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Information Systems in Organisations

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Submitted as part of a PhD as a staff candidate at City
University

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Prologue - Preliminary Considerations on the award of a PhD at City University

This document is presented in accordance with City University regulations as set out in the City University Research Studies Handbook (2004).

Chapter 4 of the City University: Research Studies Handbook (2004) on Academic Issues includes a statement on the regulations governing staff candidates. This states that

‘... staff Candidates may submit either a thesis or published papers embodying the results of his/her research pursued whilst on the staff of the University. Where such a candidate is a graduate of at least four years’ standing he/she may submit published papers including the results of research pursued prior to his/her appointment. Candidates submitting published papers must also submit a paper, which presents a reasoned argument in support of the published papers. The paper is considered as part of the submission and will be examined as such’ (City University: Research Studies Handbook, Section 4.2 on Academic Issues, 2004).

City University’s Research Studies Academic Handbook (2004) makes no stipulation about the number or nature of the papers to be included, when staff submit published papers as part of a PhD. Nine papers have been chosen for this submission and these are contained in appendix 1. Clause 6 (e) of ordinance C3.3 (City University’s Research Studies Academic Handbook, Ch 10 Appendix 3, Ordinances and Regulations, 2004) states that joint work may be submitted as part of the PhD, so long as there is a statement from the co-author(s) on the candidate’s contribution. Co-authors’ statements are included in appendix 2 of this submission. It is stipulated that the linking paper (this document) is an integral part of the submission and should be examined as such. The

requirement is that the totality of the work submitted, in any form, must meet the university's standards for a PhD.

Clause 8 of ordinance C3.3 (City University's Research Studies Academic Handbook, Ch 10 Appendix 3, Ordinances and Regulations, 2004) states that the thesis or papers submitted must be judged by the examiners to –

'contain sufficient evidence of systematic study and to make an original contribution to his or her subject, shown either by the discovery of new facts or by the exercises of independent critical power'

Doctorates are awarded to students who have demonstrated (City University: Research Studies Handbook, Section 4.1 on Academic Issues, 2004):

- the creation and interpretation of new knowledge, through original research or other advanced scholarship, of a quality to satisfy peer review, extend the forefront of the discipline, and merit publication;
- a systematic acquisition and understanding of a substantial body of knowledge which is at the forefront of an academic discipline or area of professional practice;
- the general ability to conceptualise, design and implement a project for the generation of new knowledge, applications or understanding at the forefront of the discipline, and to adjust the project design in the light of unforeseen problems;
- a detailed understanding of applicable techniques for research and advanced academic enquiry.

This is in addition to the requirements to defend the research at a viva voce.

The purpose of this integrating document is to make the case for this body of work to be awarded a PhD. All the research papers were

conceived before I took the decision to aim for a PhD by the papers route. This document gives a view of the overall contribution of the papers taken as a whole. It positions the papers as a linked, coherent piece of work and forms the core of the reasoned argument.

This body of work meets the requirements for a City University PhD as follows:

- The quality and originality of the work is demonstrated in several ways. Six papers are journal publication and have passed the peer review process. The three sections (3, 4 and 5) present the core of my reasoned argument for the work to be read as a consistent piece of research. The three principles proposed in section 5 are an original contribution to IS research. Together they synthesise the relevant IS literature and the findings of the research papers to offer a comprehensive and holistic view of the factors that affect IS business value creation for organisations.
- The papers were completed over ten years of continuous and systematic study on the subject of organisations' use of information systems. The discipline of information systems research was regarded as relatively new in the early 1990s when this work began. This document together with the nine papers demonstrates my understanding of a number of the subject themes that form part of the IS research discipline. My previous work in operational research and end user computing formed the basis for many of my initial ideas for research. The story of how these experiences have been utilised for my work on information systems, told in section 2, is evidence of my ability to continue to reflect on and make use of diverse experiences. For more than thirty years I have been interested in the quality of knowledge that can be found through the application of research methods. This was sparked by the debate over the drawbacks in scientific method that took place in the OR

community in the 1970s and 1980s and led to my current study of social research methods as discussed in section 3. This is presented as evidence of systematic research and study into two subjects – information systems in organisations and research methods.

- Each paper represents a research project, which has been designed and implemented to generate new knowledge at the forefront of one of the themes of information systems research. Critical power is demonstrated in the papers. However most of these are written jointly or with several co-authors. The letters from my collaborators make clear that my contribution was a major one and valued by them (as I value their contribution and what I learnt from them). Independent critical power is also demonstrated in this document. The conclusions demonstrate how the creation of the three principles developed on the basis of the work of the research papers give direction to future research.
- The review of IS research methods together with the critical assessment of the methods used in the papers, given in this document (section 3) demonstrates my understanding of applicable techniques for research.

Acknowledgements

I would like to take this opportunity to thank the many colleagues that have collaborated with me on joint papers, and that have contributed advice and support to my research work and understanding of the subject area. I have also benefited considerably from the ideas and comment offered by many students.

I would like to offer a special thanks to Erik Larsen, as my advisor at Cass, and to Dan Remenyi both of whom provided valuable and constructive criticism and advice at various stages.

I would like to offer particular thanks to Axel Johnne who organised and supported the group of staff at Cass that have worked for a PhD and to the group members - Martin Rich, Sally Woodward Selim, Clive Holtham, and Lakis Kaounides without whom I would not have started on this endeavour and to Georges Selim and my family without whose support I would not have had the confidence to complete it.

Declaration

I grant powers to the University Librarian to allow the thesis to be copied in whole or in part. This only covers single copies made for study purposes, and does not supersede any copyright limitations that apply to the constituent papers which are included in the appendices.

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Abstract

This research explores two separate but related lines of enquiry - the business value of individual applications and the social and organisational impact of information systems.

From this research it is clear that information systems have immense potential to change organisations. The conventional view focuses on the value that organisations can obtain through greater efficiency or new activities made possible by specific applications. But experience suggests that many organisations fail to gain the value expected. This research was started with the aim of attaining a greater understanding of the business value that information systems could offer organisations and finding ways by which organisations could assess and realise this value.

The research has adopted a variety of methodological approaches and this integrating paper assesses the choices made and locates the papers in relation to the literature on information systems research methodology. The nine research papers taken together demonstrate that IS business value is a complex concept and difficult to measure in practice. The research finds that the business and organisational environments are key factors in achieving the business value to be reaped from the range of benefits that each type of IS application offers. The research also demonstrates why IS evaluation practice continues to pose problems for researchers and practitioners.

This integrating paper situates the work within the relevant literature on information systems research, assesses the contribution of the research papers to information systems research and concludes with a discussion of future research that flows from this work.

1 Introduction

This research is presented through the work of nine research papers (contained in Appendix 1) that were selected from a larger body of work (see Appendix 3 for details). The criteria that governed the choice of papers were twofold - relevance to the main research question and the quality of the work done. This section sets out the research focus, the nature of the findings, the structure of this document and the list of papers.

1.1 Research Aims

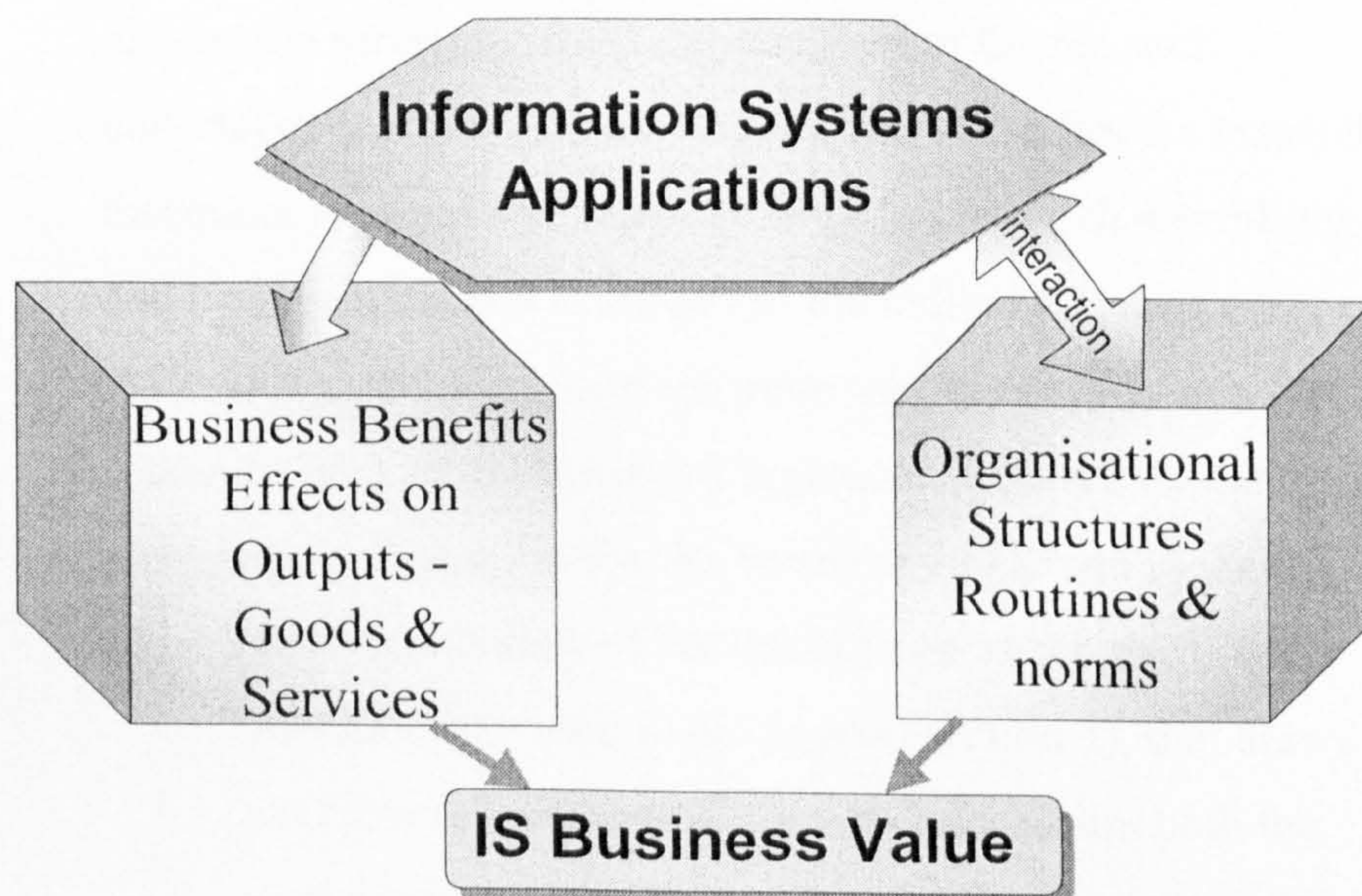
For more than ten years I have been interested in how information systems affect organisations. My objective has been to attain a greater understanding of the impact of information systems on organisations and to find ways by which this impact can be assessed.

As this research was conducted through work on nine papers over a period of ten years, there was no single research question. However the question that drove the work was how much information systems were actually put to use within organisations. To what extent was and is the potential business value of information systems being realised? The focus is on information systems that are new to the organisation. These may be IS applications that have been available for some time and for which there are a number of standard packages on the market. Nonetheless if an IS application is being implemented within an organisation for the first time then it can be considered as new to this organisation.

The aim developed into the more practical objective of attaining a greater understanding of the business value that information systems could offer organisations and finding ways by which organisations could assess and realise this value.

Information systems may be designed primarily with business or operational goals in mind but will nonetheless always have organisational consequences. Figure 1 shows the two separate but related lines of enquiry that were followed from the start of the research. One investigated the contribution of specific individual information systems applications to business operations and its outputs. The second researched how organisational structures and norms could affect the way information systems are actually used.

Figure 1: Initial Research Focus



1.2 Nature of the findings of this research

The research demonstrates that new information systems cannot be treated by organisations as an investment separate from the rest of its activities. Three principles are developed from the papers that enhance our understanding of what factors affect the business value that information systems could offer organisations. These principles identify the key role of context in realising IS business value and demonstrate the complexity of the problems addressed by the research question.

1.3 Structure and purpose of this paper

This integrating document presents an analysis of the papers and should be read in conjunction with them so that the whole presents a coherent narrative. Its purpose is to present a robust argument for the papers to be read as a consistent piece of research that complies with the requirements for a PhD at City University. It contains:

- A prologue to this document (pages 1-4) that sets out the requirements for a PhD at City University and explains how these requirements have been met by this submission.
- An account of the experiences that influenced my initial choice of research direction and the main thrust of the research undertaken (section 2). This account also identifies the research discipline to which the papers belongs (IS research discipline) and lists the main achievements of the individual papers.
- An analysis of the papers from three separate perspectives. This forms the core of the ‘reasoned argument’ required by the university’s regulations for the award of a PhD and includes:
 - A critical review of the research approach and methodology used in the papers (section 3), that draws on the research methodology literature from both the social sciences and the information systems disciplines
 - The main findings of the individual papers grouped into the two original lines of enquiry shown in figure 1 (section 4)
 - The contribution of the papers as a whole (section 5). This states the three principles that form the main contribution of the papers and explains their development based on the common themes that underlie and unite the papers and the relevant information systems research literature. It argues for the originality of the principles by reference to the IS research literature

and outlines the significance of the work for organisations and IS researchers.

- Conclusions and future research (section 6)

1.4 List of papers

Table 1.1: List of papers

Paper no & type	Short Name	Reference and Paper Title
1 Journal paper	Integrating IS	Brown A, (1994) 'Getting value from an integrated IS strategy', European Journal of Information Systems vol3 no 2 pp 155-165
2 Journal paper	DBM model	Lewington John, De Chernatony Leslie & Brown Ann (1996) 'Harnessing the Power of Database Marketing' Journal of Marketing Management vol 12 no 4 pp329-346
3 Journal paper	DBM construct	Lewington John, De Chernatony Leslie & Brown Ann (1998) 'Building a Scale to Assess Levels of Sophistication in Database Marketing Systems', Journal of Targeting, Measurement and Analysis for Marketing, Vol. 7, no 2 pp. 164 – 190
4 Conference paper	Valuing email	Brown A (1997) ' Valuing the soft benefits of Information Systems: the case of email' Occasional paper based on (1994) 'Appraising intangible benefit from Information Technology Investment' CUBS working Paper and in The Proceedings of the First European Conference on Evaluation of IT investment, pp 187-199
5 Conference paper	Intranet evaluation	Heather Magrill & Ann Brown (1998) 'Evaluating Intranet Applications' The Proceedings of the Fifth European Conference on the Evaluation of Information Technology, pp77-109 Reading University
6 Journal paper	Colruyt	Janson M, Brown A and Taillieu T (1997) 'Colruyt: An Organization Committed To Communication', Information Systems Journal vol 7 no 3 pp175-199
7 Occasional paper	IT for CAT	Janson M and Brown A (1998) 'Information Technology in support of Communicative Action theory: a practical investigation' occasional paper
8 Journal paper	Rationality Framework	Cecez-Kecmanovic D, Janson M, Brown A (2002) 'The Rationality Framework for a Critical Study of Information Systems' Journal of Information Technology vol 17,no 4 pp215-227
9 Journal paper	ebanking	Brown A, Remenyi D and Bajomo A (2004) 'Electronic Banking for SMEs: A case study of Fortis Bank UK' accepted for the special issue of the International Journal of Electronic Business, on Achieving Competitive Advantage in e-business, vol 2 no 4 July- August 2004

2 The experiences that shaped my research program

My academic career followed a period spent in industry working in Operational Research in the Steel Industry. My choice of research subject, developed in these papers was influenced by this early experience and by key ideas about the potential and impact of information systems that were being discussed in the early 1990s. This section outlines the main influences that gave impetus and direction to my research. It explains the importance of the subject and the initial research focus. It positions the work within the information systems research discipline and lists the key achievements of the individual papers.

2.1 The British Steel Corporation

My industrial work in Operational Research gave me direct experience of work in which the scientific method was applied. The most important project that I worked on at British Steel was on port investment. I was a member of a team charged with evaluating the proposals for several new deep-water ports. This was part of the Corporation's first attempts to develop national plans for the Steel industry. We introduced a number of new approaches including a model that calculated the costs of all ports-to-works combinations to find the minimum cost solution and the use of standard financial appraisal methods to assess the proposed investments. I was co-author of the paper that reported this work (Beattie et al, 1971).

The financial appraisal methods raised many problems when applied. The team spent considerable time in discussing the implications of our choices for the port investment decisions and gaining an understanding of the strengths and weaknesses of the technique. However the most interesting result was the corporation's unexpected rejection of some of our conclusions, as to which ports to build and which to reject. Senior management asked for extensive additional work with the model

proposing a wide range of demand and cost figures. As it became clear to the team and to our sponsor the transport director that the evaluation exercise would have little effect on the port decision, the focus of the work changed. The transport director commissioned the team to use our analytical tools to identify the best transport options for exploiting the new ports.

At the time this seemed to confirm the Operational Research Department's general experience of the relative lack of acceptance by the corporation of the results of this type of quantitative analysis. The conclusions drawn from quantitative models and analysis were given less weight than the analysts (operational researchers) felt to be appropriate.

The ports that were chosen and built were an expensive choice according to our calculations and in fact proved even more costly in practice. My analysis of the ports decision at a later date using the ideas of Nutt (2002) on decision-making confirmed, what we had concluded at the time, that the evaluation exercise had had a relatively minor effect on the actual port decisions. The most valuable contribution of the work was in evaluating how best to utilise the new ports so as to minimise transport costs. According to Nutt (2002) the key difference between poor decision making processes and good processes is the extent to which the analysis actually carried out is relevant to the problem and the use made of the results by the decision maker(s). The ports decision had many of the characteristics of a poor decision making process.

This experience established for me, both the limitations of financial investment techniques and the dominating influence of organisational context for new business investment. It focused my interest on how choices are made when embarking on a new business direction or considering a project or an investment.

2.2 City University Business School

Two work experiences at City during the 1980s and early 1990s had a major influence on my research:

1. Developments in end user computing that followed from the 'PC revolution of 1980' (Hoyle, 2003; Carlson et al, 1996)
2. The addition of a new specialist stream on the MBA course in 1989 on the subject of Information Technology Management (ITM).

Beginning in 1980, I was one of the academic members of staff encouraging the development of Personal Computing (PC) resources at the Business School. I collaborated with an academic colleague Al Russell, Senior Lecturer in Management Science, in learning about the new tool and developing its use at the Business School. The driving force behind our early work was its potential impact on our own subject of Operational Research. Later it also became clear that personal computing would be of great importance to many additional activities, both for our own personal work and for the Business School as a whole. This project included a wide range of activities - researching the technological developments of each new generation of PC, learning the new software packages, designing and setting up new student PC rooms at the School, making the case for IT support staff and developing the appropriate new teaching material. We were both members of various IT working groups and IT planning committees at both School and University level throughout this period- for example I was a member of the Senate Committee on Information Technology between 1988 and 1991.

The principle initial effect on teaching was the development of new courses in information technology skills and the redesign of existing Quantitative Methods (QM) and Operational Research (OR) courses around the new options that this tool gave us. Much of my teaching at that time was in Operational Research (application of mathematical techniques to business analysis), statistics for business and basic

quantitative methods for business. The development of packages like spread sheets and statistical packages transformed our approach to teaching QM. The power of the packages in crunching large amounts of data meant that we could teach the subject through practical application to real life data and focus on the results and their interpretation rather than on manual manipulation of the technique itself as we had been doing. The impact that PCs began to have on office work was just as profound and I was in a position to appreciate the changes brought about. My publications prior to 1990 include conference contributions on this subject (see appendix 4). By 1989 when the new MBA specialist stream in ITM was started at Cass (then City University Business School) I was ready to contribute a module on the subject of the effective management and exploitation of information systems for organisations.

The new MBA specialist stream marked the acceptance at the Business School of the existing and future importance of information systems to business. My work designing and teaching this module, contributing to the MBA Strategy course and collaborating with colleagues Leslie Willcocks and Clive Holtham convinced me that information systems had not only become a valuable tool for all organisations but also promised additional potential for the foreseeable future. Despite the arguments of Carr (2003), I hold the same view today after more than a decade of research into the impact of information systems on organisations (discussed in detail below), teaching IS/IM modules at both undergraduate and postgraduate levels and collaborating with colleagues in the technology subject group at Cass.

2.3 The debate on information systems business value achieved

Information systems investment had been growing exponentially and this was expected to continue. According to the McKinsey Global Institute (MGI) (2002) nominal investment in information technology for the US over the second half of the 1980s had grown at 9%pa. This growth accelerated in the 1990s (MGI, 2002; OECD, 2003). The

business justification for this high level of investment has been the subject of intense debate since the early 1990s.

2.3.1 Forces driving growth in information systems investment

The growth in this type of investment was driven by the high rate of development achieved by the IT vendor industry. An exponential growth in capacity of computers paralleled by a similar rate of reduction in costs (Moore, 1965, 2003; Gelsinger et al, 1998) supported the proliferation of new information systems applications and made the new computing services seem attractively priced to many organisations. Software developments of the 1980s and early 1990s had produced applications that tended to support existing jobs, for example those supporting managerial work like office automation, Decision Support Systems (DSS), Group Decision Support Systems (GDSS), Computer Supported Co-operative Work (CSCW) (Money et al, 1988; Swanson and Ramiller, 1992) and those supporting experts and professionals like Expert Systems and CAD/CAM for architects (Laudon and Laudon, 1996-2003). Forecasts of the business value to be obtained from these applications were optimistic (Leavitt and Whisler, 1958; Diebold, 1965; Keen, 1988; Scott-Morton, 1991; Tapscott and Caston, 1993).

The experience of the last decade and half has been even more extraordinary. Computing power has continued to grow at exponential rates (Moore, 2003). This been joined by an explosive expansion of communications capacity, both fixed line and wireless. Growth in investment in ICT and communications infrastructure accelerated during the 1990s (OECD, 2003; Hundley et al, 2003). Growth in electronic communications capacity drove the development of a new wave of applications. The internet generated new types of business like e-commerce and electronic communities of experts (Afuah and Tucci, 2001; Turban et al, 2004; Hagel & Singer, 1999). Wireless communications seem set to achieve a similar effect (Anderson et al, 2000). For example m-commerce (Barnett et al, 2000; Budden and Nakamoto, 2003; Benni et al, 2003) and Radio Frequency Identification

(RFID) in the retail sector (IDTechEx 2003; Parkinson, 2003; Levinson, 2003) both appear to promise much. Today (2004) forecasts of business and social impact of ICT are as high as they have ever been (Hundley et al, 2003).

2.3.2 The Debate

In the early 1990s a more critical view, as to the actual business value of information systems investment being achieved, was also gaining considerable publicity and attention by academics and practitioners. Measures of performance at both macro-economic and firm levels cast some doubt as to the overall value of all this investment in information systems and IT. Attempts to measure productivity growth were failing to find the rate of increase expected from the IT investment being made (Brynjolfsson, 1993; Strassman, 1990, Earl, 1992). Robert Solow, MIT Nobel laureate, summed up the situation in 1987 when he said, “You can see the computer age everywhere but in the productivity statistics.” (quoted in McKinsey Global Institute (MGI) report, 2002).

Managerial confidence in the business value achieved by new information systems projects was low. Surveys on information systems project performance tended to support this scepticism (Farbey et al, 1993). The results of the Standish survey of 1995 (quoted by Sauer and Cuthbertson, 2003) are typical of many. This survey estimated that over 30% of projects were abandoned with only 16% that could be regarded as successful (defined as those that met their targets on budget, schedule and scope).

There were many highly publicised large-scale information systems project failures at this time (Page et al, 1993; Collins, 1998; Keil et al, 2000). There continues to be no shortage of information systems project failures to this day (Computer Weekly, 2003, June 2004; Public Accounts Committee, 2003; National Audit Office, 2000; Transport, Local Government and the Regions Committee 1999, 2002; House of Commons Select Committee Publications, 2004; House of Commons

Works and Pensions Committee, 2004; Rumbelow, 2004). According to Paul Williams, co-author of the report on the London Ambulance Service disaster (Page et al, 1993) the failure rate for information systems projects has remained unchanged (Williams, 1999, 2004).

Recent studies have begun to detect some positive effects from information systems investment at the macro-economic level (Hitt and Brynjolfsson, 1996, Brynjolfsson, E. and Hitt, L., 1996; McKinsey Global Institute (MGI), 2002; OECD, 2003; Jorgenson, 2003). Some of these studies show great variations between sectors (McKinsey Global Institute (MGI), 2002; OECD, 2003). The recent survey carried out by Sauer and Cuthbertson (2003) also detected some improvements in information systems project management in that they found significantly fewer major project failures than had been reported in the Standish survey of 1995.

2.3.4 IS Business Value?

One of the continuing problems of performance assessment is that of measurement. The macro economic and firm measures of IT performance and information systems project statistics of failure discussed above are only a few of the many that have been proposed. Taken alone they are unlikely to capture the full range of the business effect (positive or negative, lagged, indirect) that information systems can have on organisations (Remenyi et al, 1993; Cronk, 2002; Bannister and Remenyi, 2000; Melville et al, 2004). Hence the actual state of information systems investment yield remains largely unclear.

Nonetheless there seems good reason to deduce that a significant amount of investment in information systems is disappointing in terms of business value. That this is a view held by many researchers and practitioners in information systems is made clear by the many publications offering advice to organisations on how to manage this resource (Harvard Business Review, 1999; Remenyi, 1999a and b; Marchand et al, 1999; Tapscott et al, 2000; Holmes, 2001; Turban et al,

2004). IS/IT projects are funded that never reach completion through technical failures or poor project management or business change (for example Collins, 1998; Page et al, 1993; Farbey et al 1993).

Information Systems are installed but are left unused. Markus and Keil (1994) believed that 'technically successful, but unused or underused, systems' caused enormous wastage of resources to US businesses.

Others take similar views (Orlikowsky, 1999; The McKinsey Global Institute (MGI), 2002). This could be due to poor requirements specifications (Computer Weekly, August 2004) and lack of fit to the business need or inability to integrate the new application into the business operations (Davenport, 1995; Martin et al, 1995; MGI, 2002).

It could be due to business changes like mergers and takeovers that dramatically change the organizational context. It could be due to an IT function that cannot offer the flexibility and control needed by the organisation to cope with changing business conditions (Lacity et al, 1995). It could be due to problems of implementation (Markus, 1983; Willcocks and Mark, 1989; Davenport, 1998). It could be that the organizational changes required to effectively exploit the new system cannot be achieved (for example Willcocks and Mason, 1987; Markus and Keil, 1994). As Yetton et al (1994) demonstrated innovative and effective use of new applications takes creativity, skill and an understanding of how the new tool can be integrated into the business operations.

2.4 Initial Research Focus

My initial research focus was shaped by the debate on the poor performance of information systems in organisations. I chose to investigate the earliest stage of information systems projects in which organisations made their decisions about investment proposals, with a view to finding ways to improve the process by which IS investment is made. From the start two interrelated issues held my attention - the potential of information systems to improve organisational operations and the way organisations actually made use of them.

2.4.1 IS evaluation

The evaluation methods applied to new information systems proposals seemed a natural choice of subject. From my days at British Steel, I retained some scepticism about standard financial evaluation methods and this prompted my early work on evaluation of information systems projects. My participation in the annual European Conference on Information Technology Investment Evaluation, since the first conference in 1994, has been an extremely valuable and formative experience. I have been a reviewer for every year of the conference and this has made me aware of the considerable research activity in this field. Evaluation remains both an important and an intractable problem to this day. Towards the end of the decade of the 1990s Smithson and Hirschheim (1998) noted that ‘developments in the business and organisational context, and the information systems context itself, have made information systems evaluation even more necessary and yet, even more difficult’. It is the weaknesses of current practice together with the acute practical relevance that ensures the continuing interest in the subject. Two recent issues of the European Journal of Information Systems (vol 7(3), 1998; vol 10(4), 2001) have been special issues on this subject. Evaluation methodology was the research focus of two early papers (Valuing email, intranet evaluation), but the issue of information systems business value also emerged as a key factor. All five papers in this group (including DBM model, DBM construct, ebanking) address this subject.

2.4.2 Information systems and organisations

My attendance at the IFIP WG8.2 (International Federation for Information Processing Working Group 8.2) conference of 1994 on Transforming Organizations with Information Technology (Baskerville et al, 1994) was an exciting experience that confirmed my judgement that the organisational consequences of new information systems could also have a major effect on the value of new information systems. I was respondent for the paper presented by Claudio Ciborra and met or listened to many academics, like Marius Janson, Edith Mumford, Niels

Bjorn-Anderson, Duane Truex and Ojelanki Ngwenyama working in a subject area that was to be of great importance to me. I have attended and contributed to many IFIP WG8.2 conferences since 1994.

Ngwenyama et al (1999) summed up the work of this conference in their introduction to the proceedings for 1999 as ‘responding to the challenges of demystifying the new information technologies and explicating their implications for every day organizational life and activity’. Four of the papers deal with the organisational effects of information systems (integrating IS, Colruyt, IT for CAT, Rationality framework). An early version of one paper was presented at the 1997 IFIP WG8.2 conference.

The results of the early work on evaluation led me to shift my research focus towards achieving a greater understanding of the overall potential value and impact of information systems on organisations.

2.5 Relation to the IS Research Discipline

Diversity has been a hallmark of the IS research field (Benbasat and Weber, 1996; Robey, 1996). IS researchers have used a wide variety of research methods, drawing on theories from many other reference disciplines to study an expanding range of topics and questions. This diversity has been viewed as a threat to the discipline, retarding the development of a unique identity for it and hence threatening its continued existence as a separate field of research (Benbasat and Weber, 1996; Benbasat and Zmud, 2003). Lack of a clear identity creates problems for the whole discipline. For example the boundaries between IS research and other disciplines become fuzzy. Research direction can suffer, slowing the development of knowledge within the discipline.

Diversity can also be a source of advantage (Robey, 1996). A narrow definition of the IS research field, controlled by an ‘elite corps of gatekeepers’ (Robey, 1996) could stifle research and bury the very issues of most relevance and value. The problem is that of developing a

unique resilient identity distinct from other disciplines that can also incorporate the type of work required by the dynamism of the subject matter (Davenport and Markus, 1999) and its overlap with other disciplines.

Baskerville and Myers (2002) claim that this has been achieved and that a distinctive identity now exists. Information systems research is no longer simply a consumer of concepts from other disciplines but is also a 'Reference Discipline in a Discourse with other Reference Disciplines'. They base this view on:

- The creation of a research community with a strong and growing scholarly communication network of journals, conferences (international, regional and specialist) and on-line resources
- The development of exemplar work such as that of Markus (1983) on implementation, which has been cited over 200 times according to Baskerville and Myers (2002)
- The creation of a working definition of the subject matter largely achieved via empirical analysis of journal papers
- The use made by IS researchers of the IS literature for theoretical concepts, as well as that of other disciplines
- The development of a distinctive research perspective that embraces both quantitative and qualitative methods together with a diversity of philosophical perspectives

Lee's (2001) description of the discipline quoted by Baskerville and Meyer is an elegant statement of these ideas. 'research in the information systems field examines more than just the technological system, or the just the social system, or even the two side by side; in addition it investigates the phenomena that emerge when the two interact. This embodies both a research perspective and a subject matter that differentiates the academic field of information systems from other disciplines. In this regard our field's so called "reference disciplines"

are actually poor models for our own field. They focus on the behavioural or the technological but not on the emergent socio-technical phenomena that set our field apart. For this reason, I no longer refer to them as reference disciplines but as “contributing disciplines” at best’ (Lee, 2001).

The nine papers submitted with this document conform to Baskerville and Myers’s definition. The published papers are in academic journals that belong to the recognised group of IS Journals (European Journal of Information Systems, Information Systems Journal, Journal of Information Technology, International Journal of Electronic Business) or belong journals in the recognised reference discipline for IS of marketing (Journal of Marketing Management, Journal of Targeting, Measurement and Analysis for Marketing). The papers draw on both IS and reference discipline literature. For example paper 8 (Rationality Framework) draws on the ideas of the Critical Social Theorists and paper 2 (DBM model) uses ideas from the marketing literature. Paper 5 (intranet evaluation) draws on the extensive IS literature that has developed around the subject of the evaluation of IS.

The next section, 3, describes the main research methods employed within the IS discipline and explains how the papers fits within this. All the methods used by these papers are drawn from this pool of research tools.

Since the inaugural date of the MIS Quarterly in 1977, which can perhaps be taken as the creation of a self-aware community of scholars in the IS discipline, there have been many articles on the state of the discipline. Defining the subject matter of IS has attracted a large proportion of these reviews. This has been accomplished mainly through empirical investigations of what actually is submitted to and published in recognised IS Journals (Culnan, 1987; Swanson and Ramiller, 1993; Walsham, 1995a; Orlikowski and Iacono, 2001) or through the reviews of special subject themes such as Critical IS by

Brooke (2002a) or individual IS applications like that of email by Rudy (1996). The alternative approach of developing ideas on the subject matter proper to the discipline can be seen in the work of Orlikowski and Iacono (2001) and Benbasat and Zmud (2003). Orlikowski’s call for the IS discipline to include the IS artifact as a core part of the subject matter is met for all the nine papers.

The empirical approach will clearly tend to lead to a changing set of themes as issues grow and decline in significance. Since the discipline deals with a developing range of subjects (new IS applications) whose effects are subject to business change, this will always be an important method of defining the field.

Table 2.1: Subject themes of IS research and the papers

Subjects themes found in surveys by:		Main Topics [& location of the papers]
Culnan (1987)	Swanson & Ramiller (1993)	
	CSCW	Individual IS Applications [papers 2-5, 9]
Foundations – mainly DSS	DSS	
User behaviour	Users	Aspects like user-IT relationships, user perceptions
MIS management	- Evaluation and control - Economics and strategy	Wide range of topics including: Management of IT function, IS evaluation, strategic planning, resource allocation [papers 1-9]
Social and organizational impact	Introduction and impact	IS implementation, diffusion and organisational effects [papers 1,6-8]
	ISD	All aspects of IS development process for example - project management, IS development methods

The results of the surveys by Culnan (1987), Swanson and Ramiller (1993) are shown in Table 2.1. The papers are located in three of the subject themes shown in Table 2.1; IS applications, MIS management and organisational impact. The topics to which the papers contribute include the specific applications of email, intranet applications, DBM, and e-business; IS evaluation; the social and organizational consequences of information technology and critical IS.

2.6 Key achievements of the nine papers

Key achievements include:

- Additional knowledge about the potential of individual information systems applications:
 - ❖ To deliver a wide range of benefits to organisations, as a result of in depth analysis of the potential of four applications – Data Base Marketing (DBM), email, Intranet applications and Internet banking
 - ❖ To create or destroy business value, from an analysis of the effect of business context on the business value obtained in various case studies (for example Fortis Bank in paper 9 on ebanking)
- An enhanced understanding of the practical and theoretical problems of information systems evaluation:
 - ❖ Based on the results of the attempts to assess benefits and IT business value
 - ❖ Based on the difficulties encountered in the development of two separate evaluation methodologies (valuing email and intranet evaluation).
- The development of two original frameworks that enables organisations to critically assess how their organisational routines, structures and attitudes can reduce or enhance the value obtained from information systems (integrating IS and Rationality framework).

- An enhanced understanding of how the choice of information systems and the use to which they are put is affected by existing organisational structures and norms, from the analysis of one case company, Colruyt.

3 Research Methodology

The papers include both theoretical and empirical work and make use of a range of research methods and approaches. This is consistent with the research focus and with the research perspective identified as distinctive to IS research outlined in 2.5 above. The research aim - achieving greater understanding of the effects of new information systems on organisations, is concerned with many types of applications offering differing potential benefits and costs and with the range of organisational impacts that these applications can have. No one research approach is necessarily appropriate for such a set of issues.

For IS researchers, interested in questions of organisational impact, social research methods are of great relevance (Remenyi et al, 1998; Myers, 2004). Many of the ideas developed in the social sciences have had a major impact on the work of IS researchers and on these papers. The next subsection discusses information systems research and its selection of social science methods.

The research question determines the nature, potential value and direction of an enquiry. The choice of and execution of the chosen research methodology determines the quality of results achieved. In the remaining subsections these questions are assessed for each paper. The research methods used are identified together with the reasons that determined each choice. Finally an assessment of the rigor of the empirical work is made.

3.1 Social Science research methods and information systems

Social science research has developed a variety of differing views on the characteristics and nature of the social world (ontology) and what we can know about it (epistemology) (Denzin and Lincoln, 2000). This has spawned a number of differing research paradigms (Myers, 2004; Bryman 2004; Lincoln and Guba, 2000; Deetz, 1996) and research strategies or designs (Bryman, 2004). It offers a wide choice of methods and approaches for empirical research work (Bryman, 2004).

In discussing Burrell and Morgan's four paradigm grid for sociological paradigms, Deetz (1996) argues that 'their conceptions continue to foster less interesting and productive conflicts and developments than are possible'. He is less concerned with the representational accuracy of the grid but with the usefulness of the proposed paradigms that come from the two sets of dimensions offered by the grid. This captures the most important aspect of the current situation in both information systems and social science research, that differing paradigms research 'differing phenomena for different reasons' (Deetz, 1996). Deetz goes on to offer his own two dimensions, creating an alternative set of four paradigms (which he calls discourses). From this perspective, the debate should be about developing paradigms that allow us to pose and investigate important research questions which will in turn produce insightful knowledge and understanding of the key issues for information systems. It could be argued that the emergence of interpretivism in IS research (Walsham, 1995a) owes much to the practical relevance of the questions that can be posed within this tradition and the success of the research methods and modes of analysis that have been developed within it. Trauth and Jessup (2000) demonstrated the value to be obtained from taking different philosophical perspectives in their analysis of an example use of a Group Support System (GSS) to support a group discussion. They analyse the discussions from two perspectives using different analysis techniques. Their work shows how the differing perspectives generate different research questions. The traditional positivist methods of

content analysis sought to answer the question of how effective the GSS had been in enabling groups to work together on the issue under discussion. The interpretivist approach sought to probe the quality of the discussions. The two analyses gave different but equally valuable and valid types of understanding of the GSS discussion. This example supports Lee's (1991) argument that there is value in combining positivist and interpretivist approaches in organizational research. Social Science researchers are engaged in a far more extensive debate on philosophical paradigms than IS researchers. Revisions and additional ideas seem a regular occurrence (Lincoln and Guba, 2000; Denzin and Lincoln, 2000). IS researchers have tended to appropriate the philosophical ideas developed in social science. In their survey of information systems empirical papers, Orlikowski and Baroudi (1991) identified three philosophical perspectives which they considered valid and useful approaches for IS research. These were positivist, interpretivist and critical. These perspectives have since achieved wide spread theoretical acceptance by the IS research community (Myers, 2004). However surveys of published IS journal papers have repeatedly attested to the dominance of the positivist paradigm (Orlikowski and Baroudi, 1991; Dube and Pare, 2003; Chen and Hirschheim, 2004). The three paradigms are discussed in greater detail below (in 3.5).

Bryman (2004) distinguishes between research design and research method. Research design is defined as 'a framework for the collection and analysis of data'. The choice of design reflects the nature of the research questions being asked and the type of outcome looked for. Bryman (2004) proposes five different types of research design for social science research of which three are of most significance for IS research: experimental design, cross-sectional or survey design and case study design. The survey of published information systems papers carried out by Orlikowski and Baroudi (1991) found that cross-sectional and survey design was the dominant approach taken for empirical work. Experimental design (laboratory and field experiment in the survey) was the second most used design. However practical

problems inherent in managing controlled interventions render this design of less potential use for organisational research (Remenyi and Williams, 1995). Case study came third being used for a significant minority of papers (13.5%) This method is now a well respected research design for IS research (Darke et al, 1998; Walsham, 1993; Walsham 1995b; Myers 2004), Three recent surveys of information systems journal publications over the decade of the 1990s, found that the incidence of case papers varied between 15% of published papers (Dubé and Paré, 2003), 27% (Mingers, 2003).and 36% (Chen and Hirschheim. 2004). These results suggest that there is a trend towards increasing use of case methods.

Bryman defines research method as a technique for collecting data (for example interviews, survey data). There are two basic types of data collection qualitative (based on verbal data) and quantitative (based on numerical data). The differences between research based on qualitative data and that based on quantitative data has seemed of great significance to many social researchers (Bryman, 2004). Quantitative data is associated with the scientific approach to research. Early social researchers sought to apply the methods so successfully developed for the hard sciences to social research. Continuing attempts have been made to apply the standards developed for the hard sciences to the social sciences and the results can be seen in the positivist philosophical tradition (Lee, 1989; Eisenhardt, 1989; Yin, 1994). The perception that quantitative work could only be applied to a narrow arena of issues led to an increased interest in other methods. Many pressing questions of importance to social science researchers (and IS researchers) could not be investigated using numerical data alone. Quantitative methods sought to measure social phenomena rather than understand people and their actions.

Qualitative methods were developed in the social sciences 'for the study of human group life' (Denzin and Lincoln, 2000). They were developed 'to enable the study of social and cultural phenomena'

(Myers, 2004). Qualitative research is now an important source of methods for social and IS research (Denzin and Lincoln, 2000; Bryman, 2004; Lee et al, 1997; Markus and Lee, 1999; Trauth, 2001a; Myers and Avison, 2002; Myers, 2004). The sharpest distinction between quantitative and qualitative work can be seen in the approach taken at the analysis stage. For numerical work, a clear distinction can be made between data collection and data analysis. For qualitative researchers collection, analysis, interpretation and reporting are often carried on in parallel and the results of one activity can alter the direction of the others. However the type of data is no longer automatically considered as the determining factor in the research design or research method. A mixed approach that combines both quantitative and qualitative data and uses more than one research method is now fully accepted for IS research (Cavaye, 1996; Markus, 1997; Myers, 1999; Myers, 2004), but in fact little used (Chen and Hirschheim, 2004). The main factors influencing the choice of qualitative methods according to Trauth (2001b) include not only the nature of the research question but also the degree of uncertainty (and presumably accessibility of data) and the researchers assumptions about the world (philosophical perspective) and skills.

3.2 Research approach of each paper

Table 3.1 shows the research approach of each paper. Both theoretical and empirical approaches have been employed. All three philosophical perspectives appropriated by IS researchers from the social sciences are represented. Two of the three research designs commonly used in IS research for empirical work have been used (cross sectional statistical design and case study). Case studies predominate and these are based to a large extent on qualitative data.

Table 3.1: Research Approach of the Papers

Paper	Short name	Theoretical or Empirical (including Research Strategy and Philosophical Perspective)
1	Integrating IS	Empirical; case study design (Qualitative data) from a Positivist perspective
2	DBM Model	Theoretical
3	DBM construct	Empirical; quantitative developing a construct from a positivist perspective
4	Valuing email	Empirical; case study design (Qualitative data) from an Positivist perspective
5	Intranet evaluation	Theoretical
6	Colruyt	Empirical; case study design (Qualitative and Quantitative data) with an Interpretivist perspective
7	IT for CAT	Empirical; case study (Qualitative data) design from a critical perspective
8	Rationality Framework	Empirical; case study (Qualitative data) design from a critical perspective
9	Ebanking	Empirical; case study (Qualitative data) design from a positivist perspective

3.3 Theoretical and Quantitative Papers (DBM model and construct, intranet evaluation)

The research theorist draws on the ideas, theories, empirical results obtained by others to ‘construct a new or different view of the situation, which sometimes may be regarded as a new theory’ (Remenyi et al, 1998). In Lee and Baskerville’s (2003) framework for Generalizing, this is the TT type - generalising from concepts to theory. The survey of IS journal papers by Chen and Hirschheim (2004) showed that non-empirical papers were the majority at the start of the 1990s. The trend is towards empirical work but non-empirical papers still form 40% of all papers. Two of the research papers match this description, DBM model and Intranet evaluation. Lee and Baskerville (2003) argue that no criteria yet exist by which to assess the capability of such theories to be generalized. However there are a number of ways by which the value of such ideas can be judged: for example credibility of the

arguments, plausibility of the results, value ascribed by the academic community (Walsham, 1995a), predictive power and use made of the ideas. Zuboff's (1988) concept of automating and informing is an example of an immensely successful idea that has become core to the way IS academic and practitioners think about information systems. It has been quoted in academic journal papers, practitioner publications and within organisations, achieving value through wide spread use.

The model of a Database Marketing (DBM) system developed in paper 2 (DBM model) describes the three key elements that make up an effective DBM system. The model can be used by any organisation. Companies with an interest in improving their customer relationship management can use it to identify the gaps in their current operations. The model is highly credible. It is well grounded in existing literature on customer relationship marketing and in data base systems and analytical and modelling methods of data analysis. It needs to be tested empirically through application to organisational examples of DBM systems. Paper 3 (DBM construct) develops one approach. In this paper, the concept of data base marketing system sophistication, developed in paper 2, is operationalised into a valid, reliable construct using classical quantitative statistical methods in the positivist tradition (Hair et al, 2003). This scale is built using data collected from one industry only, the catalogue industry in the US. The result is a scale that can be used to assess DBM systems within the catalogue industry. However the process of building the scale can be applied to create appropriate scales for other industries. The construct is limited to the catalogue industry. The value of the work would be enhanced through the use of the scale to assess individual companies systems within the industry and through the development of measures for other industries.

The paper on Intranet evaluation created a credible evaluation methodology. It was well grounded in existing theoretical ideas of the characteristics of intranets and drew on key existing proposals for information systems evaluation methodology. The resulting

methodology addressed the issues of concern that had been raised by many commentators. The proposed evaluation methodology is applicable to other intranet installations. The process by which the methodology was built is also of interest. This is an approach that would be applicable for most evaluation exercises that required an application specific methodology. There are several factors that limit the value of this work. The methodology was developed and tried out in only one case example. How effective would this approach be for an intranet in another company perhaps in a different industry? The assessment of the effectiveness of the methodology was subjective – only the participants were asked for their views on value. Moreover this assessment was made as the evaluation was carried out. The researchers had no opportunity to investigate how far the recommendations made were implemented and if so whether they proved robust. No post implementation evaluation could be carried out to test the accuracy and relevance of the results. The systematic application of the methodology in many different situations, monitored over a period of time that would allow the assessment of effects from a representative group of stakeholders would have immeasurably improved the value of the work. Nonetheless the development process gives the methodology plausibility. Some of the reasons for the lack of recognition of these types of methodologies are discussed in section 5.2 below.

3.4 Choice of Case study strategy

Case study research design is the main type of method used for the empirical work in these papers. There are five individual case companies and these form the basis of the empirical element of six of the papers. Paper 1 on integrating IS describes 2 cases (Amerada Hess, Business Unit responsible for technical building standards). Paper 4 (Valuing email) describes a retail company as it installs email. The Colruyt company introduced in paper 6 is also drawn on for papers 7 and 8 (IT for CAT and Rationality framework). Fortis bank is the case described in the last paper (ebanking). This subsection explains the choice of case study methods.

A case study is 'an empirical study that investigates a contemporary phenomenon within a real life context, especially when the boundaries between phenomenon and context are not clearly evident' (Yin, 1994, 2003) and 'no experimental control or manipulation is used' (Benbasat et al, 1987). Case studies rely on multiple sources of data such as for example interviews, documents and observation (Benbasat et al, 1987; Yin, 1994, 2003; Darke et al 1998). Data can be quantitative or qualitative or a combination of both. The qualitative data obtained from interviews and documents for example can be subjected to quantitative analysis through the use of measures, like content analysis (Bryman, 2004; Trauth and Jessup, 2000). The case information may include data on many variables that have an influence on the contextual environment (Benbasat et al, 1987; Remenyi & Williams, 1995). The problem for the researcher is to identify those variables of significance to the phenomenon under investigation. The researcher seeks an in-depth understanding of the interaction between phenomenon and context.

This definition fits the empirical work of six of the papers (Integrating IS, Valuing email, Colruyt, IT for CAT, Rationality Framework and ebanking). All deal with contemporary phenomena within an organisational setting. For example in paper 1 (integrating IS), the phenomenon under investigation is the requirements for successful integration of information collected and stored electronically within organisations. The case context involves two case examples in which organisational units are seeking to implement integration. In paper 7 the phenomenon being investigated is the role of information systems with respect to Communicative Action Theory (CAT). The context is the Colruyt Company over an extended period of years. This is a particularly clear example of how the phenomenon (use of information systems to help realise the ideals of CAT) could not be analysed without an in depth description of important contextual variables as for example the company's culture. For most of the cases, the data

collected is qualitative but the case study on the Colruyt company described in paper 6, also includes some quantitative measures on the financial performance of the company.

Case study design has a particular significance for IS research. Benbasat et al (1987) suggested that it 'is particularly appropriate for problems in which research and theory are at their early, formative stages, and [also for] sticky, practice based problems where the experiences of actors are important and the context of action is critical'. They argued that the problems posed by Information Systems development, implementation and use within organisations fit those conditions well. At that time (the late 1980s) Information Technology was undergoing rapid development creating new IS applications that organisations attempted to exploit through trial and error. Few previous studies were available and little theory as to what worked. Case methods offered a way to study practitioner experience and formalise these into theory. These arguments continue to apply today. There is still little established theory (Remenyi and Williams, 1995) and technology continues to develop creating new services and topics at a rapid rate. The cases conform to this. They describe either the introduction of new information systems applications (Amerada Hess, Business Unit responsible for technical building standards, the retail company, Fortis bank) or a longitudinal study focusing on both introduction and exploitation of information systems applications (Colruyt company).

Many of the research questions of interest to IS researchers and practitioners deal with managerial and organisational issues raised by contemporary information systems developments where the context interacts with innovation (Benbasat et al, 1987). These are exactly the types of research enquiry for which case study design is well suited. The researcher has little control over the environment and the research questions focus on 'how and why' (Yin, 1994,2003; Benbasat et al, 1987). For Benbasat et al (1987) the research aims are 'to understand

the complexity of the processes taking place'. For Yin (1994) case study methods can be used to explain the phenomena under investigation. Case methods can be used to provide a rich description of social phenomena generating knowledge of the particular (Walsham, 1993; Macpherson et al, 2000). The case study is flexible, producing diverse research outcomes (Darke et al, 1998). Case studies can be exploratory, descriptive or explanatory (Yin, 1994,2003). They can be used to generate and/or test theory (Eisenhardt, 1989). They can be intrinsic, instrumental (providing insight into an issue or situation of concern) or collective - based on more than one site (Stake, 2000). Remenyi et al (2004) consider that case studies are an appropriate research strategy in two circumstances - as a framework for collecting evidence about a phenomena of interest, or as research objective in its own right.

The research questions of the six papers that include case studies (Integrating IS, Valuing email, Colruyt, IT for CAT, Rationality Framework and ebanking) are of this type. All deal with contemporary problems relating to the introduction and use of information systems in organisations. The issues are managerial. The intent varies between papers. For example the ebanking paper generates theory in the process of seeking to answer the question as to why internet banking for SMEs did not prove to be the predicted immediate strategic success for early adopting banks. Four papers (Integrating IS, valuing email and Rationality framework, ebanking) conform to Remenyi et al's (2004) framework classification using case examples to investigate particular phenomena. The remaining two (Colruyt, IT for CAT) focus on the case company, Colruyt conforming to the research objective classification.

Qualitative research methodology has spawned a heterogeneous range of ideas and methods (Bryman, 2004; Markus, 1997), which defy simple classification. The close relationship between data collection, analysis, interpretation and reporting blurs the distinction between

research design and research methods. Myers (2004) distinguishes between case methods and three other types of qualitative research methods that he considers of potential value to IS researchers. These are Action Research, Ethnography and Grounded Theory. None of these methods were used in the papers.

The key differences between Ethnography and traditional case study methods are the process by which data is gathered (participant observation) and the research aims (Bryman, 2004; Myers, 1999). Researchers immerse themselves in the life of the people they study so as to gain an understanding and appreciation of the culture of the social group of interest. Ethnographers aim at in-depth understanding of the information systems phenomena and its interaction with people and their organisation. The intensity of the scrutiny leads to a relative lack of breadth and is time consuming both for data collection and analysis (Myers, 1999). A practical issue is the requirement for extended access to or membership of the social group under scrutiny. Zuboff's work (1988) into the dual potential of information systems to automate work or to informate workers illustrates both the power and the problems of this type of research. This is a method that might have been applied at the Colruyt company (reported in 3 papers; Colruyt, IT for CAT, Rationality Framework) to investigate in greater depth the response of members of the company to the policies for information systems development and use. However the extended access required for even the most limited research objective made it impractical.

Bryman (2004) introduces grounded theory, as a method for the analysis of qualitative data. This is a technique that is explicitly aimed at generating new theory inductively from the data. It is not the method of data collection, but the way in which it is analysed that sets this method apart from case and ethnography. Coding of data a central process in grounded theory. Data is broken down into basic components, which are then used for interpretation. New concepts that emerge from this interpretation generate further data collection and new

codes. For grounded theory there is a continuous interplay between data collection, analysis and interpretation (Charmaz, 2000). This method raises the practical problems of access to the research site for repeated data collection. Interpretation and writing up also present problems due to the large amount of data collected and the skill required to create order from it. Orlikowski's (1993) paper comparing the adoption of CASE development tools within two companies illustrates the complexities of this approach. None of the case sites in the papers offered much opportunity for iterating between data and interpretation and hence grounded theory was not an option.

Action Research is of particular interest to both organizational scientists and information systems researchers (Eden and Huxham, 1996; Carr & Kemmis, 1986; Avison et al, 1999; Baskerville and Wood-Harper, 1996,1998; Baskerville and Myers, 2004). Action researchers seek solutions of immediate practical relevance to existing problems while simultaneously expanding scientific knowledge (Eden and Huxham, 1996; Avison, et al., 1999). This is achieved through the collaboration of researchers and practitioners. For Eden and Huxham (1996) the most significant characteristic of action research is that these two groups collaborate on a subject of great practical importance to the practitioners and that the expectation of both groups is that organizational change will be enacted based on the results of the work carried out. This emphasis on action is one of the great attractions of action research. The relevance of research carried out by more conventional research methods has come under increasingly harsh criticism especially for those subject domains that are concerned with the social world (Greenwood and Levin, 2000; Benbasat and Zmud, 1999). Action Research, by emphasising the practical outcome seems to address some of the concerns expressed (Baburoglu and Ravn, 1992; Greenwood and Levin, 2000; Baskerville and Wood-Harper, 1996). Lee and Baskerville (2003) consider that Action Research may be a way to manage the theoretical problems inherent in generalising information systems theory to practice.

Action Research fits more comfortably within the experimental research design. It embraces change. Other research methods seek to study and understand existing organisational and social structures. The action researcher seeks to create organisational change and study the results (Baburoglu and Ravn, 1992; Brown et al, 2003). This is an interventionist approach that encourages social experimentation. It is a method of particular relevance to fluid situations that are subject to continuous development and change. This is exactly the situation of most organisations and their use of IS. Hence Action Research is a method that holds great promise for future research into the organisational impact of IS. The decade long project by a hospital's management in obtaining the co-operation of physicians 'to reduce clinical procedural costs and adopt practices benchmarked to produce better outcomes' reported by Kohli and Kettinger (2004) gives an extra-ordinarily powerful example of the value of this approach when successful. The hospital management achieved not only the immediate improvement in clinical practice that they had aimed for, but also altered the process by which physicians regulated themselves. The researchers used the results of the two interventions carried out over the decade to refine ideas about the applicability of the two theories (agency theory and the Clan-based concertive control) on which the interventions had been based. The major problems with this technique are the time it requires to achieve results and the practical problem of obtaining the collaboration of a suitable organisation at a point of change.

The case method was an appropriate choice for the six papers. All dealt with research questions for which the organisational or business context was an important factor. The cases caught significant events (from an information systems view) and were accessible. Two case examples (Amerada Hess, Business Unit responsible for technical building standards) came through my other work. In two cases Cass students were employees and they provided access and continuing support

(retail company and Fortis bank). The Colruyt company case was introduced to me by my co-author Marius Janson. We found the company of extra-ordinary interest because of its discussion of cultural norms and explicit policy of managing its operations and the company life through the use of information systems.

3.5 Rigor for Case Studies

The case study method is accepted as a valid research strategy for all three of the epistemological or philosophical perspectives taken in these papers (Klein and Myers, 1999; Orlikowski and Baroudi, 1991; Myers, 2004). However case research methods like other qualitative methods have raised serious concerns. At the heart of these concerns is the changing role and increased responsibilities of the researcher.

Traditional scientific methods have worked for the natural sciences, despite the shaky foundations of scientific method on for example the process of induction (Lee & Baskerville, 2003; Chalmers, 1978).

Scientists continued to apply a method that was enormously successful in developing descriptions for what seemed to be a relatively stable physical world. The attempt to describe the social world has raised research questions of a different nature to those that had been posed by early science. The social world is potentially unstable, with many possible realities. It is complex involving many variables both perceived, hypothesised and unknown. The most significant factors are people and their interaction with each other. Research questions tend to raise issues for which the boundaries are unclear. The subjects for study, such as organisational and social activities live only once and are potentially unique. Traditional quantitative measures and models are useful for a narrow range of these issues. The qualitative methods developed for these problems place a heavy emphasis on the individual contribution and choices of the researcher. The scientific ideal of the detached observer is no longer the most appropriate role. These methods often did not or could not adhere to the traditional standards established for scientific method. This has had the effect of renewing interest in the relevance of the scientific method for methods like case

study (Lee, 1989; Lee and Baskerville, 2003). In a sense the questions raised by the social sciences have highlighted the limitations of scientific method, but leave pressing questions for the execution of qualitative work - of what constitutes good practice and what sort of value to ascribe to the results obtained.

Case study work is difficult (Yin, 1994; Dubē and Parē, 2003; Darke et al, 1998). The wide range of research questions and situations to which it can be applied attest to the flexibility of the method but also leave the researcher with many difficult choices. Methodological rigor is important under such conditions, to improve the quality of work carried out and to gain greater acceptance of the results. There has been a stream of work throughout the 1990s developing good practice for IS case research (Benbasat et al, 1987; Yin, 1994,2003; Eisenhardt, 1989; Cavaye, 1997; Darke et al, 1998; Walsham, 1993, 1995b; Lee, 1989; Klein and Myers, 1999; Lee and Baskerville, 2003; Remenyi et al, 2004). This work has made a number of proposals for meeting the standards through good practice in terms of the steps to be carried out for a research project. These proposals are far from simple to implement. The researcher will need to fit the research question to a design that can be implemented. Practical problems include access to organisations and key staff and decisions like the scope of the investigation in terms of the amount and type of data to be collected, the number of sites and/or cases to include and time period to cover. Data analysis and interpretation for example depend on the skills, judgement and experience of the researcher.

Remenyi et al (2004) propose 10 characteristics that should be demonstrated by a case study to qualify as high quality. Table 3.2 shows the results of evaluating the five cases using these criteria. This shows that case quality improves over time. The cases fulfil most of the criteria. Quality would be improved through greater rigor in data collection methods.

There are standards important for all case study work but it seems that there are also issues and objectives of varying significance to work carried out within the three philosophical perspectives. The standards to be applied will differ as the philosophical perspective from which the work is carried out changes. This is discussed below. Few published IS articles have fully met the criteria proposed for good quality work (Dubē and Parē, 2003; Lee and Baskerville, 2003; Klein and Myers, 1999).

Table 3.2: Evaluation of Case Quality: (based on Remenyi et al, 2004)

Paper	1	4	6	7	8	9
Classification	Fr.wrk	Fr.wrk	Res. obj	Res obj.	Fr.wrk	Fr.wrk
Case(s)	Amerada Hess, Business Unit	Retail ltd	Colru yt	Colruyt	Colruyt	Fortis bank
Characteristic						
Story	yes	yes	yes	yes	yes	yes
Multiple sources of evidence	two	two	yes	yes	yes	Yes
Triangulation	no	no	Some issues	Some issues	Some issues	Some issues
Meaning in context	yes	yes	yes	yes	yes	yes
In depth on central issue; broad on context	yes	yes	yes	yes	yes	yes
Organisation, situation or context	Sit.	Sit.	Org.	Org.	Sit.	context
Bounded	Yes	Yes	Yes	Yes	Yes	Yes
Reasonable range	Yes	Yes	Yes	Yes	Yes	Yes
Mainly Qualitative data	Yes	Yes	Yes	Yes	Yes	Yes
Protocol	no	no	Some issues	Some issues	Some issues	Some issues

From an examination of the research goals, it is clear that three cases take a positivist view of the world, one interpretivist and two critical. This adoption of differing perspectives is consistent with the overall research aim. Each perspective allows the different type of questions

that are relevant to the issue of organisational and business context of information systems. Each set of papers grouped by philosophical perspective, is assessed below for rigor of approach.

3.5.1 Positivist papers - Integrating IS (1994), Valuing email (1997) and ebanking (2004)

Positivists assume that there is an objective reality that can be described, independent of the researcher. The ideal for such work is the discovery of universal or general laws through the application of the methods of the natural sciences (Lee and Baskerville, 2003). These type of studies attempt to increase the predictive understanding of the phenomena under investigation (Orlikowski and Baroudi, 1991). All three papers, Integrating IS, Valuing email and ebanking conform to this perspective. A fundamental assumption for these papers is that the existing factual circumstances of the case are the most important issues in their development of and use of the information systems applications under study. Paper 4 (Valuing email) is exploratory while the remaining two papers are explanatory (Yin, 1994). Valuing email draws extensively on the literature on email with two purposes – to create a comprehensive description of email intangible effects and to identify the problems of incorporating these effects into an evaluation exercise. The case (Retail Ltd) is used along with other published cases to support this aim. The explanatory papers seek to develop causal relationships that increase predictive understanding. The paper on integrating IS develops a theory on the requirements for the move to effective integration information systems across an organisation and uses two cases to support the theory and illustrate its value in use. The ebanking paper tests banking industry ideas on internet banking. The case is a factual account of the results of one bank's attempt at internet banking for SMEs. The case analysis led to a rejection of the original hypothesis.

There is now a de facto standard for evaluating case study work carried out in the positivist tradition (Benbasat, 1987; Lee, 1989; Eisenhardt, 1989; Yin, 1994,2003). This tradition acknowledges the importance of

the three criteria of reliability, replication and validity (internal for causality, external for generalizability). Durē and Parē (2003) used these ideas to develop a detailed set of attributes for assessing information systems positivist case studies methodology. From their survey of published information systems case papers over the 1990s, they found only modest progress in some specific attributes, with many instances in which IS researchers ‘ignored or largely ignored the guidelines provided by experienced methodologists’. Their approach is used to evaluate the work of the two papers Integrating IS and ebanking (see Tables 3.3 and 3.4).

The analysis of the methodology used in the cases in Table 3.3, shows that there is an improvement in rigor between the first paper (Integrating IS) and the last one (ebanking). More of the attributes of good practice are adhered to in the last paper – for example in data collection methods and their reporting (Table 3.4). However as Dubē and Parē (2003) found for other case study work, better documentation of data collection and analysis would have improved both papers. The case of Retail Ltd in Valuing email was carried out in a similar way to the two cases for Integrating IS and is subject to similar criticisms

The difference in the quality of the research aim between papers is also marked. The paper on integrating IS had a relatively general research aim and hence comes to weaker conclusions. A more effective approach would test the theory more rigorously. Two questions arise from this work – how successful were the case companies in reaping value from integration and how comprehensive is the theory. Are there other factors that affect the move from level 1 to level 2 on Venkatramen’s framework (Venkatramen, 1991) A longitudinal case example over the period of time required to make the move from level 1 to level 2 would test the theory more fully. The theory predicts issues that need managing to achieve effective integration and this can be generalised to similar organisational situations. The ebanking paper had

**Table 3.3: Evaluation of the case work – Research Design
(based on Dubē and Parē, 2003)**

Attributes of good practice: Research Design [criteria]	Paper 1, Integrating IS, 1994	Paper 9, ebanking, 2004
Clear research question [validity]	Clear but limited; dealing with a why question	Clear; dealing with a why question
Theory of interest [internal validity]	Yes: Developed in paper	Yes: Testing and refinement
Predictions from theory [internal validity]	Yes	Yes
Rival theories [validity]	No	No
Multiple-case design [validity]	Yes: selection of 2 cases for differing stage & experience of process under investigation	No:
Nature of single case design [internal validity]	No	Critical: Chosen to test original theory
Replication logic in multiple case design	Theoretical	N/r
Unit of analysis [validity]	Yes: internal integration within an organisational unit	Yes: Internet banking for SMEs
Pilot case	No	No
Context of case study [reliability and validity]	Information on business activity and IS application; case period not specified; not longitudinal; on-going data	Information on bank and IT history; case period specified 2000-2003; small amount of longitudinal data; both retrospective and on-going data
Team based research [reliability]	No	Yes
Different roles for multiple investigators [reliability]	N/r	Yes: collaboration in analysis and interpretation; separate responsibilities for data collection

Table 3.4: Evaluation of the case work – Data Collection and Analysis (based on Dubē and Parē, 2003)

Attributes of good practice:	Paper 1, Integrating IS, 1994	Paper 9, ebanking, 2004
<i>Data Collection</i>		
Elucidation of data collection process [reliability, replication, validity]	Little information	Moderate: major source co-author in charge of case project and documents, little detail on for example interviewees
Multiple data collection methods; Mix of qualitative and quantitative methods [reliability]	No: Interviews only source	Yes: Interviews, reports, internal documents and direct observation (not give in paper), published information and reports; some quantitative data
Triangulation [reliability]	No	Implicit from multiple sources
Protocol [reliability, replication]	No	Some information
Database [reliability, replication]	Not mentioned in paper	Not mentioned in paper but raw materials available; early analyses
<i>Data Analysis</i>		
Elucidation of analysis process [reliability]	Brief description	Brief description
Field notes, coding, data displays [replication; external validity]	Field notes (not mentioned in paper), no analysis tools	Field notes (not mentioned in paper); coding n/r; longitudinal aspects led to some cycling between data collection and analysis
Chain of evidence [internal validity]	Not clear	Reasonably Clear
Empirical testing & Time series analysis [internal validity]	Empirical investigation of theory predictions	Textual in depth investigation of original hypothesis, tested against actual events
Cross case comparisons [internal validity]	Yes	N/r
Use of natural controls [internal validity]	N/r	N/r
Quotes [reliability]	None	Few
project reviews [reliability]	None	Regular reviews by co-author in charge of case project
Comparison with literature [validity]	None	Similar experience of a banking case (Nigeria) quoted

a clearer more focused aim that has led to a more precise conclusion of significant practical value. The research aim actually changed during the data collection period from attempting to confirm the original hypothesis to an explanation of its rejection. The paper develops a middle-range theory, that is an ‘explanation of observed regularities’ (Bryman, 2004). In Lee and Baskerville’s (2003) framework for Generalizing, this is the ET type - generalising. from description to theory. It can be generalized for the banking industry in two ways – greater understanding of the potential range of benefits to be gained from internet banking and the dependence on business context described in the model of adoption for a bank to obtain value. Additional case examples from other banks could be used to test the model of adoption.

3.5.2 Interpretivist paper – Colruyt (1997)

Interpretivism has to some extent been defined through its difference to Positivism. To an interpretivist the subject to be studied is the social world. This differs profoundly from the natural world in that it is constructed by the interaction of many individual people and social groups, all of whom are unique. Social phenomena are created by humans and can be understood only through the interpretation of human communications (Orlikowski and Baroudi, 1991; Deetz, 1996; Bryman, 2004). The goals of positivism, the discovery of universal laws are not the goals of interpretivism and the methods of natural science are not the most appropriate. To an interpretivist, positivism constrains the field of study within narrow limits. Interpretive methods are “aimed at producing an understanding of the context of the information system, and the process whereby the information system influences and is influenced by the context” (Walsham 1993). Generalizability is an important aim but it takes a different form. The researcher seeks to formulate theory that not only explains what has been observed but could also help other researchers investigating a similar setting (Lee and Baskerville, 2003). Walsham (1995b) proposes

four types of generalization. A case can be used to develop concepts, a theory, specific implications or a rich insight.

Paper 6 (Colruyt) clearly conforms to the interpretivist philosophy. The intent is to describe and understand phenomenon within the underlying situation. The case is focused on understanding the interaction between the way the Colruyt company chose to manage and use information systems and the life of the organisation, its structure and the people working for it. The case offers a rich insight into the company and its use of information systems.

The interpretivist perspective changes our ideas about rigor. The people and social groupings that are the subject of study assign their own, often contradictory, meaning to the phenomena under scrutiny. Their subjective reality is the object of study for the interpretivist researcher, who attempts to understand and interpret it. The theories created by the researcher are therefore ‘interpretations of interpretations’ (Lee and Baskerville, 2003) and reflect his or her culture and concerns. There may be many social realities constantly changing and the researcher is unlikely to be able to describe all. Hence the researcher cannot help but have a large effect on the study and its findings. The criteria for rigor that apply to positivist research do not translate well to these conditions and research aims (Bryman, 2004; Stake, 1995; Klein and Myers, 1999). Alternative criteria like ‘trustworthiness’ (Bryman, 2004) have been proposed. But it is the conduct of empirical work that has attracted most discussion.

The following draws on the ideas of Walsham (1995b), Stake (1995), Klein and Myers (1999); Macpherson et al (2000) and Bryman (2004). Good practice for interpretivist research differs most from positivism in

- The nature of the research question
- The importance assigned to the type and quality of reporting,

- The significance of the choices made for the design and execution of data collection and analysis
- The emphasis on the clarity and transparency required in describing the choices made for data collection, validation and analysis techniques
- The inclusion of a description of the role of the researcher

If there are many possible realities, the importance ascribed to documenting all the choices made, with reasons becomes clear. A detailed description of the data collection approach taken, validation techniques like triangulation, an audit trail storing all information collected, are some of the measures recommended. Reporting that includes a thick description of the case, wider context and relevant history provides a ‘consultable record’ (Walsham, 1995b) that can be re-interpreted at a later date. The research question is key (Stake, 1995) to establishing the direction of the study and the nature of the reporting. The effect of the researcher is so important that some description of the researcher role (impersonal to participant observer) together with information on for example theory used to guide the whole project and the interactions between researcher and case actors is also considered important.

For the Colruyt case (paper 6) the research methods and data sources are well described and the type of case study explicitly stated. Multiple data sources and actor views are used. There is no reference to an audit trail, but it implied that the data is available for inspection. A thick description of the case company, its history and business context is given. The interpretivist study by Walsham and Waema (1994) illustrates the use of theory to guide data collection and interpretation. The study specifies that Pettigrew’s theory of change and existing theories as to Strategic information systems planning are used to guide investigation and selection of data for analysis and interpretation. For the Colruyt paper, the research goals together with the philosophy of the key actor (Managing Director and founder) as to the type of social

conditions he wished to create for the company were described and used to guide the data collection and interpretation. The analysis was carried out using the standard categories of business functions. The researcher role is not discussed but the paper was the result of a close collaboration between the lead author, Marius Janson and myself. This offers some validation for the interpretation. The weaknesses identified for this case are similar to those found in other published interpretivist case work (Bryman, 2004; Klein and Myers, 1999).

3.5.3 Critical papers – IT for CAT (1998), rationality framework (2002)

New Information Systems provides ‘an unprecedented opportunity for the redistribution of knowledge, resources and conventions in organisations’ (Orlikowski and Robey, 1991). Nonetheless many studies have shown that new information systems tend to be used to support the social and organisational status quo (Markus, 1983; Zuboff, 1988; Orlikowski, 1992; Myers, 1994; Markus and Keil, 1994; Robey and Sahay, 1996; Trauth and Jessup, 2000; Doolin and Lowe, 2002). The critical IS researcher is concerned with the effect that systems have on the work and social conditions of the individual. Like interpretivists, the critical researcher is concerned with a social world and seeks to understand the effects of new information systems on this world. However this is not enough. To the critical theorist most social worlds have objective properties that harm their members and ‘render sense making and communication problematic politically vulnerable’ (Ngwenyama and Lee, 1997). The primary aim of the researcher is to critique existing conditions so as to make people aware of the various existing forms of social domination and to enable the human actors to transform existing social structures (Macpherson et al, 2000). Critical IS research is concerned with the contribution that a new information systems can make to the achievement of social ideals (Orlikowski and Baroudi, 1991; Hirschheim and Klein, 1994; Ngwenyama and Lee, 1997; Klein and Myers, 1999; Brooke, 2002b; Myers, 2004; Bryman, 2004).

Critical IS research differs from interpretive research on the following points (Orlikowski and Baroudi, 1991; Brooke, 2002a,b; Ngwenyama, 2002)

- The Primary goal (discussed above)
- The selection of factors that are held to be key influences on social structures and use of new information systems
- The use of the theories of Critical Social Theorists like Habermas as a standard by which to measure social conditions
- Belief that humans can and should change their conditions.

The interpretivist perspective ignores a number of important factors, of which Orlikowski and Baroudi (1991) considered four the most significant. Interpretivism ignores the wider context of experiences external to the case situation and fails to incorporate the effects of unintended consequences of individual actions. It neglects both structural conflicts within organizations and the way in which a particular social situation develops through historical change. Critical research overcomes some of these criticisms. A central belief of critical researchers is that social reality is historically constituted so that this dimension would be explicitly investigated. The study of social and structural conflict is also an explicit aim for critical research. Myers (1994) would claim that critical hermeneutics is even more effective in overcoming the basic weaknesses of interpretivism.

According to Brooke (2002b) an important component of critical research is its roots in the critical theory of the Frankfurt school of the 1920s. Critical social theorists like Habermas and Weber sought to analyse the effects of the uneven power distribution that they saw in the society of their day. They were particularly concerned with the distorting effect of social domination on the individual. The achievement of the emancipated actor is a central issue for this school of thought. Critical IS research developed using these ideas as the lens

by which to assess social phenomena. More recent work has criticised critical research for its lack of an effective social theory of emancipation, inadequate conceptualisation of power and over reliance on the theories of Habermas (Brooke, 2002b). Recent debate has focused on alternative frameworks by other social theorists (Brooke, 2002b; Adams 2002).

Both the critical IS papers (IT for CAT and rationality framework) are in the tradition of the early critical social theorists. IT for CAT applies the ideas of Habermas to the case company Colruyt. Paper 8 (Rationality Framework) draws on Weber and Habermas to develop a new theoretical framework of rationality for IS. It explicitly identifies the philosophical perspective as critical. The goals of both are consistent with critical research as both aim to enhance awareness of the effects of existing social structures. Both have a significant empirical case element. The case material incorporates a description of issues of significance to critical research such as the history of the company, and the political and economic environment in which it operates.

What constitutes rigor for an information systems paper in the critical tradition is far from clear. Many papers focus on theoretical issues and there have been relatively few empirical studies (Orlikowski and Baroudi, 1991; Brooke, 2002b; Adam, 2002; Doolin and Lowe, 2002). The ideas developed below are based on the work of Brooke (2002a) and the example of three empirical papers (Myers, 1994; Ngwenyama and Lee, 1997; and McAulay et al, 2002). Critical IS cases:

- Critique taken for granted assumptions underpinning organizational behaviour
- Develop case material on the IS phenomena to similar standards as for an interpretivist case
- Develop knowledge that enables change and indicates new ways of working

- Autocritique subjecting the work to critical reflection

Critiquing the assumptions behind existing social and organizational arrangements can take many forms. The case by Myers (1994) uses a technique of critical hermeneutics to interpret and understand the apparent conflict in the position of the various stakeholders with respect to the information systems under review. The case by McAulay et al (2002) uses the critical approach of Habermas to evaluate the underlying ideological concepts that informed the opinions of the case managers on outsourcing. Ngwenyama and Lee (1997) apply the ideas of Habermas to a hermeneutic textual analysis of an example email communication exchange. The issue of case methods does not apply to this example. The remaining two cases give extensive descriptions of the case material. The knowledge developed in all three cases contributes to our general perception of the way social arrangements can dominate our thinking but none offer specific suggestions for change. Only McAulay et al's (2002) paper offer an autocritique. As Orlikowski and Baroudi (1991) found critical research tends to be less effective at self-evaluation. Critical research is by its nature focuses on single unique situations. Generalisability does not seem to be a prime aim, nonetheless all three papers produce contributions to theory almost as a by product of their analysis. Ngwenyama and Lee (1997) contribute a modification of the information richness theory (Daft and Lengel, 1986) of communication. Myers (1994) deepens and enhances the concept of information systems success, which has relevance to every information systems project, and McAulay et al (2002) contribute an additional factor for incorporation into evaluation methodology, of relevance to most evaluation exercises.

The two papers (IT for CAT and Rationality framework) are based on the same case company and draw on extensive longitudinal case material. The methodology for data collection is well described and is broadly in line with interpretive standards. The papers differ in their approach to critiquing social conditions and suggestions for change. Neither include an autocritique. A key aim of the paper on IT for CAT

is to develop a description of what an organisation has to achieve for the implementation of the ideas of Habermas and the contribution that information systems make to this. The paper produces an ideal by which organisations can be critiqued and applies it to the case company. It demonstrates a number of ways in which information systems play a key role in realising part of the CAT ideal. This paper would benefit from a more suspicious (Klein and Myers, 1999) approach to data collection, analysis and interpretation.

The paper on rationality framework develops a framework that exposes the underlying irrationality in the conventional way in which IS applications are often viewed and implemented. The case study is used to demonstrate the value of the framework in use. The main limitation is the nature of the case example. This is an unusual company.

Application of the framework to other cases and IS applications would be of value - in particular an investigation into the effect of misclassification. The framework is the change proposal. The framework can be used by all organisations to categorise all its information systems applications. It would be of particular value for those making extensive use of information systems combined with communications technology.

3.6 Personal skills development

The skills and philosophical perspective of the researcher are key factors in qualitative research. At the start of the period during which these papers were written I had been working in a subject (Operational Research) that was most sympathetic to positivist ideas and I had only a basic knowledge of case research methods. Over the period of this research, my worldview changed and my skills in case study work improved. I have come to consider that multi paradigm and multimethod (Mingers, 2003) approaches will produce richer, more interesting and relevant results. My choice of research goals and focus for case study has become clearer and more practical. My approach to rigor and interpretation of case material has become more professional.

This progress is due to increasing experience of case work, attendance at two case research methods workshops (Sheffield Business School and ECCH, 1994; BAM, 1995) and to the help of my collaborators of which Marius Jansen and Dan Remenyi were the most important. I consider that both case and Action Research drawing on multiple philosophical perspectives are the most promising approaches for the future direction of my work on information systems in organisations.

4 The papers

This section presents the findings of the individual papers and discusses their limitations. The papers are organised into two groups. The first group assesses the business benefits associated with individual information systems applications and researches how these are translated into business value. The second group investigates the way that information systems applications interact with organisations and seeks to establish what effect this has on their business value.

4.1 IS applications and business benefit (DBM model, DBM construct, Valuing email, intranet evaluation, ebanking)

My initial focus was on evaluation methodologies for information systems. I presented an early version of paper 4 (valuing email) at the First European Conference on Information Technology Evaluation (Brown, 1994) and continued to develop it until 1997. Over that period, existing evaluation methodologies and tools were attracting extensive criticisms (Hochstrasser, 1990; Symons, 1990; Hochstrasser and Griffith, 1991; Balantine et al, 1996). New ideas on methodology were being proposed, designed to overcome the problems perceived with existing methods. A large body of work has resulted developing alternative methods, methodology and approaches (Parker et al 1988, Kaplan & Norton, 1992; Farbey et al, 1992; Remenyi et al, 1993; Ward, Taylor and Bond, 1996; Smithson and Hirschheim, 1998;

Remenyi and Sherwood-Smith, 1998; Farbey et al, 1999; Renkema, 2000).

The paper on valuing email should be considered against this background. It had a seminal influence on my future work. The paper focus is on IS evaluation methodology and the problem of incorporating intangible benefits. It approaches this question through an investigation of a specific IS application – email. Drawing extensively on communication theory as it has been applied to email, the paper brings together both published examples of email use and the results of an exploratory case study (Retail Ltd) into the implementation of a new email system. Email was a relatively new information systems application at the time and was attracting intense attention (Rudy, 1996). This was a new communications channel and its effect on information richness theory was of interest to social scientists (Daft and Lengel, 1986; Sproull and Kiesler, 1986, 1991; Trevino et al, 1987; Fulk, 1991; Nohria and Eccles, 1992). Hence my judgement that the soft benefits would be extensive and important. The cases are used to develop a typology of six types of benefits, of which two would be considered hard measurable quantities and four intangibles. The process of developing the typology creates rich insights into intangible benefits (Walsham, 1995b). Each type of intangible benefit is discussed in some detail. The examples quoted show that effects are wide ranging and of a nature and on a scale rarely forecast by organisations. For email it seems likely that these intangible effects are the most significant for the business. In many of the examples, business context and organisational routines determine whether the intangible benefit offers any value and this in turn contributes to the difficulties of estimation. A serious attempt to include the intangible effects of email, for example, in an appraisal would involve a relatively detailed analysis of the relevance and potential value of all four types for every part of the organisation. This would have to rely on estimates from the appropriate line managers – a time consuming, controversial and costly exercise. Most evaluation exercises for email, including Retail Ltd use

traditional financial methods and ignore intangible effects. This paper concludes that such an approach is inappropriate for this type of information system application.

The question that paper 5 (Intranet Evaluation) addresses is the problem of choosing between competing applications for an intranet. The dominant costs and benefits were considered to be intangible or strategic and highly specific to the information system under consideration (intranet applications) and to the business of the host organisation. The paper developed a new evaluation methodology and critiqued the results of applying it to one case. The methodology – TEAM - had several unusual features. It drew together traditional financial measures and the ideas of Information Economics (Parker et al, 1988) to create a way to score each application for cost and overall value. The scoring mechanism was specifically designed for intranet applications and incorporated all the major types of intangible and strategic costs and benefits that theory and previous work suggested was significant for such IS. The process by which these scores were obtained represented a new approach. Many criticisms of existing evaluation methods had identified their inability to take account of the views and assessments of multiple stakeholders. TEAM developed a detailed set of actions by which those stakeholders that were thought to have an interest could contribute to the scoring process. This is a composite approach (Bannister and Remenyi, 2000). The information provided by the methodology renders it particularly relevant to the hermeneutic process of decision making (Bannister and Remenyi, 2000). The contribution of this work to the literature developing new evaluation methods is both a potentially useful evaluation tool for intranet applications and an innovative, generic approach for creating appropriate tools for other IS applications. The process of development demonstrated that this information system application required a tailored methodology and indicates that this is probably the case for many other types of information systems applications. The method proved effective in dealing with the example evaluation case discussed

in the paper, but the results of applying this technique brought up some unexpected practical issues. There were stakeholders from many different parts of the company. Ensuring that all interested groups were represented was far from simple. The method is time consuming, costly in terms of staff time (both expert facilitators and stakeholders), administratively complex and produces results that were sometimes difficult to interpret.

The attempts to develop an evaluation methodology in the two papers, intranet evaluation and valuing email, was extremely valuable even though neither achieved much practical success. They demonstrated the high cost of IS evaluation exercises that apply sophisticated methodologies, and the severe problems involved in estimating the business value of new information systems applications.

The papers on Database Marketing (DBM) (DBM model and construct) represent an attempt to investigate one information systems application – DBM systems - in depth. The choice of this application was made at a time when computing developments were bringing the large capacity requirements for data capture, storage and analysis of such an application within practical reach. The new model developed in paper 2 (DBM model) describes the three key elements of DBM systems. In doing so it demonstrates the interrelationship of the three elements and the need to achieve a balance between them if resources and efforts are not to be wasted. The extensive detail provided by the model as to the resources required to develop or enhance DBM systems also clarifies the choices to be made and the range of levels of sophistication possible for any individual system. It also demonstrates why such information systems are difficult to understand and apply. The model offers a guide to marketing managers when assessing the level of sophistication of existing systems and the identification of any significant gaps in them.

Paper 3 (DBM construct) uses statistical theory and data from the catalogue industry to translate the ideas of the previous paper (DBM model) into a new valid, reliable construct to measure the level of sophistication of individual DBM systems within the catalogue industry. This scale demonstrates that there is a wide range of options for each installed system. The factors picked to form part of the construct offer insight into what contributes most to the effectiveness of the system. In addition the construct could be used in the process view of IT value research typified by the work of Barua et al (1995). It is a measure that researchers like Barua et al (1995) could use in their attempts to establish the factors that are correlated with obtaining business value from information systems. This approach identifies the range of levels at which DBM systems can be developed, but offers much less help on assessing business value. A case based approach applying the model to example cases could investigate which companies really do profit from sophistication and which not. The result of this work is to demonstrate the complexity of the DBM system application and to establish the importance of business context, but it fails to make the connection between business context, levels of sophistication and business value.

The early papers researched particular information systems applications (email, intranet applications, DBM) with a view to developing methods that could value their contribution to many different types of organisation. This work demonstrated the importance of business context in obtaining business value from an application. The latest paper (ebanking) took account of this finding and adopted a case based approach that investigates the impact of one type of application (internet banking) within one specific business context (Fortis Bank). The paper gives a detailed comparison of the potential benefits of an internet banking service with that of PC banking, for the SME sector. Fortis bank had started the internet banking project based on the judgement that early adopters would gain competitive advantage. The case demonstrates how the business environment reduced the business

value for both bank and customer. The results offer some insight into the reasons for the continuing erratic yield from information systems. The paper makes a contribution on several levels. It develops a model of adoption for bank's attempting a similar move. It adds to the developing literature investigating the reasons for the variability in IT productivity between firms and industries. It makes a major contribution to the literature on electronic business and IS business value.

4.2 Information Systems and Organisations (integrating IS, Colruyt, IT for CAT, Rationality framework)

The role of information systems in organisational change has been of major interest to information systems research for many years. Markus and Robey (1988) identified three main approaches taken by researchers in seeking to explain the role of information systems in organisational change – the technological imperative, the organizational imperative and the emergent perspective. The organizational imperative takes the view that it is possible to plan and control both the information systems and the changes it brings to meet social and organizational objectives. Much of the work on information systems development (ISD) methods for example (Mumford 1994; Hirschheim and Klein, 1994) would be consistent with this view. By the early 1990s the new types of information systems applications and their contribution to service operations had led a group of researchers to the conclusion that a considerable amount of organizational restructuring was going to be necessary to gain the full potential business value (Zuboff, 1988; Walton, 1989; Scott-Morton, 1991; Venkatramen, 1991; Tapscott and Caston, 1993; Hammer and Champy, 1993; Ciborra, 1994; Applegate, 1994; Bjorn-Anderson and Turner, 1994).

The difficulty of achieving organizational change, even when there is a clear aim and plan, has for some time cast doubt on the organisational imperative as a complete explanation of what can happen to

organisations that implement new information systems (Bessant and Buckingham, 1991; Willcocks 1991; Page et al, 1993; Markus and Keil, 1994; Douzou and Legare, 1994; Myers, 1994). Empirical work cited by Markus and Robey (1988) showed little support for either the technological or the organizational imperative. Studies show results inconsistent with either view. The results of some studies that show how far the final use of information systems can vary from action plans or predictions (Robey and Sahay, 1996; Larsen and Myers, 1999) suggests that a far more complex process is at work. This appears to support the third view, the emergent perspective, which holds that ‘ the consequences of information technology emerge unpredictably from complex social interactions’ (Markus and Robey, 1988). This perspective may seem closer to the reality but as presented offers few guidelines to the researcher and has little to offer managers in terms of a recipe for managerial action.

4.2.1 The organisational imperative (Integrating IS, Rationality Framework)

The two papers - integrating IS (paper 1) and Rationality Framework (paper 8) - are both written from this point of view. Both draw on existing research and theory to develop frameworks that suggest how certain types of information systems can be exploited more effectively by organisations through design of appropriate organisational routines and structures. Each framework is applied to case examples to establish their value in use. The implicit assumption of both papers is that the changes recommended by the frameworks can be made to existing structures in order to exploit information systems of similar types.

Paper 1 (Integrating IS) identifies the main organisational structures required to achieve the internal integration of information systems (Venkatramen, 1991) across organisational and departmental lines. Achieving this continues to be difficult but of tremendous practical business value (Brown and Spanos, 1995; Bannister, 2001; Local Government House, 2000; Wastall, 2002; Bannister and Walsh, 2002).

Paper 8 (Rationality framework) draws on ideas of critical IS to develop a typology of rationalities. It shows how correct identification of the rationality type of information systems can lead to a more effective use of information systems. This is a new approach to categorising information systems and is of particular relevance to those applications that make use of electronic communications, (communicative rationality) since it is these that are most often mistakenly classified and hence misused. The value of the frameworks lies in their identification of structures, organisational routines and resource gaps that work to reduce the business value of information systems in use. The results are consistent with the view that effective exploitation of information systems can require significant organisational change.

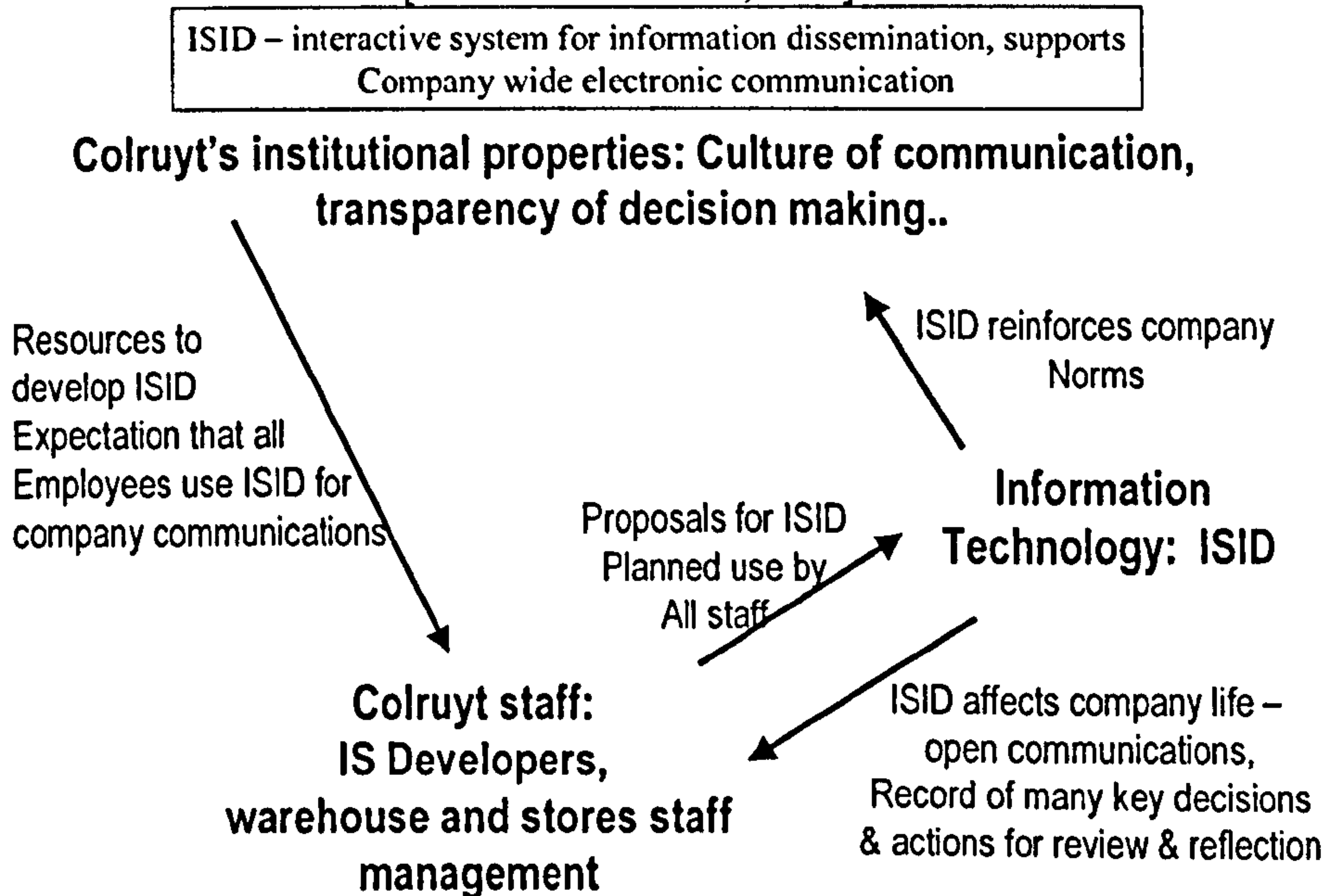
4.2.2 The emergent perspective (Colruyt, IT for CAT)

Orlikowski (1992) makes a valuable contribution to the emergent perspective by shifting the focus from information systems and organizational change to an approach that seeks to identify the myriad ways in which the technology can interact with organisations. Her structurational model of technology offers a meta theory (Orlikowski and Robey, 1991, p165) which incorporates both emergent and critical perspectives. The model offers a way to explain how the three elements - the institutional properties of organisations (their culture, routines etc), their members (staff of human agents like system developers) and new information systems – can affect each other (Orlikowski and Robey, 1991; Orlikowski, 2000). The paper on Colruyt (paper 6) is a case study of the Colruyt company focused on this interaction. The paper does not refer to this model explicitly but the case description is aimed at exactly this issue, and includes all elements of the model.

Figure 2 uses the structurational model to analyse how one of the most important information systems at Colruyt, called ISID (interactive system for information dissemination) interacts with the company. ISID supports and records company wide electronic communication.

Figure 2: Structural model of ISID at Colruyt:

[based on Orlikowski, 1992]



The decision to develop ISID came out of the company's culture of communication and open decision-making. The demand that all employees use it for key intra-company communications is consistent with these norms. It both constrains and facilitates staff jobs. For example significant decisions will be discussed on ISID and results recorded. This allows many to participate but the record encourages review and comment at a later date. ISID has been used in the case to reinforce existing norms but could be used to drive changes to these norms. The case description establishes the central role of business users in the development and exploitation of new information systems. The paper on Colruyt researches the elements highlighted by the structural model adding a rich, unique, empirical example of this theory to the few existing case examples (Walsham, 1995b). The case demonstrates the intimate inter-relationship between organisation and its information systems. A comparison of similar analyses of other case companies would be of great interest.

Paper 7 (IT for CAT) analyses the Colruyt case drawing on ideas from critical IS. The ideals on which the company was founded seem close to those of Habermas's Communicative Action Theory (Habermas,

1984). The paper seeks to test the proposition that IT is essential to realising them.

Much of critical IS research applies the ideas of the critical social theorists to the subject of information systems but remains largely theoretical (Brooke, 2002a and b; Adam, 2002; Doolin and Lowe, 2002; Varey et al, 2002). The common factor in the empirical critical IS reported research has been the use of a critical approach to the analysis of the situation or issue of interest. The situations or events critically analysed range from individual examples of CMC (Ngwenyama and Lee, 1997; Cecez-Kecmanovic, 2001) to an evaluation exercise on outsourcing (McAulay et al, 2002) and a failed information systems project (Myers, 1994). The paper on IT for CAT makes a different contribution to the body of empirical critical IS research. It does not use CST ideas to criticise existing conditions. Instead it considers the question of what an organisation would be like, that sought to establish working practice consistent with these ideals.

The paper establishes that information systems have great potential to support the norms of CAT within organisations. There are many examples of how these ideas shape the development and use of information systems within the company and how their realisation is also enabled by these systems. Three examples are typical – the process by which new ideas for information systems are developed, the way in which information systems are placed in user hands and the possibility for reflection on past actions. The selection and design has long been recognised as a defining step in new systems development. The choice of system and the way it is designed determines organisational work practice. At Colruyt this process is highly visible and open to contributions from any members of the work force. The process is designed to be user led in conformance with CAT ideals. Several examples are given of the effects of systems use when controlled by the front line are described – for example the checkout system in the hands of the sales clerks.

The significance of text - recorded communications, statements, case descriptions, reports, documents, plans - for critical research is well illustrated by the CMC discussion analysed by Cecez-Kecmanovic (2001). She used the ideas of Habermas to critically assess the 'communicative practices and dialogical structures embedded in the email discussion' (Cecez-Kecmanovic, 2001, p151). It is the process of the interchange of communications that she came to analyse. Reflection, the exercise of re-assessing actions and assumptions, is a key idea for critical researchers and this cannot be done without records. At Colruyt the demand for open discussion recorded on ISID gives an unparalleled opportunity to assess decisions made and to reflect on social process. An example of this is given in the case. This development moves the company closer to being able to implement some aspects of CST ideals.

However the case also demonstrates that the ideals of CAT are almost certainly impossible to implement fully in practice. Heng and de Moor (2003) came to a similar conclusion based on a case example in which the internet was used with the aim of creating the conditions for the ideal speech conditions defined by Habermas. The paper attempts a lot. It would be improved by using the case material to demonstrate how information systems could be used to support CAT ideals within organisations.

The two papers on the Colruyt Company give an unusual view of information systems in operation within an organisation. Many studies have focused on individual information systems and their use by organisations, few have attempted to consider the wider picture of the total organisational context as these papers do. Moreover the company is of particular interest because it made a deliberate choice to organise the company around information systems. The deciding factor seems to have been the perception that information technology could offer many ways to aid communications within the company, a facility that

was highly valued by the founder. The case description in the two papers demonstrates how the choice and design of information systems and the use to which they are put is critically affected by organisational routines and norms.

5 Contribution of the papers

This section presents the contribution made by the papers as a whole. It states the three principles that form the main contribution of the papers and explains their development based on the common themes that underlie and unite the papers and the relevant information systems research literature. It argues for the originality of the principles by reference to the IS research literature and outlines the significance of the work for organisations and IS researchers.

The aim for the papers was that of attaining a greater understanding of the business value that information systems could offer organisations and finding ways by which organisations could assess this value. The findings discussed in section 4 suggest that there is no universal measure that adequately assesses IS business value. The business value obtained depends on many contextual factors as well as the potential benefits offered by the IS application. Three principles have been developed based on this work. Two highlight the role of context for IS business value. The third defines the minimum requirements for a useful IS evaluation exercise.

The principles are:

1. *The potential business value of an individual information systems application is unique to each organisation as is also the most appropriate choice of measures for it. Both are determined by the combination of:*
 - *The range of business benefits of the application*
 - *The business context and the industry environment*
 - *The organisational context*

2. *The members of staff of an organisation are its key resource in the exploitation of information systems. Their level of mastery of IS, attitude towards new technology and ingenuity in using it are a critical factor in determining the IS business value obtained.*
3. *The minimum requirements for an organisation to be able to execute a useful IS evaluation exercise are:*
 - *Use of appropriate methodologies tailored to the characteristics of the individual IS application under review*
 - *Employees with the requisite specialised skills, including for example evaluators, analysts, facilitators and project managers*
 - *Commitment of adequate resources to the exercise*
 - *An effective decision making process within the organisation*

5.1 Business Value of IS applications - Principles 1 and 2

There is little agreement on what constitutes IS business value and even less on how to assess it. It is linked to but differs from the concept of IS success.

The concept of IS failure is relatively straightforward. Unused systems are failures (Markus, 1983; Alevi and Joachimetheler, 1992; Markus and Keil, 1994; Bussen and Myers, 1997; Seddon, 1997). Information systems that pass the proposal stage can fail at a number of stages prior to implementation. They can be abandoned sometime during the period of their development or require major redesign during development (incurring major additional cost) or fail to work (Farbey et al, 1993; Collins, 1998; Sauer and Cuthbertson, 2003). Projects that are terminated early (Myers, 1994) or as in the case of many BPR projects, simply fall a long way short of expected (mainly efficiency) benefits (Willcocks and Smith, 1995) are also normally considered failures.

The concept of success has proved much more difficult to define. Larsen and Myers (1999) consider that many projects are too easily

labelled as successful and ‘suggest that “success” is a moving target.’ They ‘believe that the extent to which a BPR project is successful or not is not easy to determine, particularly if the viewpoints of various stakeholders are taken into account’. They are critical for example, of the emphasis in the BPR literature on the simplistic financial and efficiency criteria as the determinant of success (Hammer, 1990; Hammer and Champy, 1993; Brown, 1993; Caron et al, 1994). Moreover an information systems development project can be considered successful and yet yield little business value (Newman and Robey, 1992; Nandhakumar, 1996).

This section investigates the concept of IS business value. It discusses the contribution of IT value research and factor research to the definition and measurement of IS Business Value. The case for the significance of both business and organisational context for IS business value is made drawing on both the relevant literature and the papers. This establishes the argument for the first two principles.

5.1.1 IT value research

The literature on ‘IT value research... examine(s) the benefits of IT investments’ (Chan, 2000). The relationship between investment in IT and the return achieved has been investigated at macro-economic, sector and firm levels (Weill, 1992; Barua et al, 1995; Brynjolfsson and Hitt, 1996; 2000; McKinsey Global Institute, 2002; Melville et al, 2004). The approach emphasises numeric measurement and typically uses one of the standard financial and company performance measures like ROA, market share and productivity, to assess what level of return is being earned from the IT investments made. The results of the early work were inconclusive finding both positive and negative impacts of IT investment (Weill, 1992; Barua et al, 1995).

The studies of the latter half of the 1990s are more positive (Brynjolfsson and Hitt, 1996; 2000; Santhanaam and Hartona, 2003). Weill (1992) gives a two-fold objective to his research – establishing

the measurable effect of IT investment and searching for those characteristics that are associated with positive relationships. The limited value of studies using a single number to represent the overall effect of IT, when information systems applications have been found to affect many different levels and sections of an organisation (from individuals, work groups to Strategic Business Units and the overall performance of the firm) differentially, led to studies based on a range of impact measures. These included the effects on intermediate variables (Barua et al, 1995), on various types of IT (Weill) and on organisational complements (Brynjolfsson and Hitt, 2000). Studies like the McKinsey Global Institute (2002) demonstrate that firms and sectors differ considerably in the value they obtain from their IT investments. The value reaped from IT investment by an organisation is the result of its success in exploiting many individual IS applications.

This approach measures the aggregate effect of many information systems applications. It cannot offer much insight into the level of success achieved by individual IS applications. Nor can it be used to assess the size of the gap between the potential business value of an application to the organisation and the actual value obtained. It contributes little to the definition of IS business value.

5.1.2 Factor Research Approach to IS Success Measurement

The emphasis on quantitative measures of IS success is one outcome of the use of the factor research approach to investigate information systems success. The factor research approach seeks to identify those variables that predict IS success (or failure) and test empirical associations between predictors and outcomes (Newman and Robey, 1992; Seddon, 1997; Larsen and Myers, 1999; DeLone and McLean, 2003). This has been a major stream of IS success research throughout the last three decades (Alevi and Joachimsthaler, 1992; DeLone and McLean, 1992; Garrity and Sanders, 1998a; Larsen and Myers, 1999; DeLone and McLean, 2003; Larsen, 2003). Numerical measures are needed for both the (independent) factors that are thought to ensure

success and the dependent variable that is proposed as a measure of the scale of success achieved. The importance assigned to identifying why information systems fail or succeed has meant that this work has concentrated as much effort on producing measures for the independent factors that are thought to lead to success as for the chosen dependent measures of success (Money et al, 1988; Alevi and Joachimsthaler, 1992; Rainier and Watson, 1995).

The seminal work by DeLone and McLean (1992) produced a synthesis of a large body of work on information systems measures of success, published before the late 1980s. Their I/S Success Model has been critiqued, extended, modified and used as a basis for an extra-ordinary amount of further research work (as for example: Seddon, 1997; Garrity and Sanders, 1998b; Ballantine et al, 1998; Ishman, 1998; Woodroof and Kasper, 1998; DeLone and McLean, 2003). DeLone and McLean (1992) proposed six categories of success measures. Of these two (system quality and information quality) are shown in their model to represent measures of the initial stage of IS creation, two more (use and user information satisfaction) represent measures of use of the information systems and the final two (individual impact and organisational impact) represent the effect produced by the system. One of the most significant findings of this work is the enormous number and variety of accepted measures of IS success. Table 7 (pages 84-85 DeLone and McLean, 1992) lists those proposed or used in each of the six categories. All but User Satisfaction show around twenty or more variations. As the authors comment 'no single measure is intrinsically better than another, so the choice of success variable is often a function of the objective of the study..' It is notable that with this plethora of measures most of the studies reviewed had chosen to use only one or at most two of the available measures of IS success. The updated model (DeLone and McLean, 2003) incorporates the work carried out both on the model and on IS success measures over the intervening ten years. This made some changes to the categories, for example the inclusion of service quality into the creation stage, the inclusion of intention to use

in the use stage and the simpler measure of net benefits to the impact stage. But the approach remained the same.

Factor research or variable analysis studies (Larsen, 2003) has exerted a major influence on IS research. Many studies of the 1990s have continued the type of work reviewed by DeLone and McLean (for example: Saleem, 1996; Whyte and Bytheway, 1996; Drury and Farhoomand, 1997; Garrity and Sanders, 1998a; Ishman et al, 2001). It continues to drive the creation of many new measures and constructs (Straub et al, 2002; Torkzadeh and Dhillon, 2002; Croteau and Raymond, 2004). These attempts to find quantitative predictors of IS success have also helped to uncover the depth and complexity of the concept of IS success.

5.1.3 Limitations of Factor Research

The results achieved by factor research have been disappointing, the principle problem being the lack of consistency between studies (Melone, 1990; Alavi and Joachimsthaler, 1992; DeLone and McLean, 1992; Woodroof and Kasper, 1998; Larsen and Myers, 1999).

Reservations as to the results have generally been attributed to one of two very different explanations - that:

- there are weaknesses in existing constructs and in the approach taken to developing new measures
- the outcomes of an information systems project result from a complex interaction of many factors which the factor research approach cannot fully represent. One result of this view was the development of the process approach.

A fundamental problem for the factor research approach is one that applies to all constructs that pass the reliability test – the question of what each is actually measuring. This has to be a significant factor in this situation in which so many measures have been proposed and used. What concept does each construct measure (Bryman, 2004) and how does this relate to IS success?

The debate over the user information satisfaction construct (UIS) is a good example. According to DeLone and McLean (1992), UIS is 'probably the most widely used single measure of I/S success.' Larsen (2003) agrees with this finding. It has face validity, in that it clearly reflects the concept of success in the minds of one interested group with relevant experience – the users. It is a measure that continues to attract much interest from information systems researchers (Melone, 1990; DeLone and McLean, 1992; Garrity and Sanders, 1998a; DeLone and McLean, 2003). Continuing work on refining the instrument has meant that there are a variety of versions with no one accepted standard (Melone, 1990; Woodroof and Kasper, 1998; DeLone and McLean, 2003). Its widespread adoption seems to be due to the existence of reliable instruments, intuitive appeal, face validity and belief in its value as a measure of information systems effectiveness (Melone, 1990). DeLone and McLean (1992) suggest that its popularity lies principally in its superiority to the alternative measures available. Nonetheless many reservations have been expressed as to the appropriateness of its use as a measure of IS success. The main concerns lie in type of data collected by this construct and its interpretation. It is subjective based on individual perception, which can be affected by many factors other than system success, such as user attitudes, involvement in the development process, previous experiences and expectations (Ishman et al, 2003; Melone, 1990). High scores may have more to do with the quality of the system and its support or ease of use than the achievement of any output goals of value to the organisation (Melone, 1990). According to Melone (1990) there is no universal agreement on the conceptual definition underlying the construct. She cites the use of terms as different as "system acceptance" and "perceived usefulness" by different researchers. While the construct UIS has been of great value to IS research, it has yet to acquire a generally agreed interpretation and cannot claim to be a complete or comprehensive measure of IS success. Remenyi and Money (1991; 1994) put this concept to more practical use by

developing an instrument to measure the gap between perceived expectation and performance – the service quality gap. The measure helped to identify where improvements to existing systems and the service provided by IT departments would have the most effect from the users perspective.

These criticisms have prompted work on both the creation of new constructs and the refinement of existing constructs (Melone, 1990; Saleem, 1996; Whyte and Bytheway, 1996; Drury and Farhoomand, 1997; Garrity and Sanders, 1998b; Woodroof and Kasper, 1998; Ishman et al, 2001). This is an approach advocated by DeLone and McLean (1992, 2003). The observation that 'MIS success is a multidimensional construct and that it should be measured as such' (observation 4 of DeLone and McLean, 1992) gives a precise aim for further work within this worldview. However even they have some doubts as to the utility of this approach. Their review also identified that the component of IS success that they first labelled impact on individual and organisation (1992) and then net benefits (2003) presented serious conceptual problems. This dimension of IS success assesses the business value of information systems. The review cites an enormous diversity of measures developed for this concept. It includes improvements in the efficiency or effectiveness of individuals ranging from time to complete tasks (or decisions) to user productivity to decision accuracy. The assessment of organisational impact has been even more wide ranging and included traditional measures of firm performance like ROI, revenue, profits or competitive advantage and operational measures like productivity gains, cost/ benefit measures and increased work volume. DeLone and McLean acknowledge 'the difficulty of isolating the contribution of information systems to organisational performance' (1992). In their revised model they group all these effects into one category of net benefits (2003) and identify them as 'the most important success measures for e-commerce'. Their description of this category raises many issues all of which suggest that it will not be easy to create appropriate constructs for it.

In his development of a taxonomy of the quantitative work on IS success antecedents (ISSA), Larson (2003) includes a review and assessment of the measures used for the dependent variable, IS success. He finds that information systems researchers have worked with eight dependent variables, which represent different aspects of the three stages of Implementation, Behaviour and use and Performance. These three stages appear similar to the three proposed by DeLone and McLean (2003). Although the objective of his work is to categorise the existing quantitative studies in terms of the independent variables that have been investigated, he has some important comments to make on the dependent measures used. In his view the research carried out so far has tended to use convenient measures rather than attempt to find ways of representing organisational value. Future studies need to assess the importance of information systems to the success of an organisation. ‘..it seems clear that variable analysis studies do not have the methodological strength to adequately explain IS success. New methods must facilitate two-way relationships between variables, large sets of variables and time-delayed results’ (Larsen, 2003).

A more critical view of factor research has led to an examination of the assumptions underlying it (Nandhakumar, 1996; Bussan and Myers, 1997). These ideas have implications for both the understanding of implementation success (the original driver of factor research) and for the concept of IS success. Factor research has been criticised for its mechanistic view of organisations (Myers, 1994). This world-view hypothesises a series of factors that directly drive the outcome of an information systems project. It makes the assumption that each factor is an independent variable and does not take account of any interactions between them. It cannot explain why some actions (factors) are associated with success and others with failure. Nor can it explain inconsistencies in these key success factors. It conceptualises success as determined at one point in time, ignoring the dynamic nature of an information systems project and the effect of changing conditions. The

use of one measure of success, forces the need to make difficult choices - between differing positions and views of multiple stakeholders and between alternative levels of analysis such as firm or work group level (Larsen and Myers, 1999; DeLone and McLean, 2003). Finally IS projects can seem successful by many of these measures and yet produce little business value.

The process view of an information systems project offers an alternative way to view information systems implementation. It focuses on the sequence of events over time which appear to lead to some outcome and seeks to explain how and why an individual information systems outcome has occurred (Newman and Robey, 1992). For process models, factors or categories may or may not help to produce the outcome. Outcomes are not dependent variables but 'the "final cause" of preceding events' (Newman and Robey, 1992). Newman and Robey consider that factor and process models can be complementary and DeLone and McLean (2003) implicitly support this view. Their I/S success model is presented as a temporal process model of 3 stages (IS creation, IS use and IS impact). In this formulation each stage is necessary but not sufficient for ultimate IS success. Implementation problems can reduce or eradicate all value and this has been the question of greatest interest for much of the literature on factor and process research (Davern and Kauffman, 2000) and for studies like the one carried out on BPR at Cigna by Caron et al (1994). A number of process models have been proposed to explore the way in which the potential benefits of IT are used to create Business value (Soh and Markus, 1995; Davern and Kauffman, 2000). Of these the model proposed by Soh and Markus (1995) is probably the most quoted. For Soh and Markus (1995) the required outcome is 'improved organisational performance'. They discuss what this means and review the main measures that have been used for it. They conclude that is a 'multi-dimensional construct'. Their process model proposes the conditions that are necessary for value to be created, but does not probe further into its measurement.

Neither factor research methods nor process models have much to offer towards understanding the concept of IS Business value, or developing measures for it.

5.1.4 IS Business Value and the papers

There is general agreement that information systems investment should deliver business value, by researchers and practitioners alike (Soh and Markus, 1995; Bussen and Myers, 1997; Davern and Kaufman, 2000; DeLone and McLean, 2003; Larsen, 2003; Melville et al. 2004). There is less agreement as to what this means in terms of measurement. There has been comparatively little attention paid to the definition of IS business value (Cronk and Fitzgerald, 1997; Banister and Remenyi, 2000; Bannister 2001). In their analysis of the literature on IS Business value, Cronk and Fitzgerald (2002) demonstrated how the many measures that have been employed stem from differing philosophical paradigms and interpretations of the term. The review of the first ten years of work of the European Conference on Evaluation carried out by Berghout and Remenyi (2003) found a similar variety of approaches to evaluation representing a wide range of views as to the meaning of information systems value. The definitions proposed by Bannister and Remenyi (2000) 'Value in use' and by Cronk and Fitzgerald (2002) 'if an investment is valuable, it will make a difference to organisational performance' are inclusive but difficult to operationalise. No one measure or theoretical approach is likely to produce a full picture of the value generated by an information system for any individual organisation.

Value in use is a concept that Orlikowski (1999) has explored - '...technology is not valuable, meaningful or consequential by itself; it only becomes so when people use it' (Orlikowski, 1999, p253 of Marchand et al, 1999) . She makes an important distinction between espoused technologies (those physically available for use) and technologies-in-use (those actually made use of) and describes the

variety of levels of use to which one information systems application (Lotus Notes) has been put by different groups and organisations. Davenport et al (2001) cite examples of organisations that have installed advanced information systems to capture transaction data but have yet to make effective use of it. These organisations have invested in espoused technologies such as ERP systems and point of sale scanners, but by failing to turn the data these systems collect into useful knowledge, have obtained only part of their full potential business value. To investigate business value (or its lack) Orlikowski (1999) and Davenport et al (2001) focus on individual information systems applications and the organisational context within which they are used. The papers propose ways by which the gap between actual and perceived potential business value could be closed. Business value is de facto considered a function of the individual information systems application and the particular context within which it is of applied.

The significance of context has often been noted (Soh and Markus, 1995; Seddon, 1997; Gopal and Prasad, 2000; DeLone and McLean, 1992, 2003; Davenport et al, 2001). If this is accepted it becomes clearer why measurement of IS business value is proving difficult. If context is of great significance then both actual and potential value of each information systems application will vary from situation to situation and from viewpoint to viewpoint. Differing information systems application types offer different benefits. The reality lies in a welter of detail on existing (and possibly future) business and organisational conditions and the interaction of these with each information systems application.

The business and organisational context seems to be particularly significant for information systems applications like Executive Information Systems (EIS) (Watson et al, 1991; Belcher and Watson, 1992; Rainier and Watson, 1995; Nandakumar, 1996; Bussan and Myers, 1997) and DSS that support managers and experts in carrying out their jobs, or internet based services that create new strategic

options for a firm. An EIS for example offers different potential benefits to a GDSS. Watson et al (1991) defined an EIS 'as a computerized system that provides executives with easy access to internal and external information that is relevant to their critical success factors'. Belcher and Watson, (1993) translated this into three major types of benefits; improved decision making and productivity, cost reduction for example in distribution of information and intangibles like the unifying effect of a company wide common information dissemination system. Group Decision Support Systems (GDSS) is of particular interest as context plays such a large part in its exploitation. It has been studied intensively, but this 'body of research has failed to meet its own goal, that of establishing consistent, positive and generalizable results'(Gopal and Prasad p511, 2000) as to its value in use. In Gopal and Prasad's view it is doubtful that such results are possible and the case that they describe explains why. GDSS is a tool for groups. Its value derives from the way that the group puts it to use. This will depend on both the individual group member's attitudes and skills and on the social norms that govern the interaction of the group. In the case described by Gopal and Prasad (2000) the discussions that took place between the various group members in the time periods between the three formal GDSS sessions are considered to have been as significant in establishing the final decisions as the sessions themselves. Gopal and Prasad reject the technocentric approach of the earlier studies. These used a simple concept of success measured by decision quality. In their view 'success.. is multidimensional, dependent on perspective, and temporally fluid' (Gopal and Prasad p539, 2000). Translating these ideas into more specific, identifiable benefits is not easy.

This is not a problem amenable to a standard approach. Measures that are appropriate in some situations will not be so in others. Evaluation methodologies that are effective for some applications will be less so for others. The attempts to create one approach, one measure to fit many situations produces methods that will not necessarily capture the

most significant aspect of the business or organisational environment. Yet this has been the aim of both factor research and many of the techniques developed within the IS evaluation stream of research (Parker, Trainor and Benson, 1989; Remenyi, Money and Twite, 1995; Cronk and Fitzgerald, 1997)

For all types of application, it is the use made of their potential benefits in practice that converts them to business value. For this concept of IS business value, the valuation process needs to assess the unique characteristics of a specific information systems application and its fit to the organisation. This is the approach taken by the research papers. They focus on individual information systems applications and the business or organisational context within which they are used (Table 5.1).

Table 5.1: The papers: IS applications & the focus of case description

Paper	Case	Application	Focus of Case Contextual description
1 Integrating IS	Amer. Hess	Document management system	Business organisational
1 Integrating IS	Business Unit	CAD on a LAN and central data store of expert knowledge	Business and organisational
2,3 DBM model and construct		DBM system	
4 Valuing email	Retail Ltd	Email	Business
5 Intranet evaluation	Sponsor co	Intranet applications	Business
6 Colruyt	Colruyt	Bar codes; Pricing database; ISID	Business and organisational
7 IT for CAT	Colruyt	ISID, customer waiting times (point of sale), pricing system,	Organisational
8 Rationality framework	Colruyt	Data capture of temperature; customer waiting times; ISID.	Organisational
9 ebanking	Fortis Bank	Internet banking for SMEs	Business

All the papers are concerned with the ways in which information systems applications impact or interact with organisations and the business value that results. Two papers (DBM model and construct) consider one information systems application (DBM) and its potential in depth. Three of the papers (Valuing email, Intranet evaluation, ebanking) devote considerable space to a description of the individual information systems application (email, intranet applications, internet banking) together with the business context. Two papers (IT for CAT, Rationality framework) discuss several information systems applications within the organisational context of the case company, Colruyt. Two papers (Integrating IS, Colruyt) consider the interaction of the example information systems applications with both business and organisational context.

5.1.5 IS Business value and the effect of context

Some information systems appear successful, but closer examination of the circumstances suggests that their actual business value is not high. The research carried out by Markus and Keil (1994) into the development and implementation of an expert system (CONFIG) designed to support the work of the sales people at a computer company showed that a technically successful information system was nonetheless relatively little used. Their analysis suggests that the system did not support the sales staff in their day-to-day work and hence was of little value to them. This was similar to the experience of the EIS described by Bussan and Myers (1997). This also appeared to be a successful information systems project at the early stages. Despite various technical problems, it was implemented and used by senior management. However within a year pressure to cut costs from the parent company led to its termination. Bussan and Myers suggest that the apparent lack of support from the users (Executives) may have been due the failure of the system to deliver information any more effectively than was already being achieved through other channels.

The BPR project described by Larsen and Myers (1999) offers a different perspective on failure. The project sought to re-engineer the accounting processes of a company called Alpha. A new financial information system was eventually acquired and the result appeared successful in that the project generated significant financial savings on implementation. Even at this stage the views as to its value varied significantly between stakeholders. The project team and consultants viewed it as a success, but the main users, accounting staff in various departments had more mixed view as to the value added to the company's operations. In particular they did not consider the project to have created an improvement in the quality of the work or customer service – both early objectives. In the event within six months of implementation the company had been taken over by another and the new system was scrapped in favour of the new owners's systems. As a result, Larsen and Myers (1999) characterise IS success as 'a moving target' varying over time. Bannister (2001) also noted how the business value obtained from individual information systems applications would normally vary over time, as conditions change.

For these information systems examples the operational needs and the business environment exerted a major effect in reducing the potential value of the system benefits. It was only by examining the context within which the information systems were employed that a more realistic assessment of business value could be made. The internet banking application developed by Fortis Bank (ebanking paper) exhibits similar characteristics. The paper describes the major potential benefits of cost saving and enhanced customer service that internet banking seems to offer to the bank. But by the end of the case the business value obtained by the bank was considerably less than had been expected. Development had been delayed due to difficulties with the new technology and the down turn in the business environment (in particular the telecommunications industry) and customer take up had been low. The Bank remains optimistic as to the ultimate potential internet banking and is continuing to develop it. This is an example in

which the business environment has proved the dominant factor in determining the value added by a new information systems application.

Two studies that attempt valuations of working information systems are of particular interest - that by Belcher and Watson (1993) on an EIS at Conoco and by Mukhopadhyay et al (1995) on the EDI at Chrysler. Both exercises are post implementation evaluations of the impact and value of the information system in question and both included a considerable amount of detail on how each application affected the companies concerned. The applications are different in potential impact and type of benefits. An EIS provides information and could be of use to many members of staff. The evaluation at Conoco investigated the use made of the application, department by department and at all levels up to the corporate level. As Belcher and Watson (1993) observe 'it is the individual users that must determine its business value'. The evaluation includes both hard, relatively measurable benefits like increase in productivity and intangible benefits like improved decision making, obtained through the self assessment of the biggest individual users. In contrast only the tangible benefits of cost reduction were included for the evaluation of the EDI. EDI systems 'lead to "vertical information integration" between trading partners' (Mukhopadhyay et al, 1995). The study investigated the 'dollar impact' of the operation of the EDI system over a nine-year period of time. The study included nine Chrysler assembly plants and developed detailed models of the way the EDI system had improved the management of inventory, transportation and information handling at Chrysler. The final results demonstrated significant cost savings and were presented in terms of dollar savings per vehicle manufactured.

These two studies have several similar characteristics. They created a methodology tailored to the specific type of information systems application demonstrating how prior perception of the potential benefits of any particular type of information systems application affects the final outcome. Evaluators tend to restrict their assessments to those

benefits that theory or prior observation suggests are most significant. Innovative, new uses will not be known and hence ignored. The two studies also tailored their methodology to the business context. Both drilled down to a high level of detail on the operations of the business.

The papers that considered the problem of IS valuation (valuing email, intranet evaluation) and investigated the benefits that could be delivered by one IS application (DBM model and construct) support this finding. The investigation of DBM demonstrated that obtaining an understanding of the full potential of new applications can be far from easy. DBM systems are shown to offer a wide range of benefits corresponding to the various levels of sophistication of installation. The research papers most concerned with the problems of valuing information systems application (valuing email, intranet evaluation) came to the conclusion that realistic valuation of the effects of the IS applications concerned would require the aggregation of many examples of its effects.

For the information systems applications in the Colruyt company (Colruyt, IT for CAT, Rationality framework) and the two case companies in paper 1 (integrating IS) another significant aspect of the business context becomes evident. In these examples the actual or expected benefits are valuable for both the direct returns obtained such as cost savings but also for their contribution to the critical success factors of the organisation or for their alignment with its strategic aims. The use of barcodes, customer waiting times (point of sale) and the development of the pricing database at the Colruyt Company, for example are key support systems for the business model of company. Their business value is judged to be high by the company management, not just due to their contribution to efficiency but also because they enable key aspects of the competitive strategy to be realised. For the Business Unit (Integrating IS), the CAD on a LAN combined with a central data store of expert knowledge were expected to deliver both cost and efficiency savings (consultant time) and the less tangible

benefit of a more effective collaboration between the various professional groups. This was expected to produce better quality buildings - a key objective of the Unit.

The need to change the way organisations operate for them to gain the full business value of the potential benefits of new information systems applications, is a common theme in IS research (Zuboff 1988; Scott-Morton, 1991; Keen, 1991; Caron et al, 1994;). Identifying the required structures and the necessary changes to be made to existing conditions and then achieving these changes becomes the objective. The information systems application comes to dictate the way that organisations operate (Teo et al, 1997; Markus, 2004).

The uneven and often disappointing results of IT-enabled transformation has tended to focus attention on the transformation process (Markus and Robey, 1988; Robey and Sahey, 1996; Davenport et al, 2001). These research papers are not concerned with the transformation process, but with the way the organisational environment affects the business value obtained from IS applications.

Many of the papers focus on the nature and characteristics of the organisational environment required to reap the value promised by the information systems application. One (Integrating IS) describes the technological and organisational features required for integrating information systems applications to work. Another (Rationality Framework) proposes a theory by which the roles of different types of information systems applications can be recognised and exploited. Three of the research papers consider IS applications with the potential to support collaborative work (Integrating IS, valuing email, Evaluating intranets) for which staff attitudes are a key factor. The ebanking paper offers an unexpected view of how the banker-SME relationship needs to change for the exploitation of the potential benefits of internet banking.

The two papers on the Colruyt Company (Colruyt, IT for CAT) give an unusual view of information systems in operation within an organisation. Both papers use this case company to assess the implications of using information systems applications to support a chosen organisational structure and culture. The case description in the two papers demonstrates how the choice and design of information systems and the use to which they are put is critically affected by organisational routines and norms.

Principle 1 summarises these effects on IS business value as follows:

The potential business value of an individual information systems application is unique to each organisation as is also the most appropriate choice of measures for it. Both are determined by the combination of:

- *The range of business benefits of the application*
- *The business context and the industry environment*
- *The organisational context*

5.1.6 Business value and the human resource

The members of staff of an organisation play a key role in determining the value of information systems to it. They are potential proposers and designers, the users and exploiters in control of the way an information systems application is applied. Alavi and Joachimsthaler (1992) in their review of the empirical implementation literature on DSS found a strong correlation between the level of user involvement, training and prior experience and the successful implementation of a DSS (measured by existing constructs such as system use, decision making time and user satisfaction). Davenport et al (2001) found that the apparent difficulty that organisations had in exploiting the information obtained by their transaction systems was due to several factors of which the lack of skilled employees was an important item. They identify five types of competencies that must be developed 'if a firm wants to build strong analytic capabilities' (Davenport et al, 2001, p123). This is the type of skills identified as necessary for the

successful exploitation of DBM systems in the research paper, DBM model (Table 5.2).

But it is a user's mastery of the new facilities offered by information systems applications, that is the most valuable skill. Yetton et al (1994) describe how the partners of an architect's practice acquire a CAD package, learn to use it and then preside over the rollout of the application to all their staff of architects. The job roles of both partner and architect begin to change. Staff were required to 'put down their pencils' (Yetton et al, 1994) and use the package as a personal tool. The partners embarked on path of continuous learning as CAD technology went through a steep development curve. Their role came to include that of sponsors of the new technology and 'drivers of learning' (Zuboff, 1988) of their staff.

The Colruyt Company exhibits a similar attitude in demanding and supporting its staff to make maximum use of IS (Colruyt, CAT for IT). Examples include: sales clerk's management of company prices and pricing database, checkout clerk's control of waiting time system, use of ISID by all staff. The results for the architect's practice were spectacular. Over a period of five years, the partnership reduced the number of staff while achieving a five fold increase in turnover. The most significant and value enhancing benefit was the change wrought to client/architect relationship. The roles began to move from customer and provider to collaborators. This is the type of change that can be seen as of potential value to Fortis Bank (ebanking). The IT staff at Fortis were also aware of how much the business value of the new service depended on the creativity of the SME staff in making use of it.

Table 5.2: The papers: Staff contribution

Paper (Case)	Application	Staff contribution; required/actual skills, knowledge and attitudes
1 Integrating IS (Amerada Hess)	Document management system	All staff to both use and maintain content (documents) of the system. System requires acceptance of universal access to information.
1 Integrating IS (Business Unit)	CAD on a LAN and central data store of expert knowledge	Collaboration between IT and various groups of professional experts to build system: • Professional experts required to extend technical vocabulary, create common set of terms, use system, maintain content • Managers to support rather than supervise. • System requires positive attitudes to collaboration, acceptance of access to information for all (no opt outs)
2,3 DBM model and construct	DBM system	Collaboration between IT and Marketing experts to design and build an appropriate system • Marketing analysts with skills to exploit data, maintain system and enhance as appropriate. • Marketing Managers to understand the results and use to create business value
4 Valuing email (Retail Ltd & other public cases)	Email	All members of the communicating groups • willing & able to use email • able to master the more sophisticated functions.
5 Intranet evaluation (sponsor co)	Intranet applications	All members of the communicating groups • able and willing to collaborate with members and with IT staff to design applications • willing to use the new application, • able to learn to use it for collaborative working where appropriate • able to master the more sophisticated functions.

Table 5.2 (cont.): The papers: Staff contribution

Paper (Case)	Application	Staff contribution; required/actual skills, knowledge and attitudes
6 & 7 Colruyt, IT for CAT (Colruyt)	Bar codes; Pricing database; ISID; waiting time IS	• Control and use to forward company objectives by operational staff • Mastery of existing IS applications • New IS applications proposals form all levels - staff understanding of both system capability and business direction
8 rationality framework (Colruyt)	data capture; customer waiting times; ISID	Management and staff identification of appropriate roles for various types of IS applications
9 ebanking (Fortis)	Internet banking for SMEs	• SME staff ability to master the possibilities of internet banking, and use • Bank and SME staff handling of changed bank/client relationships.

The papers illustrate the importance of the user skills and attitudes in exploiting information systems (Table 5.2). Principle 2 states that:

The members of staff of an organisation are its key resource in the exploitation of information systems. Their level of mastery of IS, attitude towards new technology and ingenuity in using it are a critical factor in determining the IS business value obtained.

5.1.7 The inter-relationship of principles 1 and 2

It is often case based IS research similar to that reported by Kohli and Kettinger (2004) that offers the most valuable insights into the role of context in obtaining business value from information systems applications. The original research aim may not mention the issue of business value but it emerges as an important factor over the course of the case description and analysis (Markus L, 1983; Caron et al 1994; Myers M, 1994; Nandakumar, 1996; Bussen W and Myers M, 1997; Teo et al, 1997; Larsen M and Myers M, 1999; Gopal A and Prasad P, 2000;).

The case described by Kohli and Kettinger (2004) is of particular relevance to principles 1 and 2. It describes a situation in which the interaction of the organisational culture, business need and staff attitudes and skills have a critical impact on the business value obtained from a new information system. Over the period of the case, these three factors change or are changed in such a way as to transform a relatively ineffective information system project to one that contributes significant business value.

The organisation is a hospital and the case describes the attempts of the hospital management to introduce an information system aimed at improving the decision making of the physicians employed by the hospital. The hospital management was under pressure to reduce clinical costs, while continuing to improve the quality of patient care. It was accepted that the physicians controlled the clinical process that in turn determined the costs and quality achieved. The route to better practice was through 'informating' this group. The management had a clear business aim and their definition and measure of business value was relatively precise. This was to reduce costs per case and improve quality care. The improvement in care was interpreted as reduced variance in clinical activities, because this was thought to signal the adoption of best practice. A clinical DSS was developed 'to collect and process physician benchmarking information' (Kohli and Kettinger p370, 2004). The information system was designed to track individual physician's activities through his or her patient data on costs and quality measures like length of stay (LOS). The system produced reports that could be used by the various clinical specialities (departments) to monitor performance and hopefully improve the decision making of each physician. The clinical DSS was managed by the central IT department who produced the reports. Although the information system was agreed to be a success in that the physicians acknowledged that it accurately represented clinical practice, the early results were disappointing in terms of adoption by physicians. By classic measures, that of user response, the system was a failure, as

most physicians and clinical specialities made little use of the information provided by it. The case description explains how the norms by which the physicians operated worked to reduce their willingness to use this information system.

At this stage, two initiatives were started by the management and design team. The information system was redesigned to one in which the information could be delivered straight to each physician through his or her PC, instead of through paper reports from management. It was renamed a physicians profiling system (PPS) and came under their own personal control to interrogate and use as they saw fit. In addition the management sought to work with existing group cultural norms of peer pressure and assessment to create the conditions within which physicians would view the system as a valuable tool to improve their own and their group's performance. The outcome of this second initiative was successful in terms of the management aims. For the first year following implementation both cost and quality indicators improved significantly.

This case demonstrates how the business need was met through an iterative process that eventually matched the information system to the organisational culture. At the end of the process the physicians were beginning to internalise (master) the information provided to them and use it to improve their own performance and in the process produce significant business value for the hospital.

The approach used, that of Action Research, meant that the research project had both theoretical and practical objectives (Kohli and Kettinger, 2004). The process was designed to improve clinical performance and to create a greater understanding of the hospital-physician interaction through evaluation of the effect of the new information system. In fact the study also considerably enhances our understanding of IS business value, although this was not the original aim. Business value is defined in terms specific to the organisation (the

hospital) to the time period (when cost was becoming a dominant concern) and to the information systems application type (DSS tailored to the hospital situation) and the organisational culture is shown to play a key role in value creation. Not only does the study support both principles 1 and 2 but it also suggests that these principles are highly interrelated.

5.2 IS evaluation - Principle 3

IS evaluation exercises continue to engender scepticism (Stefanou, 2001; Farbey et al, 1999). An evaluation of an information systems application proposal involves several actors and activities. It is often treated as an individual exercise, by researchers and by practitioners, but the approach taken and techniques used stem from organisational routines developed for other evaluations. Hence it is also an organisational operation. The exercise has two key components – the organisation's decision making process and the assessment of the individual IS application. Information systems pose particular problems for both these activities. For effective results they must complement each other and this is difficult to achieve

The research papers report a rich range of case examples of evaluation exercises. Two papers (valuing email, intranet evaluation) develop ideas on evaluation methodology. The papers based on the Colruyt case (Colruyt, IT for CAT) focus on the evaluation process as part of the firm's general routines. The remaining papers (valuing email, intranet evaluation, integrating IS, ebanking) assess the individual evaluation exercises carried out for specific information systems applications. Principle 3 is based on the literature of evaluation and an analysis of the evaluation exercises in these papers.

5.2.1 Evaluation exercises in practice

One of the most persistent results of field work on evaluation practice, whatever the original aim of the study, is the continuing relatively unsophisticated and low level of evaluation activity in all types of

organisations (Bacon, 1992; Farbey et al, 1993; Balantine et al, 1996; Smithson and Hirschheim, 1998; Farbey et al, 1999; Irani and Love, 2001; Jones and Hughes, 2001; Frisk and Plantén, 2004). The examples in the papers support this finding (Table 5.3).

Table 5.3: The IS evaluation exercises, in papers 1,4-7,9

Paper (Case)	Evaluation exercise	Reasons for development: Perceived costs and benefits
1 Integrating IS (Amerada Hess)	Cost/Benefit (savings) using hard financial estimates. No estimates of intangibles.	Need for system accepted by all staff; Manager's gut feel that IS will increase efficiency and effectiveness of project staff (intangible benefit)
1 Integrating IS (Business Unit)	Cost/Benefit (savings) using hard financial estimates. No estimates of intangibles.	Driving force for IS - to achieve better communication and collaboration between the experts (intangible benefit)
4 Valuing email (Retail Ltd)	Cost/Benefit (savings) using hard financial estimates – including estimates of productivity gains. No estimates of intangibles.	Driving force for email - dissatisfaction with existing channels of communication. (intangible cost)
5 Intranet evaluation (sponsor co)	New methodology designed to include both hard financial costs, benefits & an assessment of the value of intangible & strategic effects - applied within the sponsor company .	Initial problem of deciding which intranet applications to support, accepting that for all, intangible effects are the most significant.
6 & 7 Colruyt, IT for CAT (Colruyt)	Cost/benefit based on hard estimates of contribution to the 'bottom line'. Concern with ISD process not techniques	Proposals for new IS that meet organisational need and contribute business value.
9 ebanking (Fortis)	Cost/benefit based on hard financial estimates; supported by qualitative statement of strategic gains	Expected strategic gains the driver for internet banking project. No apparent systematic assessment of all aspects of the strategic case.

The evaluation exercises carried out for the two case organisations in paper 1 (Amerada Hess, Business Unit), for assessing the email application in paper 4 (quoted published examples, Retail Ltd) and the evaluation process described in papers 6 and 7 for the Colruyt company all make their cases based on hard estimates, mostly cost savings or contribution to the bottom line (Colruyt). Most exercises explicitly ruled out incorporating estimates of intangible benefits or strategic considerations. The evaluation carried out by Fortis Bank (ebanking) could be considered to be more than a cost/benefit exercise as the case for developing internet banking was supported by the inclusion of a qualitative discussion of three strategic arguments. The evaluation exercise in paper 5 (intranet evaluation) was the only one to apply more sophisticated methods and this was because the sponsoring company required a methodology that would incorporate intangible and strategic effects.

Yet a major factor in the decisions to develop many of the proposed new information systems applications was the intangible or strategic benefits that each was expected to bring (Table 5.3). For example, it was believed that the email system installed at Retail Ltd (paper 4 valuing email) would solve or ameliorate the intense dissatisfaction with the existing methods of communication between the stores and Head Office felt by all staff. The expected improvement would result in intangible values like more effective message passing, less buck passing, and less hostility between the two groups. However no attempt was made to take account of these effects. The prime reason for proposing new systems in the three cases of Amerada Hess, Business Unit and Retail Ltd was for the intangible benefits that each was expected to produce, but these factors were ignored in the formal evaluation. It seems that organisations apply traditional financial methods, even when it is known that the most compelling reasons for (or most significant costs of) developing a new information system will be excluded by these methods. This alone would explain some degree of scepticism.

5.2.2 Evaluation methods

A major stream of the early work in the IS evaluation literature was devoted to the creation of new tools and measures for estimating the value of proposed new information systems applications. The complexity of the problem and the weaknesses perceived in many traditional financial and other measures has spawned a huge range of more sophisticated measures (Remenyi D, Money A and Twite A, 1995; Cronk and Fitzgerald, 1997; Bannister and Remenyi, 1999).

The previous section (5.1) has reviewed the problems posed in attempting to assess the business value of information systems applications even after implementation. Achieving realistic and credible estimates of the business value at the proposal stage of evaluation continues to be regarded as a major problem for IS evaluation (Farbey et al, 1999; Stefanou, 2001; McAulay et al, 2002; Bannister et al, 2002; Bannister and Walsh, 2002).

Despite the recognition of potential problems, few of the case companies address the issue of the evaluation methods used for IS (Table 5.4). The investigation into the intangible benefits of email (paper 4 valuing email) demonstrated the scale of measurement problems. Intangible benefits of email come in many forms but their value to the organisation was shown to depend to a great extent on the business and organisational context. Hence realistic assessment would have to include both potential benefit and contextual conditions. In addition the application affected large parts of the all the case organisations quoted, further extending the analysis. The paper concludes that managerial judgement is key to a realistic assessment. But this is not applied. Most of the more sophisticated evaluation methodologies proposed for IS applications offer ways both to obtain a comprehensive list of potential costs and benefits and to apply relevant expert judgements for estimating their value (Parker, Trainor and Benson, 1989).

Table 5.4: Analysis of the IS evaluation methods, in papers 1, 4-7,9

Paper (Case)	Perceived evaluation problem, methods proposed (in addition to traditional financial assessment) & level of success	Implications of extended methods - resources required, staff contribution
1 (Amerada Hess and Business Unit) 4 (Retail Ltd)	Intangible effects difficult to assess; no new methods proposed	Not relevant
4 Valuing email - Investigation of intangible effects	Many examples of how business context affects intangible value of email and reach of effects throughout an organisation; valuing difficult; managerial judgement proposed; no results	Various email examples demonstrate the need for contributions from many business staff from a wide range of departments, to make judgements as to cost and value of intangible effects.
5 Intranet evaluation (sponsor co)	Intangible effects of communication and distribution of information dominant effect; New methodology - a basket of techniques designed to combine judgements of organisational experts to obtain estimates of full range of costs and values including intangibles. Measures both financial and scales based on judgments; some success claimed	Labour intensive method that requires contributions from many business staff and expert evaluators and facilitators.
6 & 7 Colruyt, IT for CAT (Colruyt)	Finding promising new IS that contribute to the 'bottom line'. Concern with ISD process not techniques; Company claims that level of success improving	Sponsors responsible for estimation, making the business case and financial success of the IS. Steering committee responsible for assessing proposals and past track record of sponsor.
9 ebanking (Fortis)	Qualitative assessment of the strategic case for the bank considered adequate, costs and value to SME clients not considered; no new methods	

The evaluation methodology proposed in paper 5 (intranet evaluation) follows this approach. The use of the methodology to assess the value of an example intranet application demonstrates the complexity of the problem of estimating information systems effects on an organisation. The methods proposed in the paper were new to the sponsoring company. Informal feedback suggested that they had some success but no systematic assessment was made as to the outcome. For the Colruyt company (Colruyt, IT for CAT) the methodology was considered part of the system development decision process. For this company the decision stages and the people involved from proposal to acceptance and implementation were an important part of the appraisal. The case notes that the company claimed increasing success with its IS decisions after changing the decision process.

The two papers that attempt to include intangible and strategic effects (Valuing email, intranet evaluation) demonstrate the amount of skilled effort that would be required for more sophisticated evaluation exercises (Table 5.4). Paper 5 gives a detailed example. The methods described for assessing the potential value of a new intranet application require the contribution of many members of staff representing the target user group in the company, as well as the more specialist evaluators and facilitators.

The process of collecting the relevant data analysing and interpreting and then reproducing in a form suitable for the decision makers is also clearly labour intensive and requires special skills. For the Colruyt Company, the business sponsor of a new information systems proposal is the key evaluator. The depth of analysis is his or her responsibility but the company routines ensure that all those affected are expected to contribute as relevant. The subsequent review by a high level steering committee involves yet another group of staff. If organisations consider IS evaluation to be intractable, they will be reluctant to put this level of effort into evaluation exercises.

5.2.3 The Decision making process

The evaluation activity itself is likely to be the centre of controversy.

The results of any individual exercise seldom please every one. If taken seriously they can determine the start or demise of major new initiatives or long held plans. The activity cannot help but have political and social consequences, as the results will determine future investment and organisational directions and have the potential to change existing organisational relationships and hence job roles and power balances. For information systems projects this can mark the first stage of a project that will clearly alter the organisation in major ways (Stefanou, 2001). Most of the information systems applications in the case examples are likely to do this. They need considerable resource and many will change working practice in significant ways (see table 5.5).

Organisations develop methods and routines designed to take the major decisions affecting their future (Grant, 1995). Evaluation is part of this process. Information systems involving large-scale resources and organisational time would fall into the category of a major decision and be subject to this process. But IS evaluation adds a further complication in that the standard routines and approaches for evaluation adopted by an organisation may be inappropriate for assessing the potential of a new information system.

According to Nutt (2002) the misuse of evaluation is a major cause for failure in making major decisions. In his model of poor practice, evaluation tends to be used for political rather than investigative uses. In essence this process acts to reduce discussion of contentious or ambiguous issues. Little time is spent on discussing and assessing the problem or opportunity that sparked the need for a decision. Conflicts of interest between significant stakeholders are ignored. Organisational objectives are frequently unclear but assumed to be understood by all the stakeholders. In many cases the solution about which the decision is supposed to be, emerges early in the process. The decision process then

becomes one of justifying and selling this solution rather than a genuine investigation. Decision makers take a defensive position in which evaluation is used to justify the chosen conspicuous solution, 'More time and money is spent doing this type of evaluation than all the other decision making activities combined' (Nutt, 2002 page 34). The potential value of evaluation that can be generated through analysis of objective data, the generation of alternative ideas and the analysis of risk is lost. IS evaluation exercises seem particularly prone to falling victim to this process.

Table 5.5: Analysis of the organisational aspects of the IS evaluation exercises in papers 1,4-7,9

Paper (Case)	Likely Impact of IS application on organisation	Organisation's decision making process IS evaluation methods match to problem?	Attempts to change existing routines
1 Integrating IS (Amerada Hess)	Document Management System – Moderate effect, automating existing procedures	Evaluation exercise appears to be justifying agreed decision Methods inappropriate for IS application	None
1 Integrating IS (Business Unit)	CAD on a LAN connecting technical building experts – High impact changing working practice, big investment	Evaluation exercise appears to be justifying agreed decision Methods inappropriate for IS application	None
4 Valuing email (Retail Ltd)	Email connecting stores and HO – high impact eventually changing working practice and information dissemination, big investment	Email wanted by company. Evaluation exercise appears to be an attempt to justify system and satisfy company's decision process. Methods inappropriate for email	Evaluation exercise tried to include intangibles but this aspect ignored in final report.
5 Intranet evaluation (sponsor co)	Intranet applications - could be high eventually changing working practice	Methods appropriate for IS application but new to company. Process taken seriously. Decision outcome good at case end	major change; little expectation of use in other IS evaluations

Table 5.5(cont.): Analysis of the organisational aspects of the IS evaluation exercises in papers 1,4-7,9

Paper (Case)	Likely Impact of IS application on organisation	Organisation's decision making process IS evaluation methods match to problem?	Attempts to change existing routines
6 Colruyt & 7 IT for CAT (Colruyt)	Some IS applications have major impact on working practice and business operations eg barcode, ISID Big investment in IT for company as a whole	Decision making process described in detail. Little detail on methods. Process taken seriously. Decision outcome monitored and used to assess business sponsor in subsequent proposals. Improved outcomes noted from latest approach.	Existing routines encourage debate and review, hence change to methods an option accepted by company.
9 ebanking (Fortis)	Potentially major impact on SMEs; big investment for the bank	Formal decision making process taken seriously. Strategic arguments dominated decision. Methods not designed to handle this dimension. Decision outcome poor	None discussed

The political manoeuvring that can occur around IS evaluation exercises, has been repeatedly noted (Farbey et al, 1999; Walsham, 1993; Jones and Hughes, 2001). In three of the case examples (Amerada Hess and Business unit in paper 1 and Retail Ltd in paper 4), exhibit this phenomena as the evaluation exercises appear to be used to justify existing choices of information systems (table 5.5). The example in Fortis (paper 9, ebanking) also suggests a similar process. Perhaps not surprisingly the methodologies used in each case are inappropriate for the proposed new application and hence there is a mismatch between methodology and information system application under investigation. The ebanking case was the only example in which the

outcome of the decision was reported. This was shown to have produced disappointing results.

An enormous amount of effort has been put into developing a wide variety of alternative IS evaluation methods, tailored to many eventualities and differing objectives. Paper 5 was one such attempt. But little practical use has been made of these ideas so far (Smithson and Hirschheim, 1998; Farbey et al, 1999; Bannister and Remenyi, 2000). These proposals have limited value if as Farbey et al (1999) found many organisations remain unclear as to the purpose of their evaluation exercises. Nor can they be used if they run counter to existing cultural norms. Organisational learning for example has long been considered an important benefit of post implementation evaluation exercises. The learning is usually obtained through identifying mistakes (Dymoke-Bradshaw, 1999). As Jones and Hughes observe (2001) 'it was unusual for a mistake to be admitted – no-one wants to admit failure, a system goes in and is made to work.' An organisation not committed to learning will have little interest in post implementation exercises.

Moreover evaluation methods are one among many organisational routines embedded as accepted practice. Existing practices will normally prove resistant to change. The case described by Serafeimidis and Smithson (2000, 2003) gives a graphic illustration of the problems that can arise when attempts are made to change accepted methods. The case company had decided that it's existing IS evaluation methods were inadequate. Serafeimidis and Smithson discuss the development of the new tools and approaches that would, in the company's view, improve the quality of evaluation of new IS projects. Their description of the failure of the attempt to get these methods accepted as standard practice is illuminating. This turned into a major change project and hence was subject to all the problems and risks of managing organisational change. The sponsoring company in paper 5 (intranet evaluation) seems to be in a similar situation – willing to investigate new methods but not

adopt them. None of the other cases considered changing existing methods apart from the Colruyt Company (Table 5.5). The Colruyt company (Colruyt, IT for CAT) takes the decision making process seriously. The case describes how decision outcomes are monitored and used to assess the business sponsor in subsequent proposals. The decision and evaluation process described identified routines that encourage debate and review. Hence change to methods is an option accepted by the company. The case records successful changes made in the past that had led to an improved record on investment in information systems

IS evaluation is a complex activity. There are few clear examples of success in measuring the total impact of the type of IS applications that generate strategic and intangible effects. The proposed methodologies that might achieve this are labour intensive and require specialised expertise. But it is the organisations' decision-making process that determines the value of the evaluation exercise. Principle 3 states the conditions necessary for an evaluation exercise to contribute positively to an organisation's management of its information systems investments.

The minimum requirements for an organisation to be able to execute a useful IS evaluation exercise are:

- *Use of appropriate methodologies tailored to the characteristics of the individual IS application under review*
- *Employees with the requisite specialised skills, including for example evaluators, analysts, facilitators and project managers*
- *Commitment of adequate resources to the exercise*
- *An effective decision making process within the organisation*

5.3 The contribution of the principles

These principles have important implications for both organisations and researchers.

IS business value is central to the three principles. Together they offer a more comprehensive and holistic view of the factors that affect its creation for organisations. Principle 3 sets out the basic requirements for IS evaluation exercises to be useful and relevant to an organisation's operations. A key component of this is the ability to make credible estimates of the business value of IS applications. Principle 1 establishes the main factors that affect not only the potential IS business value but also the way that its measurement needs to be approached. Principle 2 suggests that an organisation's employees are the key factor in determining whether the full potential of an IS application is realised.

The principles demonstrate that the practical realisation of IS business value for organisations involves a great deal of effort. It requires an organisation to practice good management. It requires staff at all levels to have an understanding of the business and the contribution that IS applications can make. It requires some staff with special skills. It requires considerable resource in staff time. Above all it requires an acceptance that obtaining value from IS applications demands continuous, sustained and thought out effort. Organisations that apply the principles stand to improve their selection, design and exploitation of new IS applications.

For IS researchers, this work not only contributes to the IS evaluation subject theme, but it also identifies the emergence of a new subject theme around that of IS business value. Combining rigor with relevance has been identified as an important aim for IS research (Benbasat and Zmud,1999). The principles address questions and problems of great relevance to organisations. They also raise intriguing questions about research methodology. The discussion of the research methodology

used in the papers and in the emerging literature for IS business value raises questions as how to handle the requirement for rigor. The principles point the way to this and other promising future research directions. These are discussed further in the next section.

6 Conclusions and future research

This integrating document together with the nine papers has fulfilled the requirements for a PhD at City University. They have demonstrated the creation of new knowledge through the three principles and an understanding of the applicable techniques for research. The research papers have demonstrated evidence of systematic research over a considerable period of time into the two subjects of research methodology and information systems value to organisations. They have also demonstrated my ability to design and implement research projects.

The three principles meet the research aim of attaining a greater understanding of the business value that information systems could offer organisations. They demonstrate that new IS cannot be treated by organisations as an investment separate from the rest of its activities. Most of the applications developed in the last two decades are of the type which contribute most value in supporting staff in their jobs. They become integral to the organisation's life and operations impacting many groups and departments. So the way that an organisation manages its operations, its management style, its culture and values, its organisational routines and style of decision making, its people and their skills as well as the nature of its business affect both the choice and design of new IS applications and the way in which they are put to work. Few organisations are likely to be reaping the full potential business value of their information systems, but may be unaware of the extent to which they could improve their performance.

The three principles demonstrate the complexity of the problems raised by the research question.

IS business value is a complex concept, difficult to measure in practice. Both the business and organisational environments exert a major effect on the potential business value to be reaped from the range of benefits that each type of IS application offers. Understanding of the possibilities of new information systems applications and hence exploitation of the full potential value depends critically on an organisation's staff.

IS evaluation exercises present many problems for organisations. The quality of management and the decision-making processes at an organisation have an effect on the how useful such exercises turn out to be. The problems posed in trying to assess the potential value of a new information systems application for any individual organisation at a particular point in time, are a major factor in the relative lack of progress in IS evaluation practice.

Three promising directions for future research work can be discerned from this work - to:

- Extend knowledge of IS business value through:
 - A review and synthesis of existing published work on the business value of each of the major types of IS applications
 - The development of cases on the business value of new types of applications that are beginning to be installed such as for example RFID
 - Further analysis of the concept of IS business value
- Test principle 3 on IS evaluation through Case research into the evaluation practice of large companies that have publicised their incorporation of IT evaluation processes into their

Corporate and IT planning processes as for example Philips (Hartert D, 2004)

- Explore the implications of the requirements for contextual analysis and interpretation for research methodology

There is an extensive literature on many IS applications that if synthesised could offer much to increase our understanding of their potential business value. The literature on GDSS (and GSS) is a good example. It offers not only extensive examples of the use of the applications but also conflicting results (Gopal A and Prasad P, 2000; Trauth E and Jessup L, 2000). This application is one of the most interesting as it demonstrates most clearly that choice and design of research methodology is an important issue for IS business research. It seems likely that a synthesis of all the work carried out so far, which extracts the findings with respect to business value could explain how this application could be most effectively used.

This document argues for a case based approach to the research on IS business value. The range and scope of the benefits that a new application, such as RFID offers, can be identified by their developers. But an understanding of their potential business value can only be achieved through the case examples of their use within organisations. RFID is of particular interest at present. The costs of installation are falling quickly to that level that makes it a technology accessible to many organisations. It is a versatile application that can be applied to many different situations and types of business. Examples already include retail, supply chain and the criminal justice system. New applications are expected to continue to appear and case study work on each will accelerate our understanding of how they can best be used.

There are few examples of case studies of IS evaluation exercises that include a full description of the context within which the decisions are made. The case study by Serafeimidis V and Smithson S (2000, 2003) is an exception and demonstrates the relevance of context. There are

few case studies of an IS evaluation exercise that includes the outcome of the decisions made and hence the success of the evaluation and decision making process. It is case studies that incorporate these issues that are needed to test and refine principle 3. An important question is how many organisations carry out their own evaluation of the process by which they decided to back an IS application (or not) and the results of such work. The comparative rarity of post implementation evaluation suggests that there are few such studies. But if they exist they would contribute greatly to our understanding of how to implement IS evaluations.

Analysis of business and organisational context is not a simple exercise. The accepted approach is case based research. The researcher faces many choices in between philosophical paradigms and the various methods of data collection and analysis. These methods are labour intensive. The case period may be required to cover a lengthy period of time – often years (Kohli and Kettinger, 2004). The inclusion of the social dimension brings the possibility of many realities (Gopal and Prasad, 2000). Perceptions of value may differ from stakeholder to stakeholder (Bussan and Myers, 1997; Gopal and Prasad, 2000; Trauth and Jessup 2000). Data collection and analysis can be carried out in a variety of ways developing differing perhaps clashing interpretations of one situation (Gopal and Prasad, 2000; Trauth and Jessup, 2000). For interpretivist, critical and action research approaches, prior judgement as to the key issues for the investigation can exert a large effect on the quality and type of results (Trauth and Jessup, 2000). It can be only too easy to work in what proves to be a relatively unproductive direction. Gopal and Prasad (2000) suggested that traditional research goals like consistency may not be appropriate for this type of research. This raises the question – what are appropriate goals?

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Glossary

BPR – Business Process Engineering

CAD/CAM – Computer aided design/computer aided manufacturing

CAT – Communicative Action Theory

CMC – Computer mediated communication

CRM – Customer Relationship Management systems

CSCW – Computer Supported Co-operative Work

CST – Critical Social Theory

DBM – Database Marketing

DSS – Decision Support System

e-commerce – buying goods or services over the internet

EIS – Executive Information System

ERP – Enterprise Resource Planning

GDSS – Group decisions support systems

GSS – Group Support Systems

ICT – information and communications technology

IFIP WG8.2 - International Federation for Information Processing
Working Group 8.2

Internal Integration – the second of the IT-induced levels of business transformation in Venkatramen's framework

Internet – electronic communications infrastructure supporting the world wide web

IS – information systems

ISD – Information Systems Development

ISD methodology – approach to developing new IS applications packages or bespoke software

IT – information technology

ITM – information technology management

LAN – Local Area Network

MBA – Masters degree in Business Administration

Mobile commerce (m-commerce) – buying goods or services over a mobile device

OR – Operational Research

PC – Personal Computer

QM – Quantitative Methods

RFID – Radio Frequency Identification

ROI – Return on Investment, financial measure of capital investment

SME – Small or Medium size Enterprise

UIS – User Information Satisfaction