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**POLYCHRONICITY IN TOP MANAGEMENT TEAMS: THE IMPACT ON
STRATEGIC DECISION PROCESSES AND PERFORMANCE OF NEW
TECHNOLOGY VENTURES**

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POLYCHRONICITY IN TOP MANAGEMENT TEAMS: THE IMPACT ON STRATEGIC DECISION PROCESSES AND PERFORMANCE OF NEW TECHNOLOGY VENTURES

ABSTRACT

This study focuses on *polychronicity* as a cultural dimension of top management teams (TMTs). TMT polychronicity is the extent to which team members mutually prefer and tend to engage in multiple tasks simultaneously or intermittently instead of one at a time and believe that this is the best way of doing things. We explore the impact of TMT polychronicity on *strategic decision speed and comprehensiveness* and, subsequently, its effect on new venture *financial performance*. Contrary to popular time-management principles advocating task prioritization and focused sequential execution, we suggest that TMT polychronicity has a positive effect on firm performance in the context of dynamic unanalyzable environments. This effect is partially mediated by decision speed and comprehensiveness. Our study contributes to research on strategic leadership by focusing on a novel value-based characteristic of the top management team (polychronicity) and by untangling the decision making processes that relate top management team characteristics and venture performance. It also contributes to the attention-based view of the firm by positioning polychronicity as a new type of attention-structure.

INTRODUCTION

An interesting and practical focus for research on strategic leadership is to seek to understand the consequences of top managers' temporal pattern of activities. Early observation-based studies focusing on what managers do (Mintzberg, 1973; Kotter, 1982a) argued that the managerial work is characterised by multiple, brief, interwoven activities and continuous interruptions. However, not all managers schedule their activities in the same

way. Preference-driven variations in the temporal pattern of top managers' activities could affect their decision processes and, consequently, firm-performance. This issue has not yet been investigated. In general, not much work in strategic leadership has expanded and refined ideas from early seminal studies that observed top managers' temporal pattern of activities (Finkelstein, Hambrick and Cannella, 2009). Our study fills this void, in the particular context of new technology firms operating in dynamic, "unanalyzable" environments.

We draw from recently emerged literature on the influence of timing issues on organizations (Bluedorn and Denhardt, 1988; Zaheer, Albert & Zaheer, 1999; Ancona, Goodman, Lawrence & Tushman, 2001; Ancona, Okhuysen & Perlow, 2001; Bluedorn, 2002) to expand research on strategic leadership, which studies top managers and the consequences of their actions (Finkelstein *et al.*, 2009; Carpenter, Geletkanycz and Sanders, 2004). We focus on an important but under-researched temporal construct in terms of its strategic impact, Hall's (1959) construct of *polychronicity*.

Hall (1959) conceptualized polychronicity at the group level of analysis, as a dimension of culture. We define *top management team polychronicity as the extent to which TMT members mutually prefer and tend to engage in multiple tasks simultaneously or intermittently and believe their preferences is the best way to do things* (we adapted the definition by Bluedorn, Kalliath, Strube and Martin, 1999). In practice, managers in more polychronic TMTs switch extensively their attention between tasks (simultaneous or intermittent task-engagement), often in response to new issues or opportunities (Kotter, 1982a). In contrast, in less polychronic TMTs, managers control attention-switching with techniques such as quiet times and appointment schedules in order to work on task lists sequentially (Griessman, 1994).

We argue that TMT polychronicity is an important concept to introduce to strategy research because it reflects how top managers allocate their most valuable scarce resource:

their own time. Our main thesis is that since polychronicity captures the temporal pattern of activities of top managers (Bluedorn, 2002) it has an impact on strategic decision processes and firm performance.

We propose that in the context of new technology ventures, TMT polychronicity is beneficial for strategic decision-making and firm performance. We examine empirically the relationship between TMT polychronicity and financial performance and between TMT polychronicity and two key strategic decision process dimensions: *strategic decision speed* (Eisenhard, 1989) and *comprehensiveness* (Fredrickson, 1984; Forbes, 2007). We also test whether speed and comprehensiveness partly mediate the polychronicity-performance relationship. We combine two complementary theories to anchor our model: a) The upper-echelons theory, which suggests that top executives' values and cognition at the team level, are reflected into their firms' strategic choices, via the different ways executives process information (Hambrick and Mason, 1984) and b) The attention-based view of the firm, which proposes that organizational choices depend on what issues and answers decision makers focus their attention on (Ocasio, 1997).

We aim to contribute to the research field in three broad ways. First, we extend research on strategic leadership and upper echelons (Carpenter *et al.*, 2004; Hambrick, 2005 and 2007; Finkelstein *et al.*, 2009). We look at the effects of polychronicity, an untested cultural (value-based) characteristic of TMTs; we also peek into the "black box" of the upper-echelons theory by introducing dimensions of the decision making process (speed and comprehensiveness) as mediators of the polychronicity to performance relationship. Second we contribute to the attention-based view by expanding its set of attention structures to include norms of time-allocation of top managers and by extending the concept of firm-level attention structures to the TMT level. Third, we extend work on the nature of managerial work, by introducing an established construct to capture Mintzberg's (1973) and Kotter's

(1982a) descriptions of interwoven activity-sequencing. We go beyond “typical managers” to argue that there is variation in polychronic orientation among TMTs. We explore the relationships between polychronicity, decision-making processes and financial performance using (for the first time in the literature of how managers spend their time) quantitative data from a relatively large sample of new technology ventures.

The Context of New Technology Ventures.

The context of new technology ventures is appropriate because it controls for three key moderators, with important theoretical and empirical implications: dynamic “unanalyzable” environment, managerial discretion and behavioral integration (Cannella and Monroe, 1997).

Environmental dynamism (instability or turbulence) (Forbes 2007) is concerned with the presence of “rapid and discontinuous change” (Bourgeois and Eisenhardt, 1988; 816). Daft and Lengel (1986), Atuahene-Gima and Li (2004) and Forbes (2007) distinguished between two types of environmental dynamism, namely analyzable (uncertainty) and unanalyzable (ambiguity). Uncertainty refers to absence of information. As the amount of information increases, uncertainty decreases, therefore it is analyzable. Ambiguity instead means confusion and lack of understanding (multiple and conflicting interpretations of a situation). Therefore, it is considered to be unanalyzable and it does not decrease with quantity of information alone; quality information that can change understanding is needed in unanalyzable environments (Daft and Lengel, 1986).

New technology firms operate in dynamic environments, because of rapid changes in technology and market developments in their sectors (Yli-Renko, Autio and Sapienza, 2001). These firms are the embodiment of risk (Carpenter, Pollock and Leary, 2003), because their technology is new and its reliability and adoption-rate is unpredictable (Atuahene-Gima and Li, 2004). Moreover, they develop highly differentiated products, in new and often ill-defined segments (Carpenter *et al.* 2003). Market demand is unpredictable, as there are no past-sales

data and it is difficult to establish buying intentions for novelties. Therefore new technology ventures operate in dynamic and unanalyzable environments.

Moreover, new technology firms have high levels of “managerial discretion” (Hambrick, 2007) as executive orientations manifest themselves much more strongly in smaller entrepreneurial companies (Finkelstein and Hambrick, 1996; p.108; Cannella and Monroe, 1997; Forbes 2005). High managerial discretion implies that TMT characteristics, such as polychronicity, strongly influence strategy and outcomes (Hambrick, 2007).

Finally, in the context of new technology ventures we can conceptualize polychronicity at the TMT-level, making the implicit assumption that TMT members will exhibit similarity in their preferences and behavioral tendencies. The assumption is valid as TMTs of new ventures are self-selected groups of people with similar values and beliefs and a strong team culture. Similarity among TMT members is consistently found in the entrepreneurship literature (Forbes, Borchert, Zellmer-Bruhn and Sapienza, 2006; Ruef, Aldrich and Carter, 2003; Francis and Sandberg, 2000) and is explained by two different theories: a) the social psychological theory of similarity /attraction which asserts that individuals are attracted to others similar to themselves (Byrne, 1971) and b) homophily which is a sociological explanation based on the probability of contact: because people socialize with those similar to themselves, new venture teams of similar people occur at much higher rates than teams of dissimilar people (Ruef *et al.*, 2003). Friendship and social interaction is common among TMT members of new ventures as team members spend long hours working together (Francis and Sandberg, 2000). Similarity in values, social interaction and work interdependence lead to behavioral integration among group members and to within-group agreement regarding perceptions of the work environment (Klein *et al.*, 2001; Hambrick 2005)^a.

^a Empirically, there is prior evidence of within-group agreement in response to the group-polychronicity scale for managers reported by Bluedorn (2002) and Onken (1999). More importantly, in our dataset, we found very high within-group agreement about polychronicity among two respondents in each team (the ICC values ranged from 0.77 to 0.96 and the r_{wg} values from 0.87 to 0.95 – see the method section). Moreover, during in-depth

THEORETICAL AND CONCEPTUAL BACKGROUND

Upper Echelons Theory and Attention-Based View

We build on the upper-echelons theory and the attention-based view to frame our model on the effects of TMT polychronicity. The two theories are complementary (see Cho and Hambrick, 2006) deriving from the bounded rationality theme of the Carnegie school. The underlying logic is that humans have limited capability to attend information, action-alternatives and action-consequences, which results in their bounded capacity to be rational.

The upper-echelons theory suggests that organizational choices and outcomes are linked to the way top executives filter and process information from their environment (Hambrick 2005; Hambrick and Mason, 1984). The way top managers process environmental information (and on this basis make choices) depends on a set of personal characteristics, namely their cognitive base and their values. The upper-echelons theory focuses on TMTs, as group characteristics will be far more predictive of organizational outcomes than those of the chief executive alone (Hambrick and Mason, 1984).

The bulk of the substantial empirical literature on upper-echelons theory has focused on demographic characteristics (age, tenure, education) as useful, albeit imprecise, proxies for executive cognitions and values (for a recent review see Carpenter *et al.*, 2004). Few studies have examined the influence of values and cognitions directly because of the difficulty of obtaining psychometric data from executives (Hambrick, 2007). Our study responds to this gap by focusing on a cultural characteristic of the TMT, i.e. polychronicity.

On another note, research on upper-echelons theory has yet to explain the exact processes that convert TMT characteristics into firm performance. In fact, this “black-box” is

interviews with eight selected companies, executives indicated a strong TMT culture and agreement regarding polychronicity (see Appendix 1). The above offer empirical evidence supporting the assumption of similarity in polychronic preferences and behaviour among TMT members in the context of new technology ventures.

one of the upper-echelons theory's key shortcomings (Hambrick 2005 and 2007) and our study attempts to address this issue, by proposing decision making processes as mediators.

Our model builds on the upper-echelons theory in two ways: Firstly, we focus on the TMT as the unit of analysis. Building on the upper-echelons theory's main thesis that the firm is a reflection of its top managers we propose that a shared TMT-characteristic (polychronicity) affects firm decision-processes and performance. Secondly, we view the selective filtering of environmental information by TMT members (caused by polychronicity), as the key to what they focus their attention on and how their firm performs.

The attention-based view of the firm is built around the concept of attention. Its core argument is similar to the one by the upper-echelons theory, posing that organizational choices depend on what issues and answers decision makers focus their attention on (Ocasio and Joseph 2005). In our view the attention-based view complements the upper-echelons theory in two important ways: Firstly, the attention-based view expands the set of "attention structures" (Ocasio, 1997 p.195), namely determinants of what decision makers focus their attention on. Apart from top managers' characteristics deriving from their personality and their past, it includes firm-level attention structures, such as culture, rules, resources and social relationships. Secondly, the attention-based view highlights the importance of decision-making channels and processes as *mediating mechanisms* between attention structures and managerial focus of attention. A principal mechanism by which attention structures govern and distribute the attentional focus of decision-makers is via the channelling of decision-making (Ocasio, 1997).

Our model also builds on the attention-based view in two ways. Firstly we view polychronicity as a TMT-level "attention-structure" that guides managerial focus of attention and strategic choice. The essence of the polychronicity construct in the TMT context is the extent to which its members prefer and tend to switch their attention between tasks. Secondly,

we build on the attention-based view to base mediating hypothesis of how polychronicity (an attention structure) affects decision-making channels and processes and subsequently firm performance.

Polychronicity: A Temporal Construct at Work

Consistently with the prior literature (Hall, 1959; Bluedorn *et al.*, 1998), we conceptualized top management team polychronicity as a dimension of group-culture. The core elements of defining and measuring group-culture are shared *values* (liking of a certain behavior), *beliefs* (that a certain behavior is good) and *behavioral tendencies* (patterns of behavior, conventions, customs or habits) (Schein, 1985 p. 6; O'Reilly, Chatman and Caldwell, 1991; Hofstede, Neuijen, Ohayv and Sanders, 1990). In accordance to norms regarding cultural constructs and to the specific precedence of measuring polychronicity at the group level (Bluedorn *et al.*, 1998), our definition and scale of TMT polychronicity taps preferences (values and beliefs) and behavioral tendencies.^b

We note that behavioral tendency is not the same as consistent actual behavior by all members of the group, at all times and at all situations, but indicate a typical pattern of behavior (Bluedorn, 2002, p.56). In this study we did not measure actual polychronic behavior, as this would require direct observation (this is a future research target). In essence, we make the implicit assumption (present in all cultural constructs) that cultural characteristics predict and guide actual behavior (Schein, 1985). This assumption is validated by theoretical, practical and empirical evidence^c.

^b Empirically, there is robust evidence of consistency between polychronic preferences and behavioral tendency. Bluedorn *et al.* (1999) validated the group-polychronicity scale with 11 different samples and a total N of 2190 people. More importantly, the preference and behavioral items in the scale were highly consistent in our sample. A sensitivity analysis showed that results did not change when we considered the preference and the behavioral-tendency items separately (see section on robustness checks).

^c Schein (1985) offered a theoretical explanation: as a group evolves from its inception, values and beliefs are gradually transformed from explicit social norms (ones that individuals are conscious about and are debatable) into "basic underlying assumptions", which is the essence of culture. Basic underlying assumptions are so taken for granted and institutionalized that they seldom rise to the conscious level for extensive examination. These implicit assumptions are non-confrontable and non-debatable and guide behavior. Polychronicity represents basic underlying assumptions about the use of time (Schein, 1985; Bluedorn, 2002).

To control for the possible effect of situational differences (e.g. the speed of the workflow and the urgency of incoming tasks) on polychronic behavior we sampled people that work under similar conditions. TMT members of new technology ventures are all very busy and subject to multiple, incoming, “urgent” tasks; therefore, in our particular context, the variation in the behavior (i.e. the sequence of task execution) is attributed to differences in preferences.

Looking through the lens of the attention-based view, we argue that the essence of the polychronicity construct is the preference and tendency to “*switch*” *attention* between tasks. Attention-switching captures both the simultaneous and the intermittent (back-and-forth) pattern of task-engagement mentioned in the construct’s definition; it implies that tasks are put on hold (remain temporarily incomplete) while other tasks start. Having multiple “unfinished” tasks in progress is a characteristic of polychronic cultures (Hall, 1959). Instead, engaging with tasks sequentially (monochronic work) involves “shifting” attention from a completed task to the next one in the list, without coming back.

Attention switching before the completion of the current task (polychronic work) can happen in two ways: The actor decides to switch attention between the current task and

Observing the world of practice, Kotter (1982a) noticed that there was considerable variation among his top managers’ temporal pattern of activities, around some central tendencies. To illustrate the point, he distinguished the organized, appointment-based manager, who acted like a “military general” from the less scheduled manager who spent most of his time in interwoven informal conversations (Kotter 1982a, p97). Such behavioral variation among people doing the same type of work is the manifestation of differences in polychronic preferences.

The managerial interest in time management also validates the assumption that time allocation can be guided by preferences (rather than the situation). Time management focuses on the mastery of timing and scheduling in order to increase output (Jett and George, 2003) and is about “taking control” of one’s time (Covey et al. 1994; Griessman, 1994). Time management manuals suggest that executives have a choice of how to use their time during the day. TMT members might chose to switch to a new task (e.g. a telephone call) when it arrives (behave polychronically) or prefer to continue with their existing task trying to complete it (behave monochronically). In the latter case, an assistant or an answering machine can be used to schedule the request for a later time. Executives can “hide” for a while if they want to (Tracy, 2007).

Empirically, our interviews with 8 selected companies confirmed the consistency between polychronic preferences (scales) and behavior (as described in words). Executives explained that their polychronic behavior was intentional (preference driven) regardless of external conditions (see selected statements at appendix 1).

The above theoretical, practical and empirical evidence validates our implicit assumption that executives can “take control” of their time during the work day, despite the apparent influx of urgent new tasks. We thank an anonymous reviewer for suggesting us to provide evidence to back our assumption.

another scheduled task in his/her to-do-list or the actor decides to switch attention between the current task and an unscheduled incoming task, i.e. he or she accepts an externally initiated “interruption”. Polychronicity scholars argued that treating unscheduled tasks as equal to planned tasks (i.e. accepting interruptions) is the most common behavioral manifestation of polychronicity for top managers (Cotte and Ratneshwar, 1999; Bluedorn *et al.*, 1992). Minzberg (1973) and Kotter (1982a) observed top managers’ work-patterns and suggested that they are constantly at risk of interruption. Top managers cannot work on something for long, before something else arrives to compete for their attention.

Polychronicity is a continuum. At the one extreme (low polychronicity) one task follows neatly upon the completion of its antecedent. At the other extreme (high polychronicity) TMT members would constantly switch attention between tasks and revisit tasks multiple times during a given interval. In the middle ground, TMT members would switch attention between tasks moderately, by creating chunks of uninterrupted time to complete specific tasks.

Extant time research on the impact of polychronicity focused more on individuals and linked the construct with work-related outcomes such as job satisfaction and effectiveness (e.g. Arndt, Arnold & Landry, 2006; Madjar & Oldham, 2006). There is little research on the organizational consequences of top managers’ polychronicity, especially as a cultural characteristic of the TMT. Two studies reported that “considering decision alternatives simultaneously” increases speed of decision making (Eisenhardt, 1989; Judge and Miller, 1991), but these studies did not focus on polychronicity. Two exploratory studies tried to link polychronicity with performance in small samples (Bluedorn, 2002; Onken, 1999) and they did not reveal consistent relationships. Our study fills this research gap by attempting to link TMT polychronicity with strategic decision processes and firm performance.

Our model on the effects of TMT polychronicity is shown in Figure 1. The relationships are split in three parts: the direct effect of TMT polychronicity on firm performance, direct effects of polychronicity on strategic decision processes and mediation effects of strategic decision processes on the polychronicity-performance relationship.

Insert Figure 1 about here

The Impact of TMT Polychronicity on Firm Performance

Psychological research on interruptions, mental work-load and task-switching has shown that performance can diminish when people switch focus from one task to another and/or work on several tasks simultaneously (Hecht and Allen, 2005). Intrusions may have negative consequences because they can result in insufficient time to complete tasks; they can create feelings of time-pressure, stress and anxiety; and they can disturb total involvement in and attention to the performed task, which delays its completion or reduces the quality of the outcome (Jett and George, 2003).

Perlow (1999) used a qualitative study to illustrate that software engineers had difficulty getting their work done because of the firm's polychronic culture and the resulting constant interruptions by colleagues. The result was a negative feeling among the engineers of having too much to do but never enough time, which Perlow called the "time famine". At a later stage the firm tried a less polychronic way of work by introducing uninterrupted blocks of individual time (quiet time) followed by time to engage in interactive activities (interaction time). As a consequence, productivity increased and workers were happier.

These arguments would suggest a negative relationship between polychronicity and performance. However, in the context of the TMTs of new technology firms, we propose an alternative thesis, based on theoretical insights from the upper-echelons theory and the attention-based view and on early, seminal descriptions of managerial work (Mintzberg, 1973; Kotter, 1982a).

Looking through the lens of the attention-based view, we view TMT polychronicity as *an attention structure*, a “cultural structure that governs the allocation of time, effort and attentional focus of organizational decision makers in their decision-making activities” (Ocasio, 1997, p.195). More specifically, we view polychronicity as an attention structure which favors the attendance of unscheduled interpersonal interactions over planned tasks. Benadou (1999, p.261) supports this view arguing that in polychronic cultures people view interpersonal interaction at least as important as the work to be performed.

The core benefit for TMT members of attending unscheduled interpersonal interactions is an information advantage. We build on the upper-echelons theory’s core argument that the top managers’ “field of vision” (where they look for information) affects decision making and firm outcomes (Hambrick and Mason, 1984). We suggest that polychronicity helps TMT members to acquire “insightful” information via unscheduled interactions with other people (externals to the organization as well as internal employees). We define insightful information as timely, relevant, soft and privileged information that can change understanding. The entrepreneurship literature has recognised that insights are often unexpectedly discovered rather than planned (MacMillan and McGrath, 1997). The timing of the interpersonal interactions often makes a difference. Trying to schedule the acquisition of potentially insightful information at a later time might find the information-holder unavailable or not ready to share the insight.

Our core thesis that polychronicity brings insightful information is illustrated in the ethnographic descriptions of managerial work by Mintzberg (1973) and Kotter (1982b). Mintzberg argued that managers work on their tasks in a continuous back-and-forth fashion *to encourage the flow of timely information*. Top managers play a key role in securing and distributing soft and privileged external information, much of which is available only to them because of their status. This soft information – which includes gossip, hearsay and

speculation - is valuable because of its timeliness. Today's gossip may be tomorrow's fact.

"The manager who misses a telephone call revealing that the company's biggest customer was seen golfing with a main competitor may read about a dramatic drop in sales in the next quarterly report. But then it's too late" (Mintzberg, 1990 p.166). According to Richard Neustadt who studied the information-collecting habits of three US presidents:

"It is not information of a general sort that helps a President see personal stakes; not summaries, not surveys, not the bland amalgams. Rather... it is the odds and ends of tangible detail that pieced together in his mind, illuminate the underside of issues put before him. To help himself he must reach out as widely as he can for every scrap of fact, opinion, gossip, bearing on his interests and relationships as President. He must become his own director of his own central intelligence." (Neustadt, 1960, as quoted in Mintzberg, 1990 p.166).

Kotter (1982b) and Eisenhardt (1989) also stressed the importance of acquiring and distributing timely and relevant internal information in facilitating effective decision-making. Kotter (1982b) described how top managers obtain internal information via unscheduled interactions: "On his way to a meeting a general manager bumped into a staff member that did not report to him. Using this two minute opportunity he asked two questions and received the information he needed..." The early descriptive literature also suggested that managers favor verbal media, telephone calls and meetings rather than documents to gather soft, privileged information (Mintzberg, 1973; Kotter, 1982a).

In the context of dynamic unanalyzable (ambiguous) environments, such as the one faced by new technology firms, decision-makers do not need to process large amounts of information but instead they need insightful information that can change understanding (Daft and Weick, 1984). When structural mechanisms (such as polychronicity) facilitate the acquisition of insightful information, firm-performance increases (Daft and Lengel, 1986).

Overall, we build on the upper-echelons theory and the attention-based view of the firm. We view TMT-polychronicity as an attention structure (Ocasio, 1997) which favors frequent unscheduled interactions (Schein, 1985). The latter expand the TMT members' field of vision

(Hambrick and Mason, 1984) and bring in insightful information (Mintzberg, 1973; Kotter, 1982b). Insightful information from unscheduled events can generate new core-issues and initiatives for managers to focus their attention on (Ocasio, 1997; Ocasio and Joseph 2005) improving strategic choice and performance (Hambrick and Mason, 1984). We propose:

Hypothesis 1: In the context of new technology ventures, TMT-polychronicity is positively related to financial performance.

The Impact of Polychronicity on Strategic Decision Speed and Comprehensiveness

The attention-based view suggests that attention structures affect the channelling of decision making. Building on this broad theoretical premise we link polychronicity with two key dimensions of the strategic decision process, strategic decision speed and comprehensiveness (Miller, Burke and Glick, 1998; Rajagopalan, Rasheed and Datta, 1993).

Strategic decision speed refers to the velocity with which organizations execute all aspects of the strategic decision process, from the initial consideration of alternative courses of action to the time a commitment to act is made (Eisenhardt, 1989).

Strategic decision comprehensiveness captures the extensiveness with which an organization's executives systematically gather and process information from the external environment in making strategic decisions (Fredrickson, 1984). Firms that scan their environment for greater quantities of information or that analyze environmental information more extensively – for example by employing quantitative analytic techniques to a greater degree – are considered more comprehensive (Forbes 2007).

Therefore, comprehensive decision making is about *systematically* gathering *quantities* of information and *extensively analyzing* this information. Instead we argue that polychronicity leads to a different style of decision making. Polychronic work offers *insightful* information (which denotes information quality rather than quantity) gathered by managers in a *non-systematic* way. This distinction between insightful information via

personal interaction versus quantity of information formally gathered and analyzed was made also by other scholars such as Daft and Lengel (1986; p.559-560) and Eisenhardt (1989).

Insightful information often eliminates action alternatives early in the process because of a key problem. For example, suppose that a TMT has to choose among four suppliers. One supplier could be quickly eliminated on the basis of soft external information that they are “too close” to a competitor. Another one could be eliminated because of timely internal information that their delivery schedule does not fit the focal firm’s production line. Early elimination of unsuitable alternatives saves time and analysis. Moreover, insightful information about the critical element defining a particular decision can focus the evaluation-effort, again saving time and analytical extensiveness. Going back to our example, suppose that the TMT has insightful external information that the main differentiating factor between good and less good suppliers is their reliability of delivery. Managers can now concentrate their effort on comparing alternative suppliers primarily in terms of this key element, rather than analyzing every other aspect of the decision to the same extent.

Overall, we build on the attention-based view’s key premise that attention structures affect decision making channels. We suggest that as an attention structure, TMT polychronicity channels decision making by influencing characteristics of the strategic decision process. Polychronic TMTs, because of their insightful information, can eliminate unsuitable alternatives early and focus their evaluation effort on key elements of the decision rather than evaluating everything to the same extent. Therefore, they can make decisions faster and they need a less comprehensive strategic decision process (in terms of information quantity and extensiveness of analysis). We hypothesize:

H2: In the context of new technology ventures, TMT polychronicity is positively related to strategic decision speed.

H3: In the context of new technology ventures, TMT polychronicity is negatively related to strategic decision comprehensiveness.

Strategic Decision Process Dimensions as Mediators

The attention-based view proposes that the primary mechanism explaining the effect of attention structures on focus of attention is the channelling of decision making. Building on this theoretical premise we propose a mediation model where polychronicity affects how top managers strategize, and this affects how the firm performs. The mediation hypotheses are intuitively logical. Since strategic decision-making is one of the key activities of top managers (Mintzberg, 1973) their temporal pattern of activities should affect dimensions of the strategic decision process. In turn, differences in the strategic decision process can lead to variations in strategic choices and organizational performance (Dean and Sharfman, 1996).

Specifically, we expect that strategic decision speed and comprehensiveness *partially* mediate the relationship between TMT polychronicity and firm-performance. We predict partial mediation because other, unmeasured strategic decision-process dimensions could also partially mediate the relationship. Moreover, polychronicity might also affect performance via other more direct mechanisms, such as better valuation of issues and answers (Ocasio, 1997) due to insightful information (see hypothesis 1). In the following paragraphs we explain how exactly speed and comprehensiveness affect firm performance in order to justify the mediation hypotheses.

The majority of extant empirical evidence has indicated a positive relationship between strategic decision speed and firm performance in dynamic environments (Eisenhardt, 1989; Judge and Miller, 1991; Baum and Wally, 2003). The underlying argument has been that decision speed enables firms to exploit opportunities before they disappear (e.g. adoption of “winning” new products, process technologies or business models) and therefore, improves competitive performance (Baum and Wally, 2003). However, we note two studies that have

argued that accelerated decision speed can sometimes be detrimental to performance by reducing the accuracy and quality of the decision. (Perlow, Okhuysen and Repenning 2002; Forbes, 2005).

In accordance with information-processing theory, which suggests that in dynamic environments a firm faces complex information-processing requirements that call for fast information collection and interpretation (Atuahene-Gima & Li, 2004), we predict a positive relationship between decision speed and performance of new technology ventures. Since we proposed that TMT polychronicity is positively related with decision speed (H2) and the latter is positively related to firm performance, we hypothesize:

Hypothesis 4: In the context of new technology ventures, strategic decision speed will partially mediate the relationship between TMT polychronicity and firm performance. Specifically, polychronicity will be positively related to speed and the latter positively related to performance.

The literature features two contradicting perspectives regarding the strategic outcomes of comprehensiveness in dynamic environments (Atuahene-Gima and Li, 2004; Forbes, 2007; Priem, Lyon & Dess, 1999). The first perspective predicts that environmental dynamism increases the benefits that can be attained through comprehensiveness, as unstable environments require the collection and analysis of large amounts of information (Glick, Miller & Huber, 1993) which must be studied diligently (Miller and Friesen, 1983). On the other hand, the second perspective contends that environmental dynamism decreases the benefits of comprehensiveness while simultaneously increasing its costs (Hough and White, 2003). Fredrickson and Mitchell (1984) argued that a non-comprehensive firm is well-equipped for an unstable environment. Its decision speed and flexibility allow fast, low-cost action that can exploit a changing list of opportunities that defy thorough understanding.

Two recent studies attempted to resolve this contradiction, (Atuahene-Gima and Li, 2004; Forbes, 2007). Based on information-processing theory, they suggested that decision comprehensiveness raises performance under unstable but analyzable environments (where more information is useful), but it hurts performance under unstable but unanalyzable ones (where information-quantity is costly and often misleading). Since new technology firms operate in unanalyzable environments we predict a negative relationship between decision comprehensiveness and firm performance. We also proposed that TMT polychronicity is negatively correlated with decision comprehensiveness (H3), and so we hypothesize:

Hypothesis 5: In the context of new technology ventures, strategic decision comprehensiveness will partially mediate the relationship between TMT polychronicity and firm performance. Specifically polychronicity will be negatively related to comprehensiveness and the latter negatively related to performance.

METHODS

Sample and Data Collection

We surveyed the total population of 305 new technology ventures, listed in the London Stock Exchange (LSE) in 2001. How long for a firm is still considered new, is a debate in the entrepreneurship literature. Opinions on the length of the “liability of newness” range between a cut-off of 6 years (e.g. Zahra, Ireland and Hitt, 2000), 8 years (e.g. Atuahene-Gima and Li, 2004) or 10 years (e.g. Yli-Renko *et al.*, 2001). We adopted an 8-year cut-off point, which is neither too conservative nor too inclusive. As a robustness check we run the analysis with a subsample of firms less than 6 years old and the results did not change.

We ensured that our firms were involved in technology creation by checking their SIC codes and their detailed business descriptions in their annual reports (following Yli-Renko *et al.*, 2001). The firms were spread across the typical range of high-technology sectors, namely

computers, telecommunications, chemicals and materials, electronics and life sciences. We focused on listed new technology firms because they represent an important sector that creates significant employment opportunities (Shane, 1996).

Data on TMT polychronicity, decision speed and comprehensiveness were obtained via a questionnaire. We mailed a questionnaire to the CEO of each firm as the most knowledgeable informant for the TMT (Simons, Pelled and Smith, 1999). We received 217 replies, 197 of which were finally usable, for an effective response rate of 64.6%, which is well above the 15% average (e.g. Simons *et al.*, 1999). This high response rate was achieved by pilot-testing the questionnaire with 5 academics and 10 executives and by a campaign of introductory and reminding telephone calls and emails, in accordance with the principles outlined by Dillman (2000).

For the purpose of corroborating the team-level data (polychronicity, speed and comprehensiveness), we sent a second questionnaire to the next most senior member in the TMT as indicated by the CEO. Second respondent corroboration is a common robustness check for firm and team level data (e.g., Atuahene-Gima and Murray, 2004). 129 executives responded providing colleague-responses of 42.3% of the firms in our sample. Basic demographics of the CEOs and second respondents are presented on table 1. The second responses were used to statistically test for interrater agreement for the team variables. Firstly, we ran a one-way ANOVA to ensure that the variance between teams was greater than the variance within teams, which was positively confirmed for all variables. Subsequently, we calculated intraclass correlation coefficients ICC[1] and ICC[2] (Shrout and Fleiss, 1979; Bartko, 1976) and interrater agreement r_{wg} (James, Demaree and Wolf, 1984) reported later for each variable. The ICC values ranged from 0.77 to 0.96 and the r_{wg} values from 0.87 to 0.95 demonstrating very high interrater agreement.

Insert table 1 about here

To maintain empirical rigor, the results presented in this manuscript are based on the sub-sample of companies (N=129) for which we had two respondents. Since we had high interrater agreement, we averaged the values of the two respondents for the team variables.

We checked for non-response bias comparing: a) the final sample of 129 firms with two respondents with the non-responding firms in the population (176) and b) the larger sample of 197 firms for which we had at least one respondent (we used this sample for robustness checks) with the rest of the firms in the population (108). We compared groups on a number of dimensions such as performance, firm size, firm age, TMT tenure and TMT size. The t-tests demonstrated no significant differences and therefore we did not face selection bias.

Data on firm performance and other firm characteristics (age, size and line of business) were retrieved from annual reports and from the most accurate and popular database of UK firms, Financial Analysis Made Easy (FAME). To allow for temporal lags, we collected performance-data one year after we administered the instrument (at t+1).

The questionnaire prompted the CEOs to identify the members of their TMTs. This direct approach to identifying the TMT is more common and more appropriate for studies focusing on strategic decision-making, than the alternative strategy of identifying the team indirectly by archival data of members' titles and positions (Cohen & Bailey, 1997). After obtaining the names of the TMT members from the questionnaire, we found archival data on their backgrounds from annual reports and website biographies. We then calculated TMT-level demographic characteristics and used them as control variables.

Measures and Reliability

New-venture financial performance. Consistent with prior studies in a similar context (e.g. Murphy, Trailer and Hill 1996; Robinson and McDougall, 2001) we selected two widely-used performance measures: Return on Total Assets (ROTA) as a measure of new venture efficiency and Return on Sales (ROS) as a measure of new venture profitability. Our

reported results are based on archival objective measures obtained from the FAME database. Correlation between the two performance measures was high as expected (0.68). To increase parsimony, we standardized the two indicators and averaged their values, creating a composite measure of financial performance (as recommended by Venkatraman and Ramanujam, 1986 and Halebian and Finkelstein, 1993).

We also asked respondents to report their satisfaction with their firms' ROTA and ROS on a 5-point scale ranging from very unsatisfied to very satisfied. Subjective measures of performance are also widely used in strategy and entrepreneurship research. The correlations between the subjective measures and the respective archival objective measures were high (.61, $p < 0.01$ for ROTA and .63, $p < 0.01$ for ROS).

We decided not to rely on stock-market measures of performance for theoretical and practical reasons. Top management teams have greater control over (internal) accounting measures than over (external) stock market measures of performance (Murphy, 1999). This is due to their ability to control levels of investment, adjust discretionary accruals, and shift earnings across periods. Stock market measures are subject to greater levels of extraneous noise than are accounting measures (Agle, Nagarajan, Sonnenfeld and Sribivasan, 2006). This noise was aggravated in our particular case by the crash of the technology stocks in London (and globally) in 2001, the year of the survey. In accordance with other scholars (e.g. Berry and Sakakibara, 2008; p.21) we felt that the burst of a tech-bubble would reduce the accuracy of market based measures for that particular time period.

Polychronicity in top management teams. Bluedorn and his colleagues have developed and thoroughly validated a scale to measure group polychronicity (Bluedorn *et al.*, 1999; Bluedorn, Kauffman & Lane, 1992). Consistent with similar studies (e.g. Hecht & Allen, 2005; Slocombe & Bluedorn, 1999), we measured TMT polychronicity by using a concise five-item version of the scale (Bluedorn *et al.*, 1992). We measured the items along a 5-point

Likert scale ($\alpha = 0.96$). Two items were reversed scored. Statistical checks indicated high interrater agreement for the two respondents [$F=10.6$, $p<.001$; $ICC[1] = 0.77$; $ICC[2] = 0.88$; $r_{wg} = 0.87$]. A factor analysis of the scale showed that all 5 items loaded cleanly on one factor and therefore the construct is unidimensional. Since polychronicity is a relatively new and complex construct we did further tests to assess the validity of the scale. Firstly, we conducted in-depth interviews in 8 companies in the sample asking top managers to describe their temporal pattern of activities. We then compared these descriptions with the polychronicity scores measured with the scale (see appendix 1). We observe that the scale captured the polychronic orientation described in words (evidence of convergent validity). Secondly, we followed the procedure described by Bluedorn *et al.* (1998) and conducted a “know-groups” test for content validity in a new sample of 116 managers studying for an Executive MBA (see appendix 2). We created two opposing scenarios of high and low polychronicity (known measure) and we split our sample in two equal-size parts. Each participant had to read one scenario (either high or low) and answer to the scale as managers of the company in the scenario would. The mean difference between the high and low polychronicity scenario was highly significant ($t=15.3$, $p<0.001$) providing evidence of the content validity of the scale.

Strategic Decision Speed. We adapted and employed Schriber and Gutek’s (1987) “pace” instrument to measure strategic decision speed. Our choice in utilizing this three item scale ($\alpha = 0.96$) for speed rather than the “duration of the firm’s most important decision” (e.g. Forbes, 2005; Judge & Miller, 1991), was motivated by recommendations from respondents and industry leaders in our pilot study. They said that measuring the duration of the most important decision depends too much on the respondent’s decision choice and on the nature of this one decision. It was felt that Schriber and Gutek’s more general instrument (across decisions) was more appropriate since we wanted to determine the organization’s

customary (average) speed in strategic decision-making. The choice of measure was also supported by empirical evidence that duration measures are in agreement with general speed scales when rated by the same respondent (Wally and Baum, 1994). Statistical checks indicated high interrater agreement for the two respondents [$F=42.4$, $p<.001$; $ICC[1] = 0.91$; $ICC[2] = 0.96$; $rwg = 0.95$].

Strategic Decision Comprehensiveness. We employed Miller's *et al.* (1998) five 5-point Likert scale items ($\alpha = 0.86$). As with Miller *et al.*, we decided against the use of scenario-based items because we thought that these items were generally perceived to be artificial, complex and hence, harder to administer to respondents. Statistical checks indicated high interrater agreement [$F=14.1$, $p<.001$; $ICC[1] = 0.84$; $ICC[2] = 0.91$; $rwg = 0.91$]

Consistent with previous TMT and strategic decision process studies (e.g. Barrick Okhuysen and Repenning 2007), we controlled for firm-level variables (*firm size*, *firm age*) and TMT demographics (*TMT size*, *average age*, *average tenure*, *average education level*, *age diversity*, *tenure diversity*, *education diversity*). These variables have been identified as forces that could influence strategic decision processes and outcomes (e.g. Hambrick, 2005 and 2007; Miller *et al.*, 1998). *Firm size* was measured as the number of employees. The logarithm of size was used in the actual statistical analysis, which is the traditional way to minimize the impact of large outlier firms. *Firm age* was measured as the number of years since the organization was established. *TMT size* was measured as the number of individuals who were designated by CEO respondents as members of their TMT. *TMT average age* was measured as the mean of the age of all the TMT members. *TMT average tenure* was measured as the mean number of years of each TMT member as part of the TMT. *TMT average education level* was measured as the mean number of years in post-secondary education of each TMT member. *TMT age*, *tenure* and *education diversity* were measured by

the coefficient of variation (ratio of the standard deviation to the mean) of each respective variable.

We also added *industry effects* to the control list^d. We created dummy variables for the most important technology industries in our sample: information technology (35.7%), telecommunications (7.8%), chemicals and materials (4.7%), electronics (13.2%), life sciences (4.7%), technology-based services (R&D and testing) (18.5%) and others (15.4%).

To minimize the probability of *common method bias*, we adhered to suggestions by Atuahene-Gima and Li (2004) and Papadakis, Lioukas and Chambers's (1998). First, we combined archival and survey data. Then we reversed some scale anchors to decrease the development of undesired response patterns. We examined the psychometric properties of the administered scales by conducting first factor analysis and then a confirmatory factor analysis (CFA) model. Principal component analysis with varimax rotation found a three-factor solution that explains 82.5% of the total variance. All the measures "loaded" cleanly on separate factors (See Appendix 2.) The results of the CFA indicated that the measurement model fitted the data reasonably well ($\chi^2/df = 1.96$; GFI = .96; CFI = .98; NFI = .98; RMSEA = .07). The constructs had high reliability, all having alphas over .70 (See table 2). Further evidence of reliability was provided by calculating Composite Reliability (CR) - an estimate of internal consistency analogous to an alpha coefficient - and Average Variance Extracted (AVE) (Fornell and Larcker, 1981). For all measures, the CR was well above the cut-off value of 0.70 and the AVE exceeded the .50 cut-off value. (See Table 2). Then we assessed discriminant validity; a construct should share more variance with its measures than with other constructs in the model, so the square root of the AVE should exceed the

^d ROTA and ROS were not consistently available for the year before the survey (t-1) to control for past performance. Many companies in our sample had just entered the public market and there were no publicly available financial ratios for their previous year. As an alternative proxy for past performance, we tested the dollar value of sales at t-1 (found consistently from FAME database), which controls for incoming cash flow. However, one could argue that total past revenues is more a measure of firm size than past performance. Since adding the variable did not have influence on the main pattern of results, we report the more parsimonious results without it. We thank one anonymous referee for this suggestion.

intercorrelations of the construct with the other constructs in the model (Fornell and Larcker, 1981). In our study, none of the intercorrelations of the constructs exceed the square root of the AVE, shown as the diagonal elements of the three latent constructs in Table 2.

Analysis

We tested the hypotheses with hierarchical regressions, regressing first the controls and then the predictors. The standard Baron and Kenny (B&K) (1986) approach to test mediation with a series of regressions was preferred to the structural equation modelling approach; since we hypothesized partial mediation, there is little statistical difference in how the two approaches test for mediation (James, Mulaik and Brett, 2008) and B&K has the advantage of being able to incorporate multiple controls. For the performance models, we estimated the parameters with Robust Standard Errors because of a heteroscedasticity problem (a Breusch-Pagan/Cook-Weisberg test gave a χ^2 of 28.42, $p < 0.001$).

RESULTS

Table 2 shows the means, standard deviations, and correlations among the study variables. **Insert Table 2 about here.**

As high levels of multicollinearity can result in unstable regression coefficients in linear regression models, we followed procedures outlined by Besley, Kuh, and Welsh (1980). We calculated condition indices for each of the regression models and the indices were far below the level of 10.0 for mild collinearity. Hence, no serious multicollinearity problems were expected. Correlation analysis as shown in Table 2 gives an early insight into the relationships between constructs. The correlations among TMT polychronicity, speed, comprehensiveness and financial performance are all statistically significant at $p < 0.01$ and in the expected directions. Table 3 presents the regression results for effects on speed and comprehensiveness, and table 4 presents results for effects on performance.

Insert Tables 3 and 4 about here.

In accordance with extant literature (e.g. Certo, Lester, Dalton and Dalton, 2006; Priem Lyon and Dess, 1999; Papadakis *et al.*, 1998), we found modest support for the effects of TMT demographic control variables. TMT tenure, age and educational diversity were all positively correlated with financial performance; their effect became weaker as more control and predictor variables entered the regression models. Firm size had a positive effect on performance, which became insignificant as the predictors came into the models. Firm age was positively correlated with performance, but its effect was not significant in the multivariate models. Industry was correlated with performance for two industrial classes, information technology and chemicals and materials.

As for the predictors, the coefficients for the direct relationships were all significant and in the direction predicted. Models 1 and 2 confirmed hypothesis 2, positing that TMT polychronicity has a positive impact on strategic decision speed ($\beta = .65, p < .001$). Models 3 and 4 confirmed hypothesis 3, which predicted that polychronicity has a negative effect on strategic decision comprehensiveness ($\beta = -.35, p < .001$). Models 5 and 6 confirmed hypothesis 1, which predicted that polychronicity has a direct positive effect on financial performance ($\beta = .53, p < .001$).

According to Baron and Kenny (1986) to establish partial mediation (hypotheses 4 and 5), we need the following conditions: First, polychronicity (the independent variable) should predict speed and comprehensiveness (the mediators), which is already established by models 1 to 4. Second, polychronicity should predict financial performance (the dependent variable), which is established by models 5 and 6. Third, speed and comprehensiveness should affect financial performance when entered in a regression together with polychronicity. This is established by models 8-10. In model 8 speed is positively related to performance in the presence of polychronicity ($\beta = .44, p < .001$). In model 9 comprehensiveness is negatively related to performance in the presence of polychronicity ($\beta = -.50, p < .001$). In model 10

speed and comprehensiveness together predict performance in the presence of polychronicity (for speed $\beta = .23, p < .05$; for comprehensiveness $\beta = -.43, p < .001$). Finally, the effects of polychronicity on performance should be reduced when speed and comprehensiveness are included in the regression equation. This condition is also confirmed as the effect of polychronicity drops substantially from model 6 ($\beta = .53, p < .001$) to model 8 ($\beta = .25, p < .01$), model 9 ($\beta = .36, p < .001$) and model 10 ($\beta = .24, p < .01$). The significance of the drop of the polychronicity effect from model 6 to model 10 was formally confirmed with a Sobel test (Sobel statistic = 4.26, $p < 0.001$ for speed and 3.14, $p < 0.001$ for comprehensiveness).

We run a series of robustness checks and the results proved robust: a) We estimated the parameters for the performance models with standard OLS regressions, b) We run the analysis with the larger sample of 197 firms for which we had only one respondent (the CEO), c) We separated the items measuring polychronicity as preference only (items 1, 2, 5) from the ones that measured polychronicity as behavioral tendency (items 3 & 4) and we run two separate analyses one for preference and one for behavioral items, d) We run the analysis with the subjective measures of performance. For all the above analyses, the results proved stable in terms of the direction and statistical significance of the hypothesized relationships^e. Moreover, we run a sensitivity analysis and found that the relationships generally hold within individual sectors. In summary, the results largely supported our hypotheses.

DISCUSSION

The primary purpose of this study was to test the effect of TMT polychronicity, an important but under-researched temporal construct in terms of its strategic impact. Our results showed that TMT polychronicity has a positive effect on venture performance. The positive effect of polychronicity on performance is partially mediated by strategic decision speed and comprehensiveness. Specifically, TMT polychronicity has a positive influence on decision

^e Results for all the robustness checks in this manuscript can be obtained on request by the first author

speed, which is positively related to financial performance. In contrast, polychronicity has a negative effect on decision comprehensiveness, which is negatively related with performance.

Theoretical Contributions and Implications for Research

We make three broad contributions to the literature. Firstly, we advance strategic leadership research and upper echelons theory. *We focus on a cultural (value based) characteristic of the TMT, which has received little empirical attention (polychronicity).* Research on the effect of executive values is a wide open field (Finkelstein *et al.*, 2009; p.57) because of the difficulty of gathering empirical data (Hutzschenreuter and Kleindienst, 2006; Hambrick, 2007). *We also introduce decision-process variables as mediators of the link between the TMT characteristic of polychronicity and firm performance, taking a step towards opening the “black-box” of the upper echelons theory (Hambrick 2005, 2007).* Despite conceptual arguments that decision making processes might intervene between team characteristics and outcomes (Finkelstein *et al.*, 2009; Ocasio 1997), little empirical work has been done to illustrate the exact relationships. Few empirical studies have linked TMT characteristics with decision making processes (e.g., Miller *et al.*, 1998 and Papadakis *et al.*, 1998) and few studies have empirically tested mediating relationships (e.g., Simons, *et al.*, 1999 and Cho and Hambrick, 2006).

Secondly we contribute to the attention based view of the firm (Ocasio, 1997). *We argue that norms of time-allocation of top managers (such as polychronicity) are an important category of attention-structures not mentioned in Ocasio’s model.* The relationship between norms about time allocation and managerial focus of attention is an interesting and open area for further research on attention. Moreover, *we extend the concept of firm-level attention-structures to the level of the TMT.* We propose that since the TMT makes strategic decisions, team-level attention structures should guide the organizational focus of attention.

Thirdly, *focusing on TMT polychronicity, we extend work on the nature of managerial work* (Mintzberg, 1973; Kotter, 1982a; Eisenhardt, 1989). Finkelstein *et al.* (2009; p.41) noted that despite the initial enthusiasm for understanding what managers do with their time, little research has been done to extend the ideas of the early authors. We extend this line of work by introducing the established and measurable construct of polychronicity to capture Mintzberg's and Kotter's description of interwoven activity-sequencing. We go beyond the "typical manager" to argue that there is variation in polychronic orientation among TMTs. Extending the early qualitative studies, we explore the relationship between polychronicity and financial performance using quantitative data from a large sample.

In general, in the spirit of viewing strategic management as an interdisciplinary field (McGahan and Mitchell, 2003) we relate polychronicity (a behavioral construct) with business-strategy. We clarified what the construct means in the context of managerial work and we linked it with managerial attention as the bridge towards organizational outcomes. Finally, despite the fact that we do not have reasons to believe that our results are specific to the UK geographical context, our European sample offers a sought-after international perspective to the literature of strategic leadership (Elenkov, Judge and Wright, 2005; Tsui, 2008).

Managerial implications, Extensions and Limitations

Our study has significant implications for top management teams and new ventures. First, it supports the contention that polychronicity matters. Polychronicity is one of the subtler, yet more profound ways TMTs can differ from each other (Bluedorn, 1992). Therefore, managers should be aware of their own and their teams' polychronic orientation. Our results contrast the prescriptions of the popular literature on time management advocating task prioritization and sequential execution (Covey, Merrill and Merrill 1994; Griessman, 1994; Tracy, 2007). In the particular context of dynamic, unanalyzable

environments polychronicity has a positive impact on performance. Being polychronic enables top management teams to reach a strategic decision faster and with less emphasis on analysis. In turn higher speed and less analysis raise firm performance.

A potential extension of our work would be to investigate who defines TMT polychronic culture. Is it the CEO? A broader question is whether and how individual time-oriented preferences act as a catalyst or pacing mechanism for subsequent group preferences and behavioral tendencies. An early example of this line of work is the study by Waller, Giambatista and Zellmer-Bruhn (1999), who found that individual time-urgency affects group polychronicity. Another possible determinant of polychronicity is national culture (Hall, 1959). Do cultural characteristics affect the preference for working on many tasks simultaneously? International samples in similar working contexts would be appropriate to answer this question.

A related question for future research is whether TMTs can modify their time-use preferences and behavioral tendencies in order to improve performance. Does education or training have an effect on polychronicity? If polychronicity has an effect on strategic decision-making and performance as our results indicated, can we do something to develop polychronic TMTs or should we just look for polychronic executives? Given our findings, we wonder what other impact polychronicity has on organizations. For example, would polychronicity influence strategic planning or organizational structure?

At a broader level, researchers should continue to unravel other temporal constructs and to investigate the interrelationships of these forces and their impact on organizational behaviors and outcomes. Whilst temporal dynamics are very much at the heart of new ventures, scholars still know very little about how time or temporal constructs impact actors in new ventures.

Like any study, ours has its limitations. First, results only generalize to dynamic environments. We cannot assert that we would find similar mediation effects in mature and stable industries, where TMTs have to make big-money bets to gain economies of scale. It is intuitively reasonable to argue that in mature industries comprehensive decision making would be more beneficial than decision speed, as wrong decisions are hard to undo.

Second, there may be other uncontrolled team mechanisms (e.g., cohesion or debate) that also affect decision speed and comprehensiveness as well as performance. This is a common limitation in most survey research designs, especially TMT studies. To mitigate the problem, at least in part, we controlled for the most common TMT demographics and firm-specific variables, which could capture some of the variance attributed to unmeasured process variables. We also controlled for environmental dynamism (and in particular ambiguity) by selecting a context of new technology ventures, but we did not specifically measure fine-grained aspects of the environment, as this was beyond the scope of our study.

Third, since our decision making process measures did not ask respondents to think about one specific decision, we did not explicitly control for decision type. However, the scales in the questionnaire clearly indicated that we were asking about characteristics of important, strategic decisions and there is evidence that decision-specific measures and more general scales like ours yield similar values (Wally and Baum, 1994). Fourth, since performance is a multidimensional construct, other measures of firm performance such as sales growth, or market share could show different relationships. For the purpose of comparison with previous research, we selected two of the most common measures of financial performance: ROTA and ROS. A fifth limitation, given our cross-sectional research design, is that we cannot reliably predict the direction of the cause-effect relationships. Finally, since we had two respondents per TMT we cannot be absolutely certain about the quality of the team-level data. What we measured might be the perception of the CEOs about

their team's polychronicity, confirmed by their 'second in command'. This was due to the difficulty of obtaining responses from all or most TMT members.

Conclusion

Previous research has shown that to increase performance in unstable and unanalyzable environments, strategic decisions must be made quickly (Eisenhardt, 1989; Baum and Wally, 2003) using less comprehensive research and analysis (Fredrickson and Mitchell, 1984; Atuahene-Gima and Li, 2004). Moreover, information-processing theory argued that to deal with environmental ambiguity, the key is not a great quantity of information but insightful information (Daft and Lengel, 1984). Our study provides an important addition to the above thesis: It contends that polychronicity is a TMT characteristic that enables casual collection of insightful information (as argued by Mintzberg, 1973), that reduces the need for comprehensiveness (analyzing in depth every aspect of every alternative) and increases decision speed, thus raising the firm's financial performance.

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Appendix 1: A validation of the polychronicity scale and of our core assumptions using interviews of companies in the sample

Background of the Interviews

The primary purpose of the interviews (part of our wider research program) was to delve deeper and understand further the issue of how top management teams understand and deal with the various aspects related to ‘time’. In the original survey instrument, respondents were allowed the option to indicate if follow-up interviews were possible. In total, 8 companies were interviewed. Interviews ranged from 2 – 6 separate sessions per company, involved between 2 to 4 TMT members as respondents, each lasting between 1 to 1 ½ hours. The interviews were conducted after the questionnaires were returned. The range of questions was purposely broad, addressing all issues such as strategy, resources, structure and industry factors with the intention to uncover if (and to what extent) temporal issues were pertinent.

Purpose of this appendix

This appendix has a dual purpose:

1. We compare selected statements regarding the polychronic orientation of TMTs (from the interviews), with their score in the polychronicity scale (from the questionnaire). We observe that the scale captured the polychronic orientation described in words. This adds evidence for the convergent validity of the scale.
2. We present selected statements supporting our two key assumptions that a) polychronicity preference predicts behavior and b) TMT members exhibit similarity in their polychronic preference and behavior.

Firm Code	Scale Score	TMT Type	Selected Statements validating the convergent validity of the scale (i.e. what the scale captured converges with what managers described in words)	Selected statements supporting our two key assumptions a) polychronic preference predict behavior (regardless of external conditions) b) TMT members exhibit similarity in their polychronic preference and behavior
NTV 6	4.8	Poly chronic	This team prides itself at being able to oversee several on-going projects at the same time quite easily. It is like a badge of honor, for example, to be on 10 apps at any one moment and switch between each without breaking a sweat. If you ask them, I’m sure they’ll tell you they wouldn’t want it any other way. They would be bored if they had to work on just one specific thing at a time. I guess, at the end of the day, we enjoy the variety, that constant switching, the challenge of needing to concentrate harder simply because you have to, at least in order to freeze whatever you’re doing and still be able to come back to it without losing track. Yes... it’s a buzz!	You can say it’s this team and organization’s DNA. It’s just how we’re wired. <u>No matter what the conditions are, we need to be on top of everything, every single second of the day.</u> Like I said before, badge of honour, remember?
NTV 3	4.8	Poly chronic	Right now, we have multiple projects going on at the same time and no surprises, they all need to go to market fast. All require “our immediate attention” (respondent mimes inverted commas). So it’s a good thing we’re pretty darn good at multitasking and improvising on the fly. We make it work... we see this as a chance to cross pollinate ideas, test possible links between projects or innovations that would otherwise remain on the drawing board. Our approach has served us well and I think the rest of the team absolutely agrees with me...	We multitask all the time here <u>not simply because we can because we want to...</u>
NTV 8	4.4	Poly chronic	It’s unavoidable! When you’re in charge, there are many balls all up in the air at once and we can’t afford to let anything drop. So what do you do? Deal with it! Keep your eyes on everything, every time!! Otherwise, you have no business leading your company.	Look, I’ve known these guys from way back and <u>the common red thread</u> is whether at work or play, they’re driven, switched on, with <u>many things on the go</u> all at once. Drives some nuts but hey....

NTV 7		Overlapping and juggling several projects at the same time is the key to growing this company. As the executive team of a young company, it is absolutely vital that we have the corresponding bandwidth to deal with multiple issues real time. We don't have the luxury of letting urgent things stew and coming back to it. Anyway, it's always best to deal with urgent things straightaway and send it out the door. That way, it's done and dusted and we can get back to what we're doing. To be responsive, you can't do things one at a time, right?	I'm proud that even during the quieter months, <u>we actively look out for new things to do</u> to add on to what's already in the pipes. It goes back to what I was saying about the key to growing our young company, bandwidth and multiplicity...
4.2	Poly chronic		
NTV 1		Being single minded is great but working on one thing at a time only poses serious downsides....after a while, you might find yourself putting too many eggs in that one basket... In handling multiple offerings at one go, we actually enable a helicopter view of our business. I suppose it could overwhelm the uninitiated but we actually prefer it this way. It's fulfilling... gives us control over tracking progress on all fronts.	
4.2	Poly chronic		
NTV 2		Although we're managing several projects right now, as best as we can, we break them down into specific phases with specific deadlines and deal with them separately. In our opinion and actually from experience, this is the most efficient way of getting things done.	In the early days, we made a conscious effort to put some structures in place, including zeroing in on issues one at a time ...why?! Well, how else can a company function? To give you an example, we had a guy then, brilliant, but he was all over the place. He had a million new ideas swirling in his head, always working on multiple proposals, constantly jumping in and out of assignments. He was pulling some of us in so many different directions, it got really <i>(interviewee emphasised)</i> frustrating. It's not to say that nothing got done...but it was crazy. Eventually, he had to leave, maybe feeling as frustrated as we did. Pity really, since it's more a work style conflict rather than anything.
2.2	Mono chronic		
NTV 5		Finishing things on schedule is important to us. To do so, we need to focus. Block out all the other issues and give it our undivided attention. For example, in a meeting, if it's not in the agenda, we don't discuss it. We are strict on checking items off the list, dealing with them point by point, one by one, and then move on swiftly. We are far more productive this way and these meetings, well, they finish on time!	There is mutual understanding on how things should be done. <u>Whether we're swamped or simply having a standard day</u> , we create process flow charts to breakdown and pin point critical action steps to make sure <u>we give uninterrupted attention on each step</u> . <u>Everyone is firmly on the same page on this</u> .
1.4	Mono chronic		
NTV 4		We don't believe in multitasking. It's the surest way to have quality compromised...	It doesn't matter if anyone thinks one project is less revenue-generating than another. Once we're on it, our absolute priority lies in finishing what we've started. And the best way to check off the to-do list is to simply concentrate on sending out projects one after the other, one at a time. <u>This is how we choose to do things around here</u> and I think it's fair to say that <u>we've been consistent with it</u> .
1	Mono chronic	Hopping from one project to another? Is that really wise? I mean, there is no time to really think things through, right? I believe it would only ruin our concentration and disrupt our thought process and quite frankly, if we absolutely had to, we'll probably manage but let me tell you right now, we won't like it one bit!	

Appendix 2: The high polychronicity and low polychronicity scenarios

The test

A known-groups test for content validity compares scale scores for groups whose levels on the variable of interest are already known by other means. If the scale successfully differentiates the groups in the manner already known, it demonstrates content validity (Bluedorn, *et al.*, 1998). In the absence of alternative psychometric tests to measure polychronicity, we approached the problem by creating two TMTs with known polychronicity levels. One scenario describes a very polychronic TMT and another scenario a very monochronic TMT. We based our scenarios on the ones described by Bluedorn *et al.* (1998) but we made adaptations. We took care to avoid any phrasing from the polychronicity scale or even comparably synonymous phrasing to make the test meaningful. We showed the scenarios to 7 experts in the polychronicity literature (faculty and doctoral students) and they unanimously agreed that they described high and low levels of polychronicity respectively. Our sample was 116 Executive MBA candidates in a leading business school in London (77 male and 39 female, average age = 34 years). They were all practicing managers in a range of industries (on average 10.85 years of work experience). We split the sample in two groups. One group (58 people) was given the high polychronicity scenario and the other group (58 people) was given the low polychronicity scenario. Each participant had to read the scenario and then answer the five questions of the scale in the same way he or she believed members of the Top Management Team of the described venture would answer them. The instructions and the scenarios are presented below.

The task for the Executive MBA candidates

Please **carefully read** the following description of managerial work at the Top Management Team of a new technology-venture. After you finish reading the description, please answer the five questions on the next page in the same way you believe members of the Top Management Team of this venture would answer them. Jane, Jack and Tom are members of the Top Management Team of this venture and their behaviors are included in the following description.

The low-level of polychronicity scenario.

Jane began her workday by inspecting the production line. As she inspected the line, one worker asked Jane to explain the company's retirement policy. Jane said: "Please call my secretary and make an appointment to see me about that later. I am inspecting the production line now." Jane returned to her inspection and received a call on her mobile phone. The call was from one of the company's sales representatives who wanted to discuss about a common concern faced by a number of customers. Jane asked the representative to call her secretary for an appointment to discuss the matter and returned to her inspection of the production line. Before she finally finished her inspection, Jane received questions from two other workers, both of whom she referred to her secretary to make appointments.

On the same day, Jack arrived to his office and examined his to-do list for the day. It contained the following five items: (1) developing a new performance appraisal form for the company; (2) writing a letter of recommendation for one of his current employees; (3) commenting on a progress report about a new product under development (4) preparing an oral presentation to propose a joint venture with a major supplier; and (5) reviewing the CVs of three job candidates. Jack picked up the task of preparing the oral presentation for the joint venture and worked on it for the rest of the morning, neither working on nor thinking about the other four projects. Jack received eight phone calls during the morning, all of which were taken by his secretary who made appointments with the callers for times later in the week when they should call back. This was normal for members of the top management team. Meetings were scheduled, interruptions were filtered by personal assistants and urgent requests were kept short with tactics such as having stand-up conversations and using verbal hints to close the encounter ("Is there anything further you need to know?" or "Thank you for the information. I appreciate it"). Jack made significant progress on the presentation and completed it just before lunch. The other four projects, however, remained untouched as the afternoon began.

While Jane and Jack were going for lunch, Tom, the CEO, was giving a tour to a job candidate for the post of head of marketing. Tom pointed Jane and Jack out to the candidate from a distance and said "Those two are really good and efficient executives. They provide an excellent example of the way we do things around here. We would like every member of the top management team to handle things this way."

The high level of polychronicity scenario

Jane began her workday by inspecting the production line. As she inspected the line, one worker asked Jane to explain the company's retirement policy. Jane said: "Walk with me while I inspect the line, and I will explain the policy to you." After explaining the retirement policy, Jane received a call on her mobile phone. The call was from one of the company's sales representatives who wanted to discuss about a common concern faced by a

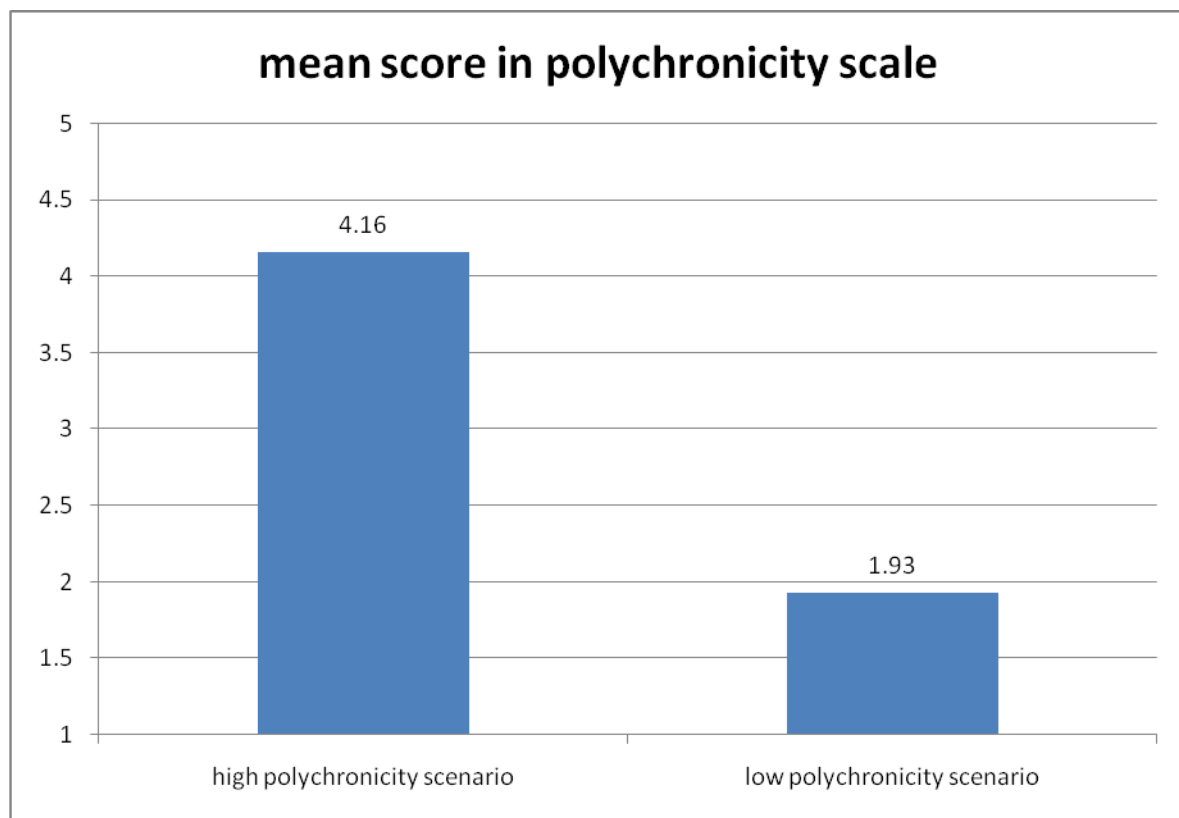
number of customers. Jane began discussing the concern as she continued her inspection of the production line. Before she finished her inspection, Jane received two more questions from workers, both of which she answered while continuing her inspection of the production line.

On the same day, Jack arrived to his office and examined his to-do list for the day. It contained the following five items: (1) developing a new performance appraisal form for the company; (2) writing a letter of recommendation for one of his current employees; (3) commenting on a progress report about a new product under development (4) preparing an oral presentation to propose a joint venture with a major supplier; and (5) reviewing the CVs of three job candidates. Jack often developed ideas for the other projects while he worked on one of them, so he frequently switched back-and-forth among the projects throughout the morning. Jack received eight phone calls and two unscheduled visitors during the morning, and he talked to every single caller. This was normal for members of the top management team. Top-managers' doors were literally open, offices had comfortable seating area and desks facing the corridor to encourage interruptions. Constant interruptions from subordinates, peers and externals created a back-and-forth pattern of activity. Jack made significant progress on several of his five projects during the morning, but more work was needed on all of the projects as the afternoon as the afternoon began.

While Jane and Jack were going for lunch, Tom, the CEO, was giving a tour to a job candidate for the post of head of marketing. Tom pointed Jane and Jack out to the candidate from a distance and said "Those two are really good and efficient executives. They provide an excellent example of the way we do things around here. We would like every member of the top management team to handle things this way."

Results

The mean scale-score for the high polychronicity scenario was 4.16; for the low polychronicity scenario the mean was 1.92, a highly significant ($t=15.3$, $p<0.001$) mean difference of 2.24 in the 5-point scale. The alpha coefficient of the scale was 0.94. In correlational terms, these results give an r and an η of 0.82 ($p<0.01$) (r and η being identical in this case because the scenario variable is a dichotomy). Therefore the test confirmed the scale's content validity



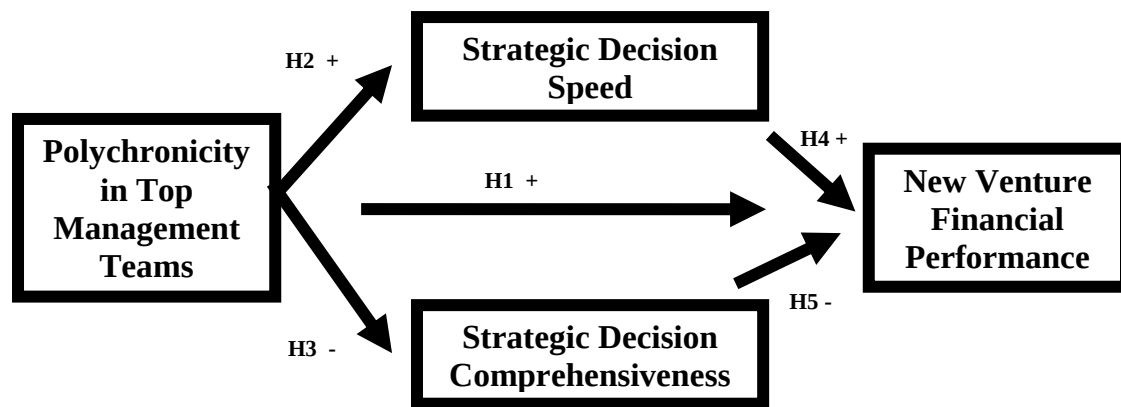


Figure 1: The study's conceptual model

Appendix 3: Results of principal component analysis with varimax rotation of polychronicity, strategic decision speed and strategic decision comprehensiveness items

Item	Factor 1	Factor 2	Factor 3
Polychronicity			
We believe people should try to do many things at the same time.	.81		
We would rather focus on one project each day than on parts of several projects. ^a	.80		
We tend to juggle several activities at the same time.	.93		
We think it is best and tend to complete one task before beginning another. ^a	.92		
We believe it is best for people to be given several tasks and projects to perform simultaneously.	.94		
Strategic Decision Speed			
We prefer and tend to take our time when making strategic decisions. ^a			.81
We generally believe in making quick strategic decisions.			.82
Please tick the extent (1 being "Not at all" to 5 being "To a great extent") on which your company places on: Speed when planning or thinking about strategies			.89
Strategic Decision Comprehensiveness			
Faced with an immediate, important, non-routine threat or opportunity, we usually: Develop many alternative responses.		.74	
Faced with an immediate, important, non-routine threat or opportunity, we usually: Consider many different criteria and issues when deciding the course of action to take.		.84	
Faced with an immediate, important, non-routine threat or opportunity, we usually: Thoroughly examine multiple explanations for the problem or opportunity.		.88	
Faced with an immediate, important, non-routine threat or opportunity, we usually: Conduct multiple examinations for the suggested course of action.		.68	
Faced with an immediate, important, non-routine threat or opportunity, we usually: Search extensively for possible responses.		.74	

^a This item was reverse coded.

Following Hair *et al.*'s (1998) suggestion, all factor loadings < 0.45 were excluded from the table given our sample size ($N=129$).

Table 1: Basic demographics of respondents

	Age mean (years)	Age standard deviation (years)	Team tenure mean (years)	Formal post-secondary education mean (years)
CEO respondents (n=197)	50	10	2.5	5.3
Second respondents (n=129)	50.5	2.2	2.2	4.9

TABLE 2 Means, Standard Deviations (S.D), Cronbach's Alpha (CA), Composite Reliability (CR), Average Variance Extracted^f (AVE) and Correlations^g

	Variable	Mean	S.D	CA	CR	AVE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	Financial Performance (Standardised measure)	0	0.98																						
2	TMT Polychronicity	2.97	1.17	0.96	0.97	0.87	0.61**	0.93																	
3	Strategic Decision Speed	2.99	1.22	0.96	0.93	0.81	0.66**	0.65**	0.90																
4	Strategic Decision Comprehensiveness	3.17	0.91	0.86	0.93	0.73	-0.64**	-0.38**	-0.50**	0.85															
5	Firm Size (Log N)	2.49	0.76				0.30**	0.32**	0.30**	-0.27**															
6	Firm Age	4.91	2.16				0.15	0.11	0.13	-0.12	0.13														
7	TMT Size	7.67	2.56				0.14	0.17	0.05	-0.03	0.57**	0.09													
8	TMT Average Age	49.36	3.73				0.26**	0.16	0.17*	-0.10	0.31**	0.26**	0.16												
9	TMT Average Tenure	2.32	1.26				0.26**	0.28**	0.21*	-0.16	0.14	0.66**	0.09	0.23**											
10	TMT Average Educational Level	4.88	0.50				0.12	-0.05	0.06	-0.09	0.16	0.31**	0.22*	0.19*	0.20*										
11	TMT Age Diversity	0.17	0.06				-0.20*	-0.09	-0.20*	0.08	-0.09	0.02	0.15	-0.25**	0.01	-0.01									
12	TMT Team Tenure Diversity	0.36	0.29				0.06	0.10	0.09	0.00	0.15	0.64**	0.30**	0.11	0.50**	0.24**	0.05								
13	TMT Educational Diversity	0.18	0.05				0.22*	0.13	-0.01	-0.08	0.02	0.12	0.12	0.27**	0.11	0.05	0.05	0.04							
14	Industry: IT	0.36	0.48				-0.22*	0.01	-0.12	0.01	-0.14	-0.16	-0.17	-0.23**	-0.12	-0.32**	0.03	-0.10	-0.30**						
15	Industry: Telecoms	0.08	0.27				-0.02	-0.04	0.00	0.07	0.08	-0.04	0.12	0.03	-0.10	-0.06	0.04	-0.04	0.00	NMF ^h					
16	Industry: Chemicals/Materials	0.05	0.21				0.19*	0.17	0.18*	0.15	-0.02	0.11	0.04	0.11	0.13	-0.01	-0.14	0.09	0.18	NMF	NMF				
17	Industry: Electronics	0.13	0.34				0.12	0.08	0.12	-0.03	0.06	0.20	-0.01	0.22*	0.23**	0.12	-0.01	0.07	0.21	NMF	NMF	NMF			
18	Industry: Drugs	0.05	0.21				0.12	0.02	0.14	-0.13	0.08	0.21	0.07	0.00	0.09	0.25**	-0.03	0.16	0.06	NMF	NMF	NMF	NMF		
19	Industry: Technology Services	0.19	0.39				0.02	-0.11	-0.14	-0.03	-0.14	0.03	0.03	-0.01	0.05	0.32**	0.04	0.11	0.03	NMF	NMF	NMF	NMF	NMF	

* p < 0.05 (2 tailed) ** p < 0.01 (2-tailed)

^f Where applicable

^g N = 129

^h NMF = Non Meaningful

TABLE 3. Results of hierarchical OLS regression analysis for strategic decision speed & comprehensiveness⁹

Variables	Strategic decision speed		Strategic decision comprehensiveness	
	Model 1	Model 2	Model 3	Model 4
Firm Size	0.34**	0.12	-0.35**	-0.23*
Firm Age	-0.10	-0.01	0.08	-0.13
TMT Size	-0.16	-0.16⁺	0.13	0.13
TMT Average Age	0.02	0.02	0.04	0.04
TMT Average Tenure	0.17	-0.04	-0.16	-0.05
TMT Educational Level	-0.01	0.07	-0.02	-0.06
TMT Age Diversity	-0.11	-0.08	0.07	0.05
TMT Team Tenure Diversity	0.03	0.05	0.15	0.14
TMT Educational Diversity	-0.08	-0.15*	-0.13	-0.10
Industry: IT	-0.03	-0.13	-0.07	0.01
Industry: Telecoms	0.03	0.02	0.05	-0.06
Industry: Chemicals/Materials	0.19⁺	0.08	0.17	0.23*
Industry: Electronics	0.11	0.05	0.03	0.06
Industry: Drugs	0.14	0.09	-0.10	-0.07
Industry: Technology Services	-0.04	-0.07	-0.08	-0.06
Polychronicity		0.65***		-0.35***
R^2	.22	.54	.18	.27
Adjusted R^2	.12	.47	.07	.17
F	2.13*	8.20***	1.67 ⁺	2.65**
ΔR^2		.32		.09
F for ΔR^2		77.57***		14.35***

⁺ $p < 0.10$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

TABLE 4. Results of hierarchical Robust Standard Errors regression analysis for financial performance

Variables	Standardized Measure of Financial Performance (ROTA + ROS)					
	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Firm Size	0.29**	0.11	0.01	0.06	0.01	0.01
Firm Age	-0.06	0.02	-0.06	0.02	-0.05	-0.04
TMT Size	-0.03	-0.03	0.09	0.04	0.04	0.06
TMT Average Age	0.04	0.04	0.06	0.04	0.07	0.06
TMT Average Tenure	0.25*	0.08	0.11	0.09	0.05	0.06
TMT Educational Level	-0.01	0.05	-0.02	0.02	0.02	0.01
TMT Age Diversity	-0.14	-0.11	-0.07	-0.08	-0.09	-0.07
TMT Team Tenure Diversity	-0.11	-0.10	-0.06	-0.12	-0.03	-0.05
TMT Educational Diversity	0.14	0.08	0.11⁺	0.14*	0.03	0.07
Industry: IT	-0.02	-0.10	-0.04	-0.05	-0.11	-0.08
Industry: Telecoms	0.02	0.01	0.03	0.00	0.04	0.03
Industry: Chemicals/Materials	0.16	0.07	0.16*	0.03	0.18*	0.14*
Industry: Electronics	0.07	0.02	0.04	0.00	0.06	0.04
Industry: Drugs	0.12	0.08	0.02	0.04	0.05	0.03
Industry: Technology Services	0.11	0.08	0.09	0.11	0.05	0.07
Polychronicity		0.53***		0.25**	0.36***	0.24**
Strategic decision Speed			0.38***	0.44***		0.23**
Strategic decision comprehensiveness			-0.44***		-0.50***	-0.43***
R^2	.26	.48	.65	.57	.66	.68
F	3.47***	8.43***	10.66***	10.31***	10.77***	13.05***
ΔR^2		From model 5	from model 5	from model 6	from model 6	From model 6
		.22	.39	.09	.18	.20

⁺ $p < 0.10$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

⁹ Regression coefficients shown are standardized coefficients (β). Boldface indicates significant coefficients. $N=129$.