**The effects of top management team strategic cognition on corporate financial health and value: an interactive multi-dimensional approach**

**Rexford Attah-Boakye**

Business School, University of Hull, UK

Rexford.Attah-Boakye@hull.ac.uk

**Laura A Costanzo**

Southampton Business School, University of Southampton, UK

Laura.Costanzo@soton.ac.uk

**Yilmaz Guney** (corresponding author)

Centre for Financial and Corporate Integrity

Coventry University, UK

ad5249@coventry.ac.uk

 ORCID ID: [http://orcid.org/0000-0001-6011-6505](https://mc.manuscriptcentral.com/jom)

**Waymond Rodgers**

 College of Business Administration, University of Texas, El Paso, USA

 Business School, University of Hull, UK

W.Rodgers@hull.ac.uk

wrodgers@utep.edu

 ORCID ID: [http://orcid.org/0000-0003-4349-5667](https://mc.manuscriptcentral.com/jom)

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**Abstract**

The upper echelons theory posits that the values, personalities, experience and education background of the top management team (TMT) affect both executives’ strategic cognition and corporate outcomes. Since TMT members differ in their cognitive structures, as also acknowledged by the presence of managerial biases and irrationalities in the behavioural finance theories, policy makers and scholars are saddled with the problem of identifying specific cognitive elements that can secure optimum organisational outcomes. Conceptual approaches or linear relationships between TMT strategic cognition (TMT-SC) and outcomes are unable to capture the complex interdependencies among TMT-SC, TMT attributes and performance. We propose and empirically test a dynamic multi-dimensional TMT-SC model. Using handpicked UK company panel data, we provide robust empirical evidence that extends our understanding of the theory. Our PLS-SEM analyses show that heterogeneity in TMT academic and professional qualifications, and work experience alone cannot provide optimal benefits to organisations. However, when they are combined with other TMT cognitive factors such as social networking, innovativeness and risk-taking levels, these aspects appear to improve firm value and financial health.

**KEYWORDS:** Firm solvency and value, risk appetite, human capital, strategic cognition, upper echelons theory, behavioural finance

**JEL CLASSIFICATIONS**: G02, G32

1. **Introduction**

Strategic decision-making processes reflect changes in the organisational environment in line with top management team (TMT) characteristics (Daniels et al. 1994; Naranjo‐Gil et al. 2008; Mintzberg et al*.* 1976). Upper echelons theory (UET) suggests that the experience and education background of the TMT affects both executives’ strategic cognition and corporate outcomes. TMT strategic cognition (TMT-SC) captures linkages in the cognitive trust pathways governing TMT mental models in the formulation and implementation of corporate strategies. Such mental models include the assumptions, theories and arguments that TMTs use to navigate through their complex networks of information during strategic decision-making. Changes in organisational performance should reflect TMT characteristics such as experience, education, risk-taking, innovativeness and social capital (Kor and Mesko 2013; Acquaah 2012; Berger et al. 2014; Hambrick and Mason 1984). Behavioural finance literature also acknowledges the relevance of managerial characteristics and biases (Baker and Wurgler 2011; Kaplan and Sorensen 2021).

Yet, there is no consensus regarding the effect of TMT attributes on firm outcomes (Hambrick et al. 2015; Buyl et al. 2011). Despite TMT-SC popularity (Kaplan 2011), our understanding of the relationship between TMT-SC and outcomes is limited by associations that are either conceptual and, therefore, untested, or that simply assume linear links (DeFond et al. 2005; Hamori and Koyuncu 2015; Kor 2003; Kunc and Morecroft 2010), which may mask complex interdependencies among TMT-SC, TMT attributes and performance. Considering the recent emphasis on the complexity of TMT constrained decision-making processes and cognition (Costanzo and Di Domenico 2015) and insights from configuration theory (Hughes et al. 2018) to explain complex interdependencies, we respond to the calls (Carpenter et al. 2004; Shepherd et al. 2017) for empirical research to examine the interactions among multiple dimensions of TMT-SC and firm outcomes.

Drawing on UET (Hambrick and Mason 1984) and strategic cognition and managerial capabilities literature (Kor and Mesko 2013; Teece 2007; Helfat and Peteraf 2009, 2015), we propose an interactive TMT-SC model that influences firm outcomes via random configurations and multiple combinations of overlaps of TMT-SC dimensions. Particularly, we investigate the multi-faceted micro dimensions of TMT-SC (i.e. different combinations of education background, work experience, risk-taking and innovativeness, and networking capabilities) that shape TMT-SC, and relate them to corporate performance. We provide empirical evidence based on handpicked data between 2008-2016 on the background and experience of over 14,175 TMT members of the FTSE 350 companies. Using partial least squares-structural equation model (PLS-SEM) to capture the unique cognitive latent constructs, we find that TMT education and experience alone do not generate positive effects on corporate outcomes. Rather, it is the peculiar combinations of TMT education and experience together with their innovativeness, risk appetite and networking capabilities which have positive effects on corporate financial health and value as they provide firms with competitive advantages.

We contribute to the UET and strategic management literatures in several ways. First, our study uses the two-stage throughput decision-making model (TPDMM) with PLS-SEM to examine how TMT-SC influences firms’ financial health and value in the UK. The throughput model is a cognitive framework that captures different pathways and stages that can influence TMT strategic decision-making (Rodgers 2010; Rodgers et al. 2013, 2017). This enables us to extend previous studies which used conceptual approaches or simple OLS in examining the effect of TMT-SC on performance (Cannella et al. 2008; Lee and Brinton 1996; Nadkarni and Narayanan 2007; Narayanan et al. 2011; Talke et al. 2010). We argue that organisations are parts of complex social structures and, therefore, their performance not only reflects TMT characteristics, but also the dynamic nature of the structures and complex webs of the institutional, professional and social networks in which they are embedded. Second, we contribute to the TMT-SC perspective by acknowledging dynamic interactions among multiple cognitive elements (i.e., social networking, education, experience, risk-taking and innovation capabilities) to measure the effects of the TMT-SC process on performance; in so doing, we propose and demonstrate that TMT-SC influences firm outcomes via random configurations and multiple combinations of overlaps of heterogeneous TMT-SC elements in a dynamic framework. Third, we contribute to the strategic management literature by providing robust empirical evidence about why some firms may perform better than their rivals. This study, thus, looks inside the minds of the strategists. This is relevant as we argue that heterogeneity in the resource configurations of rival firms (Molloy and Barney 2015; Wernerfelt 1984, 1995; Barney et al. 2001) emerges from the interactions between TMT-SC processes and dynamic capabilities.

This study proceeds as follows. In Section 2, we provide the literature review and discuss the theoretical background, and in Section 3 we develop hypotheses. Our methods, data and latent constructs are elaborated in Section 4. Section 5 explains the measurement validations and provides the results of the analyses. Section 6 provides a discussion for practical implications and future research. Section 7 concludes the paper.

**2. Literature review and theoretical framework**

***2.1. Issues related to behavioural finance considering cognitive biases***

Since the seminal work of Modigliani and Miller (1958), much research effort has been directed at understanding firms’ financing and investment decisions and the corresponding effects on firm value. Until recently, the standard approach has been to assume the rationality of managers and investors. For example, a large body of research exists examining the role of security signaling in the face of informational asymmetries in a rational framework (e.g. Leland and Pyle 1977; Ross 1977; Myers and Majluf 1984). Another strand of research examines the use of capital structure to mitigate agency problems (Jensen and Meckling 1976; Grossman and Hart 1982; Jensen 1986; Fairchild 2005a). This approach assumes a principal-agent problem based on selfish managerial rationality.

However, the cognitive and psychological biases may have a significant effect on decision-making and outcomes in corporations and financial markets. This has resulted in the development of behavioural finance with behavioural assumptions, examining the effects of investors’ biases on financial markets, and behavioural corporate finance, focusing on the effects of managerial biases on corporate finance decisions. Within behavioural corporate finance, scholars are increasingly recognising that the bias of overconfidence may play a significant role in managers’ financing and investment decisions (Baker and Wurgler 2011; Kahneman and Lovallo 1993; Shefrin 2001; Goel and Thakor 2008; Malmendier and Tate 2005; Heaton 2002, Gervais et al. 2003, Hackbarth 2009). Heaton (2002) cites the psychological research (Weinstein 1980; March and Shapira 1987) that supports the view that people are overoptimistic/overconfident. This research demonstrates that agents tend to be more optimistic about outcomes a) they believe they can control, and b) to which they are highly committed. Both findings support the view that managers may be overconfident about the success of their ventures.

Departing from focusing only on individuals, Gervais and Goldstein (2003) show the importance of a concerted effort in a team of rational and overconfident individuals. They argue that performance can be enhanced via the hard work and effort triggered by the overconfident individual, and this Pareto improvement can be applied to corporate TMTs. Fairchild (2005c) extends Gervais and Goldstein’s (2003) study and incorporates the dimension of the overconfident individual’s negotiating power that reduces the efforts of the rational peer. As this occurrence reduces the firm value, Fairchild (2005c) proposes an optimal solution by considering the concept of fairness in a game-theoretic setting, as fairness during bargaining would restore the incentives of the rational player to increase their effort. Similarly, Meissner et al. (2018) examine the decision-making in teams (i.e. top management team) as opposed to individual decision-making. They demonstrate that demographic diversity alleviates group-level overconfidence and cognitive conflicts in teams owing to the diverse perspectives and ideas pertaining to a specific team. This discussion has implications for the relevance of human and/or social capital in our empirical analyses.

Decision-making at firm level is complicated and prone to cognitive biases. The effects of psychological factors on corporate financial policies have been broadly studied, more studies beginning to recognise the importance of this field of research (Bertrand and Schoar 2003; Heaton 2002; Malmendier and Tate 2005; Ben-David, Graham, and Harvey 2010). Overconfident executives are likely to overestimate the probability of success of projects and make optimistic forecasts (Statman and Caldwell 1987; March and Shapira 1987; Kahneman and Lovallo 1993). It is further shown that overconfident managers issue excessive levels of debt and avoid new equity issues (Malmendier et al. 2011; Hackbarth 2008). Moreover, Ataullah et al. (2018) show that overconfident executives lengthen the maturity of borrowings and consider overconfidence a preferable managerial trait as it reduces the agency cost of debt financing. Further, Hirshleifer et al. (2012) argue that overconfident CEOs are better innovators (i.e. as per their entrepreneurial characteristics), which is parallel to the consideration of innovativeness and risk-taking levels in our empirical analyses. As high risk-taking and responsibility tend to be linked with overconfident/overoptimistic managers, one would expect such managers to produce very good or very bad corporate outcomes. The perception of risk for overconfident executives can be shaped by some emotional and cognitive factors.

Doukas and Petmezas (2007) examine the correlation between managerial overconfidence and post-merger return using data from UK private firms. They find that self-attribution, which naturally leads to overconfidence, encourages managers to engage in more acquisitions after the initial success. Their work also reports that overconfident managers generate lower announcement returns and poorer long-term performance than their rational peers. Xia and Pan (2006) present a dynamic model of takeover which incorporates managerial overconfidence. It is shown that a high level of overconfidence can lead to negative return on a bidding firm’s shareholders. On the other hand, Brown and Sarma (2007) argue that it is of equal importance to study the extent to which a CEO is able to impose their overconfidence on corporate decisions. During the period 1994-2003, they suggest that Australian CEOs’ dominance is at least as significant as overconfidence in deciding to make an acquisition.

Malmendier and Tate (2005) consider the relationship between managerial overconfidence, internal funds and corporate investment. Gervais et al. (2003) employ a real-options framework in order to consider the combined effects of managerial risk-aversion and overconfidence on the decision to invest immediately in a project, or to delay investment. Kahneman and Lovallo (1993) argue that managerial optimism may lead to managers making ‘bold forecasts’ regarding prospective projects, while at times making timid choices due to risk aversion. Heaton (2002) argues that overconfidence leads to managers overestimating the net present value of new investment projects. Hence, they will invest in negative NPV projects that they mistakenly believe to be positive NPV. Hence, overconfidence is value-reducing. Similarly, Malmendier and Tate (2005) argue that overconfidence may result in corporate investment distortions. Overconfident managers view external funds as unduly costly. Therefore, they overinvest when they have abundant internal funds, and underinvest when they require external financing. Zacharakis and Shepherd (2001) consider the investment appraisal process of venture capitalists. They argue that, due to time and resource constraints, VCs may be overconfident in their ability to evaluate business plans. In particular, they may overestimate the bad signals that they receive, and this can lead to the excessive rejection of potentially good projects. Statman and Tyebjee (1985) examine the effect of managerial overconfidence on the forecasts of revenue and costs in the NPV calculation. They argue that overconfidence results in managers overestimating the expected revenues and underestimating the expected costs for a potential project. Hence, the NPV is inflated by overconfidence, resulting in managers taking up too many bad projects. Pruitt and Gitman (1987) conducted a mail survey of US managers in order to analyse various aspects of managerial bias in capital budgeting forecasts. They support Statman and Tyebjee (1985) that capital budgeting forecasts are optimistically biased by people with work experience.

Considering conflicts between shareholders and executives, Hackbarth (2008) reports that the capital structure chosen by overconfident managers always deviates from optimal capital structure theory, which becomes a challenge to the trade-off theory. He shows that, compared with the rational managers, overconfident executives tend to use more debt. This is because overconfident managers are prone to overestimate the profitability of the invested project and underestimate its risks.

Heaton (2002) integrates the managerial overconfidence assumption and free cash flow theory, establishing an underinvestment/overinvestment trade-off related to free cash flows without invoking asymmetric information or rational agency costs and using the optimism management hypothesis to explain the pecking order theory. He reports that optimistic managers overestimate their ability to create value for their firms, and also overestimate the future free cash flows brought by their investment, believing that capital markets undervalue their firms’ risky securities, and may pass up positive net present value projects that must be financed externally.

Hackbarth (2009) employs a real options framework, combined with an earnings-based leverage model to analyse the link between overconfidence, investment and debt. Specifically, he focuses on the conflict between shareholders and bondholders, embodied in Myers’ (1977) underinvestment problem. Debt induces an inefficient delay in investment, but mild overconfidence mitigates this problem. Hackbarth further demonstrates that an increase in risk-shifting opportunities exacerbates underinvestment, and that leverage is inversely related to the value of investment opportunities.

Entrepreneurs are more prone to cognitive biases than others and might display a higher level of optimism. For example, Palich and Bagby (1995) find that entrepreneurs tend to think positively about equivocal business situations. Wu (2005) suggests that entrepreneurs are overconfident in their ability, leading to excessive risk tolerance. An entrepreneur would choose an industry with a high cost of ability uncertainty over one with a low cost of ability uncertainty. Busenitz and Barney (1997) claim that ‘entrepreneurial cognition’ (Busenitz and Lau, 1996), such as overconfidence, is what makes one an entrepreneur. Landier and Thesmar (2009) provide a similar discussion and evidence for French entrepreneurs with persistent biases/beliefs that lead to high expectations.

Malmendier and Tate (2005) categorise CEOs according to their degree into three groups: the first group is CEOs with finance education - namely, those who have graduated with a degree in finance, accounting and economics; the second group is those with a technical education, for instance, computing or engineering; the third group consists of those with other degrees, such as law or literature. However, there have been few attempts to link education background theoretically to managerial overconfidence. It is suggested that the education background of CEOs has an influence on their level of overconfidence. The authors imply that a CEO’s human capital is tied to corporate-specific riskiness. This aspect is related to our measure regarding human capital with social capital implications, which we will discuss in detail in the following sections.

Despite the fact that heavy use of debt increases the risk of bankruptcy, and that overconfident CEOs may perceive less risk due to the illusion of control, some researchers uncover the positive role of overconfidence in reducing bondholder-shareholder conflict. Hackbarth (2009) incorporates an earnings-based capital structure model into a real option framework and finds that overconfidence as a commitment device drives CEOs to achieve results closer to first-best option. He provides evidence that overconfidence, which results in higher leverage, could reduce agency costs and reconcile manager-shareholder conflicts. Similarly, Fairchild (2005b) investigates the combined effects of overconfidence, asymmetric information and moral hazard on financing decisions, and reaches the conclusion that overconfidence does not necessarily undermine shareholder value.

Additionally, Fairchild (2009) sheds light on life-cycle financing choices and proposes the model of ‘excessive life-cycle debt sensitivity due to managerial overconfidence’. He states that overconfident managers might perceive value-reducing projects as value-increasing.

***2.2. Overconfidence as a cognitive bias and firm performance***

While rational managers argue that they are attempting to maximise their shareholders’ value, we can hear the same statement from irrational (overconfident) managers as well. However, what we hear from the latter should be less convincing due to their cognitive biases. Some researchers argue that managerial overconfidence can affect the financing behaviour and thus the value of the firm. Hackbarth (2008) incorporates well-documented managerial traits into a trade-off model of capital structure to study their impact on corporate financial policy and firm value. Optimistic managers choose higher debt levels and issue new debts more often. However, biased managers’ higher debt levels restrain them from diverting funds, which increases firm value by reducing this manager-shareholder conflict. Although higher debt levels delay investment, mildly biased managers’ investment decisions can increase firm value by reducing this bondholder-shareholder conflict.

Ahmed et al. (2020) consider a theoretical model in which overconfident managers take strategic decisions regarding corporate hedging to manage risk and relate these decisions to firm performance and value creation. They argue that overconfidence leads managers to overestimate their ability but underestimate the financial distress costs. Their empirical and theoretical analyses report both value-enhancing and value-destroying outcomes of corporate risk management, depending on the situations involving managers’ ability, risk appetite levels and overconfidence.

Overconfident managers may misjudge negative NPV projects as positive-NPV ones, and hence destroy firm value by overinvesting (Heaton 2002). Gervais et al. (2003) argue in their real option-based approach that risk-averse managers hesitate more than overconfident managers with respect to taking up new projects. This implies that overconfident managers may adopt risky investment policies and that their efforts may deteriorate due to their optimism. The authors further state that compensating overconfident managers means transferring wealth from shareholders to managers. They propose that a moderate level of overconfidence and optimism mitigates agency costs by reducing the need for option compensation, thus enhancing firm value. While massive research has focused on the adverse impact of optimistic bias, it should be noted that overconfidence sometimes plays a positive role and increases firm value. As Gervais et al. (2003) state, unlike risk-averse rational managers who will postpone a project until uncertainty is eliminated, overconfident managers appear to be less hesitant before making decisions. Hence, with a moderate level of overoptimism, the interests of managers and shareholders can be aligned and agency costs can be reduced. There are conflicting arguments regarding the benefits of holding free cash flows (FCF). Jensen (1986) argues that the presence of FCF can make managers overinvest in projects or squander cash for their personal use. Myers and Majluf (1984), on the other hand, favour the presence of FCF because when managers need external financing, they might reject positive-NPV projects, which leads to underinvestment inefficiencies. The underlying reason is that managers perceive their stocks to be undervalued and hence avoid issuing equities. Heaton (2002) blends these two arguments: optimistic managers who need external financing may cause underinvestment by passing up valuable projects as they believe external funding is too costly. In such cases, FCF would avoid this underinvestment. The other side of the coin is that optimistic managers can overestimate future cash flows and thus overvalue investments. Hence, managerial optimism and the availability of FCF together could lead to overinvestment. Chatterjee and Hambrick (2007) hypothesise that the higher intensity of CEO narcissism leads to more extreme firm performance, i.e. very high returns or big losses. Also, Gider and Hackbarth (2010) state that mildly biased managers can enhance firm value. These issues suggest that it is difficult to observe a linear association between firm value and managerial overconfidence.

***2.3. Strategic decision-making by top management team***

Organisations are made up of normative, cultural-cognitive, legal and regulatory elements which influence TMT-SC (Scott 2013). The UET provides a strategic armoury during TMT strategic decision-making and enables TMTs to predict rival firms’ behaviour; furthermore, it suggests that TMT characteristics matter more when more complex decisions need to be addressed. This is consistent with McGuinness (2019), who discusses the role of upper echelons, resource dependence and stakeholder theories in affecting TMT decision-making and how TMT demographics influence corporate value. Helfat and Peteraf (2009) and Korand Mesko (2013) argue that managerial capabilities are governed by TMT cognitive abilities which enable managers to integrate, build and re-engineer firms’ resources and competencies, and adopt appropriate processes to achieve evolutionary fitness for the organisation. TMT cognitive footprint influences the manner in which firms employ their capabilities (Barneyet al*.* 2001; Helfat and Peteraf 2009; Ndoforet al*.* 2015; Wernerfelt 1995). Moreover, firms maximise yields not because they have better resources but because they have unique capabilities of making good use of the resources via enhanced TMT-SC (Cannella et al. 2008; Nadkarni and Narayanan 2007; Narayanan et al. 2011; Talke et al. 2010) and more effective strategy implementation processes (Barney 1991).

TMT-SC involves intuition, conscience, consciousness, sensing, seizing, reflexivity and reconfiguration, which constitute the main micro components of TMT dynamic capabilities (Teece 2007). Intuition and consciousness influence the attention to, and absorption of new knowledge, whereas conscience is related to ethical stance. Sensing involves the alertness and discovery process (Helfat and Peteraf 2009; Ndofor et al*.* 2015). Sensing is drawn from TMT perception, competence, experience and trust relations, whereas seizing involves taking advantage of opportunities by designing new business models (Korand Mesko 2013). Reflexivity and reconfiguration are processes adopted by TMT to achieve evolutionary fitness, and involve speed of adjusting to technological change, selection, configuration, alignment and modification of corporate resources (Helfatand Peteraf 2015). TMT-SC is influenced by TMT education, experience, risk-taking and innovativeness, social and human capital and the availability of adequate and relevant information (Hambrick et al. 2015; Wang et al. 2016; Carpenter et al. 2004; Sparrow 1999). Social relations are important since they partly influence TMT logical sense-making (Ibarra and Andrews 1993; Robert et al. 2008).

Scholars have acknowledged the connection between reputation and firm performance. For instance, Tischer et al. (2014) find that positive (negative) announcement effects exist regarding upgraded (downgraded) companies. Following event announcements that impact on the perceptions of corporate reputation, investors gain new information from the changes in published rankings to adjust share prices. Further, regarding reputation linked to corporate environmental responsibility, Jo et al. (2015) report that the latter enhances operating performance not only in the manufacturing sector but also in the financial services sector. Boldness in strategic implementation can positively influence firm performance. It is argued that high levels of managerial self-belief, commitment and determination are needed to outperform rivals. Such elevated levels are not just useful, but indeed essential. In tough competitive situations where positive thinking can influence outcomes, only those who are willing to go beyond what seems reasonable will be able to succeed and outperform their rivals (Rosenzweig 2013). However, during times of crises, greedy CEOs neglecting socially responsible investment experience greater losses in the short run. Note that it took a relatively long time to recover from the 2008 global financial crisis (Sajko et al. 2021).

Haynes (2015), in illustrating the dark side of leadership, focuses on the ‘exaggerated pride or self-confidence, often resulting in retribution’ (Hayward and Hambrick 1997, p. 106) and greed as the ‘desire for and active pursuit of extraordinary material wealth’ (Haynes et al. 2017, p. 6). Haynes (2015) highlights a theoretical link between these two extreme traits and posits that the presence of either or both can have a negative effect on human and social capital in entrepreneurial ventures. In turn, these mediators are likely to influence the potential success – or the lack thereof – of new ventures and lead to suboptimal financial results. Black et al. (2019) find that self-efficacy has a positive influence on team cohesion, with high self-efficacy shown to be an important mediator of the relationship between emotional intelligence and team cohesion. Particularly, high emotional intelligence promotes the development of self-efficacy, resulting in increased team cohesion, which then improves team performance. In another account on entrepreneurs’ self-efficacy and performance, Baron et al. (2016) draw on goal-setting theory, which suggests that difficult goals enhance performance in many tasks. However, if the goals are too difficult, they can become unattainable, thus causing discouragement and reduced motivation amongst entrepreneurs and in firm performance. Baron et al. (2016) find that self-control, one important aspect of self-regulation, may restrain this tendency and encourage entrepreneurs to set goals that, although difficult, are also achievable. Their study also reveals a reversed-U link between goal difficulty and performance.

In times of crises and great uncertainty, leaders’ experience may not have much relevance when adaptability and resilience are the main requirements. For instance, Williams et al. (2017) argue that how individuals and organisations anticipate and respond to adversity depends on their capabilities in the areas of durability, organising and adjusting, and responding to major disturbances. Further, during a crisis, a CEO’s narcissism can lead to bad decisions and negative performance (Al-Abrrow et al. 2019). Fourth, success can also be due to serendipity. Johansson (2012) notes that success can be born of serendipity, which involves luck or stumbling upon something unusual and then having the foresight to capitalise on it (Boomer 2018). Whereas it is well-acknowledged that success is likely to be positively affected by a formal, meticulous and well-planned strategic approach, equally, in some instances, success can also depend on making a discovery by accident or luck and capitalising on it (Serenko and Dumay 2017).

Despite such theoretical developments, to the best of our knowledge, so far there has been no robust empirical study to evidence the effects of TMT multi-dimensionality on TMT-SC and firm performance. Our understanding of such relationships is limited by conceptual approaches, based on simple linear empirical explorations, which are unable to capture complex interdependencies (Hughes et al. 2018). Drawing on Kor and Mesko (2013), Teece (2007), Helfat and Peteraf (2009, 2015) and Hambrick and Mason (1984), we build our conceptual framework of TMT-SC as depicted in Figure 1: (*i*) TMT mental structures are shaped by industry- and firm-specific experience, and help to categorise information; *ii*) TMT information structures shape TMT risk preference and innovativeness, and help TMTs to make sense of their thoughts; *iii*) TMTs’ education background serves as a knowledge repertoire that can be accessed in critical situations; *iv*) TMT human capital with social capital implications (e.g. external networking) provides a conduit through which TMTs update their mental models and world views in solving complex organisational problems. These four strategic cognition elements are intertwined with TMT dynamic capabilities as the micro-foundations of TMT-SC and decision-making.

**[INSERT FIGURE 1 ABOUT HERE]**

TMT-SC is a process (Jenkins and Johnson 1997; Bundy et al. 2013) that explains the managerial world view of an entire business (Sparrow 1999) and resource allocation to maximise firm value (Molloy and Barney 2015; Kunc and Morecroft 2010; Barney 1991). The managerial cognition elements constitute the wheels upon which the managerial capabilities (Helfat and Campo-Rembado 2016; Helfat and Peteraf 2015, 2016) of strategic decision-making rotate (Figure 1). TMT-SC is the cognitive ‘horsepower’ (Kor and Mesko 2013) that determines the speed of strategic change. Further, it helps to explain organisational inertia (Tripsas and Gavetti 2000); it goes beyond a demographics-based understanding of executives’ human capital to a skill-based, experience-based, relationship-based, and cognition- and value-based understanding of executive team capital.

**[INSERT FIGURE 2 ABOUT HERE]**

Figure 2 depicts a linear association, suggesting that value creation is enhanced by TMT cognitive abilities as the performance antecedents, assuming that TMT-SC increases firm value via the improved financial health of firms. Such linear relationships are highlighted by scholars (De Fond et al. 2005, Hamori and Koyuncu 2015; Kor 2003; Kunc and Morecroft 2010). Yet, as discussed in Kaplan (2011) and the configuration theory (Hughes et al. 2018), we propose that TMT-SC influences firm outcomes via random configurations and multiple combinations of overlaps of TMT-SC elements in a dynamic framework.

In Figure 3, therefore, we illustrate the micro elements of the managerial cognition infrastructure acknowledging the complex interactions. This setting follows the insights provided by: (i) Hughes et al. (2018), who refer to the relationship webs among the entrepreneurial orientation, exploration, exploitation and performance of family firms; (ii) Salas et al. (2010), who show in a Venn diagram the overlap between intuition and expertise related to organisational practices and effectiveness; and (iii) Finkelstein et al. (1996), who argue that executives make strategic decisions based on their experience and imply that a causal link between TMT-SC and performance depends on TMT cognition and mental models. Figure 3 shows that the TMT-SC dynamic process (Helfat and Petaraf 2015; Kor and Mesko 2013; Nielsen 2009; Nielsen and Nielsen 2013) is shaped by different configurations of cognitive elements including previous education, industry-specific and firm-specific experience, TMT risk preferences and innovativeness, and human capital. We posit that such configurations influence TMT decisions and firm value. In so doing, we draw on Huff (1982), Prahalad and Bettis (1986), Kor and Mesko (2013) and Adner and Helfat (2003), who argue that TMT cognition capabilities are formed by previous education, industry and firm experience and social interactions, which are intertwined (Salas et al. 2010; Sparrow 1999). These interacting cognitive elements (Walsh 1995) enable TMTs to navigate through a bewildering flow of information to make strategic decisions.

In cognitive psychology (see Salas et al. 2010; Carpenter et al. 2004) TMT education background and industry-specific/professional experience are deemed key cognitive elements that sharpen the dynamic capabilities of managers. Hence, TMT strategic cognitive lenses (the ability to sense, seize and configure scarce resources) are affected by their industry-specific experience. Kor and Mesko (2013) argue that TMT dynamic capabilities are governed by their cognition capabilities together with their level of innovativeness and risk preferences.

**[INSERT FIGURE 3 ABOUT HERE]**

1. **Hypothesis development**
	1. ***TMT strategic cognition***

TMT-SC refers to the connections between cognitive structures and the pathways managers follow during their decision-making process with reference to strategy formulation and implementation (Poracand Thomas 2002). Factors such as biases, search patterns, available information, time pressure, environment and the expertise of the decision-maker can influence the configuration of TMT cognitive structures (Herrmann 2014; Nadkarni and Barr 2008; Narayanan et al. 2011).

Firms are regularly faced with complicated decision-making, which requires TMTs to have complex thinking abilities. Such abilities affect the quality of strategic decisions that yield positive corporate outcomes. Wernerfelt (1984) posits that firms can generate high returns if they are able - through TMT-SC - to identify and acquire resources that are critical for the production of highly demanded products. Similarly, Calabretta et al. (2017) and Jenkins and Johnson (1997) reveal that TMT-SC is a key driver of performance. UET argues that the strategic choices, performance, health and value of firms are partially influenced by TMT background and cognitive abilities (Hambrick and Mason 1984). Levy (2005) supports the view that strategic choices are determined by cognitive processes concerning the environment, and that managers’ capabilities in dynamic environments are strongly linked to organisational outcomes. Hence, firms can enhance their performance by higher quality strategic orientation and cognitive ability of managers (Escribá‐Esteve et al. 2009). Therefore, we propose the following hypotheses:

*Hypothesis 1a: There is a positive relationship between TMT strategic cognition and firm value.*

*Hypothesis 1b: There is a positive relationship between TMT strategic cognition and firm financial health.*

* 1. ***TMT education and experience***

Relevant education and experience provide TMTs with superior information qualifications that influence TMT cognitive capabilities (Helfatand Campo-Rembado 2016; Helfatand Peteraf 2009) and TMT work experience (Helfatand Peteraf 2015; Korand Mesko 2013; Teeceet al*.* 1997).Hughes et al. (2018) state that the level of exploration and exploitation of family firms’ managers is shaped by their experience and expertise**.** General experience has to be explicit to be effectively exploited, and general experience from previous firms may exhibit diminishing marginal returns when applied to new firms during TMT-SC (Nonakaet al*.* 2000; Hoang and Rothaermel 2005). Yet, industry-specific experience enables TMTs to acquire specialized knowledge and understanding about the industry within which the firm operates. Kor and Mahoney (2005) argue that specific industry sectors are accustomed to unique knowledge attributes including specific technologies, rules and regulations. Hence, previous industry-specific experience can influence TMT-SC. Firm-specific experiences involving tacit knowledge about a firm’s operations and resource capabilities influence TMT resource allocation decisions and strategic choices (Kor 2003). Managers with firm-specific experiences are able to assess which environmental opportunities provide a better strategic fit for the firm (Barney 1991; Penrose 1959). Therefore, we posit:

*Hypothesis 2a: The positive effect of TMT strategic cognition on firm value increases with relevant TMT experience.*

*Hypothesis 2b: The positive effect of TMT strategic cognition on firm value increases with relevant TMT education.*

*Hypothesis 2c: The positive effect of TMT strategic cognition on firm financial health increases with relevant TMT experience.*

*Hypothesis 2d: The positive effect of TMT strategic cognition on firm financial health increases with relevant TMT education.*

* 1. ***TMT risk-taking and innovativeness***

Strategic risk-taking has important implications for performance and value (Amore and Failla 2020; Hoskisson et al. 2017; Sanders and Hambrick 2007). Previous studies have examined risk-taking in terms of performance feedback (Greve 2003), slack (Greve 2003; Li and Tang 2010), environmental factors (Palmer and Wiseman 1999) and R&D (Li and Tang 2010). These studies suggest that high managerial risk appetite is necessary to create wealth and performance. Some scholars refer to the UET to investigate firm risk-taking behaviour. For example, Berger et al. (2014) argue that background qualification, knowledge and experience of TMTs can influence the propensity of risk-taking in organisations. TMTs with high education usually have a favourable predisposition towards innovation (Hitt and Tyler 1991). TMT-SC is effective when TMT education and experience support higher innovation. Superior information promoting innovation is shared during the TMT-SC process in an atmosphere of trust, and investors perceive organisations with such TMTs as more committed to innovation (Amore and Failla 2020). TMTs can use their knowledge structures based on experience and education to make intelligent inferences via their cognitive frames about new strategic options including innovation activities (Talke et al. 2010). Thus, we argue that TMTs will take higher risks when their expertise levels in that venture are high and where there are significant returns prospects (Gilleyet al*.* 2002). Recently, Mazouz and Zhao (2019) argue that innovation is a mediating factor for managerial incentives and corporate value. Hence, TMT-SC involving considerable risk-taking and innovativeness will generate more favourable corporate outcomes. We thus posit that:

*Hypothesis 3a: The positive effect of TMT strategic cognition on firm value increases with TMT risk-taking.*

*Hypothesis 3b: The positive effect of TMT strategic cognition on firm value increases with TMT innovativeness.*

*Hypothesis 3c: The positive effect of TMT strategic cognition on firm financial health increases with TMT risk-taking.*

*Hypothesis 3d: The positive effect of TMT strategic cognition on firm financial health increases with TMT innovativeness.*

* 1. ***TMT human capital***

The human capital theory contends that individual CEOs’ idiosyncratic skills are critical sources of economic productivity, and that such distinctive skills can be improved by training and education (see Miller et al. 2015). It is observed that the greater majority of Ivy league students will have proven their unique talent even before arriving at university (Wai and Rindermann 2015). Miller et al. (2015) report a significantly positive association between CEOs from Ivy league schools and firm performance: CEOs graduating from these schools showed superior performance as a result of their idiosyncratic human capital. Similarly, Wai and Rindermann (2015) argue that higher CEO education and cognitive ability are associated with higher gross revenue and superior firm performance. Michelman et al. (2021) argue that while high-status Harvard students from prestigious private high schools perform worse academically than their peers, these students have access to exclusive elite premium membership clubs that ‘leapfrog’ them into highly privileged positions in society, with exclusive access to ‘causal channels’ for superior performance. These ‘causal channels’ constitute superior human capital resources for rent extractions. Therefore, top firms tend to hire CEOs from these elite clubs to enhance corporate performance via the unique human capital.

Institutional and social networks provide invaluable cognitive abilities and superior information which influence TMT-SC (Gronum et al. 2012; Sheng et al. 2011; Williams and Filippakou 2010). Oh and Barker (2018), for instance, show the relevance of social ties via CEOs outside directorship to corporate R&D activities. Managerial human capital involves the ability of TMTs to tap into strategic connections within a network (Molina‐Morales and Martínez‐Fernández 2010). Managerial cognition interactions shaped by internal and external networks capture the mental models that TMTs use in making decisions (Prahalad and Bettis 1986). Further, cognitive diversities reflecting differences in experience and education, and cognitive conflicts stemming from different TMT views can impair TMT-SC effectiveness and firm performance (Hambrickand Mason1984; Costanzo and Di Domenico 2015). However, this negativity can be mitigated via the presence of a relational-based trust (Rodgers 2010; Schaubroecket al*.* 2013). Managerial human capital resides in a network of complex relationships in an organisation or sector. The transmission of trustworthy information among managers within the network promotes knowledge sharing which can influence and improve the cognitive perspective of TMTs (Nahapiet and Ghoshal 1998). Networking relationships (Acquaah 2012) with well-connected CEOs (Miller et al. 2015) have positive effects on performance. Overall, we posit that networking and quality human capital with social capital implications, which can enhance the TMT-SC process, make additional positive contributions to corporate outcomes:

*Hypothesis 4a: The positive effect of TMT strategic cognition on firm value increases with TMT human capital.*

*Hypothesis 4b: The positive effect of TMT strategic cognition on firm financial health increases with TMT human capital.*

1. **Methodology**
	1. ***Data and Sample***

We gathered data on the FTSE 350 companies’ TMTs during 2008-2016. We deleted firms with missing, inconsistent or extreme values. After the data filtering, we ended up with 311 firms and 2,799 firm-year observations in a balanced panel format. We handpicked data on the education and experience of over 14,175 TMT members from Bloomberg’s executive profile and biography database. We define the TMT as individuals who meet the following criteria: founders of the company who are chief executives (Nielsen and Nielsen 2013) or individuals who take an active role in strategic decision-making, such as the chief executive officer (CEO), president, chairman of the board, chief operating officer (COO), managing director (MD) and chief finance officer (CFO) (Hambrick and Mason 1984; Hitt and Tyler 1991; Kor 2006; Nadkarni and Narayanan 2007). We used Bloomberg to collect other firm-level data.

* 1. ***Empirical Constructs***

*Corporate outcomes*

We employed Altman’s Z-score that measures corporate financial sustainability. Our value measure is Tobin’s Q (Herrmann and Nadkarni 2014; Miller et al. 2015; Singh et al. 2018).

*TMT strategic cognition*

We identified TMT education and experience as key factors to measure TMT cognitive capabilities (Helfat and Peteraf 2015; Naranjo‐Gil et al. 2008). Previous studies on TMT-SC used measures such as education and experience (Escribá‐Esteve et al. 2009; Herrmannand Nadkarni 2014; Rajagopalan et al. 1997; Hittand Tyler 1991; Simsek et al. 2005; Korand Mesko 2013; Hamori and Koyuncu 2015) as proxies to measure TMT cognitive abilities. Clark and Maggitti (2012) relate TMT industry experience and education to TMT potency, which then influences TMT-SC which would be crucial during strategic decision-making. They measure potency based on the response they received from team members during interviews after asking a question about ‘perception of the team’s capability to perform tasks effectively and successfully’. Ashford et al. (2018)’s TMT potency measure is based on survey questionnaires. We argue that the TMT-SC process is influenced by its dominant logic shaped by TMT education, experience and networking ability. Our TMT-SC, for which there is no direct measure, is a latent construct based on education and experience; it represents a process, and a higher value implies better TMT cognitive abilities. Our approach is comparable to that of Escribá‐Esteve et al. (2009), who measure the concept of TMT strategic orientation (see footnote 3).

We suggest that TMT-SC hinges upon four concepts (i.e. perception, information, judgement, decision) within our TPDMM setting in Figure 1. This shapes our PLS-SEM analysis.

*TMT experience*

We captured TMT experience using general supervisory experience and industry-specific experience (DeFond et al. 2005; Dokko et al. 2009; Nadkarni and Hermann 2010; Nielsen and Nielsen 2013). TMTs draw from their previous experience during strategic decision-making (Acquaah 2012; Hamori and Koyuncu 2015; Herrmann 2014; Kor and Misangyi 2008; Li 2010; Nadkarni and Hermann 2010). We use general supervisory, industry-specific and firm-specific experiences as reflective indicators to measure TMT experience.

*TMT education*

We captured TMT education using two variables including academic and professional qualifications (DeFondet al*.* 2005; Hitt et al*.* 2001). TMT education influences cognitive biases (Carpenteret al*.* 2004; DeFond et al*.* 2005; Hittet al*.* 2001). Scholars of strategy cognition recognise the negative implications of personal biases and heuristics; hence most strategic cognitive researchers use TMT education as a proxy for cognition (Geletkanyczand Boyd 2011; Hitt and Tyler 1991).

*TMT innovativeness*

We measured TMT innovativeness by R&D expenses over sales (Kor 2003; Korand Mesko 2013; Kor and Misangyi 2008; Talke et al. 2010; Mazouz and Zhao 2019, although they use assets instead of sales), noting that R&D activities are conditioned by TMT as firm-level risk-taking. TMTs with specific industry experience contribute positively towards TMT innovativeness during TMT-SC, which in turn improves performance (Daellenbach et al. 1999).

*TMT risk preferences*

TMT risk preferences might be influenced by changes in stock prices, usually accompanied by changes in executive compensation (Chen et al. 2015) and stock options that shape managerial risk perception (Sanders and Hambrick 2007). Wright et al. (2007) find that TMT option incentives are positively linked to subsequent corporate risk-taking. Our proxy for TMT risk appetite is *Delta* (i.e. change in option price over change in stock price). Positive changes in stock prices should increase option prices and the value of TMT (executive) compensation including options and stocks. Higher *Delta* can therefore suggest higher TMT risk appetite.

*TMT human capital*

Organisations are shaped by interactions in networks among employees and managers according to their values and interests, and such networks constitute social power as human capital with varying quality (Castells 2011). Directors, for instance, who graduated from top universities, or those with well-recognised professional qualifications might have different aspirations compared with lower-rated universities or less reputable professional qualifications. Boutinot et al. (2017) relate professional networking and academic eliteness to reputation, which influences others’ perceptions about TMTs’ capability to deliver. Some survey evidence suggests that obtaining a degree from the universities of Oxford or Cambridge (i.e. Oxbridge) can yield additional networking power, and that Oxbridge graduates are more likely to be cultural leaders. Following a similar approach to that adopted by Lee and Brinton (1996), we use the Times-Higher Education World University Ranking to capture TMT networking capabilities originating from their academic background, and depending on whether TMTs obtained their degrees from the top hundred universities worldwide.

According to a survey by executive search firm, Heidrick & Struggles, 24% of FTSE 100 CEOs were found to be educated at Oxbridge. In Kirby (2016), this proportion was 31% among the UK-educated managers. This level of eliteness is comparable to the levels in other countries. In the US, 37.5% to 41% of Fortune 500 CEOs were reported to have attended an elite school (Wai and Rindermann 2015) and, again, in the Fortune 500, 23.4% to 33.1% of CEOs were from Ivy League institutions (Miller et al. 2015), as average values considering multiple years. In France, the managers of almost all of the largest and most powerful 100 firms had attended one or more elite schools (i.e. Ecole Polytechnique, Institut d’Etudes Politiques de Paris, Ecole des Mines, and Ecole Nationale d’Administration) (see Maclean et al. 2010 and references therein). Finally, Germany may not have consistently obvious elite universities, yet 38% of DAX 30 and MDAX 50 CEOs are reported to have a PhD degree (see the link in footnote 2 which also states that in the top 100 companies in the US Fortune 500, 28% of top managers were part of the Ivy League, and in France half of SF 120 CEOs had attended one of four Grande Écoles).[[1]](#footnote-1)

Further, Davis (2018) provides an intriguing analysis of social circuits, social foundations of power, networks of old boys’ clubs and the relevance of having an elite education in the business world. Another UK official document shows the dominant effects of FTSE 350 CEOs with Oxbridge degrees.[[2]](#footnote-2) Further, Miller et al*.* (2015) examine the relevance of Ivy League graduates to corporate value creation, and argue that the rare and non-substitutable human capital is a strong source of value enhancement. To assess these considerations in our analyses, we also constructed an indicator for executives with an Oxbridge background. In addition to the academic aspect of human capital, we propose another indicator showing whether executives have obtained professional qualifications from highly reputable institutions (see Table 1 for details).

*Other considerations*

*Accounting information* is used by TMTs to communicate their trust to investors. Financial ratios can provide assurance to stakeholders about the need to trust TMTs. We use profitability, liquidity, efficiency and solvency ratios as benchmarks to measure corporate financial health. Return on assets and return on equity are used to construct profitability; current ratio, cash ratio and quick ratio are used to construct liquidity; debt/equity and debt/assets are used to construct leverage; assets turnover and sales to assets are used to construct efficiency. *Firm age* is another consideration: as investors trust TMTs in older firms, this can have a positive effect on firm value and financial health (Li and Tsai 2009). Thus, as a control variable (Kor and Misangyi 2008; Hermann and Nadkarni 2014), firm age is also considered, although we do not report these results. Table 1 provides the definitions.

* 1. **The method**

Following Hair et al. (2017), we used the variance-based PLS-SEM specification due to the relatively complex nature of our multiple latent variables with multiple indicators (see e.g. Naranjo‐Gil et al. 2008; Weber et al. 2017). This approach is more appropriate for obtaining optimal prediction for measuring unobservable latent constructs such as education, experience and cognition in our sample. PLS-SEM specifies how latent variables are measured and explores the overall relationships between indicators and latent construct as well as the links between exogenous and endogenous variables (Hair et al. 2017).

TMT-SC represents a complex integrated heuristic process of managerial strategic decision-making that draws from varied TMT cognitive micro-foundation elements that shape TMTs’ problem framing and interpretations of reality from different strategic lenses. These complex interactions among micro-elements of the managerial cognition include the interactions of different TMTs’ strategic viewpoints and logics (Nadkarni and Barr 2008; Miller et al. 2015). TMT-SC is shaped by intellectual capabilities such as education and experience (Kor and Mesko 2013), risk preferences, and innovativeness (Berger et al. 2014). Cognitive boundedness prohibits perfect rationality from a single isolated micro-foundation cognitive element such as innovation or human capital. Also, Shiloh et al. (2002) argue that the thinking process involves varied heuristic responses and framing effects determined by individual knowledge, experience and rational thinking style. Hughes et al. (2018) imply that, similar to entrepreneurial strategic orientations, TMT-SC involves the exploration, exploitation and exploration of varied thinking processes from overlapping viewpoints.

Clarke and Mackaness (2001) argue that the TMT cognitive map overlaps because during the cognition process, managers find common ground on either agreement or disagreement. In instances of disagreement, executives call for the need to negotiate for consensus and group decisions. During TMT-SC processes, TMTs’ views and critical perspectives on corporate strategies overlap as a result of their divergent and conflicting knowledge base, differences in personal and firm-specific experiences and in risk preferences. Therefore, negotiation strategies are the governance mechanisms used by the board to iron out overlapping TMT conflicting views (Harvey et al. 2017). The overlaps in the micro-elements of the managerial cognition infrastructure, therefore, capture conflicts in viewpoints, (dis)agreements, and how strategic negotiations are transacted to reach consensus. The nature of overlaps depends on the cognitive characteristics of the TMTs involved in the strategic decision process.

TMT strategic decision-making is a collective thinking process that involves complex interactions of varied managerial viewpoints influenced by the cognition micro-elements of TMT human capital based on education and experience background, which aggregates to form our TMT-SC construct. We used reflective measurement indicators to capture our constructs. Our reflective indicators capture the micro-elements of managerial cognition in our lower component model (LCM). Reflective indicators are viewed as the closest representation that defines or reflects the latent construct. For example, in capturing our TMT experience, we used TMT supervisory experience, TMT industry-specific experience, and TMT firm-specific experience. These experience-based measurement indicators are similar and may have overlaps as input variables. However, our estimation method eliminates the severity of any potential overlap before yielding constructs as outputs by using the hierarchical component model (HCM). This is maintained, since our reflective measures consider that all indicator items can be related to the similar constructs, and we may have a multicollinearity issue (Hair et al. 2011). Our TMT-SC is a multi-dimensional construct that cannot be captured with one simple latent construct. TMT-SC is a cognition process that involves the overlap of multi-dimensional ideological stands and viewpoints. These varied viewpoints are influenced by a multiplicity of complex micro-cognitive elements whose construction requires the use of HCM. HCM has a two-stage order: the first order is the latent construct that captures the TMT-SC micro-elements, and the second order aggregates the first order to capture the TMT-SC. These TMT-SC processes, therefore, overlap because they are the composition of both the LCM which captures the micro-TMT cognition elements and the HCM that provides explicit representations of multi-dimensional constructs. Although in the LCM the first order component model uses formative and reflective measurement indicators that tend to suffer from multicollinearity, HCM provides the second order to remedy the multicollinearity and overlap problem (Ringle et al. 2012).

* 1. **The models and variables**

We analyse the following PLS setting in Figure 4 as a throughput model framework, also showing the hypotheses. In this figure, *Tobin’s Q* is our endogenous variable to represent firm value creation; *Z-score* measures the financial health of a firm. *TMT education* is a latent construct based on *Professional education* and *Academic education*; *TMT experience* is a latent construct based on *Firm-specific experience*, *Industry-specific experience* and *Supervisory experience*; *TMT innovativeness* and *TMT risk preference* are latent constructs based on one indicator only (i.e. *R&D to sales* and *Delta*, respectively); *Profitability* is a latent construct based on *Return on assets* and *Return on equity*; *Efficiency* is a latent construct based on *Assets turnover* and *Sales to assets*; *Leverage* is a latent construct based on *Debt to equity* and *Debt to assets*; *Liquidity* is a latent construct based on *Current ratio*, *Cash ratio* and *Quick ratio*. Table 1 provides the definitions. We use the latent construct *TMT strategic cognition* as a proxy for overall TMT-SC which is the linear combination of the constructs *TMT education* and *TMT experience*.[[3]](#footnote-3) An increase in this construct represents a higher cognitive ability, i.e. the level of ability rather than the presence of ability.

**[INSERT FIGURE 4 ABOUT HERE]**

1. **Analyses and findings**
	1. ***Measurement validation***

We use Smart PLS 3 software (see Chatelain-Ponroy et al. 2017; Tippmann et al. 2017), employing 3,000 maximum iterations in the path analysis PLS algorithm to estimate each model. Model estimations provide path loadings to measure the relationship between the indicators (measurement models) and constructs (structural model). We used reflective measurement model because the nature of our latent constructs reflects our measurement model (Hairet al*.* 2016, 2017).

We checked for the reliability of our measurement models by examining the indicators’ outer loadings to meet the threshold: all measurements have loadings above 0.70 and they are significant at the 0.001 level (one-tailed). In examining the internal consistency of our model, we examined the composite reliability, Cronbach’s alpha and the average variance extracted reports. The composite reliability report examines the reliability and validity (internal consistency) of the latent constructs used in the structural model. The composite reliability uses either the Cronbach’s alpha or composite validity to measure constructs validations. Composite reliability values below 0.6 indicate lack of consistency: all our latent constructs show composite reliability above 0.7.

Further, we conducted bootstrapping based on 5000 random samples using bias-corrected and accelerated bootstrap advanced settings with two-tailed tests. This specification is the most stable method for checking the robustness of structural models (Hairet al*.* 2016). From our bootstrapping results, we further examined the significance of the path coefficient, outer loading and composite reliability, focusing on the difference of outer loadings of the indicators, average variance extracted, and Heterotrait-Monotrait ratio (HTMT)[[4]](#footnote-4) for each model, as well as the internal consistency and reliability of our model based on the inter-correlations of the indicators variables.

Average variance extracted (AVE) assesses the degree of variance between the latent constructs. We used AVE to test the discriminant validity of our model (Chin et al*.* 2003; Rodgers et al. 2013). AVE> 0.50 shows that the constructs explain more than half of the variance of the indicators; AVE <0.50 indicates that a significantly greater proportion of the variance is included in the error terms than in the variance explained by the construct (Hairet al*.* 2016). Our AVE are all greater than 0.60, confirming the uniqueness of our constructs in explaining the variance of the results, and that our latent construct has the strongest correlation with its own indicators.

Convergent validity examines whether measurement indicators correlate positively with similar indicators measuring the same construct. As indicators of reflective constructs are interchangeable, we used the outer loading and AVE to examine the convergent validity of our models. We measure the uniqueness of each latent construct by conducting discriminant validity test which examines the extent to which a construct is truly distinct from the other latent constructs. Recent research has criticised using cross-loadings and Fornell-Larcker criterion for testing discriminant validity because of their inability to indicate discriminant validity, especially when two constructs are perfectly correlated (Henseler et al. 2015). Rönkkö and Evermann (2013) further argue that Fornell-Larcker’s AVEs are inaccurate because they determine one overall AVE instead of two separate values. As a remedy, Hair et al. (2016) recommend HTMT which measures the ratios between trait correlation to the within-trait correlation and estimates the true correlation between two latent constructs. Our models show significant discriminant validity because the values are positive and lower than 0.90 (see Tables A1 and A2). All indicators are defined in Table 2 where we also provide the descriptive statistics and correlation matrix.

Our empirical approach addresses the reverse causality and endogeneity problems by addressing the issues related to measurement model that includes testing for convergent and discriminant validity, internal consistency reliability, and HTMT and AVE figures.

**[INSERT TABLES 1-2 ABOUT HERE]**

* 1. ***Results***

Table 3 reports the TPDMM PLS-SEM results. Model (1) considers the broad measures of experience (*TMT experience*) and education (*TMT education*). This model indicates that *TMT strategic cognition* does not exert any strong influence on these outcomes, noting that the *p*-values are 0.103 (*β* = 0.08) and 0.101 (*β* = 0.07) for *Z-score* and *Tobin’s Q*, respectively. Therefore, these marginal *p*-values may lend some partial support to Hypotheses 1a and 1b. The coefficient of determination (R2) is 0.41 and 0.64 for financial health and firm value, respectively. Regarding the other findings, financial health improves market value and also companies with higher liquidity, higher profitability and lower leverage have better financial health. Our discussion below focuses only on whether the empirical testing supports our hypotheses.

We add *TMT innovativeness* to Model (1) and report the results in Model (2): *TMT strategic cognition* in this case has a statistically very significant and positive impact on financial health (*β* = 0.16, *p* < 0.001) and value (*β* = 0.18, *p* < 0.001), which corroborates strongly Hypotheses 1a and 1b, and is in line with Escribá‐Esteve et al. (2009). Since this addition in Model (2) doubles the estimated value of these coefficients in comparison with Model (1) results, we also support Hypotheses 3b and 3d that TMT innovativeness enhances the positive effect of TMT-SC on value and health.

**[INSERT TABLE 3 ABOUT HERE]**

Model (3) considers TMT risk appetite additional to the education and innovativeness of TMT members, excluding TMT general experience: again, *TMT strategic cognition* has a significant and positive effect on financial health (*β* = 0.29, *p* < 0.001) and value (*β* = 0.19, *p* = 0.002). These effects are stronger in magnitude when compared to the results in Models (1) and (2). Thus, the findings clearly support Hypotheses 3a and 3c. The reasoning behind these stronger effects could be attributed to the more effective role of TMT-SC when it is considered together with TMT innovativeness and risk appetite, which confirms previous studies suggesting that greater education leads to greater innovation because higher level of education improves the cognitive processing and problem-solving ability of individuals (Hoskisson et al. 2017; Kimberly and Evanisko 1981). Managers who place high bets in risky investment by spending more on R&D tend to improve corporate value, and TMTs are prepared to consider more investment opportunities when the share price of their firm increases (Sanders and Hambrick 2007).The throughput version of this model is reportedin Figure A1.

Model (4) focuses on the effects of TMT industry-specific experience on value and financial health (i.e. *TMT experience* is represented by *Industry-specific experience*). As the positive effects of *TMT strategic cognition* on both financial health (*β* = 0.29, *p* < 0.001) and value (*β* = 0.16, *p* = 0.002) continue to hold in this model, Hypotheses 1a and 1b are again supported. Moreover, when the size of the coefficient estimates is examined in Models (1) and (4), the magnitudes more than double for the latter. These findings confirm Hypotheses 2a and 2c since they highlight the ‘relevance’ of the type of experience, which is consistent with the other studies arguing that industry-specific experience is valuable human capital to firms because it can bring goodwill and ties with key industry players and access to superior information (Kor and Misangyi 2008).[[5]](#footnote-5) The positive findings related to corporate innovation activities in Model (4) support the view that the dominant R&D logic in most firms is promoted through effective collaboration between TMTs with good education background and industry-specific or firm-specific experience (Kor 2006).

Model (5) investigates the effects of TMT firm-specific experience on value and financial health (i.e. *TMT experience* is represented by the ‘relevant’ *Firm-specific experience*). Hypotheses 1a and 1b are supported once more due to the direct effects of *TMT strategic cognition* on financial health (*β* = 0.13, *p* = 0.005) and value (*β* = 0.30, *p* < 0.001). Further, when the size of the coefficients is scrutinised in Models (1) and (5), the magnitudes are noticeably higher for the latter, and for the case of ‘firm value’ the size of the coefficient actually more than quadruples. Therefore, we reconfirm Hypotheses 2a and 2c since again they emphasise the ‘relevance’ of the type of experience. These findings are consistent with Kor and Misangyi (2008) that firm-specific experience improves TMT innovativeness and firm value, and with Denicolai et al*.* (2014) that firms develop dynamic managerial capabilities that allow managers to make better strategic resource allocations to achieve competitive advantage.

To assess the relevance of education type, Model 6 uses *Professional education* to represent TMT education:[[6]](#footnote-6) *TMT strategic cognition* in this case has a statistically significant and positive impact on value (*β* = 0.17, *p* = 0.002), which is more favourable in terms of the significance level and the coefficients’ size when compared to the results in Model (1). We therefore support Hypothesis 2b, as this finding stresses the relevance of professional qualifications in creating value. However, the findings pertaining to financial health (*β* = 0.06, *p* = 0.098) are qualitatively the same when compared with the corresponding results in Model (1), hence, Hypothesis 2d is not confirmed.

Models (7) to (9) examine whether networking and social connections can be considered as TMT human capital improving cognitive abilities, which can help enhance financial health and value. In these models, the proxy for *TMT experience* is *Firm-specific experience*. Model (7) considers whether TMTs have any degrees from reputable universities (i.e. the indicator *Elite academic* that is based on top 100 universities) and use this to represent *TMT human capital*. In Model (8), *TMT human capital* is related to the presence of degrees from only Oxford and Cambridge universities to construct our indicator *Oxbridge*. In Model (9), *TMT human capital* is based on a dummy variable that shows whether TMTs have degrees from top 100 universities and their professional qualifications are deemed as elite (i.e. the construct *Two elites*).

The effects of *TMT human capital* on firm outcomes appear very strong in Models (7) to (9): in all six cases we consistently report significant and positive association of *TMT human capital* with *Tobin’s Q* and *Z-score* as all the *p*-values are 0.009 or lower. These results strongly support Hypotheses 4a and 4b when they are compared with the findings in Model (1). Also, when we examine the impact of *TMT experience* on value and financial health, the respective coefficients are invariably positive and statistically significant at least at the 1.6% level. These findings suggest that the effects of *TMT experience* on value and financial health, given the results in Models (1) to (6), turn out to be positive and stronger when *TMT human capital* is incorporated into the analyses. Similarly, the positive effects of *TMT strategic cognition* on both *Tobin’s Q* and *Z-score* in Models (1) to (6) appear to be more salient in Models (7) to (9) as the *p*-values for the latter are lower than 0.001 in all six cases. These results imply that the components of human capital such as networking, strategic social relationships and connections seem to improve TMT-SC which would then have positive implications on firms’ market value and financial robustness. In addition, when firm-specific experience and social networking capacity of TMT members are considered in the same model, Models (7) to (9) reveal that the effects of *TMT risk preference* and *TMT innovativeness* on value and financial health are clearly positive and significant in all twelve cases (the *p*-values are mostly lower than 0.001 and the highest *p*-value is 0.080). Overall, our results in models (7) to (9) are in line with previous research contending that human capital and networking are embedded with superior industry information that can provide firms with valuable results, including promoting innovativeness (Gronum et al. 2012; Watson 2007), and that managers seek economic resource from their ‘peers’ in the network as a means to fund new projects or start a new business (Chuaand Pan 2008). The results also support previous studies arguing that the ties with professional networks offer managers unique economic benefits that can increase performance (see e.g., Chua and Pan 2008).

1. **Discussion**

This study departs from the extant literature on managerial cognition (see e.g. Nadkarni and Narayanan 2007; Talke et al. 2010) by providing both theoretical and empirical contributions to the theory of TMT-SC. Instead of employing a conceptual approach of managers’ cognitive abilities or the traditional linear regression models to examine the effect of TMT-SC on performance (Cannella et al. 2008; Lee and Brinton 1996; Nadkarni and Narayanan 2007; Narayanan et al. 2011; Talke etal. 2010), we drew on, and extended the approach by Hughes et al. (2018), to address complex interdependencies amongst TMT education, industry and firm experience, risk & innovativeness and human capital. Our innovative interactive model of TMT-SC (Figures 1 and 3) extends the theory of TMT-SC by proposing and demonstrating that TMT-SC influences firm outcomes via random configurations and multiple combinations of overlaps of TMT-SC elements in a dynamic framework (Kaplan 2011; Hughes et al. 2018).

From an empirical perspective, we adopted the TPDMM PLS-SEM to provide a robust analysis demonstrating the complex association between TMT-SC, decision-making and firm outcomes. In so doing, we therefore contribute to the UET (Hambrick and Mason 1984) by highlighting the embeddedness of corporations and their managers in complex, heterogeneous and dynamic social structures, which have profound implications on TMT cognition abilities, decision-making and firm performance. Our interactive model shows that heterogeneity in TMT academic and professional qualifications and work experience alone cannot provide optimal benefits to organisations. Therefore, we extend the UET by providing a more comprehensive and dynamic notion of TMT heterogeneity (Hambrick et al. 1996) to reflect the multi-dimensional factors of TMT-SC and the interactions amongst these factors. In so doing, we also contribute to the strategic management literature by providing additional insights into why some firms perform better than their rivals. Our study focuses on the human capital, the strategists and their cognition, and argues that heterogeneity in the resource configurations of rival firms, which is critical to competitiveness (Molloy and Barney 2015; Wernerfelt 1984, 1995), emerges from different interactions between TMT-SC processes and their cognitive dimensions (Figure 1).

Our study was motivated by Carpenter et al. (2004), Salas et al. (2010), Kaplan (2011), Costanzo and Di Domenico (2015) and Shepherd et al. (2017), who highlighted the growing importance of TMT-SC and called for a thorough analysis regarding the link between TMT-SC and firm performance. Bromiley and Rau (2016) also called for more research on TMT and CEO, and suggested simultaneous considerations of social and behavioural effects at multiple levels. In filling this gap, our results suggest that strategic cognition that gives priority to TMT education background alone does not provide significant contributions to corporate value or financial health. However, when education is combined with industry or firm-specific experience, the strategic cognition of executives can affect positively corporate financial health and value. The positive contribution of strategic cognition is even more salient when TMT members increase their risk preferences by investing in more innovative ideas that can be observed from R&D activities (i.e. high risk appetite and high innovativeness). We noticed in our sample that most TMT members are partners to their professional bodies. Furthermore, partners mostly maintain close contact with the top echelons of professional bodies which give them access to extra cognitive skills that can be utilised during the TMT-SC process in the boardroom. Our results suggest that networks are embedded with cognition-based trust because members in the aforementioned elite networks benefit from superior knowledge resources and expertise advice about the industry in which the firm operates, together with firm-specific problem-solving recommendations (e.g. Gulati et al. 2000). Such trusted networks can strengthen the positive association between TMT-SC and firm outcomes. They also strengthen the positive effects of firm-specific experience that already provides better contributions than general experience. Hence, the results show that the structure of elite networks can offer managers superior information that can support TMT-SC to produce positive significant outcomes. This set of results complements findings by Geletkanycz and Hambrick (1997), who state that strategic choices are influenced by the degree of TMT external ties, and that external interactions would improve corporate performance by supporting and updating informational requirements of a firm’s strategy. Similarly, the risk preference and innovativeness of TMTs show stronger effects on financial health and value when professional and academic qualifications from reputable institutions are considered together.

1. **Conclusion**

This study provides the first empirical evidence that simultaneously links TMT-SC to corporate performance and value by exploring in detail the cognitive elements of TMT members and how their interactions impact corporate outcomes. We suggest that TMTs with relevant industry experience and education should be rewarded adequately in order to retain them in the company, as not acknowledging their credentials would reduce firm performance and innovation decisions (Amore and Failla 2020; Dahya et al. 2002) that are critical to firms’ competitiveness. This also implies that companies should hire managers with high quality strategic orientation (Escribá‐Esteve et al. 2009).

Second, our results address the question of how organisations respond to their environment by adopting a managerial cognitive perspective. Our findings imply that the environment is not completely exogenous, but the manner by which organisations respond to their environment is influenced by TMT interpretations of that environment. Hence, we provide empirical evidence that deepens policy makers’ understanding of managerial decision-making and organisational behaviour in general (Kor and Mesko 2013; Kunc and Morecroft 2010; Salas et al. 2010). Third, we provide a framework (Figures 1 and 3) which captures different TMT cognitive pathways (i.e. TMT cognitive frames shaping TMT sense-making and strategic choices) that policy makers can use to improve decision-making outcomes. Also, our results imply that structural features do not determine outcomes; rather, organisations ‘act’ through the cognitive lenses of their TMT (Kaplan 2011).

Fourth, practitioners may use our results to decide on executive remuneration and retention schemes for TMTs who tend to be most skilled and experienced (Tröster et al. 2018). Kruger and Dunning (1999) show that unskilled individuals suffer from cognitive biases and illusory superiority- known as Dunning-Kruger effect- and argue that such people overestimate their abilities, cannot see their inadequacies and underestimate the skills of others. They further argue that with the necessary training, such cognitive biases can at least be mitigated. Considering also the limited rationality perspective of the UET, our findings are crucial to the recruitment and selection of employees, as well as the training and development arranged by human resources departments. Also, Kaplan and Sorensen (2021) show that CEO-candidates with tangible general ability, interpersonal skills and unique characteristics are more likely to be hired by the board of directors. They also note that managers’ personalities can be improved.

As for the limitations and future research, first, as we rely on secondary data (i.e. TMT characteristics) to proxy for TMT-SC, a more direct measure of TMT-SC would be inappropriate in our study. Previous studies have used TMT attributes such as education and experience to measure TMT cognitive abilities. Although these attributes can reasonably be viewed as proxies for managers’ knowledge base and cognitive abilities, they cannot entirely capture the context-specific interpretations of events. Second, concluding on the direction of causality between TMT-SC and value, and TMT-SC and performance is challenging partly due to our indirect measure of TMT-SC as a latent construct. Related to this point, Schuler and Cording (2006) posit that, to fully explain the link between decision-making process and performance, all possible linkage effects should be explored. Hence, future research could investigate whether current levels of strategic cognition, innovativeness and risk preferences of TMT members are influenced by the preceding year’s financial health and firm value. Moreover, we do not explore the empirical relationship between TMT-SC and social issues. Therefore, further studies could examine the association between TMT-SC and corporate social and environmental performance.

Finally, future research could examine more methodically i) which mechanism having social networking skills would help TMTs enhance performance, ii) why academic education and general experience in isolation do not necessarily produce good corporate outcomes, iii) the association of corporate outcomes with different managerial cognition styles such as analytical or intuitive styles, and iv) the interaction between TMT-SC and corporate social responsibility (Gond et al. 2017).

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**Appendix**



**Figure A1.** PLS results for a selected model

*Note*: These results are only for the modified version of Model (3) in Table 3 about PLS results. The results for the other models are available on request. The letter ‘r’ represents the correlations between the constructs and β represents the PLS path coefficients.

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| **Table A1.** Assessment of the indicators: validity and construct reliability tests |
| **Latent Construct** | **Indicators** | **Convergent Validity** | **Internal Consistency Reliability** |
|  |  | Loadings>0.70 | t-value for loadings | Indicator reliability>0.50 | AVE>0.50 | Composite reliability[0.60 - 0.90] | Cronbach Alpha[0.60 - 0.90] |
| **TMT education** | Academic education | 0.75 | 6.13 | Yes | 0.64 | 0.82 | 0.76 |
|  | Professional education | 0.84 | 13.05 | Yes |  |  |  |
| **TMT experience** | Supervisory experience | 0.80 | 12.67 | Yes | 0.67 | 0.83 | 0.79 |
|  | Industry-specific experience | 0.88 | 15.23 | Yes |  |  |  |
|  | Firm-specific experience | 0.90 | 16.32 | Yes |  |  |  |
| **TMT risk preference** | Delta | 0.89 | 15.99 | Yes | 0.71 | 0.87 | 0.83 |
| **TMT innovativeness** | R&D to sales | 0.88 | 15.35 | Yes | 0.69 | 0.80 | 0.77 |
| **TMT strategic cognition** | TMT education &TMT experience | 0.90 | 16.32 | Yes | 0.70 | 0.84 | 0.78 |
| **Profitability** | Return on equity | 0.89 | 16.20 | Yes | 0.70 | 0.87 | 0.82 |
|  | Return on assets | 0.90 | 16.32 | Yes |  |  |  |
| **Liquidity** | Current ratio | 0.88 | 15.63 | Yes | 0.67 | 0.83 | 0.79 |
|  | Cash ratio | 0.85 | 14.21 | Yes |  |  |  |
|  | Quick ratio | 0.87 | 15.12 | Yes |  |  |  |
| **Leverage** | Debt to equity  | 0.90 | 17.23 | Yes | 0.71 | 0.88 | 0.84 |
|  | Debt to assets  | 0.85 | 14.65 | Yes |  |  |  |
| **Efficiency** | Assets turnover  | 0.90 | 17.10 | Yes | 0.73 | 0.89 | 0.86 |
|  | Sales to assets | 0.91 | 19.15 | Yes |  |  |  |
| Note: *TMT strategic cognition* is the linear combination of five indicators based on the constituents of *TMT experience* and *TMT education*. AVE stands for average variance extracted. These results are only for Model 3 in Table 3 about PLS results. The results for the other models are available on request. |

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| **Table A2.**  Heterotrait-monotrait (HTMT) results: discriminant validity tests |
|  | **(1)** |  **( 2)** |  **(3)** |  **(4)** |  **(5)** |  **(6)** |  **(7)** |  **(8)** | **(9)** |
| TMT education>Tobin's Q  | 0.28 | 0.20 | 0.15 | 0.17 | 0.19 | 0.28 | - | - | - |
|  | [0.015] | [0.094] | [0.014] | [0.000] | [0.007] | [0.049] |  |  |  |
| TMT education> Z-score  | 0.25 | 0.20 | 0.14 | 0.13 | 0.15 | 0.25 | - | - | - |
|  | [0.024] | [0.102] | [0.006] | [0.002] | [0.006] | [0.035] |  |  |  |
| TMT experience>Tobin's Q  | 0.58 | 0.52 | - | 0.49 | 0.18 | - | 0.09 | 0.16 | 0.21 |
|  | [0.031] | [0.000] |  | [0.000] | [0.001] |  | [0.025] | [0.006] | [0.000] |
| TMT experience> Z-score  | 0.20 | 0.53 | - | 0.11 | 0.10 | - | 0.08 | 0.24 | 0.25 |
|  | [0.001] | [0.000] |  | [0.000] | [0.000] |  | [0.004] | [0.001] | [0.000] |
| TMT strategic cognition>Z-score  | 0.08 | 0.12 | 0.23 | 0.12 | 0.12 | 0.12 | 0.10 | 0.09 | 0.09 |
|  | [0.086] | [0.061] | [0.058] | [0.000] | [0.000] | [0.088] | [0.003] | [0.028] | [0.008] |
| TMT strategic cognition>Tobin's Q  | 0.20 | 0.19 | 0.17 | 0.37 | 0.37 | 0.66 | 0.14 | 0.15 | 0.17 |
|  | [0.016] | [0.004] | [0.000] | [0.000] | [0.000] | [0.000] | [0.018] | [0.002] | [0.001] |
| TMT innovativeness >Tobin's Q  | - | 0.17 | 0.17 | 0.08 | 0.11 | 0.66 | 0.17 | 0.31 | 0.24 |
|  |  | [0.005] | [0.009] | [0.004] | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] |
| TMT innovativeness >Z-score  | - | 0.34 | 0.23 | 0.13 | 0.18 | 0.60 | 0.14 | 0.22 | 0.13 |
|  |  | [0.001] | [0.000] | [0.118] | [0.004] | [0.000] | [0.009] | [0.000] | [0.004] |
| TMT risk preference> Tobin's Q  | - | - | 0.14 | - | - | 0.21 | 0.26 | 0.25 | 0.29 |
|  |  |  | [0.000] |  |  | [0.001] | [0.001] | [0.002] | [0.000] |
| TMT risk preference> Z-score | - | - | 0.07 | - | - | 0.11 | 0.30 | 0.27 | 0.32 |
|  |  |  | [0.019] |  |  | [0.062] | [0.000] | [0.000] | [0.000] |
| TMT human capital >Tobin's Q  | - | - | - | - | - | - | 0.22 | 0.20 | 0.21 |
|  |  |  |  |  |  |  | [0.003] | [0.010] | [0.007] |
| TMT human capital >Z-score  | - | - | - | - | - | - | 0.20 | 0.18 | 0.20 |
|  |  |  |  |  |  |  | [0.009] | [0.010] | [0.000] |
| Efficiency > Z-score  | 0.57 | 0.12 | 0.02 | 0.15 | 0.15 | 0.22 | 0.26 | 0.21 | 0.23 |
|  | [0.046] | [0.024] | [0.039] | [0.000] | [0.000] | [0.049] | [0.000] | [0.003] | [0.000] |
| Leverage>Z-score  | 0.30 | 0.29 | 0.18 | 0.15 | 0.13 | 0.30 | 0.15 | 0.29 | 0.26 |
|  | [0.000] | [0.000] | [0.000] | [0.006] | [0.000] | [0.000] | [0.000] | [0.000] | [0.001] |
| Liquidity> Z-score  | 0.50 | 0.49 | 0.27 | 0.24 | 0.24 | 0.46 | 0.07 | 0.31 | 0.39 |
|  | [0.024] | [0.009] | [0.005] | [0.006] | [0.006] | [0.000] | [0.037] | [0.000] | [0.000] |
| Profitability> Z-score  | 0.27 | 0.29 | 0.28 | 0.34 | 0.34 | 0.27 | 0.27 | 0.30 | 0.27 |
|  | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] | [0.009] | [0.000] | [0.002] |
| Z-score>Tobin's Q  | 0.79 | 0.80 | 0.65 | 0.59 | 0.60 | 0.79 | 0.65 | 0.65 | 0.67 |
|  | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] |
| *Note*: This tables reports the HTMT criteria that measure the correlations among constructs or indicators. The figures in the brackets are the *p*-values showing the statistical significance of the correlations. See Table 1 for the definition of the variables. |

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| **Table 1.** Definitions of the variables |
| **Indicators and constructs** | **Definition** |
| TMT risk preference  | *Delta*: the ratio of the change in price of an option to the percentage change in the price of the underlying asset, i.e., the first derivative with respect to the change in the stock price. (Source: Bloomberg) |
| TMT innovativeness | R&D intensity, *R&D to sales*, which is the ratio of R&D expenditure to total sales. (Source: Bloomberg) |
| Professional education | Categorical variable: 2, if TMTs have received professional training for 3 years or more; 1, if TMTs have received professional training between 1 and 2 years; 0, otherwise. The professional qualifications that we considered in our sample include this non-exhaustive list: Fellowship of the Royal Colleges of Surgeons (FRCS), Association of Chartered Accountants (see Meieret al*.* 2016), Chartered Institute of Management Accountants (CIMA), Chartered Financial Analyst (CFA), Chartered Institute of Marketing (CIM), Chartered Institute of Bankers (CIB), Chartered Engineers (CEng), Chartered surveyors (RICS), Chartered Institute of Actuaries (CIA), and lawyers, solicitors and barristers with legal practice course (LPC) qualification (Source: authors’ own construction) |
| Elite professional | Dummy variable: 1, if TMTs have professional qualifications from the institutions ACCA, CIMA, CFA, FRCS, CEng or with LPC qualification; 0, otherwise. (Source: authors’ own construction)  |
| Academic education | Categorical variable: 1 if TMTs have graduate degrees; 2 if postgraduate degrees; 3 if PhD degrees; 0, otherwise. |
| TMT education  | Proxy for TMT education as a latent construct, which is the linear combination of the indicators *Professional education* and *Academic education*. (Source: authors’ own construction) |
| Elite academic | Dummy variable: 1, if TMT graduated from the top 100 higher education institutions according to the ranking provided by The Times Higher Education in 2016; 0, otherwise]. (Source: authors’ own construction) |
| Oxbridge | Dummy variable: 1, if TMTs have degrees from the University of Oxford or University of Cambridge; 0, otherwise. (Source: authors’ own construction) |
| Two elites  | Dummy variable: 1, if both *Elite professional* and *Elite academic* dummy variables take the value of 1; 0, otherwise. (Source: authors’ own construction) |
| TMT human capital | It is based on either of *Elite academic*, *Oxbridge* or *Two elites*. (Source: authors’ own construction) |
| Firm-specific experience  | Dummy variable: 1, if TMTs have the specific expertise related to the core operations of the firm or if they have worked in the same firm for at least one year; 0, otherwise. (Source: authors’ own construction). |
| Industry-specific experience | Dummy variable: 1, if TMTs have expertise in the industry that their firm is operating in; 0, otherwise. (Source: authors’ own construction) |
| Supervisory experience  | Dummy variable: 1, if TMTs have previous experience as chief executive officer (CEO), chief finance officer (CFO), chief operating officer (COO), vice president, managing director or chairman; 0, otherwise. (Source: authors’ own construction) |
| TMT experience | Proxy for TMT experience as a latent construct, which is the linear combination of the indicators *Firm-specific experience*, *Industry-specific experience* and *Supervisory experience*. (Source: authors’ own construction) |
| TMT strategic cognition | Proxy for overall TMT strategic cognition as a latent construct, which is the linear combination of the constructs *TMT* *Education* and *TMT* *Experience*. (Source: authors’ own construction) |
| Firm age | The number of years since the inception of the firm as of the corresponding year in the panel. (Source: Bloomberg) |
| Return on assets | ROA. Net income over total assets. (Source: Bloomberg) |
| Return on equity  | ROE. Net income over equity capital. (Source: Bloomberg) |
| Profitability | Proxy for corporate profitability as a latent construct, which is the linear combination of ROA and ROE. |
| Current ratio | The ratio of current assets to current liabilities. (Source: Bloomberg) |
| Cash ratio | The ratio of cash and near cash items plus marketable securities & other short term investments to current liabilities. (Source: Bloomberg) |
| Quick ratio | The ratio of current assets less inventories to current liabilities. (Source: Bloomberg) |
| Liquidity | Proxy for corporate liquidity as a latent construct, which is the linear combination of *Current ratio*, *Cash ratio* and *Quick ratio*. |
| Debt to equity | The ratio of total debt to total book value of equity. (Source: Bloomberg) |
| Debt to assets | The ratio of total debt to total assets. (Source: Bloomberg) |
| Leverage | Proxy for corporate indebtedness as a latent construct, which is the linear combination of *Debt to equity* and *Debt to assets*. |
| Assets turnover | Total sales revenues divided by total assets. (Source: Bloomberg) |
| Sales to assets | Total sales revenues divided by net assets. (Source: Bloomberg) |
| Efficiency | Proxy for efficiency of corporate operations as a latent construct, which is the linear combination of *Assets turnover* and *Sales to assets*. |
| Tobin’s Q | The ratio of the market value of firm to the replacement value of the firm’s assets. (Source: Bloomberg) |
| Z-score  | Proxy for financial health. Altman’s Z-score is calculated as follows: [Z= 3.3\*(EBIT/Tangible assets) +0.6\*(Market value of equity/total liabilities) +1\*(Sales/tangible assets) +1.2\*(Working capital/tangible assets) +1.4\*(retained earnings/tangible assets)]. (Source: Bloomberg) |

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| **Table 2.** Descriptive statistics and correlation matrix |  |
| Indicator | **Mean** | **S.D.** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** | **(8)** | **(9)** | **(10)** | **(11)** | **(12)** | **(13)** | **(14)** |
| **(1)** | 0.13 | 0.49 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(2)** | 0.06 | 0.79 | 0.33\*\* |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(3)** | 0.80 | 0.55 | -0.05 | -0.06 |  |  |  |  |  |  |  |  |  |  |  |  |
| **(4)** | 1.68 | 0.48 | 0.10 | 0.07 | -0.07 |  |  |  |  |  |  |  |  |  |  |  |
| **(5)** | 0.64 | 0.75 | 0.03 | -0.01 | 0.18 | 0.04 |  |  |  |  |  |  |  |  |  |  |
| **(6)** | 0.26 | 0.39 | 0.14 | 0.19 | -0.44\*\* | 0.63\*\* | 0.36\*\* |  |  |  |  |  |  |  |  |  |
| **(7)** | 0.46 | 0.19 | 0.24\* | 0.04 | -0.09 | 0.75\*\* | 0.37\*\* | 0.39\*\* |  |  |  |  |  |  |  |  |
| **(8)** | 0.31 | 0.25 | 0.26\* | 0.14 | -0.09 | 0.53\*\* | 0.35\*\* | 0.11 | 0.59\*\* |  |  |  |  |  |  |  |
| **(9)** | 0.51 | 0.56 | 0.18 | -0.08 | 0.44\*\* | 0.03 | -0.18 | -0.09 | 0.12 | 0.12 |  |  |  |  |  |  |
| **(10)** | 1.67 | 0.57 | 0.04 | 0.22\* | 0.25\* | 0.18\* | 0.63\*\* | 0.18 | 0.63\*\* | 0.43\*\* | -0.16 |  |  |  |  |  |
| **(11)** | 0.27 | 0.44 | 0.13 | 0.05 | 0.57\*\* | 0.40\*\* | 0.19 | -0.38\*\* | 0.26\* | 0.24\* | 0.22\* | 0.46\*\* |  |  |  |  |
| **(12)** | 1.00 | 0.74 | 0.18 | 0.30\*\* | 0.10 | 0.06 | 0.05 | 0.14 | -0.05 | -0.07 | -0.13 | 0.67\*\* | 0.35\*\* |  |  |  |
| **(13)** | 1.53 | 0.30 | 0.13 | 0.41\*\* | -0.04 | 0.02 | 0.01 | 0.25\* | 0.21\* | 0.24\* | 0.32\*\* | 0.14 | 0.06 | 0.36\*\* |  |  |
| **(14)** | 26.88 | 16.13 | -0.20 | -0.16 | 0.10 | -0.08 | 0.42\*\* | -0.04 | -0.12 | -0.13 | -0.17 | 0.42\*\* | -0.32\*\* | -0.14 | 0.05 |  |
| **(15)** | 0.06 | 0.12 | 0.30\* | 0.31\*\* | -0.07 | -0.16 | 0.06 | 0.35\*\* | 0.35\*\* | 0.21\* | 0.24\* | 0.02 | -0.13 | 0.26\* | 0.18\*\* | 0.26\* |
| **(16)** | 0.18 | 0.72 | 0.13 | 0.43\*\* | 0.03 | -0.05 | 0.01 | 0.31\*\* | 0.33\*\* | 0.31\* | 0.36\*\* | 0.12 | 0.08 | 0.35\*\* | 0.27\* | 0.22\* |
| **(17)** | 1.88 | 3.41 | 0.07 | 0.28\* | -0.09 | 0.06 | -0.07 | -0.07 | -0.04 | -0.05 | -0.02 | -0.07 | -0.04 | 0.03 | -0.08 | -0.17 |
| **(18)** | 0.78 | 3.26 | 0.08 | 0.30\* | -0.05 | 0.07 | -0.14 | -0.04 | -0.04 | -0.04 | 0.04 | -0.07 | 0.02 | 0.08 | -0.06 | -0.19 |
| **(19)** | 1.17 | 3.18 | 0.08 | 0.31\* | -0.05 | 0.06 | -0.11 | -0.05 | -0.04 | -0.05 | 0.02 | -0.07 | 0.01 | 0.07 | -0.07 | -0.18 |
| **(20)** | 1.08 | 3.39 | -0.16 | 0.35\*\* | 0.31\* | 0.02 | -0.07 | -0.27\* | -0.38\*\* | -0.33\*\* | -0.01 | 0.06 | 0.37\*\* | 0.23\* | 0.61\*\* | 0.27\* |
| **(21)** | 0.22 | 0.20 | -0.18 | 0.03 | 0.36\*\* | 0.03 | -0.03 | -0.22\* | -0.36\*\* | -0.33\*\* | 0.09 | -0.14 | 0.25\* | -0.11 | 0.24\* | 0.23\* |
| **(22)** | 0.88 | 0.76 | -0.12 | -0.32\*\* | 0.15 | -0.25\* | 0.28\* | -0.16 | -0.25\* | -0.24\* | 0.04 | 0.20 | 0.19 | 0.01 | 0.18\* | 0.14 |
| **(23)** | 0.77 | 0.73 | -0.11 | -0.31\* | 0.12 | -0.24 | 0.26\* | -0.15 | -0.25\* | -0.25\* | 0.03 | 0.22\* | 0.18 | 0.05 | 0.16\* | 0.13 |
| **(24)** | 1.93 | 2.95 | 0.36\*\* | 0.56\*\* | -0.31\*\* | 0.05 | 0.07 | 0.54\*\* | 0.43\*\* | 0.52\*\* | 0.54\*\* | 0.54\*\* | 0.54\*\* | 0.34\*\* | 0.33\*\* | 0.34\*\* |
| **(25)** | 5.17 | 3.53 | 0.48\*\* | 0.53\*\* | -0.32\*\* | 0.04 | -0.16 | 0.66\*\* | 0.37\*\* | 0.42\*\* | 0.36\*\* | 0.26\*\* | 0.26\*\* | 0.36\*\* | 0.02 | 0.33\*\* |
|  |  |  |  | **(15)** | **(16)** | **(17)** | **(18)** | **(19)** | **(20)** | **(21)** | **(22)** | **(23)** | **(24)** |  |  |  |
|  |  |  | **(16)** |  0.75\*\* |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | **(17)** | 0.11 | -0.06 |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | **(18)** | 0.12 | -0.04 | 0.99\*\* |  |  |  |  |  |  |  |  |  |  |
|  |  |  | **(19)** | 0.12 | -0.04 | 0.99\*\* |  0.99\*\* |  |  |  |  |  |  |  |  |  |
|  |  |  | **(20)** | 0.11 | 0.46\*\* | -0.20 | -0.16 | -0.17 |  |  |  |  |  |  |  |  |
|  |  |  | **(21)** | 0.03 | 0.21\* | -0.24\* | -0.23\* | -0.22\* | 0.75\*\* |  |  |  |  |  |  |  |
|  |  |  | **(22)** | 0.04 | -0.06 | -0.35\*\* | -0.33\*\* | -0.32\*\* | -0.08 | -0.01 |  |  |  |  |  |  |
|  |  |  | **(23)** | 0.03 | -0.07 | -0.34\*\* | -0.32\*\* | -0.32\*\* | -0.09 | -0.04 | 0.99\*\* |  |  |  |  |  |
|  |  |  | **(24)** |  0.56\*\* |  0.35\*\* | 0.09 | 0.05 | 0.06 | 0.05 | -0.02 | -0.24\* | -0.24\* |  |  |  |  |
|  |  |  | **(25)** |  0.39\*\* |  0.31\*\* |  0.55\*\* |  0.57\*\* |  0.57\*\* | -0.29\* |  -0.36\*\* | 0.23\* | 0.22\* |  0.63\*\* |  |  |  |
| *Note*. TMT risk preference (1); TMT innovativeness (2); Professional education (3); Academic education (4); TMT education (5); Oxbridge (6); Elite academic (7); Elite professional (8); Firm-specific experience (9); Industry-specific experience (10); TMT experience (11); Supervisory experience (12); TMT strategic cognition (13); Firm age (14); Return on assets (15); Return on equity (16); Current ratio (17); Cash ratio (18); Quick ratio (19); Debt to equity (20); Debt to assets (21); Assets turnover (22); Sales to assets (23); Tobin’s Q (24); Z-score (25). The asterisk \* (\*\*) shows that the Pearson coefficient is significant at the 5% (1%) level (two-tailed). See Table 1 for the definition of the variables.  |

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| **Table 3.** PLS-SEM results for financial health and firm value |
|  | **(1)** |  **(2)** |  **(3)** |  **(4)** |  **(5)** |  **(6)** |  **(7)** |  **(8)** | **(9)** |
| TMT education >Tobin's Q  | -0.01 | -0.07 | -0.03 | 0.01 | -0.04 | -0.05 | - | - | - |
|  | [0.923] | [0.309] | [0.339] | [0.345] | [0.234] | [0.452] | - | - | - |
| TMT education >Z-score  | -0.16 | -0.16 | -0.04 | -0.05 | -0.05 | -0.23 | - | - | - |
|  | [0.038] | [0.098] | [0.204] | [0321] | [0.395] | [0.000] | - | - | - |
| TMT experience >Tobin's Q  | -0.05 | -0.03 | - | 0.06 | 0.07 | - | 0.07 | 0.08 | 0.10 |
|  | [0.495] | [0.681] |  | [0.049] | [0.003] |  | [0.007] | [0.003] | [0.001] |
| TMT experience >Z-score  | -0.20 | -0.18 | - | -0.11 | 0.05 | - | 0.06 | 0.07 | 0.10 |
|  | [0.001] | [0.003] |  | [0.000] | [0.051] |  | [0.016] | [0.012] | [0.000] |
| TMT strategic cognition >Tobin's Q | 0.07 | 0.18 | 0.19 | 0.16 | 0.30 | 0.17 | 0.08 | 0.09 | 0.11 |
|  | [0.103] | [0.000] | [0.002] | [0.002] | [0.000] | [0.002] | [0.009] | [0.007] | [0.000] |
| TMT strategic cognition >Z-score | 0.08 | 0.16 | 0.29 | 0.29 | 0.13 | 0.06 | 0.18 | 0.20 | 0.22 |
|   | [0.101] | [0.000] | [0.000] | [0.000] | [0.005] | [0.098] | [0.009] | [0.000] | [0.000] |
| TMT risk preference >Tobin's Q  | - | - | 0.16 | - | - | 0.18 | 0.13 | 0.14 | 0.13 |
|  |  |  | [0.003] |  |  | [0.102] | [0.000] | [0.001] | [0.005] |
| TMT risk preference >Z-score  | - | - | 0.13 | - | - | 0.08 | 0.07 | 0.10 | 0.08 |
|   |  |  | [0.004] |  |  | [0.346] | [0.080] | [0.070] | [0.076] |
| TMT innovativeness >Tobin's Q  | - | 0.11 | 0.18 | 0.07 | 0.10 | 0.04 | 0.13 | 0.17 | 0.16 |
|  |  | [0.003] | [0.001] | [0.008] | [0.007] | [0.102] | [0.004] | [0.001] | [0.002] |
| TMT innovativeness >Z-score  | - | 0.234 | 0.163 | 0.024 | 0.067 | 0.042 | 0.219 | 0.244 | 0.197 |
|  |  | [0.000] | [0.000] | [0.185] | [0.054] | [0.365] | [0.001] | [0.000] | [0.005] |
| TMT human capital >Tobin's Q  | - | - | - | - | - | - | 0.14 | 0.15 | 0.11 |
|  |  |  |  |  |  |  | [0.004] | [0.001] | [0.008] |
| TMT human capital >Z-score  | - | - | - | - | - | - | 0.29 | 0.39 | 0.22 |
|  |  |  |  |  |  |  | [0.004] | [0.002] | [0.009] |
| Efficiency >Z-score  | 0.04 | 0.10 | 0.18 | 0.21 | 0.11 | 0.11 | 0.13 | 0.16 | 0.16 |
|  | [0.665] | [0.103] | [0.051] | [0.007] | [0.003] | [0.345] | [0.007] | [0.005] | [0.004] |
| Leverage >Z-score  | -0.22 | -0.20 | -0.12 | -0.11 | -0.13 | -0.18 | -0.14 | -0.21 | -0.25 |
|  | [0.001] | [0.000] | [0.006] | [0.000] | [0.000] | [0.000] | [0.007] | [0.003] | [0.000] |
| Liquidity >Z-score  | 0.46 | 0.41 | 0.23 | 0.37 | 0.23 | 0.46 | 0.33 | 0.46 | 0.35 |
|  | [0.002] | [0.032] | [0.005] | [0.001] | [0.002] | [0.000] | [0.000] | [0.000] | [0.000] |
| Profitability >Z-score  | 0.25 | 0.30 | 0.29 | 0.34 | 0.33 | 0.24 | 0.31 | 0.30 | 0.40 |
|   | [0.000] | [0.000] | [0.000] | [0.005] | [0.005] | [0.009] | [0.000] | [0.000] | [0.000] |
| Z-score >Tobin's Q  | 0.77 | 0.74 | 0.62 | 0.63 | 0.55 | 0.77 | 0.63 | 0.62 | 0.70 |
|  | [0.000] | [0.000] | [0.000] | [0.002] | [0.001] | [0.000] | [0.000] | [0.000] | [0.000] |
| Adjusted R2: |  |  |  |  |  |  |  |  |  |
|  Z-score  |  .41 | .50 | .48 |  .36 | .41 | .40 | .70 | .73 | .71 |
|  Tobin’s Q  | .64 | .67 | .60 | .55 | .54 | .65 | .60 | .69 | .70 |
| *Note*: The figures in the brackets are the *p*-values. Model (1) considers the general definitions *TMT education* and *TMT experience*. Model (2) adds *TMT innovativeness* to model (1). Model (3) excludes *TMT experience* but includes *TMT risk preference*. Model (4) uses *Industry-specific experience* to proxy for *TMT experience*. Model (5) uses *Firm-specific experience* to proxy for *TMT experience*. Model (6) uses *Professional* *education* to proxy for *TMT education*. Model (7) (8) (9) uses *Elite academic (Oxbridge) (Two elites)* to proxy for *TMT human capital*,respectively. In models (7) to (9), *Firm-specific experience* is used to proxy for *TMT* *experience*. See Table 1 for the variables’ definitions. The HTMT criteria are reported in the Appendix. |



 **Figure 1.** The decomposition ofTMT strategic cognition process

 *Note*: Source: authors’ own construct, adapted from Kor and Mesko (2013), Teece (2007), Helfat and Peteraf (2009, 2015) and Hambrick and Mason (1984).



 **Figure 2.** Modelling TMT strategic cognition and firm outcomes: simplified linear framework

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**Figure 3.** Modelling TMT strategic cognition and firm outcomes: complex framework

*Note:* E= education, Ex= experience, IR= innovation & risk, HC= TMT human capital, TMTSC = top management team strategic cognition.





 **Figure 4.** TMT attributes and firm outcomes: the illustration of hypotheses

 *Note.* See Table 1 for the definition of constructs.

1. As mentioned in Table 1, we used the Times World University Ranking in 2016 as per the time period of our sample. However, we ought to note that this ranking (like other rankings) is not stable across time. For instance, in the Times Ranking in 2020, eight German universities appeared in the top 100 list. [↑](#footnote-ref-1)
2. See Management Today, October 6th 2015, [https://www.managementtoday.co.uk/foreigners-oxbridge-grads-top-ftse-100-companies/article/1367322](https://www.managementtoday.co.uk/foreigners-oxbridge-grads-top-ftse-100-companies/article/1367322%29). See also:

 <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/347915/Elitist_Britain_-_Final.pdf>. [↑](#footnote-ref-2)
3. For the PLS-SEM specification, which is robust to small sample bias and has no assumption about the scale of measurement, the formal illustration for a latent construct (say, λ) can be shown as follows: λ=θ1x1+ θ2x2+…+θnxn +υ. In this specification, xn are observable indicators; θn represent the impact of the observable indicator on the latent construct; υ is the error term with the properties of Cov(xn, υ)=E(υ)=0 to assume exogeneity of the indicators. [↑](#footnote-ref-3)
4. HTMT measures the average of the heterotrait-heteromethod (i.e. the mean of all correlations of indicators across constructs measuring different constructs) relative to the average of the monotrait-heterotrait correlations which is the geometric mean of the average correlations of indicators measuring the same construct. [↑](#footnote-ref-4)
5. In unreported results (available on request), when we used the definition *Supervisory experience* in this model, the incremental increase related to the positive impact of TMT-SC on value and health is insignificant when Models (1) and (4) are compared. This implies that if even though supervisory experience is more effective than general experience, the former is not as relevant as industry-specific experience. [↑](#footnote-ref-5)
6. MBA degree and finance expertise as per the definition of Sarbanes-Oxley Act 2002 were also used to replace *TMT education*. The results, unreported but available on request, are qualitatively the same as the ones in Model (6). [↑](#footnote-ref-6)