth about Population**			
	T13	**Four baby pandas shown off in US zoo**	No selection made	-	-
	T14	**Philippines hit by year's strongest storm**	 	  	
7	**T15**	**UK women's magazines**	No selection made Own photo used	-	
	T16	**Dinner at the Homesick Restaurant – BBC Radio drama**		 	

	T17	**Weekend Woman's Hour: Sophie Ellis-Bextor**		-	
	T18	**In the Dark [TV drama]**		-	
8	**T19**	**Turkish volunteer doctors arrested in Ghezi Park**	 		
	T20	**Unrest in Ukraine**		-	
	T21	**Simplified EU-Azerbaijan visa regime agreements start this summer**		 	
9	**T22**	**Beyonce and Jay-Z top US Billboard music power list**		-	
	T23	**British man in Pakistan Blasphemy case**	No selection made	-	-
	T24	**Justin Bieber in Miami court for 'drunk road racing'**		-	
		Justin Bieber in Miami court for 'drunk road racing' **[update]**		-	
	T25	**UK astronaut Major Tim Peake training under water**		-	
	T26	**Court of Appeal upholds principle of whole-life prison terms**		 	

11	**T27**	**Nelson Mandela 1918 – 2013**	 	-	
12	**T28**	**New £2.5m oil rig repair base for Dundee port**		-	

A10 Observational data (coded)

An example of a task requiring actual images (T14)

P.	Starting task	Starting search	Scoping	Applying	Selecting	Verifying	Ending search	Comments	Fitting to frame	Ending task
P5 T14	P5 opens the illustration tasks spreadsheet generated by the Duty Editor for this paticular shift and finds tasks assigned to her Accesses the original article via URL in the spreadsheet.	"there should be some decent images out there. It's newsy and weathery, usually there is no problem with finding images like that." "this is not a subject where we'd like to be creative, this is all facts"	"usually we are looking for something that will show the impact of the weather, sometime we do a split [collage], for example we can show the strong rain and the destruction" ; "splits are like a live event slide show" ;"needs to show the reader clearly what's going on, the scale of it"; Time: probably maximum 10 minutes for finding a good image for this and sending for approval	Chooses and opens an image resource: ELVIS Search term: "Philippines" Sorting options - newest pictures first	finds an image (1) on page 1. that interests her, previews it on the same page, > previews image 2, closes without saving, navigates to page 2.; previews photo (3) on page 2. previews another photo (4) > Previews another image (5) (a satellite image of the typhoon) and closes without saving;	reads the captions to verify the image show the 'right' typhoon; “just checking if this is the right typhoon” > < Reads caption <	saves to her computer (creates a folder on her computer: typhoon;) < saves; <	Image 1. "this is the scale of it, You see the trees? The boats? Water coming in. Immediately clear what's going on"; previewing image 3: "things like that would work, trees lying around"; Image 5: "What's going on here? (a satellite image of the typhoon) "this is good but I think people prefer to see what's actually going on on the ground."	Opens the PS template for a super promo, selects a 3 image split collage; opens 3 saved images from the folder 'typhoon'; tries to fit image 1 in one of the splits in the template; crops to zoom in on the object, saves the image (collage) "I like this image (image 3) but these are not great (points to some pillars obscuring part of the scenery) I'll probably now start throwing some stuff in [the template] and we'll see"	opens CPS; uploads the image, previews on a test web page; enters the URLs of the images, and the image is ready to be sent for approval; marks the task complete in the illustration tasks spreadsheet" "a usual process; quite a standard split, we have a formula for this type of news: show what is going on, the human element, for empathy but not in a gory way; and the impact of the disaster"

An example of a task requiring a ready image (T1)

P	Starting task	Starting search	Scoping	Applying	Selecting	Verifying	Ending search	Tailoring	Ending task
P1 T1	Illustration task received (Participant opens the illustration tasks spreadsheet generated by the Duty Editor and finds tasks assigned to him); Navigates to the original article in the news section, via URL in the spreadsheet	"the article is about Detroit and how it has recently fallen into ruin. I've read it earlier. It's interesting to me personally. I've been to Detroit a couple of times" Creates a folder Detroit on his computer I'm going to need this for the images	Broad scoping Detroit	Resource: ELVIS Search term: "detroit" pre-selected options: Sorting options - newest pictures first	Keeps scrolling and looking at images relatively fast "So looking through the images on here, the houses kind of look like town houses, something completely destroyed. It doesn't - none of them really say city to us." "So I'm having a look through and we're actually at the last page. " > < Points to an image that he likes. "So yeah, the top images were too leafy, it doesn't really say city to me. So having a look through I have now found this house which is sat by itself all derelict. In the background you can see the old grandeur of all the - that way it was. So that's how I've chosen it, to give the idea of a sinking city.	Clcks on an image and reads captions & metadata for location and dates This is where you can see how old they are. So out of date, stuff like that 2004 - can't really be putting a picture up from 2004, it's not representative and you'd be amazed how many people know where images are taken or where they're from. They'll send a complaint going oh you can't say that about that news story." <	So, like I say we had options of leafy overhangs and stuff but they weren't clear enough - they weren't clear enough what it was. You've got people in these photos, we don't know who these people are, they're not important to us. saves the image on his computer	Opens the PS template for a super promo Opens the image in PS, a slight crop and tilt	"I'm very happy with it I think. I think that it does its job. We've got Detroit in the image, for anyone who recognises Detroit that will become apparent very quickly. That was another issue really with Detroit is that it's not New York, it's not Washington. It doesn't have - it's got some buildings that you might recognise but essentially, it's known for its cars, not for its buildings - and for its rap music and things like that. opens CPS; uploads the image, previews on a test web page; enters the URLs of the images, the image ready for approval; marks the task complete in the illustration tasks spreadsheet

A11 Session summary sheets (excerpts)

Introduction

The researcher met with three participants on 5th November at their workplace at the BBC, and with two participants on 8th November 2013. These participants work for Central Editorial team that is responsible for providing images for the BBC Homepage, BBC iPlayer, BBC radio stations, and BBC Search on desktop and mobile devices, and BBC Red Button and Connected Red Button Services on TV. Before the sessions the participants were asked to read and sign consent forms.

2.1 Use of images in online journalism – general findings

The key characteristic of online journalism is its dynamic environment. Unlike print media, it enables journalists to publish information instantly while events are happening or shortly after they have occurred, and to offer consumers a possibility to follow up on stories via links to related content. On one hand, this dynamically updated content gives consumers immediate view on events, which is highly valued, on the other hand, it requires from content editors to work to very tight and fast shifting deadlines.

The average time allowed for selecting an image to content on the BBC's live Homepage is 10 minutes, and up to 30 minutes.

It is possible to pre-plan some of the content (text and images) in advance, however, in case of news and current affairs such planning is in most cases impossible. By nature *news is news because it is unexpected* (Swade, 2012). Most online information services such as for example the BBC strive to be among the first ones to report on events, and publish information online. This information comes in different formats on their web pages, of which the most standard are: text with still images, audio with still images, a gallery of still images with captions or a headline, text and video, a list of thumbnails, for example in search results.

In the interviews, participants mentioned and described examples of images they used to accompany different topics and content. It was clear that they use images from all these categories: A, B and C, and the proximity of the relationship between image and content may be influenced by the level of professional experience in the role as Content Producer (or image editor).

Most participants mentioned that less experienced Content Producers tended to choose images closely related to content (category B). Such images were informally referred to as '*safe images*' (P1, P2, P5).

This will be researched further in the observation sessions, and the following factors will be considered as indicators:

- the type of query, e.g. broad vs. narrow,
- the choice of search strategy

Still images are also used on news websites to capture consumers' attention, and to make the content more enjoyable, attractive and compelling. This function is reported to be achieved mostly through visual attributes of images such as use of bright colours, contrast within image and with the page background, ratio of empty spaces vs. objects. In some (non-factual) subject domains for example sport, content for children, entertainment these attributes are manipulated in PhotoShop, image editing software.

Composites 'built' from several images are also used across the BBC website as an alternative to pure images to enhance content consumption experience.

Nevertheless, the efforts for being among the first to publish information or for recognition as a compelling story-teller, must not be compromised with reliability and trustworthiness and quality of content.

Therefore, the use of composites may not be appropriate in all circumstances and for all subject domains. All participants agreed that the use of composites may be particularly inappropriate in news where facts and authenticity are the key values. Only skilled Content Producers are trusted with producing composites as they need to be of high quality but at the same time composites used on BBC websites must not pretend to be 'pure' photos. There is a wide range of criteria around the choice of images for composites, both related to their content and to the visual aspects. For example, Participant 1. explained that when he had to illustrate a promo of a debate between two politicians who had not been photographed together. He decided to create a composite showing the politicians on a ring. He engaged in search to find two images that would present these politicians with similar facial expressions, and both dressed formally. Visual aspect of these images had to match, too. Both photographs had to show them in similar colour schemes, for example both men had to be photographed either on dark (or both on light background), in natural (or unnatural) light, to avoid bias that could result from use of colours, contrasts etc.

2.1.1 The role of Content Producers

At the BBC Online, Content Producers are responsible for providing images across the website, for example on the BBC Homepage, BBC iPlayer, BBC Search, individual radio stations' websites; and on different platforms: web, mobile and TV.

Content Producers in their roles face all these challenges when selecting images for the BBC web pages: working in changing and dynamic environment at a fast pace, the variety of subject domains.

They work 8-hour shifts on a rota basis, 7 days a week, and their key daily responsibilities include: sourcing images and creating composite images or less frequently graphics, and writing headlines and summaries to content.

Everyone has a responsibility to check their selections for compliance with BBC's internal editorial guidelines, and a Duty Editor authorises the images selected to content before they are published.

Content Producers need to have good creative skills in the use of image processing software e.g. PhotoShop and image search strategies – these are often learned on the job and during an internal training. No specific domain knowledge is required to enter the job, but a general knowledge about current affairs is assumed.

Findings from the interviews however indicate that solid domain knowledge and interest for example in politics or sport helps to search and select images more effectively [P1, P3, P4, P5].

Poorer domain knowledge results in more 'literal' image searches where 'safe images', closely matching content are selected; and sometimes it results in wrongly chosen images e.g. an image of a footballer who has not played in the particular game that was the key topic of an article, or in images 'plot spoilers' that give away the story of an episode. This in turn, it is believed to mislead consumers and 'erode' trust in the provider.

This study aims to further focus on and the image needs of and criteria Content Producers use when selecting images to content.

2.1.2 Types of images used on www.bbc.co.uk

Different types of images are used on bbc.co.uk. These types can be identified by the following criteria:

1) quality of image and source:
   - press photography sourced through the BBC's internal image libraries: Elvis and Jarvis,
   - stock images from Getty
   - own photos
2) the level of manipulation/processing
   - pure photographs (no manipulation)
   - processed images
   - composites
   - graphics

2.1.2.1 Source of images at the BBC

At the BBC, Content Producers use the following image databases/libraries:

- BBC's internal image DB: Elvis for press photography, and
- Jarvis for entertainment photos
- Getty images

As an alternative, Content Producers may choose to use their own purpose-taken photographs, or create composite images in PhotoShop. From the interviews, it was clear that image users believed that each of these sources offered different types of images used for different purposes, and the use of each of these sources had its own advantages and limitations. BBC's internal Elvis and Jarvis image libraries offer professional press photographs from press agencies such as AP, Reuters, or editorially taken to-order photos. These photos are of high quality, taken by professional press photographers who attend high profile events. These images are licenced and there are restrictions on their use. Getty images offer stock imagery. Inexpensive to purchase, the photos often feel "too stocky, too polished, and too American" [P1, P2, P4]. Sometimes the content producers can use their own images: photographs or graphics. Taking their own photos to illustrate content gives the content producers an opportunity to be creative, which was liked by most interviewees. There are no copy rights issues with own photos but due to time pressures, using own photos is rather rare.

2.1.3 Image tailoring

Even very good quality images may require some manipulation. In situations where facts are important and may be supported by a photograph, only a minimal processing is allowed, for example, improving of colour balance and levels. Sometimes cropping or extending background may be allowed. In case of factual images, there are some types of image manipulation that are never allowed, for example, air-

brushing or flipping images. In general, image processing is not allowed if the manipulation could change the interpretation of the image and facts.

2.1.2.3 Tailoring and composites

- applied when poor image search results

- saves time

- prevents from complaints

when not obvious it is composite

- must not pretend it's a pure photo

- used by experienced content producers

- use depends on content genre e.g. rarely in factual

- images used in composites must match visually

- content subject domain

E.g. News – pure photos

- CP's experience and skills

More experienced more trusted with composites

- time (both ways)

- poor search results, so searching for aspects of the image in various images to put a composite together

- no photos from particular event or of particular people exist

2.1.3 Sourcing versus composites

There are several factors that decide whether the image must be a pure photograph, or whether it can be a composite:

- the domain, for example: in News the majority of images are pure photos with very little processing allowed,

- a CP's experience and skills: more experienced content producers are more trusted with

Composites,

- time pressure: could work in favour of sourcing, as some composites may be difficult to produce, or in favour of composites – when finding an *appropriate* image proves to be difficult,

- poor search results, so searching for aspects of the image in various images to put a composite together

- photos from a particular event or of particular people do not exist

2.1.4 Image function

>>>>To be researched further

2.1.5 Topics "difficult" to illustrate

Some material is difficult to illustrate. This may be due to the fact that the topic is abstract [P1] rather than factual. For example, P1 mentioned an article about mortgage rates and remembered that he had found it difficult to illustrate. P4 also said that for new topics or topics that are very popular there might be only a limited number of images available at a time, and that re-using the same image was not regarded to be a good practice. He believed that some content consumers used the images to check if the articles they were interested in had been updated, and expected new image with each update.

2.1.6 Use of images by domain

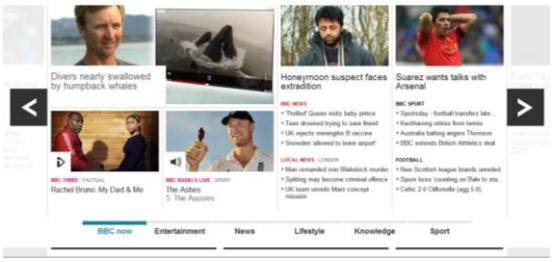
All participants agreed that the type of image: unprocessed (pure photographs) vs. composite (creative) images depended on subject domain they were to be used for. News and to a lesser extend sport required the use of factual 'pure' photographs, with very minimal editing allowed. For example Participant 1 usually applied cooling or warming filters on people's faces. In sport, all participants admitted they manipulated colour contrast and saturation to get more dynamic and vibrant pictures. However, in both cases (news and sport) the use of composites was rather rare.Composites were used to promote and curate some non-factual content, and their use depended very much on the seriousness of the story.

2.1.7 Specifics of working on different products and platforms

BBC Content Producers work across different online products and on different platforms. Some of the products are live, others allow for some pre-planning in regard to image selection.

Live Desk includes working on:

- the BBC Homepage with five themed '*flavours*': Now, Entertainment, News, Lifestyle, Knowledge, and Sport. This page (in particular the Now section) is updated several times during the day to reflect the current events.
  The content (images) must be *palatable to general audience* (Participant 3) and safe for children.



The BBC Homepage with five 'flavours'

This space is editorially independent and Content Producers generate their work and image related tasks for themselves: they choose what topic(s) appear on the page, write the headlines and select images to content. Only some pre-planning can take place when important events are being expected such as for example the birth of the Royal Baby. Participant 3 said in the interview that they had had images prepared for the event, and had discussed and considered any possible outcome. Content Producers face several challenges when providing images for the Homepage. Some of the challenges result from the fact that the content on the page needs to be responsive to current events. This creates time pressure, especially when events are developing and quick updates are necessary. Providing images to the content in time for the updates is crucial. The Homepage has a large audience and therefore, has a high priority over other sections of the BBC Homepage. The magazine-style of the page poses another challenge as the Content producers must also think about how the new image they select fits and is juxtaposed with the surrounding images. For example, Participant 3. said that he had had to deal with the following situation: he was to publish an image of the Queen on the Homepage but noticed that the adjacent photo showed a soldier pointing his gun to the side. He had to take a decision to change one of the images. In this case he changed took down the image of the soldier as the content it accompanied needed to be replaced anyway. Additionally, the homepage needs to appeal to a very wide audience, and each section has its own specific target audience, too, for example: Entertainment section is aimed at 16 – 34 women, so the images should address their image needs and expectations, too. The white background of the Homepage creates additional requirements for images that must contrast well to stand out on white.

2.1.11 Search process

The interviewed content producers reported that they use the following search strategies to find images to content. They often begin their image searches with an image in mind, but tend to keep the initial search 'broad'. [This may be reflected in how they formulate their queries]. They enter a query and pre-scan the results in thumbnails to suit across different platforms. They pre-select several candidate images and tend to open each in a separate tab. They now inspect the content of the images in more detail. They check whether each image complies with the BBC editorial guidelines and reject those that do not. They compare the selected images with their initial mental image and use their personal preferences to make the final selection.

2.1.12 Image selection criteria

Participants reported on the following image selection criteria:

- Content category/genre/ subject related criteria

  factual (news, current affairs): How it affects people, Anything tragic

- Cultural suitability

  Getty to American, British children have crooked teeth P5

- Visual aspects

  Rule of thirds

  Colours

2.1.15 Own image preferences >>> needs to be researched further

The interviewees also mentioned that they had their own personal preferences for images, and often used these to make their choices:

- "*Person is a memory, so I tend to choose photos of people*." P5
- Faces close-ups, filling in the frame P5
- No clutter (all participants mentioned this)
- Subject big in the frame P5
- Close match to the content P2, P5
- Rule of thirds P1, P3, P4

Lessons learnt

- Begin with the questionnaire and an interview in Session 1, then follow up with an observation with 'think aloud' protocol in Session 2. in order to collect examples of work
- Focus on visual attributes in selected /and rejected/ images
- Focus on Homepage for dynamic live content, and rolling news
- Focus on Radio content to uncover creative processes, and choices between pure image and composite
- Further research into the dependence between domain knowledge and effective image selection
- Further research into success measurements

Actions

- Relevant literature review
- Re-test the findings through observations
- Recruit more participants (in the same role) from outside the BBC if possible
  - Potential contacts at: The Telegraph, The Daily Mail
- An interview (& observation) with the photographers' trainer at the BBC
- Planning and scheduling the observation sessions with a focus on 'live' pages e.g. the BBC Homepage

Appendix B. Study I: Survey 1.

Contents:

B1 Invitation to participate

B2 Information for participants

B3 Consent form

B4 Schedule

B5 Questionnaire

B6 Images & results

B7 Percent agreement

B1 Invitation to participate



Dear X,

My name is Sylwia Frankowska-Takhari and I am a PhD student at City University London (School of Mathematics, Computer Science & Engineering). The focus of my PhD work is on the selection and use of images in online journalism.

I am currently looking for three image Experts who would like to take part in a validation study. The aim of this study is to gain an independent expert judgement on the occurrence of a set of visual features identified in images used in online journalism.

To join the study as an Expert, you must be either a professional working with images, for example, a photographer, image editor, or online journalist, or a PhD student whose research area falls into imagery, for example, photography, image seeking, retrieval, and image use, or image editing.

If this sounds interesting to you, please, contact me on [redacted], and
I will send you more detailed information about the purpose of this study, how you can contribute and benefit from your participation.

Kind regards,

Sylwia Frankowska-Takhari

B2 Information for participants



Information for Experts

Title of study: ***Validation Study 1. with image experts***

Title of the PhD project: Selection and tailoring of images for visual impact in online journalism.

Dear Participant,

Thank you for responding to my call for Experts. In this document you will find detailed information about the purpose of this study, how you can contribute and benefit from your participation.

Please take time to read the following information carefully, and feel free to discuss it with others if you wish. Please do not hesitate to contact me at [redacted]
if there is anything that is unclear or if you require any further information.

Kind regards,

Sylwia F Takhari

What is the purpose of the study?

The aim of this study is to gain an independent expert opinion on visual features of 14 selected news photos. As part of an Expert team, you will be asked to look at the photographs and answer 8 questions per image.

Why have I been invited?

For this study, I am aiming to recruit three participants who are image professionals or PhD students involved in research into imagery. Below you will find more information on what you should expect as Participant and how you will be rewarded for your time and effort.

Do I have to take part?
Participating in the study is voluntary. It is up to you to decide whether, or not to take part. If you do decide to take part you will be asked to sign a consent form. If you decide to take part, you are still free to withdraw at any time and without giving a reason. You may choose not to answer questions which you feel are too personal or intrusive.

What will happen if I take part?

Your participation in the research will be much appreciated and to thank you for your time and contribution I would like to offer you incentives of a £10 Amazon voucher.

What do I have to do?
Before the study, you will be asked to sign a consent form, and then to fill in a questionnaire sent to you via email. In the questionnaire, you will be asked to look at a set of 14 pre-selected news images and answer a set of 8 questions for each of the photographs.
You can complete this questionnaire in your own time and location and at your own pace. Completing this questionnaire should take you around 30 minutes. The complete questionnaire should be returned no later than on 30th October 2014.

What are the possible disadvantages and risks of taking part?
Participating in the research should not be a negative experience for you. If for any reason you feel you do not want to answer a question or participate in an activity please speak directly to the researcher.
The questionnaire is in a word format but please let me know if you prefer a different digital format, or a pen and paper copy – I will provide you with a printed version of the questionnaire.

What are the possible benefits of taking part?
If you wish, I will keep you informed about the findings from this study and the wider research.
These findings may directly benefit you in your image-related role, e.g., inform your current work, or study.

What will happen when the research study stops?
During the study, the data will be de-identified and kept safe on a password protected device. When the research study stops, the data will be kept safe on a password protected device for 10 years as per City University's regulations.

Will my taking part in the study be kept confidential?

During the research, I will not be collecting data about you and your work. You will be referred to as Expert no. X in my data collection tools (e.g. a spread sheet with raw data), and in any publication/ summary, and the final thesis.

Only I and my supervisors will have access to the raw data and the recordings. All the raw data will be kept safe in a locked filing cabinet, and electronic data will be password-protected. At the end of the study the data will be kept safe on a password protected device for 10 years as per City University's regulations.

What will happen to the results of this research study?

The findings from this research will be published and included in the final PhD thesis and other publications e.g. in academic journals. All personal or identifiable data collected will be de-identified.

If you are interested in the findings, please tick the box below and I will make sure that you will receive a copy of any publication/summary of the results.

☐ Yes, I'd like to receive a copy of any publication/ summary of the results.

What will happen if I don't want to carry on with the study?
Participating in this study is voluntary and you can withdraw from the study at any time during the research without giving a reason.

What if there is a problem?

If you would like to complain about any aspect of the study, City University London has established a complaints procedure via the Secretary to the University's Senate Research Ethics Committee. To complain about the study, you need to phone 020 7040 3040. You can then ask to speak to the Secretary to Senate Research Ethics Committee and inform them that the name of the project is:

Selecting and tailoring of images for visual impact in online journalism. A Validation study with experts.

You could also write to the Secretary at:

Anna Ramberg
Secretary to Senate Research Ethics Committee

Research Office, E214
City University London
Northampton Square
London
EC1V 0HB

Email: [redacted]

City University London holds insurance policies which apply to this study. If you feel you have been harmed or injured by taking part in this study you may be eligible to claim compensation. This does not

affect your legal rights to seek compensation. If you are harmed due to someone's negligence, then you may have grounds for legal action.

Who has reviewed the study?
This study has been approved by City University London, Computer Science Research Ethics Committee (CSREC).

Further information and contact details

First Supervisor:

Dr Andy MacFarlane

Centre for Information Science

Room A304

City University London
Northampton Square
London
EC1V 0HB

Email: [redacted]

Thank you for taking the time to read this information sheet.

B3 Schedule

Expert	Questionnaires distributed	Questionnaires received
Pilot	22 October 2014	22 October 2014
1	24 October 2014	27 October 2014
2	24 October 2014	26 October 2014
3	24 October 2014	29 October 2014

B4 Consent form



CONSENT FORM

Title of Study: ***Validation study 1. with image experts***

Please initial box

1.	I agree to take part in the above City University London research project. I have had the project explained to me, and I have read the participant information sheet, which I may keep for my records. I understand this will involve: • completing a questionnaire-type research based on either my experience in image creating, editing, and use or my research in imagery, image retrieval and use. • using a computer to complete the questionnaire	
2.	The information obtained in this research will be held and processed for the purpose of this study, as well as this particular PhD project, and any reports and publications related to it. I understand that my name and contact details will be kept confidential, and that no information that could lead to the identification of me as an individual will be disclosed in any reports on the project, or to any other party. No identifiable personal data will be published. The identifiable data will not be shared with any other organisation. The data collected in this study may be published beyond the thesis report. These publications will not include any personally identifiable information.	
3.	I understand that my participation is voluntary, that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being penalised or disadvantaged in any way.	
4.	I agree to City University London recording and processing this information about me. I understand that this information will be used only for the purpose(s) set out in this statement and my consent is conditional on the University complying with its duties and obligations under the Data Protection Act 1998.	
5.	I agree to take part in the above study.	

Name of Participant	Signature	Date
Name of Researcher	Signature	Date

B5 Questionnaire (example)

Illustration 1



In relation to the image and the headline, please answer the questions below.

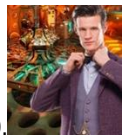
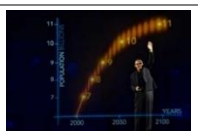
Question 1. In your view, which of the following statements apply to this image? Choose a or b for each statement.

The image:

No.	Questions	a OR b
1	a)Is a colour photograph **OR** b) black and white	
2	In the foreground, a)shows a person (people) who can be identified and named e.g. Hillary Clinton, Eiffel Tower **OR / AND** b) unidentifiable person (people)	
3	a)face is visible **OR** b)face is not visible	
4	a)face is in focus OR b) face is not in focus	
5	a)shows a realistic background that can be identified and named e.g. London, Etihad Stadium **OR** b) shows a blurry background that cannot be identified	
6	a)shows the identifiable person (people) from waist up **OR** b) shows the whole figure of the identifiable person (people) (whole body, legs visible)	
7	a)shows the identifiable person (people) in the centre or to the right of the frame **OR** b) shows the identifiable person (people) in the centre or to the right of the frame	
8	a)shows the person large in the frame **OR** b) does not show the person large in the frame	

B6 Images & results

The illustrations included in Survey 1.

T2. 	T9. 	T22. 
T4. 	T10. 	T24. 
T5. 	T11. 	T25. 
T7. 	T12. 	T27. 
T8. 	T17. 	

All features present in 9 illustrations: T2, T5, T7, T8, T11, T17, T24, T25, and T27 at 100% agreement

Q	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	Identifiable person/people depicted in the image	1	1	1	100%
2	The person/people depicted in the foreground	1	1	1	100%
3	Shot from waist up	1	1	1	100%
4	Face visible: frontal or profile shot	1	1	1	100%
5	Positioned centrally or to the right within the frame	1	1	1	100%
6	Colour image	1	1	1	100%
7	Face of the person in focus	1	1	1	100%
8	Blurry or monotone background	1	1	1	100%
Total agreement					100%

T4 (John Cole)

Q	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	Identifiable person/people depicted in the image	1	1	1	100%
2	The person/people depicted in the foreground	1	1	1	100%
3	Shot from waist up	1	1	1	100%
4	Face visible: frontal or profile shot	1	1	1	100%
5	Positioned centrally or to the right within the frame	1	1	1	100%
6	Colour image	1	1	1	100%
7	Face of the person in focus	0	0	1	66.7%
8	Blurry or monotone background	1	0	0	66.7%
Total agreement					91.7%

T9 (Everton…)

	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	Identifiable person/people depicted in the image	1	1	1	100%
2	The person/people depicted in the foreground	1	1	1	100%
3	Shot from waist up	1	1	1	100%
4	Face visible: frontal or profile shot	1	1	1	100%
5	Positioned centrally or to the right within the frame	0	0	0	100%
6	Colour image	1	1	1	100%
7	Face of the person in focus	1	1	1	100%
8	Blurry or monotone background	1	1	0	66.7%
Total agreement					95.8%

T10 (Dr Who)

	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	Identifiable person/people depicted in the image	1	1	1	100%
2	The person/people depicted in the foreground	1	1	1	100%
3	Shot from waist up	1	1	1	100%
4	Face visible: frontal or profile shot	1	1	1	100%
5	Positioned centrally or to the right within the frame	1	1	1	100%
6	Colour image	1	1	1	100%
7	Face of the person in focus	1	1	1	100%
8	Blurry or monotone background	1	0	0	66.7%
Total agreement					95.8%

T12 (Don't panic)

	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	Identifiable person/people depicted in the image	1	1	0	66.7%
2	The person/people depicted in the foreground	1	1	1	100%
3	Shot from waist up	0	0	0	100%
4	Face visible: frontal or profile shot	1	1	1	100%
5	Positioned centrally or to the right within the frame	1	1	1	100%
6	Colour image	1	1	1	100%
7	Face of the person in focus	0	0	0	100%
8	Blurry or monotone background	0	1	1	66.7%
Total agreement					91.7%

T22 (Beyonce/Jay-z)

	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	Identifiable person/people depicted in the image	1	1	1	100%
2	The person/people depicted in the foreground	1	1	0	66.7%
3	Shot from waist up	0	0	0	100%
4	Face visible: frontal or profile shot	1	1	1	100%
5	Positioned centrally or to the right within the frame	1	1	1	100%
6	Colour image	1	1	1	100%
7	Face of the person in focus	1	1	0	66.7%
8	Blurry or monotone background	1	1	1	100%
Total agreement					91.7%

B7 Percent agreement in Survey 1.

The table below shows the overall agreement achieved between the Experts in Survey 1.

Illustration	*%*	Illustration	*%*
T2	*100*	**T11**	*100*
T4	*91.7*	**T12**	*91.7*
T5	*100*	**T17**	*100*
T7	*100*	**T22**	*91.7*
T8	*100*	**T24**	*100*
T9	*95.8*	**T25**	*100*
T10	*95.8*	*T27*	*100*
Agreement			*97.6%*

Appendix C. Study II: Survey 2.

Contents:

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C2 Information for participants

C3 Schedule

C4 Consent form

C5 Questionnaire

C6 Images & results

C7 Percent agreement

C1 Invitation to participate



Dear X,

My name is Sylwia Frankowska-Takhari and I am a PhD student at City University, London (School of Mathematics, Computer Science & Engineering). The focus of my PhD work is on the selection and use of images in online journalism.

I am currently looking for three image Experts who would like to take part in a validation study. The aim of this study is to gain an independent expert judgement on the occurrence of a set of visual features identified in images used in online journalism.

To join the study as an Expert, you must be either a professional working with images, for example, a photographer, image editor, or online journalist, or a PhD student whose research area falls into imagery, for example, photography, image seeking, retrieval, and image use, or image editing.

If this sounds interesting to you, please, contact me on [redacted] and I will send you more detailed information about the purpose of this study, how you can contribute and benefit from your participation.

Kind regards,

Sylwia F Takhari

C2 Information for participants



Information for Experts

Title of study: *Validation Study 2. with image experts*

Title of the PhD project: Selection and tailoring of images for visual impact in online journalism.

Dear Participant,

Thank you for responding to my call for Experts. In this document you will find more detailed information about the purpose of this study, how you can contribute and benefit from your participation.

Please take time to read the following information carefully, and feel free to discuss it with others if you wish. Please do not hesitate to contact me at [redacted] if there is anything that is unclear or if you require any further information.

Kind regards,

Sylwia F Takhari

What is the purpose of the study?

The aim of this study is to gain an independent expert opinion on visual features of 100 selected news photos. As part of an Expert team, you will be asked to look at the photographs and answer 9 questions per image.

Why have I been invited?

For this study, I am aiming to recruit three participants who are image professionals or PhD students involved in research into imagery. Below you will find more information on what you should expect as Participant and how you will be rewarded for your time and effort.

Do I have to take part?

Participating in the study is voluntary. It is up to you to decide whether, or not to take part. If you do decide to take part you will be asked to sign a consent form. If you decide to take part, you are still free to

withdraw at any time and without giving a reason. You may choose not to answer questions which you feel are too personal or intrusive.

What will happen if I take part?

Your participation in the research will be much appreciated and to thank you for your time and contribution I would like to offer you incentives of a £50 high-street voucher.

What do I have to do?

Before the study, you will be asked to sign a consent form, and then to fill in a questionnaire sent to you via email. In the questionnaire, you will be asked to look at a set of 100 pre-selected news images and answer a set of 9 questions for each of the photographs.

You can complete this questionnaire in your own time and location and at your own pace. Completing this questionnaire should take you around 100 - 120 minutes. The complete questionnaire should be returned no later than on 5th January 2016.

What are the possible disadvantages and risks of taking part?

Participating in the research should not be a negative experience for you. If for any reason you feel you do not want to answer a question or participate in an activity please speak directly to the researcher.

The questionnaire is in a word format but please let me know if you prefer a different digital format, or a pen and paper copy – I will provide you with a printed version of the questionnaire.

What are the possible benefits of taking part?

If you wish, I will keep you informed about the findings from this study and the wider research.

These findings may directly benefit you in your image-related role, e.g., inform your current work, or study.

What will happen when the research study stops?

During the study, the data will be de-identified and kept safe on a password protected device. When the research study stops, the data will be kept safe on a password protected device for 10 years as per City University's regulations.

Will my taking part in the study be kept confidential?

During the research, I will not be collecting data about you and your work. You will be referred to as Expert no. X in my data collection tools (e.g. a spread sheet with raw data), and in any publication/ summary, and the final thesis.

Only I and my supervisors will have access to the raw data and the recordings. All the raw data will be kept safe in a locked filing cabinet, and electronic data will be password-protected. At the end of the study the data will be kept safe on a password protected device for 10 years as per City University's regulations.

What will happen to the results of this research study?

The findings from this research will be published and included in the final PhD thesis and other publications e.g. in academic journals. All personal or identifiable data collected will be de-identified.

If you are interested in the findings, please tick the box below and I will make sure that you will receive a copy of any publication/summary of the results.

☐ Yes, I'd like to receive a copy of any publication/ summary of the results.

What will happen if I don't want to carry on with the study?

Participating in this study is voluntary and you can withdraw from the study at any time during the research without giving a reason.

What if there is a problem?

If you would like to complain about any aspect of the study, City University London has established a complaints procedure via the Secretary to the University's Senate Research Ethics Committee. To complain about the study, you need to phone 020 7040 3040. You can then ask to speak to the Secretary to Senate Research Ethics Committee and inform them that the name of the project is:

Selecting and tailoring of images for visual impact in online journalism. A Validation study with experts.

You could also write to the Secretary at:

Anna Ramberg
Secretary to Senate Research Ethics Committee

Research Office, E214
City University London
Northampton Square
London
EC1V 0HB

Email: [redacted]

City University London holds insurance policies which apply to this study. If you feel you have been harmed or injured by taking part in this study you may be eligible to claim compensation. This does not affect your legal rights to seek compensation. If you are harmed due to someone's negligence, then you may have grounds for legal action.

Who has reviewed the study?
This study has been approved by City University London, Computer Science Research Ethics Committee (CSREC).

Further information and contact details

First Supervisor:

Dr Andy MacFarlane

Centre for Information Science

Room A304

City University London
Northampton Square
London
EC1V 0HB

Email: [redacted]

Thank you for taking the time to read this information sheet.

C3 Schedule

Expert	Questionnaires distributed	Questionnaires received
Pilot	16 December 2015	18 December 2015
1	21 December 2015	29 December 2015
2	21 December 2015	3 January 2016
3	21 December 2015	30 December 2015

C4 Consent form

CITY UNIVERSITY LONDON

EST 1894

CONSENT FORM

Title of Study: ***Validation study 2. with image experts***

Please initial box

1.	I agree to take part in the above City University London research project. I have had the project explained to me, and I have read the participant information sheet, which I may keep for my records. I understand this will involve: • completing a questionnaire-type research based on either my experience in image creating, editing, and use or my research in imagery, image retrieval and use. • using a computer to complete the questionnaire	
2.	The information obtained in this research will be held and processed for the purpose of this study, as well as this particular PhD project, and any reports and publications related to it. I understand that my name and contact details will be kept confidential, and that no information that could lead to the identification of me as an individual will be disclosed in any reports on the project, or to any other party. No identifiable personal data will be published. The identifiable data will not be shared with any other organisation. The data collected in this study may be published beyond the thesis report. These publications will not include any personally identifiable information.	
3.	I understand that my participation is voluntary, that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being penalised or disadvantaged in any way.	
4.	I agree to City University London recording and processing this information about me. I understand that this information will be used only for the purpose(s) set out in this statement and my consent is conditional on the University complying with its duties and obligations under the Data Protection Act 1998.	
5.	I agree to take part in the above study.	

_____ _____ _____

Name of Participant Signature Date

_____ _____ _____

Name of Researcher Signature Date

C5 Questionnaire (example)

IMAGE TASK 1.

I. Please look at the image and headline below:



Build-up and team news ahead of Stoke v Man Utd

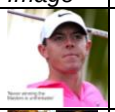
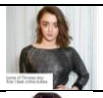
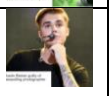
Please answer the following questions in relation to the image in this task. Mark (X) next to your answer.

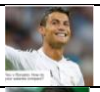
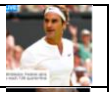
	Questions:	***YES***	***NO***
-	Do you recognise the person in this image?	**X**	
1	Does this image show only one known (identifiable) person?	X	
2	Is this person the only person depicted in the foreground?	X	
3	Is this person's face visible: frontal or profile shot?	X	
4	Is this person's face in focus?	X	
5	Is this a colour image?	X	
6	Is this person positioned either centrally or to the right within the frame?	X	
7	Is the background either blurry or monotone?	X	

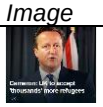
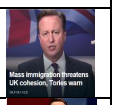
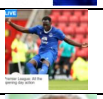
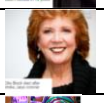
Please answer the question below (pick only one answer):

	Question:	***Mark (X) next to your answer***
8	How is the person in this image shown:	
	a) From knees up/ the whole person?	
	b) From waist up?	X

C6 Images & results

No.	Image	No.	Image	No.	Image	No.	Image
1		19		37		55	
2		20		38		56	
3		21		39		57	
4		22		40		58	
5		23		41		59	
6		24		42		60	
7		25		43		61	
8		26		44		62	
9		27		45		63	
10		28		46		64	
11		29		47		65	
12		30		48		66	
13		31		49		67	
14		32		50		68	

15		33		51		69	
16		34		52		70	
17		35		53		71	
18		36		54		72	

No.	Image	No.	Image	No.	Image	No.	Image
73		80		87		94	
74		81		88		95	
75		82		89		96	
76		83		90		97	
77		84		91		98	
78		85		92		99	
79		86		93		100	

80 illustrations carried all features from the recurring feature set

Images: 1, 2, 3, 4, 6, 7, 9, 10, 14, 15, 16, 18, 19, 20, 21, 23, 25, 28, 29, 30, 32, 33, 35, 36, 37, 38, 41, 42, 43, 44, 45, 46, 49, 50, 51, 52, 54, 55, 56, 58, 59, 60, 61, 62, 65, 66, 67, 69, 70, 71, 73, 74, 75, 76, 77, 78, 80, 81, 82, 84, 85, 86, 89, 90, 94, 95, 97, 98, 99, 100

20 images did not carry all features from the recurring feature set

Examples:

Image 5



Q	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	Identifiable person/people depicted in the image	1	1	1	100%
2	The person/people depicted in the foreground	1	1	1	100%
3	Shot from waist up	0	0	0	100%
4	Face visible: frontal or profile shot	1	1	1	100%
5	Positioned centrally or to the right within the frame	1	1	1	100%
6	Colour image	1	1	1	100%
7	Face of the person in focus	1	1	1	100%
8	Blurry or monotone background	1	1	1	100%
Total agreement					100%

Image 22



Q	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	Identifiable person/people depicted in the image	1	1	1	100%
2	The person/people depicted in the foreground	1	1	1	100%
3	Shot from waist up	1	1	1	100%
4	Face visible: frontal or profile shot	1	1	1	100%
5	Positioned centrally or to the right within the frame	1	1	1	100%
6	Colour image	0	0	0	100%
7	Face of the person in focus	1	1	1	100%
8	Blurry or monotone background	1	1	1	100%
Total agreement					100%

Image 24



Q	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	Identifiable person/people depicted in the image	1	1	1	100%
2	The person/people depicted in the foreground	1	1	1	100%
3	Shot from waist up	1	1	1	100%
4	Face visible: frontal or profile shot	1	1	1	100%
5	Positioned centrally or to the right within the frame	1	1	1	100%
6	Colour image	1	1	1	100%
7	Face of the person in focus	0	0	0	100%
8	Blurry or monotone background	1	1	1	100%
Total agreement					100%

Image 64



Q	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	Identifiable person/people depicted in the image	1	1	1	100%
2	The person/people depicted in the foreground	1	1	1	100%
3	Shot from waist up	0	0	0	100%
4	Face visible: frontal or profile shot	1	1	1	100%
5	Positioned centrally or to the right within the frame	1	1	1	100%
6	Colour image	1	1	1	100%
7	Face of the person in focus	1	1	1	100%
8	Blurry or monotone background	0	0	0	100%
Total agreement					100%

Image 83



Q	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	Identifiable person/people depicted in the image	1	1	1	100%
2	The person/people depicted in the foreground	1	1	1	100%
3	Shot from waist up	0	0	0	100%
4	Face visible: frontal or profile shot	1	1	1	100%
5	Positioned centrally or to the right within the frame	1	1	1	100%
6	Colour image	1	1	1	100%
7	Face of the person in focus	1	1	0	66.7%
8	Blurry or monotone background	1	0	1	66.7%
Total agreement					91.6%

In 19 images the background was not considered blurry/ monotone

Images: 12, 13, 17, 26, 31, 34, 39, 40, 48, 53, 63, 64, 68, 79, 87, 91, 92, 93, 96

Example

Images: 31, 79, 96







Q	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	Identifiable person/people depicted in the image	1	1	1	100%
2	The person/people depicted in the foreground	1	1	1	100%
3	Shot from waist up	1	1	1	100%
4	Face visible: frontal or profile shot	1	1	1	100%
5	Positioned centrally or to the right within the frame	1	1	1	100%
6	Colour image	1	1	1	100%
7	Face of the person in focus	1	1	1	100%
8	Blurry or monotone background	0	0	1	66.7%
Total agreement					95.8%

C7 Percent agreement in Survey 2.

Illustration	%	Illustration	%	Illustration	%	Illustration	%
1	100	26	95.825	51	100	76	100
2	100	27	91.65	52	100	77	100
3	100	28	100	53	95.825	78	100
4	95.825	29	95.825	54	100	79	95.825
5	100	30	100	55	95.825	80	95.825
6	100	31	95.825	56	100	81	100
7	100	32	100	57	95.825	82	100
8	100	33	100	58	100	83	91.65
9	100	34	95.825	59	100	84	100
10	100	35	100	60	100	85	100
11	95.825	36	100	61	95.825	86	95.825
12	95.825	37	100	62	100	87	95.825
13	100	38	95.825	63	95.825	88	95.825
14	100	39	91.65	64	100	89	95.825
15	100	40	91.65	65	95.825	90	100
16	100	41	95.825	66	100	91	95.825
17	95.825	42	100	67	100	92	95.825
18	100	43	100	68	100	93	91.65
19	100	44	100	69	100	94	100
20	95.825	45	100	70	100	95	100
21	100	46	100	71	100	96	95.825
22	100	47	95.825	72	95.825	97	95.825
23	100	48	91.65	73	100	98	95.825
24	100	49	95.825	74	100	99	100
25	100	50	100	75	100	100	100
Overall agreement							98.20%

Appendix D. Study III: Experiment

Contents:

D1 Invitation to participate

D2 Information for participants

D3 Schedule

D4 Consent form

D5 Illustration tasks & scenarios

D6 Filtered image set (the experimental set)

D7 Participants observation sheet

D8 Observational data (coded)

D9 Likert scales ratings

D10 Illustrations created in Study III.

D1 Invitation to participate



Dear X,

My name is Sylwia Frankowska-Takhari and I am a PhD student at City, University of London (School of Mathematics, Computer Science & Engineering). I have been investigating how image professionals search for and select images to news stories with an aim to inform the development and design of future image search engines.
Currently, I am looking for professional image editors /content producers whose job is to select images to news content published online, and who would like to take part in a study that aims to evaluate two prototyped systems for image retrieval.
To be eligible to join this study, you must be over 18. and either a professional working with images in online news, e.g., image editor, content editor, or online journalist whose job includes selecting images to news content.
If this sounds interesting to you, please, contact me on [redacted],
and I will send you more detailed information about the purpose of this study, the contribution required, and how you can benefit from participation.

Kind regards,

Sylwia Frankowska-Takhari

D2 Information for participants



Dear Participant,

Before you decide whether you would like to take part in this research, it is important that you understand its purpose and how you can contribute and benefit from it.

Please take time to read the following information carefully, and feel free to discuss it with others if you wish. Please do not hesitate to contact me if there is anything that is unclear or if you require any further information.

What is the purpose of the study?
The aim of this study is to test a possible concept for improving of effectiveness of retrieval of images used for illustrating of online news content.

Why have I been invited?
For this study I am aiming to recruit participants who are image professionals whose job role involves selecting and editing of images for use with online news content. Below you will find more information on what you should expect as Participant and how you will be rewarded for your time and effort.

Do I have to take part?
Participating in the study is voluntary. It is up to you to decide whether or not to take part. If you do decide to take part you will be asked to sign a consent form. If you decide to take part, you are still free to withdraw at any time and without giving a reason. You may choose not to answer questions which you feel are too personal or intrusive.

What will happen if I take part?

Your participation in the research will be much appreciated and to thank you for your time and contribution I would like to offer you incentives of a £40 M&S voucher.

What do I have to do?

Before the study you will be asked to read this information sheet, and sign a consent form, and then to confirm that you are eligible for this research. You will need to be available for a 60-minute individual study session scheduled between 21st March and 30th April 2016. The sessions will be video recorded.

> **In the study** you will be asked to perform four (4) illustration tasks. The tasks will be based on simple scenarios simulating your typical work tasks. The researcher will provide a laptop with access to tasks, image collections, and PS software.
>
> **After each task** you will have time to provide feedback in regard to image selections that you made and editing techniques that you applied to create illustrations.
>
> **To conclude the study,** you will have time to comment on your overall experience in regard to the study and images used in the tasks.

What are the possible disadvantages and risks of taking part?

Participating in the research should not be a negative experience for you. If for any reason you feel you do not want to answer a question or participate in an activity please speak directly to the researcher.

The aim of this study is not to test you or your skills, but to test the tool I am developing. There is no right or wrong answers in this study. You will be able to schedule the session in the location and at the time that suits you best.

What are the possible benefits of taking part?

If you wish, I will keep you informed about the findings from this study and the wider research. These findings may directly benefit you in your image-related role, e.g., inform your current work.

What will happen when the research study stops?

During the study the data will be de-identified and kept safe on a password protected device. When the research study stops, the data will be kept safe on a password protected device for 10 years as per City, University of London regulations.

Will my taking part in the study be kept confidential?

During the research I will not be collecting data about you and your work. You will be referred to as Participant no. X in my data collection tools (e.g. a spread sheet with raw data), and in any publication/ summary, and the final thesis.

Only I and my supervisors will have access to the raw data and the recordings. All the raw data will be kept safe in a locked filing cabinet, and electronic data will be password-protected. At the end of the study the data will be kept safe on a password protected device for 10 years as per City, University of London regulations.

What will happen to the results of the research study?

The findings from this research will be published and included in the final PhD thesis and other publications e.g. in academic journals. All personal or identifiable data collected will be de-identified.

If you are interested in the findings, please tick the box below and I will make sure that you will receive a copy of any publication/summary of the results.

□ Yes, I'd like to receive a copy of any publication/ summary of the results.

What will happen if I don't want to carry on with the study?

Participating in this study is voluntary and you can withdraw from the study at any time during the research without giving a reason.

What if there is a problem?

If you would like to complain about any aspect of the study, City, University of London has established a complaints procedure via the Secretary to the University's Senate Research Ethics Committee. To complain about the study, you need to phone 020 7040 3040. You can then ask to speak to the Secretary to Senate Research Ethics Committee and inform them that the name of the project is:

Selecting and tailoring of images for visual impact in online journalism. A Validation study with experts.

You could also write to the Secretary at:

Anna Ramberg
Secretary to Senate Research Ethics Committee

Research Office, E214
City, University of London
Northampton Square
London
EC1V 0HB

Email: [redacted]

City, University of London holds insurance policies which apply to this study. If you feel you have been harmed or injured by taking part in this study you may be eligible to claim compensation. This does not affect your legal rights to seek compensation. If you are harmed due to someone's negligence, then you may have grounds for legal action.

Who has reviewed the study?

This study has been approved by City, University of London, Computer Science Research Ethics Committee (CSREC).

Further information and contact details

First Supervisor:

Dr Andy MacFarlane
Department of Computer Science
Room A304
City, University of London
Northampton Square
London
EC1V 0HB

Email: [redacted]

Thank you for taking the time to read this information sheet.

D3 Schedule

GROUP A Filtered > Unfiltered

Participant no.	News service	Date
1	freelance	11th April 2016
2	BBC Online	21st May 2016
3	BBC Online	21st May 2016
4	Financial Times	16th June 2016
5	Haymarket	1st July 2016

GROUP B Unfiltered > Filtered

Participant no.	News service	Date
1	freelance	5th April 2016
2	Financial Times	24th May 2016
3	Unilad	19th June 2016
4	BBC Online	19th June 2016
5	Mirror Online	23rd June 2016

D4 Consent form

CITY
UNIVERSITY OF LONDON
EST 1894

CONSENT FORM

Title of Study: ***User study with image professionals (concept evaluation)***

Please initial box

1.	I agree to take part in the above City, University of London research project. I have had the project explained to me, and I have read the participant information sheet, which I may keep for my records. I understand this will involve using a computer to complete a set of simulated work tasks where I will be asked to select and edit images to illustrate news content. I understand that the research session will be **video recorded**.	
2.	The information obtained in this research will be held and processed for the purpose of this study, as well as this particular PhD project, and any reports and publications related to it. I understand that my name and contact details will be kept confidential, and that no information that could lead to the identification of me as an individual will be disclosed in any reports on the project, or to any other party. No identifiable personal data will be published. The identifiable data will not be shared with any other organisation. The data collected in this study may be published beyond the thesis report. These publications will not include any personally identifiable information.	
3.	I understand that my participation is voluntary, that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being penalised or disadvantaged in any way.	
4.	I agree to City, University of London recording and processing this information about me. I understand that this information will be used only for the purpose(s) set out in this statement and my consent is conditional on the University complying with its duties and obligations under the Data Protection Act 1998.	
5.	I agree to take part in the above study.	

_____ _____ _____

Name of Participant Signature Date

_____ _____ _____

Name of Researcher Signature Date

D5 Illustration tasks & scenarios

Scenario

In your role as image professional, you were tasked with Illustration Task X. described below.

Find and select an image (or images) to illustrate the news article: [Task]

If needed, use PhotoShop software to do as much or as little editing as you think is required for publication of the image (images).

- *Time on task that you can afford is up to 10 minutes.*
- *You have already searched for actual images from the event but they are not available in the image collection that you have access to.*
- *You begin the image search with typing in a search term: [the named person in the Task]*

Illustration Task 1. (Experimental system/Filtered image set)

HEADLINE: **Usain Bolt seals place in World Championship history**

[Editorial section: sport news
Information format: a text-based article]

Usain Bolt guided Jamaica to victory in a sprint relay to become the most successful athlete in the history of the World Championships.

Illustration Task 2. (Experimental system/Filtered image set)

HEADLINE: **Elections are key test for Merkel's future**

[Editorial section: World news
Information format: a text-based article]

Will Merkel be left out in the cold? Greece needs EU help to avoid chaos, says Merkel.

Illustration Task 3. (Baseline system/ Unfiltered image set)

HEADLINE: **Cameron on 'modern, compassionate' government**

[Editorial section: UK news
Information format: a text-based article]

David Cameron has defended his government, saying it must continue to "cut the deficit and control the cost of welfare".
His comments in Parliament come as the Prime Minister attempts to heal a rift in his party over Budget spending cuts.

Illustration Task 4. (Baseline system/ Unfiltered image set)

HEADLINE: **Weekend Interview with Sophie Ellis-Bextor**

[Editorial section: a promotion for a live radio interview
Information format: an audio clip]

Sophie Ellis-Bextor on her new album, music, family and Strictly Come Dancing.

D6 Filtered image set (the experimental system)

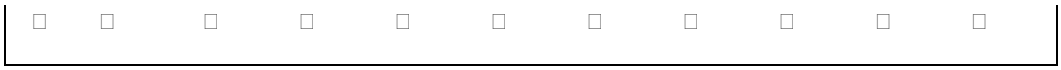
Filtered set: T2 (Angela Merkel)

Page	Screen
1	**Scenario 2** **In your role as image professional, you were tasked with Illustration Task 2 described below.** **ILLUSTRATION TASK 2.** Find and select an image (or images) to illustrate the following news article: HEADLINE: **Elections are key test for Merkel's future** [Editorial section: World news Information format: a text-based article] Will Merkel be left out in the cold? Greece needs EU help to avoid chaos, says Merkel If needed, use PhotoShop software to do as much or as little editing as you think is required for publication of the image (images). - Time on task that you can afford is up to 10 minutes. - You have already searched for *actual* images from the event but they are not available in the image collection that you have access to. - You begin the image search with typing in a search term: *angela merkel* angela merkel search
2	
3	
4	
5	

6	
7	
8	
9	
10	
11	

D7 Participants observation sheet & codes

Write down any observed actions in the task process
Participant X.



Task begins **Task ends**

Post-task feedback

Do you agree with the following statements?

1. When compared to my work tasks, this task is a typical illustration task.

1	2	3	4	5
Strongly disagree	Disagree	Neither/nor	Agree	Strongly agree

2. I am satisfied with the selection I've made in this task.

1	2	3	4	5
Strongly disagree	Disagree	Neither/nor	Agree	Strongly agree

3. I am satisfied with the amount of time it took me to complete this task.

1	2	3	4	5
Strongly disagree	Disagree	Neither/nor	Agree	Strongly agree

4. I am satisfied with the amount of effort it took me to complete the task.

1	2	3	4	5
Strongly disagree	Disagree	Neither/nor	Agree	Strongly agree

Post-test questions

1) What was your overall impression of the tasks 1 - 4?
2) Did you feel that it was easier or more difficult to perform any of the tasks?
3) If so, when was the selection easier? Why?

The coding scheme (participant's activities)

Stage in the Illustration task process (Conniss et al., 2000; Ellis et al., 1993; Makri et al., 2010; Markkula and Sormunen, 2000) (CATEGORY)	Example of action coded (definition)	Activity (CODE)
8 Starting task	Verbal acknowledgement of the particular task Verbal expression of intention to work on the particular task Reading information associated with the task	Acknowledging the task Familiarising with the task (components)
9 Staring search	Mentioning (unprompted or probed) ideas, e.g., I need…, This requires…	Image in mind> Facets (Westman, 2009; & VSS framework Generic / specific Detail: facial expression/ gestures/ pose
10 Scoping (Not supported)	An intention to scope	Selecting the strategy Selecting the source Formulating the query (re-formulating)
11 Applying (Not supported)	An intention to apply	Interacting with the IR system (capture the use of search features)
12 Selecting	Browsing, scanning the results in thumbnails, Scrolling up > down Scrolling down > up (revisiting pages) Commenting on specific images Opening results to view enlarged image (intention to) Selecting an image, or selecting candidate images Planning tailoring	Browsing (through results in) thumbnails (Bates, 2007, Hung, 2005) a – glimpsing a scene b – homing on a section visually or physically c – examining item(s) of interest: visually inspecting details, e.g. facial expression, pose, gestures d – physically or conceptually acquiring or abandoning of examined item(s) Enlarging Selecting an image OR Selecting a set Selecting for tailoring
13 Verifying (Not supported)	An intention to verify the image	Image verified for authenticity
14 Ending search	Final selection made and saved OR The task ended with no selection – communicated verbally, AND/OR moving on to another task	Final selection made OR Selection not made
15 Tailoring	Image opened in editing software Editing techniques applied: specify: a…. b…. c…. n….	Image manipulation techniques applied
16 Ending task	Final selection made and saved OR The task ended with no selection – communicated verbally AND/OR moving on to another task	Illustration created OR Illustration not created
17 Iterating (Not supported)	An intention to carry out	Change in the process Interruptions/ distractions
18 Learning	Asking questions about UI and functionality, trying functionality	Familiarising with the prototype UI

The coding scheme (effectiveness & efficiency)

Measure	Operational measure		CODES
	Observable action	**Self-reported**	
Effectiveness	User is able to select an image (or images) from the presented set and complete the illustration task with no or minimum of editorial work (tailoring) before publication.	User verbally announces task completion AND in the post-task questionnaire, user expresses satisfaction with the selection made above point 3 on Likert scale AND in the debriefing questionnaire, user makes positive qualitative comments about the selection process	TASK_COMPL > img selected NO/MIN EDTS SATISFACTION> selection
Efficiency	User is able to make a *straightforward* selection (less scrolling up and down the page, less hesitation expressed compared to baseline set) AND complete the task with no or minimum editorial work (less editorial work applied than necessary in baseline set)	In the post-task questionnaire, user expresses satisfaction with the perceived amount of work necessary to complete the task above point 3 on Likert scale AND In the post-task questionnaire, user expresses satisfaction with the perceived time spent on the task above point 3 on Likert scale AND in the debriefing questionnaire, user makes positive qualitative comments about the selection process	TASK_COMPL> straightforward NO/MIN EDTS SATISFACTION> effort SATISFACTION> time
System preference	Not observable	While performing tasks, user expresses a preference for any one of the systems AND/OR In the debriefing questionnaire, user indicates his/her preference for one of the systems (image set), AND When comparing both systems, makes (more) positive qualitative comments about the preferred system	PREFERENCE > *specify*

D8 Observational data (coded)

Coded data – Participant 1.

Filtered set (T1)	Qualitative comments	Action	Codes
Scenario page	*OK, so he's won something. I'd like an active image with a bit of motion in it.*	P. has read the task	Starting task Starting search Image in mind>visual> action
	Ok. Let me see. How do you use this? Oh, it scrolls down, OK.	Trying to scroll down	Learning
Page 1	*Maybe this one? But it's a bit predictable and boring. Ok, he's won and there he is with a medal.*	Viewing images on Page 1. inspecting images Points to an image but dismisses it.	Selecting >glimpsing the scene (a) > inspecting images (c) > abandoning (d)
	I'm going to go for that one. He looks very happy and proud.	Pointing to another image as a potential candidate.	Detail> facial expression, pose, gesture
Pages 2 – 10	No comments	Scrolling slowly down to the thumbnails then fast back to the initial candidate.	Selecting >inspecting images (c) >acquiring the image (d)
Page 1	*There is a feeling that comes with it, the feeling is joy, he is excited and the photo shows that.*	P. has made a selection. A straightforward selection. No edits.	Ending search> image selected Task completed Effective Efficient
Selected image	*He is looking in the horizon, he's happy, ecstatic. You don't want him standing, you want to see him active.*	[comments on selection]	Detail> facial expression, pose, gesture

Filtered set (T2)	Qualitative comments	Actions	Codes
Scenario page	*I can see an apprehensive Merkel, not smiling one.*	P. has read the task	Starting task Starting search Image in mind> > critical object > detail > facial expression
Page 1	*Normally these would be if there was some quotation from her but there isn't.*	Pointing to mid-speech images on page 1. Scrolls slowly down, small movements, examining the images	Selecting >glimpsing the scene (a) >inspecting images (c) detail>facial expression >abandoning (d)
Page 6	*I think this one but I'll look at these, too.*	Pointing to an image	> inspecting images (c) > profile shot > candidate image
Page 6	*I'd choose this but she's not recognisable. I prefer frontal than profile* [shots].	Pointing to an image	> inspecting images (c) >profile shot > abandoning the image (d)

Pages 6 > 10	*No comments*	Scrolling slowly down to the thumbnails then swiftly back to the initial candidate image	> inspecting images (c)
Pages 10 > 6	*I'm going for my first choice.*	Scrolls up to Page 6 P. has made a selection & finished the task	> acquiring the image (d) Ending search> image selected Task completed Effective Efficient
Selected image	*The most important thing is that she looks apprehensive, her face, her eyes. This matches the article, what the article says.*	[comments on selection]	Detail> facial expression

Unfiltered set (T3)	**Qualitative comments**	**Actions**	**Codes**
Scenario page	*He's trying to be in control, so, something like a stiff-lip.*	P. has read the task	Starting task Starting search Image in mind > critical object > detail > facial expression
Pages 1 - 2	*These are completely inappropriate, nothing to do with the article. These are related to other events, other people. These are related to EU, but this [article] is domestic politics.*	Continuously scrolling down across the set Pointing to a subset of images Scrolling down across the set to the last page	Selecting> glimpsing the scene (a) >homing on a section (b) > examining images (c) > abandoning of examined items (d) Unmet needs > single person > generic > neutral background
Page 7 (the last page) > Scenario page > back to the last page	*This is in Wales. Did it say where he made the speech?*	Pointing to an image Revisiting the task, Scrolling back to the last page	> examining an image of interest (c) Verifying > intention to verify location > abandoning (d)
Page 7 (the last page)	*This is hard one. These photos are so specific.*	Contrast with needs	Unmet need > generic
Page 7 > Page 1 > Page 7	*This is a hard one, these images are too specific. Maybe this one but there is someone in the background. We don't normally edit news images. I'm finding this one [selection] difficult, the images are too specific, they are from specific meetings.*	Scrolling up to first page Scrolling down to last page	> examining an image (c) > abandoning (d) Unmet needs > single person > generic > neutral background Inefficient> Intensive scrolling
Page 7 (the last page)	*Maybe this one. Still too animated.*	Pointing to an image Contrast with needs P. has made a selection & finished the task	> examining an image (c) > detail > facial expression > acquiring the image (d)

Unfiltered set (T4)	Qualitative comments	Actions	Codes
Scenario page	*Ok, so a very generic photo of her* [Sophie Ellis-Bextor] *looking glamorous.*	P. has read the task	Starting task Starting search Image in mind > critical object > generic > visual effect
Page 1 > Page 9 > Page 1	*Again, very specific photos of her. None of these.* *She's too small in these.*	Viewing a sub-set of images on the page Contrasts with needs Scrolling down to the last page and back to Page 1	Selecting> glimpsing the scene (a) >homing on a section (b) > examining images (c) > abandoning (d) Unmet needs > type of shot > waist-up Inefficient > intensive scrolling
Page 1	*Maybe this. I'm choosing this one and I hope this 'W'* [in the background] *is [a promotion] for her album but if not than it will be embarrassing... If it's some sort of other event. In the other photos she is too small. I want to see her face. She is going to be interviewed, you'll be getting closer to her. It's still not ideal because it's not that close. Still not ideal because she isn't close enough.* *If I could crop it, I guess, it'd be waist-up,* [head and] *shoulders sort of shot, I'd put her in the middle not to break the symmetry.*	Pointing to an image Contrast with needs P. has made a selection & finished the task Considers tailoring [does not tailor]	> examining an image (c) > background Verifying > intention to verify event > acquiring the image (d) Unmet needs > type of shot > waist-up > positioning > central Tailoring > as remedy

Participant 1. Post-test questions

Feedback	Issues	Required features
These were always waist-up, and the last task mostly full body. There were adverts, specific places, events. In this one backgrounds were one colour so they were more useful, one-person photos. It's only about Merkel. And with Sophie, too, other people are irrelevant to the article. The background, the places, events. It's only about her [Sophie Ellis-Bextor] *so other people are irrelevant and distracting.*	Full-body Backgr – adverts specific places, events other people irrelevant	Waist-up shots One colour bckgrnd Single-person shot

D9 Likert scales ratings

AUTHENTICITY of tasks

Group	Participant	T1	T2	T3	T4
A T1, T2 > T3, T4	1	5	5	5	5
	2	5	5	5	5
	3	5	5	5	5
	4	4	4	4	4
	5	4	5	5	4
B T3, T4 > T1, T2	6	5	4	4	5
	7	4	5	5	4
	8	5	4	4	5
	9	5	4	4	5
	10	5	5	5	5

Satisfaction with SELECTION made in each task

Group	Participant	T1	T2	T3	T4
A F > U	1	5	4	4	1
	2	5	5	5	4
	3	4	5	4	4
	4	4	5	4	5
	5	5	4	4	4
B U > F	6	4	4	4	5
	7	4	5	4	3
	8	4	4	4	4
	9	5	5	3	3
	10	4	5	3	4

Satisfaction with TIME invested in each task

Group	Participant	T1	T2	T3	T4
A T1, T2 > T3, T4	1	5	4	4	1
	2	5	5	5	4
	3	4	5	4	4
	4	4	5	4	5
	5	5	4	4	4
B T3, T4 > T1, T2	6	4	4	4	5
	7	4	5	4	3
	8	4	4	4	4
	9	5	5	3	3
	10	4	5	3	4

Satisfaction with EFFORT invested in each task

Group	Participant	T1	T2	T3	T4
A T1, T2 > T3, T4	1	5	5	2	3
	2	5	4	3	2
	3	5	4	3	3
	4	4	4	4	3
	5	4	4	4	5
B T3, T4 > T1, T2	6	4	5	4	4
	7	5	4	5	4
	8	5	5	5	4
	9	4	4	4	3
	10	4	5	3	3

D10 Illustrations created in Study III

	Participants testing in Filtered > Unfiltered order					Participants testing in Unfiltered > Filtered order				
Task	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
T1										
T2										
T3										
T4										

Appendix E. Study III: Survey 3.

Contents:

E1 Invitation to participate

E2 Information for participants

E3 Schedule

E4 Consent form

E5 Questionnaire

E6 Images & results

E7 Percent agreement

E1 Invitation to participate



Dear Participant,

My name is Sylwia Frankowska-Takhari and I am a PhD student at City, University of London (School of Mathematics, Computer Science & Engineering). The focus of my PhD work is on the selection and use of images in online journalism.

I am currently looking for three image Experts who would like to take part in a validation study. The aim of this study is to gain an independent expert judgement on the occurrence of a set of visual features identified in images used in online journalism.

To join the study as an Expert, you must be either a professional working with images, for example, a photographer, image editor, or online journalist, or a PhD student whose research area falls into imagery, for example, photography, image seeking, retrieval, and image use, or image editing.

If this sounds interesting to you, please, contact me on [redacted] and I will send you more detailed information about the purpose of this study, how you can contribute and benefit from your participation.

Kind regards,

Sylwia Frankowska-Takhari

E2 Information for participants



INFORMATION FOR PARTICIPANTS

Title of study: *Validation Study 3. with image experts*

Title of the PhD project: Selecting and tailoring of images for visual impact in online journalism.

Dear Participant,

Thank you for responding to my call for Experts. In this document you will find more detailed information about the purpose of this study, how you can contribute and benefit from your participation.

Please take time to read the following information carefully, and feel free to discuss it with others if you wish. Please do not hesitate to contact me at [redacted] if there is anything that is unclear or if you require any further information.

Kind regards,

Sylwia F Takhari

What is the purpose of the study?

The aim of this study is to gain an independent expert opinion on visual features of 40 selected news photos. As part of an Expert team, you will be asked to look at the photographs and answer 9 questions per image.

Why have I been invited?
For this study, I am aiming to recruit three participants who are image professionals or PhD students involved in research into imagery. Below you will find more information on what you should expect as Participant and how you will be rewarded for your time and effort.

Do I have to take part?
Participating in the study is voluntary. It is up to you to decide whether, or not to take part. If you do decide to take part you will be asked to sign a consent form. If you decide to take part, you are still free to withdraw at any time and without giving a reason. You may choose not to answer questions which you feel are too personal or intrusive.

What will happen if I take part?

Your participation in the research will be much appreciated and to thank you for your time and contribution I would like to offer you incentives of a £40 M&S voucher.

What do I have to do?
Before the study, you will be asked to sign a consent form, and then to fill in a questionnaire sent to you via email. In the questionnaire, you will be asked to look at a set of 40 pre-selected news images and answer a set of 9 questions for each of the photographs.
You can complete this questionnaire in your own time and location and at your own pace. Completing this questionnaire should take you around 60 minutes. The complete questionnaire should be returned within 7 days from the date you received it, and no later than on 27 March 2017.

What are the possible disadvantages and risks of taking part?
Participating in the research should not be a negative experience for you. If for any reason you feel you do not want to answer a question or participate in an activity please speak directly to the researcher.
The questionnaire is in a word format but please let me know if you prefer a different digital format, or a pen and paper copy – I will provide you with a printed version of the questionnaire.

What are the possible benefits of taking part?
If you wish, I will keep you informed about the findings from this study and the wider research.
These findings may directly benefit you in your image-related role, e.g., inform your current work, or study.

What will happen when the research study stops?
During the study, the data will be de-identified and kept safe on a password protected device. When the research study stops, the data will be kept safe on a password protected device for 10 years as per City, University of London regulations.

Will my taking part in the study be kept confidential?

During the research, I will not be collecting data about you and your work. You will be referred to as Expert no. X in my data collection tools (e.g. a spread sheet with raw data), and in any publication/ summary, and the final thesis.

Only I and my supervisors will have access to the raw data and the recordings. All the raw data will be kept safe in a locked filing cabinet, and electronic data will be password-protected. At the end of the study the data will be kept safe on a password protected device for 10 years as per City, University of London regulations.

What will happen to the results of this research study?

The findings from this research will be published and included in the final PhD thesis and other publications e.g. in academic journals. All personal or identifiable data collected will be de-identified.

If you are interested in the findings, please tick the box below and I will make sure that you will receive a copy of any publication/summary of the results.

☐ Yes, I'd like to receive a copy of any publication/ summary of the results.

What will happen if I don't want to carry on with the study?
Participating in this study is voluntary and you can withdraw from the study at any time during the research without giving a reason.

What if there is a problem?

If you would like to complain about any aspect of the study, City, University of London has established a complaints procedure via the Secretary to the University's Senate Research Ethics Committee. To complain about the study, you need to phone 020 7040 3040. You can then ask to speak to the Secretary to Senate Research Ethics Committee and inform them that the name of the project is:

Selecting and tailoring of images for visual impact in online journalism. A Validation study with experts.

You could also write to the Secretary at:

Anna Ramberg
Secretary to Senate Research Ethics Committee

Research Office, E214
City, University of London
Northampton Square
London
EC1V 0HB

Email: [redacted]

City, University of London holds insurance policies which apply to this study. If you feel you have been harmed or injured by taking part in this study you may be eligible to claim compensation. This does not affect your legal rights to seek compensation. If you are harmed due to someone's negligence, then you may have grounds for legal action.

Who has reviewed the study?

This study has been approved by City, University of London, Computer Science Research Ethics Committee (CSREC).

Further information and contact details

First Supervisor:

Dr Andy MacFarlane

Centre for Information Science

Room A304

City, University of London
Northampton Square
London
EC1V 0HB

Email: [redacted]

Thank you for taking the time to read this information sheet.

E3 Schedule

Expert	Questionnaires distributed	Questionnaires received
Pilot	16 March 2017	16 March 2017
1	20 March 2017	22 March 2017
2	20 March 2017	27 March 2017
3	20 March 2017	26 March 2017

E4 Consent form

CITY
UNIVERSITY OF LONDON
EST 1894

CONSENT FORM

Title of Study: ***Validation Study 3. with image experts***

Please initial box

1.	I agree to take part in the above City, University of London research project. I have had the project explained to me, and I have read the participant information sheet, which I may keep for my records. I understand this will involve: • completing a questionnaire-type research based on either my experience in image creating, editing, and use or my research in imagery, image retrieval and use. • using a computer to complete the questionnaire	
2.	The information obtained in this research will be held and processed for the purpose of this study, as well as this particular PhD project, and any reports and publications related to it. I understand that my name and contact details will be kept confidential, and that no information that could lead to the identification of me as an individual will be disclosed in any reports on the project, or to any other party. No identifiable personal data will be published. The identifiable data will not be shared with any other organisation. The data collected in this study may be published beyond the thesis report. These publications will not include any personally identifiable information.	
3.	I understand that my participation is voluntary, that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being penalised or disadvantaged in any way.	
4.	I agree to City, University of London recording and processing this information about me. I understand that this information will be used only for the purpose(s) set out in this statement and my consent is conditional on the University complying with its duties and obligations under the Data Protection Act 1998.	
5.	I agree to take part in the above study.	

Name of Participant _____ Signature _____ Date _____

Name of Researcher _____ Signature _____ Date _____

E5 Questionnaire (Example)

Illustration 1. and the set of questions from Survey 3

Illustration 1.



Please answer the following questions in relation to the image in this task. Mark (X) next to your answer.

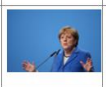
	Questions:	***YES***	***NO***
-	Do you recognise the person in this image?	**X**	
1	Does this image show only one known (identifiable) person?	X	
2	Is this person the only person depicted in the foreground?	X	
3	Is this person's face visible: frontal or profile shot?	X	
4	Is this person's face in focus?	X	
5	Is this a colour image?	X	
6	Is this person positioned either centrally or to the right within the frame?	X	
7	Is the background either blurry or monotone?	X	

Please answer the question below (pick only one answer):

	Question:	***Mark (X) next to your answer***
8	How is the person in this image shown:	
	c) From knees up/ the whole person?	
	d) From waist up?	X

E6 Images & results

The illustrations included in Survey 3. with compiled responses from three Experts

	Participants testing in Filtered > Unfiltered order					Participants testing in Unfiltered > Filtered order				
Task	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
T1										
T2										
T3										
T4										

39 illustrations: 1 – 8, 10 – 14, 16 – 18, 22 – 26, 30, 31, 33, 34, 36 – 39 carried all features from the pre-defined set at 100% agreement.

Q	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	One identifiable person depicted in the image	1	1	1	100%
2	The person/people depicted in the foreground	1	1	1	100%
3	Shot from waist up	1	1	1	100%
4	Face visible: frontal or profile shot	1	1	1	100%
5	Positioned centrally or to the right within the frame	1	1	1	100%
6	Colour image	1	1	1	100%
7	Face of the person in focus	1	1	1	100%
8	Blurry or monotone background	1	1	1	100%
Total agreement					100%

11 illustrations: 9, 15, 19, 20, 21, 27, 28, 29, 32, 35, 40 failed to carry at least one of the features.

FEATURE 7. Illustration 35



Q	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	One identifiable person depicted in the image	1	1	1	100%
2	The person/people depicted in the foreground	1	1	1	100%
3	Shot from waist up	1	1	1	100%
4	Face visible: frontal or profile shot	0	0	0	100%
5	Positioned centrally or to the right within the frame	1	1	1	100%
6	Colour image	1	1	1	100%
7	Face of the person in focus	1	1	1	100%
8	Blurry or monotone background	1	1	1	100%
Total agreement					100%

FEATURE 10. Illustrations: 15 and 27, Experts E1 and E2




Q	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	One identifiable person depicted in the image	1	1	1	100%
2	The person/people depicted in the foreground	1	1	1	100%
3	Shot from waist up	1	1	1	100%
4	Face visible: frontal or profile shot	1	1	1	100%
5	Positioned centrally or to the right within the frame	1	1	1	100%
6	Colour image	1	1	1	100%
7	Face of the person in focus	1	1	1	66.7%
8	Blurry or monotone background	0	0	1	100%
Total agreement					95.8%

Illustration 29 Experts 2 and 3



Q	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	One identifiable person depicted in the image	1	1	1	100%
2	The person/people depicted in the foreground	1	1	1	100%
3	Shot from waist up	1	1	1	100%
4	Face visible: frontal or profile shot	1	1	1	100%
5	Positioned centrally or to the right within the frame	1	1	1	100%
6	Colour image	1	1	1	100%
7	Face of the person in focus	1	1	1	66.7%
8	Blurry or monotone background	1	0	0	100%
Total agreement					95.8%

FEATURE 11. Illustrations 9, 21, 32 – Experts 1 and 2





Q	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	One identifiable person depicted in the image	1	1	1	100%
2	The person/people depicted in the foreground	1	1	1	100%
3	Shot from waist up	1	1	1	100%
4	Face visible: frontal or profile shot	1	1	1	100%
5	Positioned centrally or to the right within the frame	1	1	1	100%
6	Colour image	1	1	1	100%
7	Face of the person in focus	0	0	1	66.7%
8	Blurry or monotone background	1	1	1	100%
Total agreement					95.8%

Illustration 28, All experts



Q	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	One identifiable person depicted in the image	1	1	1	100%
2	The person/people depicted in the foreground	1	1	1	100%
3	Shot from waist up	1	1	1	100%
4	Face visible: frontal or profile shot	1	1	1	100%
5	Positioned centrally or to the right within the frame	1	1	1	100%
6	Colour image	1	1	1	100%
7	Face of the person in focus	0	0	0	100%
8	Blurry or monotone background	1	1	1	100%
Total agreement					100%

Several features

Illustration 19



Q	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	One identifiable person depicted in the image	1	0	0	66.7%
2	The person/people depicted in the foreground	1	1	1	100%
3	Shot from waist up	1	1	1	100%
4	Face visible: frontal or profile shot	1	1	1	100%
5	Positioned centrally or to the right within the frame	0	0	0	100%
6	Colour image	1	1	1	100%
7	Face of the person in focus	0	0	1	66.7%
8	Blurry or monotone background	1	1	1	100%
Total agreement					95.8%

Illustration 20



Q	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	One identifiable person depicted in the image	1	1	1	100%
2	The person/people depicted in the foreground	1	1	1	100%
3	Shot from waist up	0	0	0	100%
4	Face visible: frontal or profile shot	1	1	1	100%
5	Positioned centrally or to the right within the frame	0	0	0	100%
6	Colour image	1	1	1	100%
7	Face of the person in focus	0	0	1	66.7%
8	Blurry or monotone background	1	1	1	100%
Total agreement					95.8%

Illustration 40



Q	Visual image features	Feature occurrence			Agreement %
		1	2	3	
1	One identifiable person depicted in the image	1	1	1	100%
2	The person/people depicted in the foreground	1	1	1	100%
3	Shot from waist up	1	1	1	100%
4	Face visible: frontal or profile shot	1	1	1	100%
5	Positioned centrally or to the right within the frame	0	0	0	100%
6	Colour image	1	1	1	100%
7	Face of the person in focus	0	0	0	100%
8	Blurry or monotone background	0	0	1	66.7%
Total agreement					95.8%

E7 Percent agreement in Survey 3.

The table below show the percent agreements per illustration and the overall agreement for Survey 3.

The underlined results are for illustrations sourced from the baseline (unfiltered) system.

Illustration	%	Illustration	%
1	100	21	95.8
2	100	22	100
3	100	23	100
4	100	24	100
5	100	25	100
6	100	26	100
7	100	27	95.8
8	100	28	100
9	95.8	29	95.8
10	100	30	100
11	100	31	100
12	100	32	100
13	100	33	100
14	100	34	100
15	79.2	35	100
16	100	36	100
17	100	37	100
18	100	38	100
19	92	39	100
20	95.8	40	95.8
Total agreement			98.6%

Appendix F. Ethics approval forms (all studies)

Contents:

F1 Ethics approval form: Study I. interviews & observations

F2 Ethics approval form: Study I. validation survey 1.

F3 Ethics approval form: Study II. validation survey 2.

F4 Ethics approval form: Study III. experiment

F5 Ethics approval form: Study III. validation survey 3.

F1 Ethics approval form (Study I)

CITY UNIVERSITY LONDON

Senate Research Ethics Committee
Application for Approval of Research Involving Human Participants

Please tick the box for which Committee you are submitting your application to

☐	Senate Research Ethics Committee
☐	Cass Business School
☐	School of Arts & School of Social Sciences Research Ethics Committee
☐	School of Health Sciences Research Ethics Committee
☒	School of Informatics
☐	Learning Development Centre

For **Senate** applications: return one original and eight additional hardcopies of the completed form and any accompanying documents to Anna Ramberg, Secretary to Senate Research Ethics Committee, University Research Office, Northampton Square, London, EC1V 0HB. Please also email an electronic copy to [redacted] (indicating the names of those signing the hard copy).
For **School of Arts & School of Social Sciences** Research Ethics Committee submit a single copy of the application form and all supporting documentation to [redacted] (Social Sciences) and [redacted] (Arts) by email.
For **School of Health Sciences** applications: submit all forms (including the Research Registration form) electronically (in Word format in a single document) to [redacted] followed up by a single hard copy with signatures.
For **School of Informatics** applications: a single copy of the application form and all supporting documents should be emailed to Stephanie Wilson [redacted]
For **Learning Development Centre** a single copy of the application form and all the supporting documentations should be emailed to Pam Parker [redacted]
Refer to the separate guidelines while completing this form.
PLEASE NOTE

- Please determine whether an application is required by going through the checklist before filling out this form.
- Ethical approval **MUST** be obtained before any research involving human participants is undertaken. Failure to do so may result in disciplinary procedures being instigated, and you will not be covered by the University's indemnity if you do not have approval in place.
- You should have completed <u>every</u> section of the form
- The Signature Sections <u>must</u> be completed by the Principal Investigator (the supervisor and the student if it is a student project)

Project Title:
The role of intermediaries in the image selection process in online journalism
Short Project Title (no more than 80 characters):
The role of image editors in the image selection process
Name of Principal Investigator(s) (*all* students are require to apply jointly with their supervisor and all correspondence will be with the supervisor):
Supervisors: Dr A. MacFarlane, Dr S. Stumpf, Prof A. Göker Student's name: Sylwia Frankowska-Takhari
Post Held (including staff/student number):
Student number: [redacted] Dr A. MacFarlane: [redacted] Dr Simone Stumpf, Senior Lecturer [redacted] Prof Ayse Göker, NRP Professor at Robert Gordon University in Aberdeen, [redacted]
Department(s)/School(s) involved at City University London:
Student: School of Informatics, Centre for Interactive Systems Research, Centre for HCI Design
If this is part of a degree please specify type of degree and year
PhD, Year 2.
Date of Submission of Application:
14th October 2013

1. Information for Non-Experts

Lay Title (no more than 80 characters)

The role of image editors in the image selection process

Lay Summary / Plain Language Statement (no more than 400 words)

The aim of this study (Phase One) is to investigate the image selection process with a particular focus on how professionals in the field of online journalism select images to news content, what criteria they use, and when they are satisfied with their final decisions.
For this part of the study, I would like to recruit up to 16 professional image editors/ content producers (from the key UK online news providers e.g. the BBC) whose job is to select images to content (both text and audio) published online, and who would like to 'tell' me about their work.
I am intending to invite participants to fill in a questionnaire to collect data about their professional background and their current work roles.
I will conduct a round of individual 60-min depth interviews to collect more insights into their roles, and how they engage in the image selection process, what criteria they use and how they make their final decision. The interviews will be followed by individual 60-minute observation sessions in the participants' work places. All the data collected in the research will be anonymised and kept safe and confidential in a locked filing cabinet and on a password-protected laptop.

2. Applicant Details

This project involves:
(*tick as many as apply*)

☐	Staff Research	☒	Doctoral Student
☐	Undergraduate	☐	M-level Project
☐	Externally funded	☐	External investigators
☐	Collaboration	☐	Other
Provide details of collaboration and/or other			

Address for correspondence (including email address and telephone number)
(Principal Investigator)

Sylwia Frankowska-Takhari
City University
School for Informatics
A304
Northampton Square
London EC1V 0HB
[redacted]

Other staff members involved

Title, Name & Staff Number	*Post*	*Dept & School*	*Phone*	*Email*
Dr A. MacFarlane	Reader in Information Retrieval	Computer Science, Informatics	[redacted]	[redacted]
Dr S. Stumpf	Senior Lecturer, Course Director MSc Human-Centred Systems	Centre for Human Computer Interaction Design	[redacted]	[redacted]

All students involved in carrying out the investigation

Name & Student Number	*Course / Year*	*Dept & School*	*Email*
Sylwia Frankowska-Takhari	PhD Year 2.	School of Informatics, Centre for Information Science	[redacted]

External co-investigators

Title & Name	*Post*	*Institution*	*Phone*	*Email*
Prof A. Göker	Professor in Computational Systems	Robert Gordon University, Aberdeen	[redacted]	[redacted]

Please describe the role(s) of all the investigators including all student(s)/external co-investigator(s) in the project, especially with regards to interaction with study participants.

The student, Sylwia Frankowska-Takhari is the investigator in this study, and is responsible for designing the research, facilitating the sessions with human participants, collecting, analysing and safeguarding the data.

She will consult and agree the choice of research methods and tools with her supervisors. Dr MacFarlane and Dr. Stumpf have a supervisory role.

If external investigators are involved, please provide details of their indemnity cover.

n/a

Application Details

2.1 Is this application being submitted to another ethics committee, or has it been previously submitted to an ethics committee? *This includes an NHS local Research Ethics Committee or a City University London School Research Ethics Committee or any other institutional committee or collaborating partners or research site.* (See the guidelines for more information on research involving NHS staff/patients/ premises.) **NO** ☒

If yes, please provide details for the Secretary for the relevant authority/committee, as well as copies of any correspondence setting out conditions of approval.

n/a

2.2 If any part of the investigation will be carried out under the auspices of an outside organisation, e.g. a teaching hospital, please give details and address of organisation.

n/a

2.3 Other approvals required – has permission to conduct research in, at or through another institution or organisation been obtained? **NO** ☒

If yes, please provide details and include correspondence

n/a

2.4 Is any part of this research project being considered by another research ethics committee? **NO** ☒

If yes, please give details and justification for going to separate committees, and attach correspondence and outcome

n/a

2.5 Duration of Project

Start date: 30th October 2013 Estimated end date: 1st March 2014

Funding Details

2.6 Please provide details of the source of financial support (if any) for the proposed investigation.

n/a

2.6a Total amount of funding being sought: n/a

2.6b Has funding been approved?

YES ☐ **NO** ☐

If no, please provide details of when the outcome can be expected

n/a

2.6c Does the funding body have any requirements regarding retention, access and storage of the data? **YES** ☐ **NO** ☐

If yes, please provide details

n/a

International Research

2.7 Is any part of the research taking place outside of England/Wales? (if not go to section 3) **NO** ☒

If yes, please provide details of where

n/a

2.7a Have you identified and complied with all local requirements concerning ethical approval & research governance*? **YES** ☐ **NO** ☐

2.7b Please provide details of the local requirements, including contact information.

n/a

2.7c Please give contact details of a local person identified to field initial complaints local so the participants can complain without having to write to or telephone the UK

n/a

*Please note many countries require local ethical approval or registration of research projects, further some require specific research visas. If you do not abide by the local rules of the host country you will invalidate your ethical approval from City University London, and may run the risk of legal action within the host country.

3. Project Details

3.1 Provide the background, aim and explanation for the proposed research.

Most research into image needs in the context of journalism focuses on the image needs of professionals i.e. journalists, content producers and image editors, and does not extend to people who actually consume the content that includes images selected by these professionals (Westman, 2006). From literature, it is known that when selecting images for their content, these professionals take into consideration many factors which may be both helpful and restrictive to the choices they make e.g. editorial guidelines that put certain requirements to what is /is not an appropriate image in the wider context of the news provider, and web page design requirements in regard to the image size etc.

Little is known whether professionals are aware of their role as proxies/intermediaries for content consumers, and whether they take into account any end-users' image needs and preferences when selecting images, or compromise these in favour of other non-user centred factors such us e.g. time, cost. This is Phase One of the study and will involve professional image editors/ content producers whose role is to select images for news websites. The researcher aims to understand what approach(es) these professionals adopt when making their final decision, and to uncover the facets/factors that help them choose images for others.

More details about this Phase (Phase One):

In Phase One the researcher will conduct a study with professional content producers who are responsible for selecting images to news content on e.g. BBC Homepage, BBC News. It is already clear that while selecting images, these professionals must comply with BBC's internal editorial guidelines and choose images that meet web design criteria e.g. specific size requirements.

There are also other potential criteria mentioned in the literature such as time pressure, cost, quality of images, and topicality. However, little is known whether professional content producers are aware of and take into account any image needs and preferences of content end-users (content consumers).

The aims of Phase One are:

- to discover whether professional content producers are aware of their proxy role to the content consumers in the image selection process,
- to detect any *user-centred* facets that professional content producers currently take into account, and
- to gauge the importance of the user-centred facets in the image selection process in comparison to other non-user-centred ones e.g. cost, time.

3.2 Provide a summary and brief explanation of the design, methodology and plan for analysis that you propose to use.

Data Collection methods that will be used are:

- a questionnaire to capture demographic data and professional background information
- a round of individual, 60-minute semi-structured interviews: to investigate whether image editors take into account end-users' image needs and preferences.
- observations, to investigate how professional image editors /content producers choose images for end-users, and to identify facets that they take into account in the selection process.

Procedures

Participants will be invited to take part in the research via an invitation sent by email directly to their work email accounts. They will be sent Information Pack for Participants (Appendix C.) and introduced to the research by the researcher (in person). They will be asked to sign a consent form (Appendix B) before they engage in the study.

Participants will take part in a short questionnaire to confirm their demographic data and professional experience in the field.

In session 1. An individual 60-minute semi-structured interview will be conducted with each participants to gain a deeper understanding of their professional role, how the decisions in the image selection process are made, what the options and alternatives are considered and why they are rejected.

In sessions 2. participants will be observed/ shadowed in their workplaces (individually) while making image selections for content. They will be asked to narrate: describe and explain their activities and decisions (think-aloud protocol) whenever possible.

In this Phase the researcher will collect artefacts to be used in Phase Two (with non-professional intermediaries) & Phase Three with image/ content consumers:

- at least 20 pieces of content e.g. written text and/ or audio, and
- the images selected by the intermediaries to each piece of content (with the satisfaction rating for each match),
- a selection of images for each piece of content that the intermediaries considered as alternatives
- a selection of images that the intermediaries rejected as not suitable choices for each piece of content

The sessions will be audio (interviews) and video recorded (observations) – with the participants' consent. The researcher will also take notes from the sessions.

NB. Phases two and three of the research will involve different groups of participants and separate forms for ethical approval will be submitted in due course.

Data analysis methods:

The data from the questionnaires, interviews and observations will be deidentified then transcribed and collated in a spread sheet.

3.3 Please explain your plans for dissemination, including whether participants will be provided with any information on the findings or outcomes of the project.

After this study, I intend to include the findings in the Transfer report, and publish some of the findings to share them with the wider audience.

The participants will be asked (in the information pack) and in person during their first session with the researcher whether they would like to be informed about the findings. If so, any publication/report of the findings will be also send to these participants.

3.4 What do you consider are the ethical issues associated with conducting this research and how do you propose to address them?

Personal data: any personal identifiable data that will be kept safe, and all information obtained from participants will be de-identified and kept confidential.
The interviews will take place in rooms/ spaces that ensure confidentiality
All participants will be informed about the research: what it involves and what is expected, and that they can withdraw at any time, or may choose to answer/not answer all/ some questions only
The interviews will take place in safe environment of the participants' work place, participants will be familiar with H&S regulations at the venue.
Participants will be able to take breaks whenever they need to during the research sessions.

3.5 How is the research intended to benefit the participants, third parties and/or local community?

In this study, participants may find it useful to learn how image consumers evaluated your image choices, and what their real image needs and expectations are. Such findings may directly benefit participants in their professional role: provide them with feedback on their current work, and enable them to make informed selections of images based on actual needs of image users.

3.6a Will invasive procedures (for example medical or surgical) be used?

NO ☒

3.6b If yes, what precautions will you take to minimise any potential harm?

n/a

3.7a Will intrusive procedures (for example psychological or social) be used?

NO ☒

3.7b If yes, what precautions will you take to minimise any potential harm?

n/a

3.8a In the course of the investigation might pain, discomfort (including psychological discomfort), inconvenience or danger be caused? **NO** ☒

3.8b If yes, what precautions will you take to minimise any potential harm?

n/a

3.9 Please describe the nature, duration and frequency of the procedures?

n/a

4. Information on participants

4.1a How many participants will be involved?

16 participants

4.1b What is the age group and gender of the participants?

All participants are above 18 years old, male and female

4.1c Explain how you will determine your sample size and the selection criteria you will be using. Specify inclusion and exclusion criteria. If exclusion of participants is made on the basis of age, gender, ethnicity, race, disability, sexuality, religion or any other factor, please explain and justify why.

Depending on availability of the potential participants, I am intending to recruit up to 16 participants in this study. The main selection criterion is to be a professional image editor currently employed by an online news provider/ service such as e.g. the BBC Gender: both male and female participants
Age: above 18 years old No exclusions will be made based on any of the following factors: ethnicity, race, disability, sexuality, religion or any other factor.

4.2 How are the participants to be identified, approached and recruited, and by whom?

The researcher has worked at the BBC for the past few years and will send an email with an Invitation to research, and an information pack about the research directly to any potential participant's work email accounts. Some participants will be recruited through 'word of mouth' from their colleagues who may already be involved in the study. If possible, participants from outside the BBC will be invited to the research, too, via direct email, posts on professional forums e.g. interest groups on Linkedin, and word of mouth.

4.3 Describe the procedure that will be used when seeking and obtaining consent, including when consent will obtained. Include details of who will obtain the consent, how are you intending to arrange for a copy of the signed consent form for the participants, when will they receive it and how long the participants have between receiving information about the study and giving consent.

The researcher has prepared 2 identical copies of the consent form for each participant. The consent form is based on the City University consent form template (Appendix B). All participants will be emailed the consent forms before they engage in the research. They will be asked to read, sign and date both of the copies before they engage in the study. Participants will keep one of the copies and the other copy will be collected by the researcher on the first visit, and stored safely in a lockable filing cabinet.

4.4 How will the participant's physical and mental suitability for participation be assessed? Are there any issues related to the ability of participants to give informed consent themselves or are you relying on gatekeepers on their behalf?

All participants will be adults who have the ability to give informed consent to take part in the research. They are all in full-time employment.

4.5 Are there any special pressures that might make it difficult to refuse to take part in the study? Are any of the potential participants in a dependent relationship with any of the investigators (for instance student, colleague or employee) particularly those involved in recruiting for or conducting the project?

Participating in the study is voluntary and participants may withdraw at any time without any penalties.

4.6 Will the participant's doctor be notified? **NO ☒**

(If so, provide a sample letter to the subject's GP.)

4.7 What procedures are in place for the appropriate referral of a study participant who discloses an emotional, psychological, health, education or other issue during the course of the research or is identified by the researcher to have such a need?

This research does not address emotional, psychological, health or educational issues.

4.8 What steps will be taken to safeguard the participants from over-research? (I.e. to ensure that the participants are not being used in multiple research project.)

Participants will be informed in the Information pack about the number of sessions that they are expected to participate in. This number of sessions is the maximum number, and in case of this study this is 2 sessions, each 60-minute long. If participants feel over-researched at any point they will be able to withdraw from the study without being penalised. Professionals will take part only in phase one.

4.9 Where will the research take place?

The research will take place at the participants' work place.

4.10 What health and safety issues, if any, are there to consider?

Since the research will take place in the researcher's and participants' work place, it is assumed that all people involved in the research are well-informed about H&S rules e.g. fire exits and routes, in these places. The researcher will ensure that any cables (laptop power cable) or any recording equipment used for the sessions does not pose a potential hazard to the health and safety of anyone involved in the research. Only safe and tested equipment will be used.

4.11 How have you addressed the health and safety concerns of the participants, researchers and any other people impacted by this study? (This includes research involving going into participants' homes.)

Test all the equipment prior to the sessions. Check the venues/ rooms whether there is enough space to place the equipment safely and accommodate the required number of people for the duration of the sessions. Access to drinkable water.

4.12 It is a University requirement that at least an initial assessment of risk is undertaken for all research and if necessary a more detailed risk assessment be carried out. Has a risk assessment been undertaken?* **YES ☒**

4.13 Are you offering any incentives or rewards for participating? **YES ☒**

If yes please give details

£10 Amazon vouchers per participant

*Note that it is the Committee's prerogative to ask to view risk assessments.

5. Vulnerable groups

5.1 Will persons from any of the following groups be participating in the study? (if not go to section 6)

Adults without capacity to consent	☐
Children under the age of 18	☐
Those with learning disabilities	☐
Prisoners	☐
Vulnerable adults	☐
Young offenders (16-21 years)	☐
Those who would be considered to have a particular dependent relationship with the investigator (e.g. those in care homes, students, employees, colleagues)	☐

5.2 Will you be recruiting or have direct contact with any children under the age of 18? **NO ☒**

5.2a If yes, please give details of the child protection procedures you propose to adopt should there be any evidence of or suspicion of harm (physical, emotional or sexual) to a young person. Include a referral protocol identifying what to do and who should be contacted.

n/a

5.2b Please give details of how you propose to ensure the well-being of the young person, particularly with respect to ensuring that they do not feel pressured to take part in the research and that they are free to withdraw from the study without any prejudice to themselves at anytime.

n/a

5.3 Will you be recruiting or have direct contact with vulnerable adults? NO ☒

5.3a If yes, please give details of the protection procedures you propose to adopt should there be any evidence of or suspicion of harm (physical, emotional or sexual) to a vulnerable adult. Include a referral protocol identifying what to do and who should be contacted.

n/a

5.3b Please give details of how you propose to ensure the well-being of the vulnerable adult, particularly with respect to ensuring that they do not feel pressured to take part in the research and that they are free to withdraw from the study without any prejudice to themselves at anytime. You should indicate how you intend to ascertain that person's views and wishes.

n/a

5.3c Please give details of any City staff or students who will have contact with vulnerable adults and/or will have contact with young people (under the age of 18) and details of current (within the last 3 years) enhanced City University London CRB clearance.

Name	*Dept & School*	*Student/Staff Number*	*Date of CRB disclosure*	*Type of disclosure*
n/a				

5.3d Please give details of any non-City staff or students who will have contact with vulnerable adults and/or will have contact with young people (under the age of 18) and details of current (within the last 3 years) enhanced CRB clearance.

Name	*Institution*	*Address of organisation that requested the disclosure*	*Date of CRB disclosure*	*Type of disclosure*
n/a				

5.4 Will you be recruiting any participants who fall under the Mental Capacity Act 2005?

NO ☒

If so you MUST get approval from an NHS NRES approved committee (see separate guidelines for more information).

6. Data Collection

6.1a Please indicate which of the following you will be using to collect your data
Please tick all that apply

Questionnaire	☒
Interviews	☒
Participant observation	☒
Focus groups	☐
Audio/digital-recording interviewees or events	☒
Video recording	☒
Physiological measurements	☐
Quantitative research (please provide details)	☐
Other	☒
Please give details	In this Phase the researcher will also collect artefacts (images selected to content by image editors) for use in subsequent phases of the research

6.1b What steps, if any, will be taken to safeguard the confidentiality of the participants (including companies)?

- Any personal or identifiable data will be deidentified and participants will be referred to as Participant No. X
- the interviews will be individual sessions with the facilitator and will take place in a meeting room that will ensure confidentiality of what is being discussed
- the participants will have the right to authorise what information (about themselves or the company) may and may not be included in the collected data
- all raw data will be kept safe: locked and password-protected
- only the researcher and supervisors will have access to the raw data and the participants will be informed about this.

6.1c If you are using interviews or focus groups, please provide a topic guide

Please see Attachment A.

7. Confidentiality and Data Handling

7.1a Will the research involve:

• **complete anonymity of participants** (i.e. researchers will not meet, or know the identity of participants, as participants, as participants are a part of a random sample and are required to return responses with no form of personal identification)**?**	☐

• **anonymised sample or data** (i.e. an *irreversible* process whereby identifiers are removed from data and replaced by a code, with no record retained of how the code relates to the identifiers. It is then impossible to identify the individual to whom the sample of information relates)**?**	☐
• **de-identified samples or data** (i.e. a *reversible* process whereby identifiers are replaced by a code, to which the researcher retains the key, in a secure location)?	☒
• **subjects being referred to by pseudonym in any publication arising from the research?**	☐
• **any other method of protecting the privacy of participants?** (e.g. use of direct quotes with specific permission only; use of real name with specific, written permission only)	☒

7.1b Which of the following methods of assuring confidentiality of data will be implemented?
Please tick all that apply

• data to be kept in a locked filing cabinet	☒
• data and identifiers to be kept in separate, locked filing cabinets	☒
• access to computer files to be available by password only	☒
• storage at City University London	☐
• stored at other site	☒
If stored at another site, please give details	The files and the computer will be stored at the BBC office, in a lockable drawer.

7.1c Who will have access to the data?
Access by named researcher(s) only **YES** ☒
Access by people other than named researcher(s) **YES** ☒
If people other than the named researcher(s), please explain by whom and for what purpose

All data collected in this research will be de-identified. No-one apart from the researcher and supervisors will be able to identify who has created any given artefact.

7.2a Is the data intended for reuse or to be shared as part of longitudinal research?
NO ☒
7.2b Is the data intended for reuse or to be shared as part of a different/wider research project now, or in the future? **NO** ☒
7.2c Does the funding body (e.g. ESRC) require that the data be stored and made available for reuse/sharing? **NO** ☒
7.2d If you have responded yes to any of the questions above, explain how you are intending to obtain explicit consent for the reuse and/or sharing of the data.
7.3 Retention and Destruction of Data
7.3a Does the funding body or your professional organisation/affiliation place obligations or recommendations on the retention and destruction of research data?
NO ☒
If yes, what are your affiliations/funding and what are the requirements? (If no, please refer to University guidelines on retention.)
7.3b How long are you intending to keep the data?

According to City University guidelines on data retention, the data should be kept safe for 10 years.

7.3c How are you intending to destroy the data after this period?

By deleting the files with the data from my laptop and recording devices, and by shredding any printed or handwritten notes

8. Curriculum Vitae

CV OF APPLICANTS (**Please duplicate this page for each applicant, including external persons and students involved.)**

NAME:	Sylwia Frankowska-Takhari
CURRENT POST (from)	Since June 2012
Title of Post:	Student
Department:	Centre for Interactive Systems Research
Is your post funded for the duration of this proposal?	Yes
Funding source (if not City University London)	
Please give a summary of your training/experience that is relevant to this research project	
In 2011 the researcher graduated from City University with an MSc in Human-Centred Systems. During the course, she obtained a solid knowledge of research methodologies (data collection methods, data analysis) that are used with human participants, and research ethics. The researcher also completed a training course in Counselling that prepares for non-leading depth interviewing and has a strong focus on research ethics.	

NAME:	Dr A. MacFarlane
CURRENT POST (from)	August 2012.
Title of Post:	Reader in Information Retrieval
Department:	Centre for Interactive Systems Research
Is your post funded for the duration of this proposal?	Yes
Funding source (if not City University London)	-
Please give a summary of your training/experience that is relevant to this research project	
Andrew MacFarlane has a BSc in Computer Science from the University of Westminster, an MSc in Computer Science from Queen Mary University of London and a PhD in Information Science from City University London. He joined City University London in September 2001. His research focuses on all aspects of Information Retrieval from combinatorial optimisation problems in information filtering applications to user studies in image retrieval and dyslexia and search. He has extensive experience of user studies in IR.	
NAME:	Simone Stumpf
CURRENT POST (from)	August 2012.
Title of Post:	Senior Lecturer
Department:	HCID/ School of Informatics
Is your post funded for the duration of this proposal?	Yes
Funding source (if not City University London)	-
Please give a summary of your training/experience that is relevant to this research project	
Simone Stumpf received a PhD in Computer Science in 2001 and a BSc in Computer Science with Cognitive Science in 1996, both from University College London. She joined City University London in 2009. Previously, she conducted research at Oregon State University and University College London. Her research centres on end-user interactions with intelligent systems and personal information management esp. activity-centric systems. She has extensive experience designing and conducting empirical studies with human participants, and has received training in risk assessment (City University, September 2012) and Human Subjects Research (CTI, February 2005).	

8.1 Supervisor's statement on the student's skills and ability to carry out the proposed research, as well as the merits of the research topic (up to 500 words)

The student has a clear understanding of the methodologies for the project and a clear set of research questions to address, and I have every confidence that they can successfully complete the research, and that a useful contribution to image retrieval will be made.	
Supervisor's Signature	
Print Name	Dr A. MacFarlane
9. Participant Information Sheet and 10. Consent Form	

Please use the templates provided below for the Participant Information Sheet and Consent Form. They should be used for all research projects and by both staff and students. Note that there are occasions when you will need to include additional information, or make slight changes to the standard text – more information can be found under the application guidelines.

11. Additional Information
n/a
12. Declarations by Investigator(s)

- I certify that to the best of my knowledge the information given above, together with any accompanying information, is complete and correct.
- I have read the University's guidelines on human research ethics, and accept the responsibility for the conduct of the procedures set out in the attached application.
- I have attempted to identify all risks related to the research that may arise in conducting the project.
- I understand that **no** research work involving human participants or data can commence until **full** ethical approval has been given

Print Name	Signature	
Principal Investigator(s) (student and supervisor if student project)	Supervisors: Dr A. MacFarlane, Dr S. Stumpf Student: Sylwia Frankowska-Takhari	
Associate Dean for Research (or equivalent) or authorised signatory		
Date	14th October 2013	
9. Template for Participant Information Sheet		
10. Template for Consent form		

Approval granted 31st October 2013

F2 Ethics approval form (Study I. validation survey 1)

CITY UNIVERSITY LONDON
EST 1894

Senate Research Ethics Committee
Application for Approval of Research Involving Human Participants

Please tick the box for which Committee you are submitting your application to

☐	Senate Research Ethics Committee
☐	Cass Business School
☒	Computer Science
☐	School of Arts & School of Social Sciences Research Ethics Committee
☐	School of Health Sciences Research Ethics Committee
☐	Department for Learning Enhancement and Development

For **Senate** applications: return one original and eight additional hardcopies of the completed form and any accompanying documents to Anna Ramberg, Secretary to Senate Research Ethics Committee, University Research Office, Northampton Square, London, EC1V 0HB. Please also email an electronic copy to [redacted] (indicating the names of those signing the hard copy).
For **Computer Science** applications: a single copy of the application form and all supporting documents should be emailed to Stephanie Wilson [redacted]
For **School of Arts & School of Social Sciences** Research Ethics Committee submit a single copy of the application form and all supporting documentation to your Department's Research and Ethics Committee by email.
For **School of Health Sciences** applications: submit all forms (including the Research Registration form) electronically (in Word format in a single document) to [redacted]
For Department for Learning Enhancement and Development a single copy of the application form and all the supporting documentations should be emailed to Pam Parker [redacted].
Refer to the separate guidelines while completing this form.
PLEASE NOTE

- Please determine whether an application is required by going through the checklist before filling out this form.
- Ethical approval **MUST** be obtained before any research involving human participants is undertaken. Failure to do so may result in disciplinary procedures being instigated, and you will not be covered by the University's indemnity if you do not have approval in place.
- You should have completed <u>every</u> section of the form
- The Signature Sections <u>must</u> be completed by the Principal Investigator (the supervisor and the student if it is a student project)

Project Title:
The role of image editors in the image selection process in online journalism.
Short Project Title (no more than 80 characters):
The role of image editors in online journalism
Name of Principal Investigator(s) (*all* students are require to apply jointly with their supervisor and all correspondence will be with the supervisor):
Supervisors: Dr A. MacFarlane, Dr S. Stumpf, Prof A. Göker Student's name: Sylwia Frankowska-Takhari
Post Held (including staff/student number):
Student number: [redacted] Dr A. MacFarlane: [redacted] Dr Simone Stumpf, Senior Lecturer [redacted] Prof Ayse Göker, NRP Professor at Robert Gordon University in Aberdeen, [redacted]
Department(s)/School(s) involved at City University London:
Student: School of Mathematics, Computer Science & Engineering, Centre for Interactive Systems Research, Centre for HCI Design
If this is part of a degree please specify type of degree and year

PhD, Year 2.

Date of Submission of Application:

4th September 2014

1. Information for Non-Experts

Lay Title (no more than 80 characters)

The role of image editors in the image selection process

Lay Summary / Plain Language Statement (no more than 400 words)

The aim of this study is to validate findings from a previous round of user research that I conducted between October 2013 and February 2014.
I interviewed twelve image editors and journalists in their natural working environments, and observed seven of them while they were performing real work tasks that included finding and selecting images to news stories and publishing them online.
Conducting research based on real tasks enabled me to collect incredibly valuable insights into the day-to-day work of image editors. However, since the tasks were unique to each individual and their work context, they were not easily replicable across the sample.
I am intending to conduct this study to validate the findings from round 1, and confirm what may be perceived as individual versus more general image seeking behaviour in the context of online journalism.
The method I will use was developed in TREC workshops that continue in tradition of experimental IR, and requires a minimum of three assessors to be involved.
For this part of the study, I would like to recruit 4 participants (assessors) including: 1 participant for a pilot study and 3 participants for the main study. All participants need to be either professional image editors whose job is to select images to content published online, or image researchers e.g. PhD students and/or post-doctoral researchers from City University or RGU.
This study has a format of a questionnaire (visual stimuli: up to 25 images and headlines, and a set of questions per image + headline).
The images used in the questionnaire have been published on bbc.co.uk, they are not offensive and there is a possibility that participants in this study may have already come across these images while reading news online.
The images and headlines used in this activity are 'reference images' i.e. they were selected and used by image editors in real work situations to illustrate news stories published online between July 2013 and February 2014.
I collected them during interviews and observations in the first phase of my research project. There are no offensive images included. These are images that have been published in online news services and potentially the participants have seen them online.
The questions have a format of 'multiple choice' exercise but there is also space for participants to leave their own responses or/and comments.
Participants will be able to fill in the questionnaire in their own time and location, at their own pace – but this activity should not take them more than 30 minutes.
No identifiable personal data will be collected via the questionnaire.
All the data collected in the research will be anonymised and kept safe and confidential in a locked filing cabinet and on a password-protected laptop.

2. Applicant Details

This project involves:
(*tick as many as apply*)

☐	Staff Research	☒	Doctoral Student
☐	Undergraduate	☐	M-level Project
☐	Externally funded	☐	External investigators
☐	Collaboration	☐	Other
Provide details of collaboration and/or other			

Address for correspondence (including email address and telephone number)
(Principal Investigator)

Sylwia Frankowska-Takhari
City University
School for Informatics
A304
Northampton Square

London EC1V 0HB [redacted] [redacted]

Other staff members involved

Title, Name & Staff Number	*Post*	*Dept & School*	*Phone*	*Email*
Dr A. MacFarlane	Reader in Information Retrieval	School of Mathematics, Computer Science & Engineering, Centre for Interactive Systems	8386	[redacted]
Dr S. Stumpf	Senior Lecturer, Course Director MSc Human-Centred Systems	School of Mathematics, Computer Science & Engineering, Research, Centre for HCI Design	8168	[redacted]

All students involved in carrying out the investigation

Name & Student Number	*Course / Year*	*Dept & School*	*Email*
Sylwia Frankowska-Takhari	PhD, Year 2.	School of Mathematics, Computer Science & Engineering, Centre for Interactive Systems	[redacted]

External co-investigators

Title & Name	*Post*	*Institution*	*Phone*	*Email*
Prof A. Göker	Professor in Computational Systems	Robert Gordon University, Aberdeen	[redacted]	[redacted]

Please describe the role(s) of all the investigators including all student(s)/external co-investigator(s) in the project, especially with regards to interaction with study participants.

The student, Sylwia Frankowska-Takhari is the investigator in this study, and is responsible for designing this study: recruitment, creating the questionnaire, collecting, analysing and safeguarding the data.
She will consult and agree the choice of research methods and tools with her supervisors. Dr MacFarlane and Dr. Stumpf at City university have a supervisory role, and Prof Ayse Göker from RGU is an external supervisor on this research project.

If external investigators are involved, please provide details of their indemnity cover.

n/a

Application Details

2.1 Is this application being submitted to another ethics committee, or has it been previously submitted to an ethics committee? *This includes an NHS local Research Ethics Committee or a City University London School Research Ethics Committee or any other institutional committee or collaborating partners or research site.* (See the guidelines for more information on research involving NHS staff/patients/ premises.) **YES** ☐ **NO** ☒

If yes, please provide details for the Secretary for the relevant authority/committee, as well as copies of any correspondence setting out conditions of approval.

n/a

2.2 If any part of the investigation will be carried out under the auspices of an outside organisation, e.g. a teaching hospital, please give details and address of organisation.

n/a

2.3 Other approvals required – has permission to conduct research in, at or through another institution or organisation been obtained? **YES** ☐ **NO** ☒

If yes, please provide details and include correspondence

n/a

2.4 Is any part of this research project being considered by another research ethics committee?

YES ☐ NO ☒

If yes, please give details and justification for going to separate committees, and attach correspondence and outcome

n/a

2.5 Duration of Project

Start date: 8th September 2014 Estimated end date: 21st September 2014

Funding Details

2.6 Please provide details of the source of financial support (if any) for the proposed investigation.

n/a

2.6a Total amount of funding being sought: n/a

2.6b Has funding been approved? **YES ☐ NO ☐**

If no, please provide details of when the outcome can be expected

n/a

2.6c Does the funding body have any requirements regarding retention, access and storage of the data? **YES ☐ NO ☐**

If yes, please provide details

n/a

International Research

2.7 Is any part of the research taking place outside of England/Wales? (if not go to section 3)

YES ☐ NO ☒

If yes, please provide details of where

n/a

2.7a Have you identified and complied with all local requirements concerning ethical approval & research governance*? **YES ☐ NO ☐**

2.7b Please provide details of the local requirements, including contact information.

n/a

2.7c Please give contact details of a local person identified to field initial complaints local so the participants can complain without having to write to or telephone the UK

n/a

*Please note many countries require local ethical approval or registration of research projects, further some require specific research visas. If you do not abide by the local rules of the host country you will invalidate your ethical approval from City University London, and may run the risk of legal action within the host country.

3. Project Details

3.1 Provide the background, aim and explanation for the proposed research.

Most research into image needs in the context of journalism focuses on the image needs of professionals i.e. journalists, content producers and image editors in print journalism.

From literature, it is known that when selecting images for their content, professionals working in print media take into consideration many factors which may be both helpful and restrictive to the choices they make e.g. editorial guidelines that put certain requirements to what is /is not an appropriate image in the wider context of the news provider, and page design requirements in regards to the image size etc.

Little is known, however, about the effect that the transition from print to online has had on the role of image editors and their image selection behaviour.

The main differences between the print and online environment of news journalism are e.g. publishing and distribution in real time, cross-platform and multi-context access. Research shows that these factors have had a great impact on the work of journalists and their information seeking behaviour but the work of image editors and image selection process has not been mentioned in literature.

Between July 2013 and February 2014, the researcher conducted a study with professional image editors responsible for selecting images to news content on e.g. BBC Homepage, BBC News, and BBC iPlayer. I interviewed twelve image editors and journalists in their natural working environments, and observed seven of them while they were performing real work tasks: finding and selecting images to news stories and publishing them online.

The preliminary results show that the image selection behaviour of these professionals was influenced by:

- editorial guidelines
- web design criteria e.g. specific size requirements, colours
- time pressure
- cost
- quality of images
- topicality (spot news (breaking news) vs. general news)

Conducting research based on real tasks enabled me to collect incredibly valuable insights into the day-to-day work of image editors. However, since the tasks were unique to each individual and their work context, they were not easily replicable across the sample.
I am intending to conduct this study to validate these findings and confirm what may be perceived as individual versus more general image seeking behaviour in the context of online journalism.
I will be using a relevance assessment method used in TREC workshops. This method continues in tradition of experimental IR, recommends involving three assessors who have similar professional backgrounds and experience and will answer the same sets of questions.
This validation exercise will allow me to ensure that the results of my previous study are stable and generalizable.

3.2 Provide a summary and brief explanation of the design, methodology and plan for analysis that you propose to use.

Data Collection methods that will be used is:

- a questionnaire:
  - closed questions (multiple choice format) to collect quantitative data
  - open questions to collect qualitative data

Procedures

Participants will be invited to take part in the research via an invitation sent by email directly to their work email accounts. They will be sent an Information Pack for Participants (Appendix C). They will be asked to sign a consent form (Appendix B) before they engage in the study.
Participants will take part in a questionnaire.
The questionnaire includes visual stimuli: up to 25 images and headlines, and a set of questions per image + headline.
The images used in the questionnaire have been published on bbc.co.uk, they are not offensive and there is a possibility that participants in this study may have already come across these images while reading news online.
The questions have a format of 'multiple choice' exercise but there is also space for participants to leave their own responses or/and comments.
Participants will be able to fill in the questionnaire in their own time and location, at their own pace – but this activity should not take them more than
30 minutes.
No identifiable personal data will be collected via the questionnaire.

Data analysis methods:

Quantitative data from the questionnaires will be collated in a spread sheet. An agreement between the responses of the assessors will be calculated. According to the TREC study, an agreement of 65% between the assessors' responses to the questionnaire confirms that the results are stable.
Any qualitative data collected in the questionnaire will be treated as additional data that may become an inspiration for a separate investigation in the future.

3.3 Please explain your plans for dissemination, including whether participants will be provided with any information on the findings or outcomes of the project.

After this study, I intend to include the findings in the Transfer report, and publish some of the findings to share them with the wider audience.
The participants will be asked (in the information pack) whether they would like to be informed about the findings. If so, any publication/report of the findings will be also send to these participants.

3.4 What do you consider are the ethical issues associated with conducting this research and how do you propose to address them?

Personal data: any personal identifiable data that will be kept safe, and all information obtained from participants will be de-identified and kept confidential.
All participants will be informed about the research: what it involves and what is expected, and that they can withdraw at any time, or may choose to answer/not answer all/ some questions only
Participants will be able to complete the questionnaire in their own time and location, at their own pace.
Participants will be able to take breaks whenever they need to during the research sessions.

3.5 How is the research intended to benefit the participants, third parties and/or local community?

In this study, participants may find it useful to learn how other professionals selected images and how they evaluated each other's' image choices. Such findings may directly benefit participants in their professional role: provide them with feedback on their current work, and enable them to make informed selections of images based on actual needs of image users.

3.6a Will invasive procedures (for example medical or surgical) be used?

YES ☐ NO ☒

3.6b If yes, what precautions will you take to minimise any potential harm?

n/a

3.7a Will intrusive procedures (for example psychological or social) be used?

YES ☐ NO ☒

3.7b If yes, what precautions will you take to minimise any potential harm?

n/a

3.8a In the course of the investigation might pain, discomfort (including psychological discomfort), inconvenience or danger be caused? YES ☐ NO ☒

3.8b If yes, what precautions will you take to minimise any potential harm?

n/a

3.9 Please describe the nature, duration and frequency of the procedures?

n/a

4. Information on participants

4.1a How many participants will be involved?

1 participant in the pilot study, and 3 participants in the main study

4.1b What is the age group and gender of the participants?

All participants are between 18 and 55 years of age, male and female

4.1c Explain how you will determine your sample size and the selection criteria you will be using. Specify inclusion and exclusion criteria. If exclusion of participants is made on the basis of age, gender, ethnicity, race, disability, sexuality, religion or any other factor, please explain and justify why.

Depending on availability of the potential participants, I am intending to recruit up to 4 participants in this study. The main selection criterion is to be a professional image editor currently employed by an online news provider/ service such as e.g. the BBC Gender: both male and female participants, Age: between 18 and 55 years of age, No exclusions will be made based on any of the following factors: ethnicity, race, disability, sexuality, religion or any other factor.

4.2 How are the participants to be identified, approached and recruited, and by whom?

The participants will be recruited from the sample who participated in Phase 1 of the research, and from image researchers working at City University. They will be contacted via email to their work/school email addresses. The researcher worked at the BBC for the past few years and will send an email with an Invitation to research, and an information pack about the research directly to any potential participant's work email accounts. Some participants will be recruited through 'word of mouth' from their colleagues who may already be involved in the study. Alternatively, PhD and post-doctoral researchers whose interest is directly related to image use, may be invited to take part in this study.

4.3 Describe the procedure that will be used when seeking and obtaining consent, including when consent will obtained. Include details of who will obtain the consent, how are you intending to arrange for a copy of the signed consent form for the participants, when will they receive it and how long the participants have between receiving information about the study and giving consent.

The researcher has prepared 2 identical copies of the consent form for each participant. The consent form is based on the City University consent form template (Appendix B). All participants will be emailed the consent forms before they engage in the research. They will be asked to read, sign and date both of the copies before they engage in the study. Participants will keep one of the copies and the other copy will be collected by the researcher on the first visit, and stored safely in a lockable filing cabinet.

4.4 How will the participant's physical and mental suitability for participation be assessed? Are there any issues related to the ability of participants to give informed consent themselves or are you relying on gatekeepers on their behalf?

All participants will be adults who have the ability to give informed consent to take part in the research. They are all in full-time employment.

4.5 Are there any special pressures that might make it difficult to refuse to take part in the study? Are any of the potential participants in a dependent relationship with any of the investigators (for instance student, colleague or employee) particularly those involved in recruiting for or conducting the project?

Participating in the study is voluntary and participants may withdraw at any time without any penalties.

4.6 Will the participant's doctor be notified? YES ☐ NO ☒

(If so, provide a sample letter to the subject's GP.)

4.7 What procedures are in place for the appropriate referral of a study participant who discloses an emotional, psychological, health, education or other issue during the course of the research or is identified by the researcher to have such a need?

This research does not address emotional, psychological, health or educational issues.

4.8 What steps will be taken to safeguard the participants from over-research? (I.e. to ensure that the participants are not being used in multiple research project.)

Instructions on how to fill in the questionnaire and the number of questions will be communicated to the participants in the Information Pack. If participants feel over-researched at any point they will be able to withdraw from the study without being penalised.

4.9 Where will the research take place?

The research will take place at the participants' chose location.

4.10 What health and safety issues, if any, are there to consider?

Participants are encouraged to choose a comfortable and safe location to complete the questionnaire.

4.11 How have you addressed the health and safety concerns of the participants, researchers and any other people impacted by this study? (This includes research involving going into participants' homes.)

n/a

4.12 It is a University requirement that an at least an initial assessment of risk is undertaken for all research and if necessary a more detailed risk assessment be carried out. Has a risk assessment been undertaken?* **YES ☒ NO ☐**

4.13 Are you offering any incentives or rewards for participating? YES ☒
If yes please give details

£10 Amazon voucher

*Note that it is the Committee's prerogative to ask to view risk assessments.

5. Vulnerable groups

5.1 Will persons from any of the following groups be participating in the study? (if not go to section 6)

Adults without capacity to consent	☐
Children under the age of 18	☐
Those with learning disabilities	☐
Prisoners	☐
Vulnerable adults	☐
Young offenders (16-21 years)	☐
Those who would be considered to have a particular dependent relationship with the investigator (e.g. those in care homes, students, employees, colleagues)	☐

5.2 Will you be recruiting or have direct contact with any children under the age of 18?
YES ☐ NO ☒

5.2a If yes, please give details of the child protection procedures you propose to adopt should there be any evidence of or suspicion of harm (physical, emotional or sexual) to a young person. Include a referral protocol identifying what to do and who should be contacted.

n/a

5.2b Please give details of how you propose to ensure the well-being of the young person, particularly with respect to ensuring that they do not feel pressured to take part in the research and that they are free to withdraw from the study without any prejudice to themselves at anytime.

n/a

5.3 Will you be recruiting or have direct contact with vulnerable adults? YES ☐ NO ☒

5.3a If yes, please give details of the protection procedures you propose to adopt should there be any evidence of or suspicion of harm (physical, emotional or sexual) to a vulnerable adult. Include a referral protocol identifying what to do and who should be contacted.

n/a

5.3b Please give details of how you propose to ensure the well-being of the vulnerable adult, particularly with respect to ensuring that they do not feel pressured to take part in the research and that they are free to withdraw from the study without any prejudice to themselves at anytime. You should indicate how you intend to ascertain that person's views and wishes.

n/a

5.3c Please give details of any City staff or students who will have contact with vulnerable adults and/or will have contact with young people (under the age of 18) and details of current (within the last 3 years) City University London Disclosure and Barring check.
N/A

5.3d Please give details of any non-City staff or students who will have contact with vulnerable adults and/or will have contact with young people (under the age of 18) and details of current (within the last 3 years) Disclosure and Barring check.
N/A

5.4 Will you be recruiting any participants who fall under the Mental Capacity Act 2005?
YES ☐ NO ☒

If so you MUST get approval from an NHS NRES approved committee (see separate guidelines for more information).

6. Data Collection

6.1a Please indicate which of the following you will be using to collect your data
Please tick all that apply

Questionnaire	☒
Interviews	☐
Participant observation	☐
Focus groups	☐
Audio/digital-recording interviewees or events	☐
Video recording	☐
Physiological measurements	☐
Quantitative research (please provide details)	☐

Other	☐
Please give details	

6.1b What steps, if any, will be taken to safeguard the confidentiality of the participants (including companies)?

- Any personal or identifiable data will be de-identified and participants will be referred to as Participant No. X
- the participants will have the right to authorise what information (about themselves or the company) may and may not be included in the collected data
- all raw data will be kept safe: locked and password-protected
- only the researcher and supervisors will have access to the raw data and the participants will be informed about this.

6.1c If you are using interviews or focus groups, please provide a topic guide

n/a

7. Confidentiality and Data Handling

7.1a Will the research involve:

• **complete anonymity of participants** (i.e. researchers will not meet, or know the identity of participants, as participants, as participants are a part of a random sample and are required to return responses with no form of personal identification)**?**	☐
• **anonymised sample or data** (i.e. an *irreversible* process whereby identifiers are removed from data and replaced by a code, with no record retained of how the code relates to the identifiers. It is then impossible to identify the individual to whom the sample of information relates)**?**	☐
• **de-identified samples or data** (i.e. a *reversible* process whereby identifiers are replaced by a code, to which the researcher retains the key, in a secure location)?	☒
• **subjects being referred to by pseudonym in any publication arising from the research?**	☐
• **any other method of protecting the privacy of participants?** (e.g. use of direct quotes with specific permission only; use of real name with specific, written permission only)	☐
Please give details of 'any other method of protecting the privacy of participants' is used	

7.1b Which of the following methods of assuring confidentiality of data will be implemented?
Please tick all that apply

• data to be kept in a locked filing cabinet	☒
• data and identifiers to be kept in separate, locked filing cabinets	☒
• access to computer files to be available by password only	☒
• storage at City University London	☐
• stored at other site	☒
If stored at another site, please give details	Stored at researcher's home address

7.1c Who will have access to the data?

Access by named researcher(s) only **YES** ☒ **NO** ☐

Access by people other than named researcher(s) **YES** ☒ **NO** ☐

If people other than the named researcher(s), please explain by whom and for what purpose

In this Phase the researcher will collect artefacts: images selected to content by image editors. These artefacts will be used in the subsequent phases of the research.
All data collected in this research will be de-identified before it is used in Phase Two and Three. No-one apart from the researcher and supervisors will be able to identify who has created any given artefact.

7.2a Is the data intended for reuse or to be shared as part of longitudinal research?
YES ☐ **NO** ☒

7.2b Is the data intended for reuse or to be shared as part of a different/wider research project now, or in the future? **YES** ☐ **NO** ☒

7.2c Does the funding body (e.g. ESRC) require that the data be stored and made available for reuse/sharing? **YES** ☐ **NO** ☒

7.2d If you have responded yes to any of the questions above, explain how you are intending to obtain explicit consent for the reuse and/or sharing of the data.

n/a

7.3 Retention and Destruction of Data

7.3a Does the funding body or your professional organisation/affiliation place obligations or recommendations on the retention and destruction of research data?

YES ☐ NO ☒

If yes, what are your affiliations/funding and what are the requirements? (If no, please refer to University guidelines on retention.)

n/a

7.3bHow long are you intending to keep the data?

According to City University guidelines on data retention, the data must be kept safe for 10 years.

7.3c How are you intending to destroy the data after this period?

By deleting the files with the data from my laptop and recording devices, and by shredding any printed or handwritten notes

8. Curriculum Vitae

CV OF APPLICANTS (**Please duplicate this page for each applicant, including external persons and students involved.)**

NAME:	Sylwia Frankowska-Takhari
CURRENT POST (from)	Since June 2012
Title of Post:	Student
Department:	Centre for Interactive Systems Research
Is your post funded for the duration of this proposal?	Yes
Funding source (if not City University London)	
Please give a summary of your training/experience that is relevant to this research project	
In 2011 the researcher graduated from City University with an MSc in Human-Centred Systems. During the course, she obtained a solid knowledge of research methodologies (data collection methods, data analysis) that are used with human participants, and research ethics. The researcher also completed a training course in Counselling that prepares for non-leading depth interviewing and has a strong focus on research ethics.	
NAME:	Dr A. MacFarlane
CURRENT POST (from)	August 2012.
Title of Post:	Reader in Information Retrieval
Department:	Centre for Interactive Systems Research
Is your post funded for the duration of this proposal?	Yes
Funding source (if not City University London)	-
Please give a summary of your training/experience that is relevant to this research project	
Andrew MacFarlane has a BSc in Computer Science from the University of Westminster, an MSc in Computer Science from Queen Mary University of London and a PhD in Information Science from City University London. He joined City University London in September 2001. His research focuses on all aspects of Information Retrieval from combinatorial optimisation problems in information filtering applications to user studies in image retrieval and dyslexia and search. He has extensive experience of user studies in IR.	
NAME:	Simone Stumpf
CURRENT POST (from)	August 2012.
Title of Post:	Senior Lecturer
Department:	HCID/ School of Informatics
Is your post funded for the duration of this proposal?	Yes
Funding source (if not City University London)	-
Please give a summary of your training/experience that is relevant to this research project	
Simone Stumpf received a PhD in Computer Science in 2001 and a BSc in Computer Science with Cognitive Science in 1996, both from University College London. She joined City University London in 2009. Previously, she conducted research at Oregon State University and University College London. Her research centres on end-user interactions with intelligent systems and personal information management esp. activity-centric systems. She has extensive experience designing and conducting empirical studies with human participants, and has received training in risk assessment (City University, September 2012) and Human Subjects Research (CTI, February 2005).	

8.1 Supervisor's statement on the student's skills and ability to carry out the proposed research, as well as the merits of the research topic (up to 500 words)

Supervisor's Signature	
Print Name	

9. Participant Information Sheet and 10. Consent Form

Please use the templates provided below for the Participant Information Sheet and Consent Form. They should be used for all research projects and by both staff and students. Note that there are occasions when you will need to include additional information, or make slight changes to the standard text – more information can be found under the application guidelines.

11. Additional Information
n/a
12. Declarations by Investigator(s)

- I certify that to the best of my knowledge the information given above, together with any accompanying information, is complete and correct.
- I have read the University's guidelines on human research ethics, and accept the responsibility for the conduct of the procedures set out in the attached application.
- I have attempted to identify all risks related to the research that may arise in conducting the project.
- I understand that **no** research work involving human participants or data can commence until **full** ethical approval has been given

	Print Name	Signature
Principal Investigator(s) (student and supervisor if student project)	Supervisors: Dr A. MacFarlane, Dr S. Stumpf Student: Sylwia Frankowska-Takhari	
Associate Dean for Research (or equivalent) or authorised signatory		
Date	7th September 2014	

If you have any problems, concerns or questions about this study, you should ask to speak to a member of the research team. If you remain unhappy and wish to complain formally, you can do this through the University complaints procedure. To complain about the study, you need to phone 020 7040 3040. You can then ask to speak to the Secretary to Senate Research Ethics Committee and inform them that the name of the project is: .....
……
You could also write to the Secretary at:
Anna Ramberg
Secretary to Senate Research Ethics Committee
Research Office, E214
City University London
Northampton Square
London
EC1V 0HB
Email: [redacted]

City University London holds insurance policies which apply to this study. If you feel you have been harmed or injured by taking part in this study you may be eligible to claim compensation. This does not affect your legal rights to seek compensation. If you are harmed due to someone's negligence, then you may have grounds for legal action.

Who has reviewed the study?
This study has been approved by City University London Research Ethics Committee

Further information and contact details
Contact details of someone who will answer any inquiries about the research (include details of supervisor/s if the researcher is a student). Only University email addresses and phone numbers should be used.

Thank you for taking the time to read this information sheet.

Approval granted on: 20 October 2014

F3 Ethics approval form (Study II. validation survey 2.)

Ethics Proportionate Review Application: Staff and Research Students
Computer Science Research Ethics Committee (CSREC)

Staff and research students in the Department of Computer Science undertaking research that involves human participation must apply for ethical review and approval before the research can commence. If the research is low-risk, an application can be submitted for a proportionate review using this form. Applicants are advised to read the information in the SMCSE Framework for Delegated Authority for Research Ethics prior to submitting an application.

There are two parts:

Part A: Ethics Checklist. The checklist determines whether the research is low-risk. If it is, Part B of the form should also be completed. If not, the checklist provides guidance as to where approval should be sought, but the checklist itself does not need to be submitted.

Part B: Ethics Proportionate Review Form. This part is the application for ethical approval of low-risk research and should only be completed if the answer to all questions (1 – 18) is NO.

Completed forms should be returned to the Chair of CSREC by emai[redacted].

Part A: Ethics Checklist

If your answer to any of the following questions (1 – 3) is YES, you must apply to an appropriate external ethics committee for approval:		*Delete as appropriate*
1.	Does your research require e approval from the National Research Ethics Service (NRES)? (E.g. because you are recruiting current NHS patients or staff? If you are unsure, please check at http://www.hra.nhs.uk/research-community/before-you-apply/determine-which-review-body-approvals-are-required/)	**No**
2.	Will you recruit any participants who fall under the auspices of the Mental Capacity Act? (Such research needs to be approved by an external ethics committee such as NRES or the Social Care Research Ethics Committee http://www.scie.org.uk/research/ethics-committee/)	**No**
3.	Will you recruit any participants who are currently under the auspices of the Criminal Justice System, for example, but not limited to, people on remand, prisoners and those on probation? (Such research needs to be authorised by the ethics approval system of the National Offender Management Service.)	**No**

If your answer to any of the following questions (4 – 11) is YES, you must apply to the Senate Research Ethics Committee for approval (unless you are applying to an external ethics committee):		*Delete as appropriate*
4.	Does your research involve participants who are unable to give informed consent, for example, but not limited to, people who may have a degree of learning disability or mental health problem, that means they are unable to make an informed decision on their own behalf?	**No**
5.	Is there a risk that your research might lead to disclosures from participants concerning their involvement in illegal activities?	**No**
6.	Is there a risk that obscene and or illegal material may need to be accessed for your research study (including online content and other material)?	**No**
7.	Does your research involve participants disclosing information about sensitive subjects?	**No**
8.	Does your research involve the researcher travelling to another country outside of the UK, where the Foreign & Commonwealth Office has issued a travel warning? (http://www.fco.gov.uk/en/)	**No**
9.	Does your research involve invasive or intrusive procedures? For example, these may include, but are not limited to, electrical stimulation, heat, cold or bruising.	**No**
10.	Does your research involve animals?	**No**
11.	Does your research involve the administration of drugs, placebos or other substances to study participants?	**No**

If your answer to any of the following questions (12 – 18) is YES, you must submit a full application to the Computer Science Research Ethics Committee (CSREC) for approval (unless you are applying to an external ethics committee or the Senate Research Ethics Committee). Your application may be referred to the Senate Research Ethics Committee.		*Delete as appropriate*
12.	Does your research involve participants who are under the age of 18?	**No**
13.	Does your research involve adults who are vulnerable because of their social, psychological or medical circumstances (vulnerable adults)? This includes adults with cognitive and / or learning disabilities, adults with physical disabilities and older people.	**No**
14.	Does your research involve participants who are recruited because they are staff or students of City University London? For example, students studying on a particular course or module. (If yes, approval is also required from the Head of Department or Programme Director.)	**No**
15.	Does your research involve intentional deception of participants?	**No**
16.	Does your research involve participants taking part without their informed consent?	**No**
17.	Does your research pose a risk to participants greater than that in normal working life?	**No**
18.	Does your research pose a risk to you, the researcher(s), greater than that in normal working life?	**No**

You must make a proportionate review application to the CSREC if your research involves human participation and you are not submitting any other ethics application (i.e. your answer to all questions 1 – 18 is "NO").

Part B: Ethics Proportionate Review Form

If you answered NO to all questions 1 – 18, you may use this part of the form to submit an application for a proportionate ethics review of your research. The form must be accompanied by all relevant information sheets, consent forms and interview/questionnaire schedules.

Note that all research participants should be fully informed about: the purpose of the research; the procedures affecting them or affecting any information collected about them, including information about what they will be asked to do, what data will be collected, how the data will be used, to whom it will be disclosed, and how long it will be kept; the fact that they can withdraw at any time without penalty.

Background Information	
Name:	Sylwia Frankowska-Takhari [redacted]
Supervisor (if student):	Dr Andrew Macfarlane [redacted] Dr Simone Stumpf [redacted] Prof Ayse Göker [redacted]

Your Research Project	
Title:	**A validation study with experts** **(PhD project: Selection and tailoring of images for visual impact in online journalism)**
Start date:	**15th December 2015**
End date:	**31st October 2016**
The purpose of this research activity is to further validate the proposed set of image selection criteria identified through a qualitative user study that the researcher conducted in the initial phase of this PhD work. The method to be used in this study was developed in TREC workshops that continue in tradition of experimental IR, and requires a minimum of three assessors (experts) to be involved (e.g. Voorhees, 2000). Three Experts will be recruited for this validation study from a pool of image professionals that the researcher had established in the earlier phases of the PhD study, and through their professional contacts and recommendations. The potential candidates will be contacted via email and each will	

receive the information sheet (Appendix B.) with details of the study and what is expected from them as participants, and potential benefits and risks related to this study.

To join the study as Expert, the candidate must be employed - at the time of this study - in a role related to image production, selection, editing, (e.g. photographers, image editors, online journalists), or studying/researching imagery as e.g. PhD students and/or post-doctoral researchers. All participants will be asked to sign a consent form before the study (Appendix A.).

The study will require the image Experts to work independently, and fill in a questionnaire. The questionnaire (Appendix C.) will include:

- a 100 randomly sampled journalistic images published on the bbc.co.uk website between January 2015 – November 2015, and
- a set of questions about each of the images.

All experts will see the same 100 images and will be asked to answer 9 questions for each image. The questionnaire has a multiple choice format where the possible answers are already provided. It should take approximately 90 minutes for each Expert to complete the questionnaire.

The images and corresponding headlines have been retrieved via Wayback Machine, an internet archive (http://archive.org/web/) that keeps record of websites. The images used in the questionnaire have been published on bbc.co.uk between January 2015 and November 2015, and are not offensive. As per strict BBC's editorial rules, visual material published across the BBC website must not include offensive content (e.g. any images including violence, discriminatory images etc) as the website caters to the needs of a very wide general audience. There is a high possibility that participants in this study may have already come across these images while they read news online.

Participants will be able to fill in the questionnaire in their own time and location, at their own pace – and this activity should not take them more than one hour in total.

Personal data will not be collected through the questionnaire. The names' of the experts will be changed to Expert 1, 2, and 3, to ensure the anonymity of the respondents. The names and contact details for the Experts will be kept safe and confidential in a locked filing cabinet and on a password-protected laptop for 10 years as per City, University of London regulations.

Findings from this activity will inform the development and design work of a prototype to be used in a user study (scheduled between March and May 2016) in terms of providing a re-validated set of selection criteria for images depicting specific people.

Attachments (these must be provided if applicable):	*Delete as appropriate*
Participant information sheet(s)	**Yes (Appendix B)**
Consent form(s)	**Yes (Appendix A)**
Questionnaire(s)	**Yes (Appendix C includes an example of an Image Task)**
Topic guide(s) for interviews and focus groups	**Not applicable**
Permission from external organisations (e.g. for recruitment of participants)	**Not applicable**

Approval granted on: 11th December 2015

F4 Ethics approval form (Study III. experiment)

Ethics Proportionate Review Application: Staff and Research Students
Computer Science Research Ethics Committee (CSREC)

Staff and research students in the Department of Computer Science undertaking research that involves human participation must apply for ethical review and approval before the research can commence. If the research is low-risk, an application can be submitted for a proportionate review using this form. Applicants are advised to read the information in the SMCSE Framework for Delegated Authority for Research Ethics prior to submitting an application.

There are two parts:

Part A: Ethics Checklist. The checklist determines whether the research is low-risk. If it is, Part B of the form should also be completed. If not, the checklist provides guidance as to where approval should be sought, but the checklist itself does not need to be submitted.

Part B: Ethics Proportionate Review Form. This part is the application for ethical approval of low-risk research and should only be completed if the answer to all questions (1 – 18) is NO.

Completed forms should be returned to the Chair of CSREC by email ([redacted]).

Part A: Ethics Checklist

If your answer to any of the following questions (1 – 3) is YES, you must apply to an appropriate external ethics committee for approval:		*Delete as appropriate*
1.	Does your research require approval from the National Research Ethics Service (NRES)? (E.g. because you are recruiting current NHS patients or staff? If you are unsure, please check at http://www.hra.nhs.uk/research-community/before-you-apply/determine-which-review-body-approvals-are-required/)	**No**
2.	Will you recruit any participants who fall under the auspices of the Mental Capacity Act? (Such research needs to be approved by an external ethics committee such as NRES or the Social Care Research Ethics Committee http://www.scie.org.uk/research/ethics-committee/)	**No**
3.	Will you recruit any participants who are currently under the auspices of the Criminal Justice System, for example, but not limited to, people on remand, prisoners and those on probation? (Such research needs to be authorised by the ethics approval system of the National Offender Management Service.)	**No**

If your answer to any of the following questions (4 – 11) is YES, you must apply to the Senate Research Ethics Committee for approval (unless you are applying to an external ethics committee):		*Delete as appropriate*
4.	Does your research involve participants who are unable to give informed consent, for example, but not limited to, people who may have a degree of learning disability or mental health problem, that means they are unable to make an informed decision on their own behalf?	**No**
5.	Is there a risk that your research might lead to disclosures from participants concerning their involvement in illegal activities?	**No**
6.	Is there a risk that obscene and or illegal material may need to be accessed for your research study (including online content and other material)?	**No**
7.	Does your research involve participants disclosing information about sensitive subjects?	**No**
8.	Does your research involve the researcher travelling to another country outside of the UK, where the Foreign & Commonwealth Office has issued a travel warning? (http://www.fco.gov.uk/en/)	**No**
9.	Does your research involve invasive or intrusive procedures? For example, these may include, but are not limited to, electrical stimulation, heat, cold or bruising.	**No**
10.	Does your research involve animals?	**No**
11.	Does your research involve the administration of drugs, placebos or other substances to study participants?	**No**

If your answer to any of the following questions (12 – 18) is YES, you must submit a full application to the Computer Science Research Ethics Committee (CSREC) for approval (unless you are applying to an external ethics committee or the Senate Research Ethics Committee). Your application may be referred to the Senate Research Ethics Committee.		*Delete as appropriate*
12.	Does your research involve participants who are under the age of 18?	**No**
13.	Does your research involve adults who are vulnerable because of their social, psychological or medical circumstances (vulnerable adults)? This includes adults with cognitive and / or learning disabilities, adults with physical disabilities and older people.	**No**
14.	Does your research involve participants who are recruited because they are staff or students of City University London? For example, students studying on a particular course or module. (If yes, approval is also required from the Head of Department or Programme Director.)	**No**
15.	Does your research involve intentional deception of participants?	**No**
16.	Does your research involve participants taking part without their informed consent?	**No**
17.	Does your research pose a risk to participants greater than that in normal working life?	**No**
18.	Does your research pose a risk to you, the researcher(s), greater than that in normal working life?	**No**

You must make a proportionate review application to the CSREC if your research involves human participation and you are not submitting any other ethics application (i.e. your answer to all questions 1 – 18 is "NO").

Part B: Ethics Proportionate Review Form

If you answered NO to all questions 1 – 18, you may use this part of the form to submit an application for a proportionate ethics review of your research. The form must be accompanied by all relevant information sheets, consent forms and interview/questionnaire schedules.

Note that all research participants should be fully informed about: the purpose of the research; the procedures affecting them or affecting any information collected about them, including information about what they will be asked to do, what data will be collected, how the data will be used, to whom it will be disclosed, and how long it will be kept; the fact that they can withdraw at any time without penalty.

Background Information	
Name:	Sylwia Frankowska-Takhari [redacted]
Supervisor (if student):	Dr Andrew Macfarlane

Your Research Project	
Title:	**User study with image professionals (concept evaluation)**
Start date:	**1st March 2016**
End date:	**June 2017**

In the course of this PhD investigation, a possible concept for improving of effectiveness of image retrieval has been developed. This concept is based on a set of recurring image features identified in illustrations used for online news content.

The aim of this study is to evaluate whether these features - when applied as search functionality - will improve the effectiveness of retrieval of visually engaging images as required in online journalism.

A minimum of 8 and maximum of 16 image professionals will be recruited for this study from a pool of image professionals that the researcher had established in the earlier phases of the PhD study, and through their professional contacts and recommendations.

The potential candidates will be contacted via email and each will receive the information sheet (Appendix B.) with details of the study and what is expected from them as participants, and potential benefits and risks related to this study.

To be eligible for the study, a candidate must be employed - at the time of this study - in a role related to image production, selection, editing, (e.g. image editors, online journalists) (Appendix F.). All participants will be asked to sign a consent form before the study (Appendix A.).

Each image professional will participate in one individual test session that will not take more than one hour.

Participants will be able to schedule their sessions (in regards to time and location) to suit their life style but all sessions must take place between 21st March and 30th April 2016.

Personal data will not be collected in this research. The names' of the participants will be changed to Participant X., to ensure the anonymity of the respondents. The names and contact details for the Participants will be kept safe and confidential in a locked filing cabinet and on a password-protected laptop for 10 years as per City, University of London regulations.

Participants will be offered incentives of a £40 M&S voucher.

The research materials includes four scenario-based tasks simulating real work tasks (Appendix C.), and two corresponding image sets: Set A and Set B.

Set A. for each task consists of one hundred of unfiltered images retrieved to match a particular search term from a popular image collection e.g. GettyImages where the original order of search results has been maintained.

Set B. for each task consists of one hundred images retrieved to a particular search term from a popular image collection e.g. GettyImages but pre-filtered and ordered by the researcher based on the proposed concept.

The study has been designed so that an equal number of participant within the sample will be exposed to:

- two tasks that require them to select and use images from Image Set A (e.g. Appendix D.) and
- two tasks where they will be selecting images from Image Set B (e.g. Appendix E.).

For example, for a sample of 8 participants, the order of the tasks will be as follows:

- Participants 1 – 4 will perform two tasks A first, and then two tasks B
- Participants 5 – 8 will perform two tasks B first, and then two tasks A

This (AB/BA) experimental design of this study will enable the researcher to eliminate the 'order/carryover effects'.

After each task participants will have time to provide feedback in regards to image selections that they made and editing techniques that they applied to create illustrations. To conclude the study, the participants will have time to comment on their overall experience in regards to the study and images used in the tasks.

The effectiveness of the concept will be measured based on whether a task has/ has not been completed, and a comparison between

- the number of steps required to complete each task depending on the image set used and compared between the tasks completed using sets A and sets B,
- time required to complete the task,
- user perception and personal experience in regards to selection and use of images from each of the sets (Appendix G.).

Attachments (these must be provided if applicable):	*Delete as appropriate*
Participant information sheet(s)	**Yes (Appendix A.)**
Consent form(s)	**Yes (Appendix B.)**
Questionnaire(s)	**Yes – 4 scenario based tasks (Appendix C.)** **Examples of image sets to be used (Appendices D. and E. submitted with this application in pdf format as too large to be attached in MS Word)**
Topic guide(s) for interviews and focus groups	**Not applicable**
Permission from external organisations (e.g. for recruitment of participants)	**Not applicable**

Research Study Amendments
Computer Science Research Ethics Committee (CSREC)

This form should be used to submit an amendment to research previously approved by the Computer Science Research Ethics Committee (CSREC), City University London.

Completed forms should be returned to the Chair of CSREC by email.

Principal Investigator and Study Duration	
Name:	Sylwia Frankowska-Takhari
Email:	[redacted]
Title of study:	User research with image professionals
Start Date:	1st March 2016
End Date:	June 2017

Research Amendments

Type of Amendment/s (tick as appropriate)

Research procedure/protocol (including research instruments)	**X**
Participation group	
Information Sheet/s	
Consent form/s	
Other recruitment documents	
Sponsorship/collaborations	
Principal investigator/supervisor	
Extension to approval	
Other	

Details of amendments (give details of each of the amendments requested, state where the changes have been made and attach all amended and new documentation)

In the original research design, it was proposed that "To conclude the study, the participants will have time to comment on their overall experience in regard to the study and images used in the tasks." A pilot study showed that in order to gather comparable data and finish the sessions in a timely manner (up to 60 minutes) there was a need for a more structured way to elicit the final feedback from participants. The researcher has formulated 4 questions and added a list of visual features to choose from (Appendix H.) as opposed to a free-style discussion that will be asked at the end of research sessions. These questions will allow her to focus the final discussion on the areas of interest, and also finish the sessions within the scheduled time.

Declaration (to be signed by the Principal Investigator)

I certify that to the best of my knowledge the information given above, together with any accompanying information, is complete and correct and I take full responsibility for it.

	Signature	Signature
Principal Investigator(s) (student and supervisor if student project)	Sylwia Frankowska-Takhari	Sylwia Frankowska-Takhari
Date	18th April 2016	

Approval granted on: 4th April 2016

F5 Ethics approval form (Study III. validation survey 3.)

Ethics Proportionate Review Application: Staff and Research Students Computer Science Research Ethics Committee (CSREC)

Staff and research students in the Department of Computer Science undertaking research that involves human participation must apply for ethical review and approval before the research can commence. If the research is low-risk, an application can be submitted for a proportionate review using this form. Applicants are advised to read the information in the SMCSE Framework for Delegated Authority for Research Ethics prior to submitting an application.

There are two parts:

Part A: Ethics Checklist. The checklist determines whether the research is low-risk. If it is, Part B of the form should also be completed. If not, the checklist provides guidance as to where approval should be sought, but the checklist itself does not need to be submitted.

Part B: Ethics Proportionate Review Form. This part is the application for ethical approval of low-risk research and should only be completed if the answer to all questions (1 – 18) is NO.

Completed forms should be returned to the Chair of CSREC by email ([redacted].

Part A: Ethics Checklist

If your answer to any of the following questions (1 – 3) is YES, you must apply to an appropriate external ethics committee for approval:		*Delete as appropriate*
1.	Does your research require approval from the National Research Ethics Service (NRES)? (E.g. because you are recruiting current NHS patients or staff? If you are unsure, please check at http://www.hra.nhs.uk/research-community/before-you-apply/determine-which-review-body-approvals-are-required/)	**No**
2.	Will you recruit any participants who fall under the auspices of the Mental Capacity Act? (Such research needs to be approved by an external ethics committee such as NRES or the Social Care Research Ethics Committee http://www.scie.org.uk/research/ethics-committee/)	**No**
3.	Will you recruit any participants who are currently under the auspices of the Criminal Justice System, for example, but not limited to, people on remand, prisoners and those on probation? (Such research needs to be authorised by the ethics approval system of the National Offender Management Service.)	**No**

If your answer to any of the following questions (4 – 11) is YES, you must apply to the Senate Research Ethics Committee for approval (unless you are applying to an external ethics committee):		*Delete as appropriate*
4.	Does your research involve participants who are unable to give informed consent, for example, but not limited to, people who may have a degree of learning disability or mental health problem, that means they are unable to make an informed decision on their own behalf?	**No**
5.	Is there a risk that your research might lead to disclosures from participants concerning their involvement in illegal activities?	**No**
6.	Is there a risk that obscene and or illegal material may need to be accessed for your research study (including online content and other material)?	**No**
7.	Does your research involve participants disclosing information about sensitive subjects?	**No**
8.	Does your research involve the researcher travelling to another country outside of the UK, where the Foreign & Commonwealth Office has issued a travel warning? (http://www.fco.gov.uk/en/)	**No**
9.	Does your research involve invasive or intrusive procedures? For example, these may include, but are not limited to, electrical stimulation, heat, cold or bruising.	**No**
10.	Does your research involve animals?	**No**

11.	Does your research involve the administration of drugs, placebos or other substances to study participants?	**No**

If your answer to any of the following questions (12 – 18) is YES, you must submit a full application to the Computer Science Research Ethics Committee (CSREC) for approval (unless you are applying to an external ethics committee or the Senate Research Ethics Committee). Your application may be referred to the Senate Research Ethics Committee.		*Delete as appropriate*
12.	Does your research involve participants who are under the age of 18?	**No**
13.	Does your research involve adults who are vulnerable because of their social, psychological or medical circumstances (vulnerable adults)? This includes adults with cognitive and / or learning disabilities, adults with physical disabilities and older people.	**No**
14.	Does your research involve participants who are recruited because they are staff or students of City University London? For example, students studying on a particular course or module. (If yes, approval is also required from the Head of Department or Programme Director.)	**No**
15.	Does your research involve intentional deception of participants?	**No**
16.	Does your research involve participants taking part without their informed consent?	**No**
17.	Does your research pose a risk to participants greater than that in normal working life?	**No**
18.	Does your research pose a risk to you, the researcher(s), greater than that in normal working life?	**No**

You must make a proportionate review application to the CSREC if your research involves human participation and you are not submitting any other ethics application (i.e. your answer to all questions 1 – 18 is "NO").

Part B: Ethics Proportionate Review Form

If you answered NO to all questions 1 – 18, you may use this part of the form to submit an application for a proportionate ethics review of your research. The form must be accompanied by all relevant information sheets, consent forms and interview/questionnaire schedules.

Note that all research participants should be fully informed about: the purpose of the research; the procedures affecting them or affecting any information collected about them, including information about what they will be asked to do, what data will be collected, how the data will be used, to whom it will be disclosed, and how long it will be kept; the fact that they can withdraw at any time without penalty.

Background Information	
Name:	Sylwia Frankowska-Takhari [redacted]
Supervisor (if student):	Dr Andrew Macfarlane [redacted] Dr Simone Stumpf [redacted] Prof Ayse Göker

Your Research Project	
Title:	**Validation Study 2. with experts** **(PhD project: Selection and tailoring of images for visual impact in online journalism)**
Start date:	**10th March 2017**
End date:	**30th September 2017**

The validation study I am proposing is a follow-up to the (AB/BA) user research conducted between April and July 2016, in which 10 image editors were asked to select images to news headlines (4 tasks each). Through this research, I collected 50 images (the set consists of the original photographs used in the research, as well as images edited by participants).
The purpose of the validation study is to gain an independent expert judgement on the occurrence of 8 visual image features in the set of 50 images collected through the earlier user research.

The method to be used in this study was developed in TREC workshops that continue in tradition of experimental IR, and requires a minimum of three assessors (experts) to be involved (e.g. Voorhees, 2000).

Three Experts will be recruited from a pool of image professionals that the researcher had established in the earlier phases of the PhD study, and through their professional contacts and recommendations. The potential candidates will be contacted via email and each will receive the information sheet (Appendix B.) with details of the study and what is expected from them as participants, and potential benefits and risks related to this study.

To join the study as Expert, the candidate must be employed - at the time of this study - in a role related to image production, selection, editing, (e.g. photographers, image editors, online journalists), or studying/researching imagery as e.g. PhD students and/or post-doctoral researchers. All participants will be asked to sign a consent form before the study (Appendix A.).

The study will require the image Experts to work independently, and fill in a questionnaire. The questionnaire (Appendix C.) will include:

- 50 news images from the user study conducted between April and July 2016
- a set of 9 questions about each of the images.

All experts will see the same 50 images and will be asked to answer 9 questions for each image. The questionnaire has a yes/no format. It should take approximately 60 minutes for each Expert to complete the questionnaire.

The images used in this study are typical news photographs of known people (Usain Bolt, Angela Merkel, David Cameron, and Sophie Ellis-Bextor), and are not offensive.

Participants will be able to fill in the questionnaire in their own time and location, at their own pace – and this activity should not take them more than one hour in total.

Personal data will not be collected through the questionnaire. The names' of the experts will be changed to Expert 1, 2, and 3, to ensure the anonymity of the respondents. The names and contact details for the Experts will be kept safe and confidential in a locked filing cabinet and on a password-protected laptop for 10 years as per City, University of London regulations.

This is planned as the final activity in my PhD investigation and will contribute to the objectivity and validity of the findings.

Attachments (these must be provided if applicable):	*Delete as appropriate*
Participant information sheet(s)	**Yes (Appendix B)**
Consent form(s)	**Yes (Appendix A)**
Questionnaire(s)	**Yes (Appendix C includes an example of an Image Task)**
Topic guide(s) for interviews and focus groups	**Not applicable**
Permission from external organisations (e.g. for recruitment of participants)	**Not applicable**

Approval granted on 15th March 2017

Appendix G. The VSS framework

The theory of visual social semiotics, as proposed by Kress and van Leeuwen (1996), provides tools for visual sense-making based on visual aspects (*resources*[54]) present in images, e.g. gaze, distance (length of shot), the point of view, salience of objects. Each of these resources carries a field of possible visual meaning (Jewitt and Oyama, 2001). This visual meaning can be intentionally activated by the producer of the image, as well as perceived by the viewer.

The visual aspects of images captured in the descriptions of this framework come with an interpretation in regard to the visual impact that they engender when present in images.

The *visual social semiotics* has its own terminology. The visual aspects of images are referred to as *visual resources*. The abstract or concrete people, places, objects depicted in images, referred to as *Representational Participants* (RPs).

The VSS resources and corresponding visual image features are presented below, based on Kress and van Leeuwen (1996; 2006) and Jewitt and Oyama (2001).

Gaze

Strong engagement is associated with a direct gaze (person in the picture looking directly at the viewer), while person looking outside the picture or at someone or something within the image creates less engagement.

Visual resource	Type of resource	Strong involvement	Low involvement
Gaze	**Type of gaze**	Direct at viewer	Looking outside the picture or at someone or something within the image

Distance

The type of shot in the image allows to determine the closeness of the distance between the person in the image and the viewer. The closer the person is to the viewer, the closer visual connection can be created. Long shots, as well as shots showing groups of people create larger 'gap' between the viewer and the depicted RPs.

Visual resource	Type of resource	Type of shots creating personal (close) distance	Types of shots creating social (far) distance
Distance to the viewer	**Type of photographic shot**	The head and face only	The whole figure
		The head and shoulders	The whole figure with space around it
		From the waist up	Torsos of several people

These types of shots can be associated with the photographic shots described in Bowen and Thompson (2013), and presented below.

[54] Kress and van Leeuwen (1996) used the term Resources to refer to visual aspects of images such as: colours, gaze, modality, etc.



Types of photographic shots
(Bowen and Thompson, 2013)

Point of view

a) Horizontal

Point of view is a perspective resource and refers to the position of the RP(s) in relation to the viewer's position. This relationship can be constructed (or analysed) horizontally to indicate the degree of involvement between the viewer and RPs. and/or on vertically for a power relationship.

Visual resource	Type of resource	Features engendering involvement	Features engendering detachment
Point of view	**Horizontal angle**	Frontality	Profile

b) Vertical

This relationship can be constructed (or analysed) vertically for a required power relationship.

Visual resource	Type of resource	Features engendering power of the viewer	Features engendering equal power	Features engendering power over the viewer
Point of view	**Vertical angle**	High angle (bird's eye view)	Medium angle (eye-level	Low angle (ant's eye view):

Information value

Information value realised by positioning of RPs within the image: left – right, and top - bottom, allows them to take on different information roles: familiar (left) versus unknown (right), ideal (top) versus real (bottom). Positioning of objects in the centre is interpreted as the nucleus (focus) of information to the surrounding elements.

Framing

Framing tells the viewer about connectedness or separation between RPs in the image, as well as the image as a whole. The stronger the connection is between the RPs, the greater integrity is achieved within the image.

Visual resource	Type of resource	Features engendering a strong connection within frame	Features engendering low connection
Framing	Pictorial framing devices that separate the image from background of the page e.g., colours, lines	Colours in the image contrasting with the background colour of the page. Objects within the image close to each other. The lines (regions) of the objects overlapping.	Little or no contrast between the colours in the image and the background. Objects in the image separated.

Salience

Salience is one of the most powerful resources that has the ability of an RP to capture the viewer's eye.

Visual resource	Type of resource	Features engendering high salience	Features with lower salience
Salience (attention grabbing)	**Size**	The larger the object in the frame, the more impact it can generate	
	Sharpness of focus	In focus	Out of focus
	Tonal contrast	The higher tonal contrast, the higher salience	
	Colour contrast	Saturated colours	'Soft' colours
	Positioning within the image space	Foreground	Background

Modality

Modality refers to validity and reliability of images. It had been added to the framework by *Jewitt and Oyama (2001, pp. 151–153).* The higher modality achieved, the more 'real' the image appears to viewers.

Visual resource	Type of resource	Features engendering high modality	Features engendering low modality
Modality (realness)	**Colour**	Full colour	Black and white
	Contextualisation	Fully visible background	Blurry (or non-realistic) background
	Depth	Depth	No depth (perspective)
	Illumination	Light and shade	Absence of light and shade