

When Confidence Meets Control: How CEO Overconfidence Orchestrates Strategic Exploration And Breakthrough Innovation

Nagwan AlQershi^{*†}, Ramayah Thurasamy^{**}

^{*}Faculty of Business and Management, University Teknologi MARA, Kuala Lumpur, Malaysia, College of Management, Midocean University. Comoros, Email: nagwan.ma@umk.edu.my

^{**}School of Management, Universiti Sains Malaysia, Penang, Malaysia, Sunway Business School (SBS), Sunway University, Selangor, Malaysia, Faculty of Business, Sohar University, Sohar, Oman, Asia Pacific University of Technology & Innovation (APU), Kuala Lumpur, Malaysia, Department of Information Technology & Management, Daffodil International University, Birulia, Bangladesh, University Center for Research & Development (UCRD), Chandigarh University, Ludhiana, Punjab, India, School of Business, The University of Jordan (UJ), Amman, Jordan

Abstract

Purpose. This study examines how CEO overconfidence influences business model innovation (BMI) through organizational exploration and investigates the governance and managerial conditions under which exploratory initiatives generate sustained innovation outcomes. Specifically, it explores the complementary roles of board expertise, board power, managerial advice-seeking capabilities, and coordination flexibility in transforming strategic risk-taking into adaptive innovation.

Design/methodology/approach. Drawing on upper echelons theory, corporate governance research, organizational exploration, and the dynamic managerial capabilities perspective, this study develops and tests a multi-level conceptual framework. Multi-source survey and archival data were collected from 319 publicly listed and large private firms operating in Malaysia. The proposed relationships were analysed using structural equation modelling.

Findings. The findings indicate that CEO overconfidence positively influences organizational exploration, but its impact on BMI depends on effective governance and managerial capabilities. Board expertise and board power strengthen the positive effects of exploratory initiatives by directing executive risk-taking towards productive opportunities. Furthermore, managerial advice-seeking capabilities enhance exploration breadth, while coordination flexibility facilitates the conversion of exploratory activities into business model innovation. The results demonstrate that alignment among executive cognition, governance structures, and managerial capabilities is essential for sustaining innovation in technologically dynamic environments.

Originality/value. This study contributes to the literature by conceptualizing organizational exploration as a coordinated multi-level governance process linking executive cognition, board oversight, and managerial capabilities. It extends understanding of how governance mechanisms and dynamic managerial capabilities jointly transform strategic exploration into business model innovation, offering a more integrated explanation of adaptive innovation under conditions of environmental uncertainty and technological disruption.

Keywords CEO overconfidence, board expertise, managerial advice-seeking, coordination flexibility capability, breakthrough innovation, business model innovation, environmental dynamism, dynamic managerial capabilities, strategic leadership

INTRODUCTION

Firms operating in technologically dynamic and competitively volatile environments face unprecedented pressure to innovate while simultaneously managing uncertainty, strategic complexity, and resource constraints (Teece, 2007; Schilke, 2014). The pace of technological disruption continues to accelerate: global R&D expenditures surpassed USD 2.5 trillion in 2023, while digital technologies are projected to reshape more than 70% of existing business models by 2030 (World Economic Forum, 2023; OECD, 2023). At the same time, competitive advantage has become increasingly temporary and unstable. The average tenure of firms in the S&P 500 has declined dramatically over recent decades, reflecting intensifying technological disruption, shortened innovation cycles, and growing market volatility (Gratton & Scott, 2021). Under these conditions, firms can no longer rely solely on incremental innovation or operational efficiency to sustain long-term competitiveness. Instead, they must pursue exploratory strategies capable of generating breakthrough innovation and business model innovation (BMI) that fundamentally redefine value creation, delivery, and capture mechanisms (Ahuja & Lampert, 2001; Foss & Saebi, 2017; Teece, 2018).

[†]Corresponding author

Recent corporate trajectories illustrate both the transformative potential and strategic dangers associated with exploration-driven innovation. Firms such as Netflix and Adobe successfully transformed their business models into platform- and subscription-based ecosystems, fundamentally reshaping industry value capture logics. In contrast, organizations including Kodak and Nokia invested heavily in technological capabilities yet failed to adapt their governance structures and business models to changing competitive realities, ultimately experiencing rapid strategic decline. These contrasting outcomes demonstrate that exploration alone is insufficient; firms must also possess governance and managerial mechanisms capable of directing exploratory initiatives toward sustainable innovation outcomes (March, 1991).

Strategic leadership research highlights the central role of executive cognition in shaping organizational responses to uncertainty. Upper echelons theory argues that executives' cognitive characteristics influence strategic choices by shaping how opportunities, risks, and environmental signals are interpreted (Hambrick & Mason, 1984; Hambrick, 2007). Among these characteristics, CEO overconfidence has attracted substantial scholarly attention. Overconfident CEOs tend to overestimate their abilities and the probability of favorable outcomes, increasing their willingness to pursue risky, uncertain, and novel strategic initiatives (Malmendier & Tate, 2005; Hirshleifer et al., 2012). Empirical evidence suggests that such executives invest more aggressively in innovation activities, strategic experimentation, and long-term projects, often generating higher patent output and innovation intensity (Galasso & Simcoe, 2011). However, overconfidence also represents a potentially hazardous cognitive bias. The same optimism that stimulates bold strategic action may simultaneously encourage escalation of commitment, distorted risk assessment, and inefficient resource allocation (Malmendier & Tate, 2008; Chen et al., 2015). Accordingly, the strategic value of CEO overconfidence remains contingent rather than universally beneficial. Emerging evidence increasingly suggests that overconfidence produces favorable outcomes only when supported by governance structures capable of channeling executive risk-taking toward productive strategic exploration (Hillman & Dalziel, 2003; Finkelstein et al., 2009).

Simultaneously, research on organizational learning and exploration emphasizes the importance of search processes in enabling adaptation under uncertainty (March, 1991; Posen & Levinthal, 2012). Exploration involves experimentation with unfamiliar technologies, markets, and knowledge domains, thereby increasing the likelihood of breakthrough innovation (Katila & Ahuja, 2002). Nevertheless, empirical findings regarding exploration effectiveness remain inconsistent. One important explanation is that exploration is not a singular organizational action but rather a multi-stage process involving distinct strategic decisions concerning resource commitment, search breadth, and domain selection (Katila & Ahuja, 2002). These decisions are frequently distributed across hierarchical levels within the organization. Senior executives shape strategic direction and exploration intensity, whereas managerial actors identify search domains, evaluate opportunities, and coordinate implementation processes. Despite growing recognition of these distinctions, prior research has not sufficiently explained how leadership cognition, governance structures, and managerial capabilities jointly shape exploration processes and innovation outcomes across organizational levels.

Beyond executive decision-making, successful exploration also depends on managerial capabilities that enable organizations to sense opportunities, integrate knowledge, and reconfigure resources under changing environmental conditions (Teece, 2007; Eisenhardt & Martin, 2000). The dynamic managerial capabilities perspective highlights managerial social capital and advice-seeking behaviors as critical mechanisms supporting strategic adaptation and organizational flexibility (Adner & Helfat, 2003; Helfat & Martin, 2015). Managers engaging in external advice-seeking gain access to diverse perspectives, emerging knowledge, and novel information beyond established organizational routines, whereas internal advice-seeking facilitates cross-functional coordination and implementation by leveraging firm-specific expertise (Borgatti & Cross, 2003; McDonald & Westphal, 2003). Although existing studies acknowledge the importance of managerial advice networks, limited attention has been devoted to understanding how these capabilities shape exploration breadth and facilitate the conversion of exploratory initiatives into breakthrough innovation and BMI.

Taken together, these research streams indicate that innovation outcomes depend not merely on executive boldness or organizational search intensity, but on the alignment of decision-making processes across governance and managerial levels. However, existing literature has largely examined leadership cognition, corporate governance, organizational exploration, and managerial capabilities in isolation, resulting in fragmented explanations of innovation performance. This fragmentation is particularly problematic in highly dynamic environments, where uncertainty magnifies both the risks associated with poorly coordinated exploration and the strategic value of adaptive governance mechanisms.

To address this gap, the present study conceptualizes exploration as a multi-level governance process that spans executive cognition, board oversight, and managerial microfoundations. Specifically, we argue that CEO overconfidence influences firms' propensity to engage in strategic exploration, while board expertise and board power determine whether executive risk-taking is effectively directed toward high-impact innovation. At the managerial level, advice-seeking capabilities shape exploration breadth and implementation effectiveness by facilitating knowledge acquisition, coordination, and organizational flexibility.

When aligned, these governance and managerial mechanisms enable firms to convert exploratory initiatives into breakthrough innovation and BMI, particularly under conditions of high environmental dynamism.

This study examines these relationships using data from 319 publicly listed and large private firms in Malaysia, an emerging economy characterized by rapid industrial upgrading, institutional complexity, and strong integration into global value chains (Khanna & Palepu, 2010). Malaysia provides an especially appropriate context for examining exploration governance because firms operate within highly dynamic competitive conditions shaped by digital transformation, technological upgrading, and evolving institutional structures. Malaysia's manufacturing sector contributes approximately 23% of its GDP and more than 80% of exports, while national digital initiatives aim to increase the digital economy's contribution to over 25% of its GDP by the end of the decade (World Bank, 2023). These conditions create substantial pressure for firms to pursue innovation while simultaneously managing institutional uncertainty, competitive volatility, and strategic transformation, making Malaysia an analytically valuable setting for investigating exploration governance and adaptive innovation capabilities.

By integrating research on executive cognition, corporate governance, organizational exploration, and dynamic managerial capabilities, this study advances understanding of how firms convert strategic risk-taking into sustained innovation outcomes. Specifically, the study makes three primary contributions. First, it contributes to research on CEO overconfidence by identifying governance alignment as a critical boundary condition shaping the effectiveness of executive risk-taking in generating breakthrough innovation. Second, it advances exploration research by conceptualizing exploration as a coordinated multi-stage governance process distributed across hierarchical organizational levels. Third, it extends the dynamic managerial capabilities perspective by demonstrating how managerial advice-seeking and coordination flexibility facilitate the translation of exploratory initiatives into business model innovation. Collectively, these contributions provide a more integrated and multi-level explanation of how firms achieve adaptive innovation and sustained competitiveness under conditions of environmental dynamism.

THEORETICAL BACKGROUND

Exploration as a multi-level governance process

The theoretical model developed in this study conceptualizes exploration as a multi-stage organizational governance process shaped by strategic leadership, governance mechanisms, and managerial microfoundations. Rather than treating exploration as a singular firm-level activity, this study views exploration as a coordinated sequence of strategic decisions distributed across hierarchical organizational levels. In dynamic environments, firms must make interdependent decisions regarding both the intensity of resource commitment to exploration and the domains in which exploratory search is conducted. These decisions rarely emerge independently; instead, they evolve through continuous interactions among top executives, boards of directors, and managerial actors responsible for opportunity identification, knowledge integration, and implementation activities.

Building on upper echelons theory, corporate governance research, and the dynamic managerial capabilities perspective (Hambrick & Mason, 1984; Hillman & Dalziel, 2003; Helfat & Martin, 2015), the present framework proposes that successful exploration depends on the alignment of executive cognition, governance oversight, and managerial coordination capabilities. CEO cognition shapes firms' willingness to engage in strategic risk-taking, governance mechanisms determine whether exploratory initiatives are effectively directed and constrained, and managerial capabilities influence the breadth, coordination, and implementation of exploratory activities. Accordingly, this study develops hypotheses linking CEO overconfidence, board expertise and power, managerial advice-seeking capabilities, coordination flexibility, and environmental dynamism to breakthrough innovation and business model innovation (BMI).

CEO overconfidence, governance, and breakthrough innovation

CEO overconfidence reflects an executive's tendency to overestimate personal capabilities and the likelihood of favorable strategic outcomes. Overconfident CEOs perceive uncertain situations more optimistically, invest more aggressively in research and development activities, and pursue novel strategic initiatives with greater confidence (Malmendier & Tate, 2005; Hirshleifer et al., 2012). Because breakthrough innovation frequently requires substantial resource commitments under conditions of ambiguity and uncertainty, overconfident CEOs may be more willing to initiate exploratory investments that risk-averse executives might avoid. Their cognitive optimism can encourage strategic boldness, accelerate decision-making processes, and increase organizational willingness to pursue transformative opportunities beyond existing technological and market boundaries.

However, overconfidence also represents a potentially hazardous cognitive bias. Overconfident executives may underestimate strategic risks, discount negative feedback, overcommit organizational resources, and persist with ineffective initiatives despite

adverse signals (Malmendier & Tate, 2008; Chen et al., 2015). Consequently, overconfidence alone does not necessarily produce favorable innovation outcomes. Its strategic value depends on whether organizations possess governance mechanisms capable of channeling executive boldness toward productive exploration while constraining excessive or poorly aligned risk-taking.

Corporate boards play a critical role in shaping executive decision-making and strategic direction. Boards not only monitor managerial behavior but also provide strategic guidance, expertise, and oversight regarding resource allocation and long-term organizational priorities (Finkelstein et al., 2009). Board expertise enhances the quality of strategic evaluation by providing directors with knowledge relevant to technological innovation, digital transformation, and industry adaptation. Simultaneously, board power, reflected in structural independence and decision authority, determines the extent to which directors can effectively influence executive decision-making processes (Hillman & Dalziel, 2003).

When boards possess both expertise and structural influence, they can function as strategic choice architects that guide executive risk-taking toward opportunities with high transformative potential while limiting excessive or misaligned exploration. Under these conditions, CEO overconfidence is more likely to stimulate disciplined exploratory behavior capable of generating breakthrough innovation rather than strategic overreach or resource misallocation. Therefore, the innovative benefits of CEO overconfidence should be strongest when boards possess high levels of expertise and power.

Hypothesis 1: CEO overconfidence is positively associated with breakthrough innovation when board expertise and board power are high.

Managerial advice-seeking and exploration breadth

Exploration requires not only strategic commitment to innovation but also decisions regarding where and how firms search for new opportunities. Prior research suggests that exploration involves distinct choices concerning search breadth, knowledge diversity, and domain experimentation (Katila & Ahuja, 2002). While top executives shape firms' general orientation toward exploration, managerial actors play a central role in determining exploration breadth by identifying emerging technologies, evaluating market opportunities, and coordinating experimentation processes.

Managerial advice-seeking capabilities represent an important microfoundation influencing exploration breadth and organizational adaptation. Managers who actively seek external advice gain access to diverse perspectives, emerging trends, and knowledge sources beyond the organization's existing routines and cognitive boundaries (Borgatti & Cross, 2003). Exposure to heterogeneous external networks reduces cognitive lock-in, broadens search processes, and increases opportunities for distant knowledge recombination. Such diversity of information enhances firms' ability to identify non-obvious opportunities and develop novel combinations of technologies, markets, and organizational practices that may contribute to breakthrough innovation.

Furthermore, external advice-seeking may enhance firms' capacity to recognize disruptive technological trajectories and emerging industry shifts before competitors. By engaging with consultants, industry experts, professional associations, and cross-industry networks, managers can acquire knowledge unavailable through internal organizational channels alone. These external interactions may expand exploration breadth and improve the likelihood of identifying transformative innovation opportunities under conditions of environmental uncertainty.

Therefore, managers possessing strong external advice-seeking capabilities should be better positioned to expand exploratory search and identify breakthrough opportunities.

Hypothesis 2: Managerial external advice-seeking capability is positively associated with breakthrough innovation.

Internal advice-seeking, coordination flexibility, and BMI

Whereas external advice-seeking primarily expands exploration breadth, internal advice-seeking facilitates the implementation and coordination of innovative initiatives. Internal advice-seeking enables managers to access firm-specific expertise, coordinate across functional units, and mobilize organizational resources required for strategic change (McDonald & Westphal, 2003). Because business model innovation often requires organization-wide transformation rather than isolated technological improvements, effective internal coordination becomes essential for successful implementation.

Business model innovation involves reconfiguring value creation logic, redesigning organizational processes, transforming revenue mechanisms, and aligning internal stakeholders around new strategic priorities (Foss & Saebi, 2017). These changes frequently require extensive coordination across departments, integration of diverse knowledge bases, and flexible redeployment of organizational resources. Coordination flexibility capabilities enable firms to mobilize, recombine, and realign resources effectively in response to changing strategic demands (Teece, 2007).

Managers engaging in internal advice-seeking are more likely to access tacit organizational knowledge and strengthen collaborative relationships across functional boundaries. These interactions improve communication quality, facilitate knowledge integration, and enhance organizational flexibility in implementing new business models. Consequently, internal advice-seeking should strengthen coordination flexibility capabilities, thereby supporting business model innovation.

Hypothesis 3: Managerial internal advice-seeking capability is positively associated with business model innovation through coordination flexibility capabilities.

Coordination flexibility and business model innovation

Breakthrough innovation and business model innovation represent distinct yet complementary outcomes of exploratory activity. Breakthrough innovation emerges when firms extend exploration into unfamiliar technological domains and develop novel technological solutions, whereas business model innovation arises when organizations redesign value creation mechanisms and reconfigure organizational resources.

Coordination flexibility enables firms to integrate knowledge, redeploy strategic assets, and adapt organizational processes in response to environmental change (Eisenhardt & Martin, 2000; Teece, 2007). Firms possessing strong coordination flexibility capabilities are better able to realign internal structures, integrate cross-functional expertise, and scale new business models effectively. Such flexibility becomes especially important when firms must simultaneously manage operational continuity and strategic transformation under conditions of uncertainty.

Moreover, business model innovation frequently requires synchronized adjustments across multiple organizational activities, including operations, marketing, partnerships, digital systems, and customer engagement processes. Coordination flexibility enhances firms' capacity to implement these interconnected changes while maintaining strategic coherence. Accordingly, firms with stronger coordination flexibility capabilities should demonstrate greater ability to introduce and sustain innovative business models.

Hypothesis 4: Coordination flexibility capabilities are positively associated with business model innovation.

Environmental dynamism as a boundary condition

Environmental dynamism increases uncertainty, accelerates technological change, shortens opportunity windows, and intensifies competitive pressure (Schilke, 2014). Under such conditions, reliance on existing knowledge and established routines becomes increasingly risky, while adaptive search processes and flexible coordination capabilities become more strategically valuable. Dynamic environments amplify both the opportunities associated with exploration and the risks associated with poorly coordinated strategic decisions.

Environmental dynamism also intensifies the importance of alignment across leadership cognition, governance mechanisms, and managerial capabilities. CEO overconfidence may provide the strategic impetus for bold exploration, boards possessing expertise and power may guide exploration toward productive opportunities, and managerial advice-seeking capabilities may expand search breadth while facilitating organizational adaptation. However, without effective alignment among these organizational mechanisms, firms may struggle to convert exploratory initiatives into sustainable innovation outcomes under rapidly changing environmental conditions.

In highly dynamic contexts, organizations capable of integrating executive boldness, governance oversight, and managerial coordination are more likely to respond effectively to technological turbulence and shifting market demands. Consequently, environmental dynamism should strengthen the positive relationships among governance alignment, managerial capabilities, and innovation outcomes.

Hypothesis 5: Environmental dynamism strengthens the positive relationships between governance alignment and managerial advice-seeking capabilities and both breakthrough innovation and business model innovation.

Together, these hypotheses develop a multi-level explanation of how firms govern exploration and convert strategic risk-taking into sustained innovation outcomes. The framework proposes that breakthrough innovation emerges when executive cognition, governance oversight, and exploratory search processes are effectively aligned, while business model innovation depends on coordination flexibility capabilities that enable organizational reconfiguration and adaptive transformation. Environmental dynamism further intensifies the importance of these relationships, making governance alignment and managerial capabilities critical determinants of sustained competitiveness and organizational adaptation.

RESEARCH METHODOLOGY

Participants and sample

This study examines how leadership cognition, governance structures, and managerial capabilities shape breakthrough innovation and business model innovation (BMI) in dynamic environments. The empirical context is Malaysia, an emerging economy characterized by rapid industrial upgrading, digital transformation, institutional complexity, and deep integration into global value chains. Malaysia provides an especially relevant setting for examining exploration governance because firms operate under conditions of accelerating technological disruption, evolving governance expectations, and heightened competitive volatility. Malaysia's manufacturing sector contributes substantially to national output and exports, while national digital transformation initiatives aim to increase the digital economy's contribution to GDP through large-scale innovation and technology adoption programs (World Bank, 2023). These conditions create a highly dynamic organizational environment in which firms must simultaneously pursue innovation, strategic adaptation, and governance effectiveness, making Malaysia an analytically appropriate context for investigating exploration processes and adaptive capabilities.

The sampling frame was constructed using Bursa Malaysia listings, national corporate directories, industry databases, and publicly available corporate records to ensure comprehensive coverage of medium-sized and large firms engaged in strategic decision-making and innovation activities. Combining multiple databases improved sampling breadth and reduced the likelihood of excluding firms operating outside publicly listed sectors. The final sample consisted of 319 firms drawn from publicly listed companies and large privately held firms across manufacturing, technology, services, logistics, and digital industries.

Firms were included in the study if they satisfied at least two of the following criteria: annual revenue exceeding RM50 million; employment of more than 100 full-time employees; and active engagement in innovation-related activities such as research and development, digital transformation initiatives, new product development, process innovation, or strategic business model change. These criteria were established to ensure that sampled firms possessed sufficient organizational scale, strategic complexity, and innovation involvement to meaningfully engage in exploratory activities and governance processes. Smaller firms lacking formal governance structures or strategic innovation activities were excluded because the theoretical framework developed in this study requires the presence of executive leadership, board oversight, and managerial coordination mechanisms.

To improve representativeness and reduce sampling bias, firms from multiple industries were included, and both publicly listed and privately held firms were sampled. The inclusion of private firms was particularly important because innovation and exploration activities in emerging economies frequently extend beyond publicly traded corporations. Respondents were also screened to ensure direct involvement in strategic decision-making and innovation-related activities. Eligible respondents included CEOs, senior executives, division heads, strategy managers, innovation managers, and senior functional leaders possessing substantial knowledge of organizational governance, strategic exploration, and innovation processes.

The resulting sample enhances external validity by capturing variation across industries, ownership structures, and organizational contexts while reducing the likelihood of sector-specific bias. Furthermore, the multi-industry design strengthens the generalizability of findings regarding exploration governance and innovation outcomes in dynamic environments.

Research design

The study employs a multi-source, multi-level research design integrating archival data, executive survey responses, and secondary indicators. This design reduces common method bias and enables examination of constructs across organizational levels (Podsakoff et al., 2003). The integration of multiple data sources is particularly important given the multi-level nature of the theoretical framework, which links executive cognition, governance mechanisms, and managerial capabilities to organizational innovation outcomes.

Archival data were used to measure governance characteristics, CEO attributes, and innovation outputs. Survey data collected from senior executives and top management team members captured managerial advice-seeking capabilities, coordination flexibility capabilities, and perceptions of environmental dynamism. Combining objective archival indicators with perceptual managerial measures improves construct validity and reduces reliance on single-source reporting.

The integration of multiple data sources enhances construct validity and strengthens causal inference by reducing dependence on common respondent perceptions. Additionally, the research design enables examination of both structural governance mechanisms and behavioral managerial processes within a unified analytical framework.

Instruments and measures

CEO overconfidence was measured using established archival proxies from behavioral corporate finance research (Malmendier & Tate, 2008; Hirshleifer et al., 2012). Specifically, the measure incorporated indicators related to CEO option exercise behavior,

equity retention patterns, relative compensation structures, managerial forecast optimism, and media portrayals reflecting executive confidence. Following prior overconfidence research, these indicators were standardized and aggregated into a composite index representing the degree of executive overconfidence. Equal weighting procedures were applied to avoid overemphasizing any single proxy and to capture the multidimensional nature of overconfidence as a cognitive disposition. Higher values indicate stronger tendencies toward optimistic strategic judgment and risk-taking orientation.

Board expertise was measured as the proportion of directors possessing relevant industry, technological, innovation, digital transformation, or strategic management expertise (Hillman & Dalziel, 2003; Finkelstein et al., 2009). Board power was measured using governance structure indicators reflecting board influence over strategic decision-making, including separation of CEO and chair roles, proportion of independent directors, existence of independent board committees, and director tenure diversity (Hillman & Dalziel, 2003). These indicators collectively capture the board's capacity to provide strategic oversight while maintaining sufficient independence to influence executive decision-making processes.

Managerial advice-seeking capabilities were measured using items adapted from prior research on executive advice networks and strategic decision processes (Borgatti & Cross, 2003; McDonald & Westphal, 2003). External advice-seeking captured reliance on knowledge obtained from industry peers, consultants, professional associations, academic experts, and cross-industry contacts, whereas internal advice-seeking assessed the extent to which managers sought input from colleagues across functional units and internal expert networks to improve decision quality and coordination effectiveness. Items were rated on a seven-point Likert scale ranging from strongly disagree to strongly agree. The distinction between external and internal advice-seeking was maintained to differentiate exploratory knowledge acquisition from internal coordination and implementation processes.

Coordination flexibility capability was measured using items adapted from dynamic capabilities research (Teece, 2007; Eisenhardt & Martin, 2000). The scale assessed the organization's ability to reconfigure processes, redeploy resources, integrate knowledge across organizational units, and coordinate activities in response to strategic change. Responses were recorded on a seven-point Likert scale. Higher scores indicate stronger organizational capacity to adapt internal structures and processes in response to evolving environmental demands and innovation requirements.

Breakthrough innovation was measured using high-impact technological outputs consistent with prior research on breakthrough inventions (Ahuja & Lampert, 2001). Indicators included patents within top citation percentiles, major technology commercialization milestones, industry innovation awards, and breakthrough product introductions. This multidimensional operationalization was designed to capture both technological novelty and the strategic impact of innovation outcomes.

Business model innovation was measured using items adapted from prior research on business model transformation and value creation logic (Clauss, 2017; Foss & Saebi, 2017; Zott & Amit, 2010). The scale assessed the extent to which firms introduced new approaches to value creation, altered value delivery mechanisms, evolved revenue models, developed new partnerships and ecosystem relationships, and used digital technologies to transform value capture. Responses were measured using a seven-point Likert scale. The measure reflects the systemic and organization-wide nature of business model transformation rather than isolated operational improvements.

Environmental dynamism was measured using items adapted from prior research on environmental turbulence and industry change (Jaworski & Kohli, 1993; Miller & Friesen, 1983; Schilke, 2014). The scale captured perceptions of rapid industry change, shifting customer preferences, technological turbulence, unpredictable competitive actions, and frequent market changes. Responses were recorded on a seven-point Likert scale. Higher scores represent greater perceived environmental instability and competitive uncertainty.

Procedure

Data collection followed a structured multi-stage procedure. First, archival governance and innovation data were compiled from publicly available corporate reports, governance disclosures, and industry databases. Survey instruments were subsequently distributed to senior executives, including CEOs, senior managers, division heads, and functional leaders possessing direct knowledge of strategic decision-making and innovation activities.

To reduce potential response bias, confidentiality assurances were provided, responses were anonymized, and findings were reported only in aggregate form. Participation was voluntary, and respondents were informed that the study was intended solely for academic research purposes.

A two-wave survey design temporally separated predictor and outcome variables, thereby reducing common method variance (Podsakoff et al., 2003). Follow-up reminders and targeted executive outreach were used to improve participation rates and response completeness. This process resulted in usable responses from 319 firms representing diverse industries and organizational structures.

Addressing common method bias

Several procedural and statistical remedies were employed to mitigate common method bias. Procedural remedies included multi-source data collection, temporal separation of measures, respondent anonymity assurances, and separation of predictor and outcome constructs within the survey design. These procedures were implemented to reduce social desirability bias, consistency artifacts, and respondent tendency to infer relationships among constructs.

Statistical remedies included confirmatory factor analysis marker techniques, common latent factor testing, and Harman's single-factor test. The results indicated that no single factor accounted for the majority of variance, and model comparisons involving latent method factors did not substantially improve model fit. Collectively, these findings suggest that common method bias was not a significant concern in the present study.

Data analysis strategy

Data analysis proceeded in multiple stages. Confirmatory factor analysis assessed the reliability and validity of multi-item constructs. Reliability was evaluated using composite reliability and Cronbach's alpha coefficients. Convergent validity was assessed using average variance extracted (AVE), while discriminant validity was evaluated using the Fornell-Larcker criterion. Hypotheses were tested using structural equation modeling and hierarchical regression analyses to examine direct, mediating, and moderating relationships. Interaction terms tested the joint influence of CEO overconfidence, board expertise, and board power. Mediation analysis evaluated coordination flexibility as an intervening mechanism linking managerial advice-seeking and business model innovation. Moderated regression analysis assessed the strengthening effect of environmental dynamism on the proposed relationships.

Robustness checks included alternative model specifications, industry fixed effects, lagged-variable analyses, and endogeneity diagnostics using instrumental variable approaches. These additional analyses were conducted to improve confidence in the stability and robustness of the reported findings and to minimize potential concerns regarding reverse causality and omitted variable bias.

This analytical strategy enables rigorous testing of the proposed multi-level framework and provides a comprehensive examination of how firms govern exploration and convert strategic risk-taking into breakthrough innovation and business model innovation.

RESULTS

Descriptive statistics

The final sample consisted of 319 firms representing diverse sectors of the Malaysian economy, including manufacturing (34%), services (29%), technology (18%), logistics (9%), and other industries (10%). The sectoral diversity of the sample improves the generalizability of the findings and reduces the likelihood that the observed relationships are driven by industry-specific characteristics alone. Manufacturing and technology firms represented the largest proportion of the sample, reflecting the strategic importance of innovation, digital transformation, and industrial upgrading within the Malaysian economy.

The sampled firms also exhibited substantial variation in organizational characteristics. The average firm age was 18.6 years ($SD = 9.8$), indicating the inclusion of both relatively young growth-oriented firms and mature organizations with established governance structures. Mean firm size was 1,274 employees ($SD = 2,103$), suggesting considerable heterogeneity in organizational scale and operational complexity. Firms reported an average R&D intensity of 4.7% of annual revenue ($SD = 3.1$), indicating meaningful engagement in innovation and exploratory activities across the sample.

Descriptive statistics for all study variables are presented in Table 1. The distributions were within acceptable ranges and showed no evidence of extreme non-normality. The observed variability across governance, managerial, and innovation-related variables suggests adequate dispersion for hypothesis testing and multivariate analysis.

The relatively high mean values for internal advice-seeking and coordination flexibility suggest that many firms within the sample possess moderately developed internal collaboration and adaptive coordination capabilities. Similarly, the environmental dynamism score indicates that firms generally operate under conditions of moderate to high environmental uncertainty and technological turbulence. The variance observed in breakthrough innovation outcomes further supports the suitability of the sample for examining differences in exploratory effectiveness across firms.

Correlation analysis

Pearson correlation coefficients are presented in Table 2. CEO overconfidence was positively associated with breakthrough innovation ($r = .21, p < .01$). Board expertise was positively correlated with breakthrough innovation ($r = .29, p < .003$). External

Table 1. Descriptive Statistics

Variable	Mean	SD	Min	Max
CEO Overconfidence	0.54	0.22	0.08	0.92
Board Expertise	0.41	0.18	0.05	0.83
Board Power	0.63	0.17	0.21	0.94
External Advice-Seeking	4.92	1.03	1.88	6.90
Internal Advice-Seeking	5.11	0.97	2.14	6.88
Coordination Flexibility	4.78	1.08	1.72	6.91
Environmental Dynamism	4.36	1.11	1.90	6.85
Breakthrough Innovation	2.84	1.95	0	9
Business Model Innovation	4.12	1.09	1.63	6.88

Table 2. Correlations

Variable	1	2	3	4	5	6	7	8	9
1. CEO Overconfidence	-								
2. Board Expertise	.18**	-							
3. Board Power	.16**	.32***	-						
4. External Advice-Seeking	.11	.19**	.14*	-					
5. Internal Advice-Seeking	.09	.13*	.12*	.41***	-				
6. Coordination Flexibility	.10	.17**	.15**	.29***	.47***	-			
7. Environmental Dynamism	.08	.12*	.10	.26***	.21**	.24***	-		
8. Breakthrough Innovation	.21**	.29***	.23**	.34***	.16**	.22**	.18**	-	
9. Business Model Innovation	.13*	.19**	.17**	.20**	.26***	.42***	.23**	.28***	-

*p < .05, **p < .01, ***p < .001

advice-seeking showed a positive correlation with breakthrough innovation ($r = .34, p < .001$). Internal advice-seeking was positively associated with coordination flexibility ($r = .47, p < .001$), and coordination flexibility was positively associated with business model innovation ($r = .42, p < .001$). Environmental dynamism was positively related to both breakthrough innovation ($r = .18, p < .01$) and business model innovation ($r = .23, p < .02$).

The correlation patterns generally align with the theoretical expectations proposed in the conceptual framework. In particular, the strong positive relationship between internal advice-seeking and coordination flexibility provides preliminary support for the argument that managerial interaction capabilities facilitate organizational adaptation and business model transformation. Similarly, the positive associations between board expertise, board power, and breakthrough innovation suggest that governance quality may play an important role in shaping exploratory effectiveness.

All correlations were below .70, indicating no concerns regarding multicollinearity or construct redundancy. The absence of excessively high correlations also supports the distinctiveness of the study constructs and reduces concerns regarding overlapping conceptual measurement.

Multicollinearity diagnostics

Variance Inflation Factor (VIF) values ranged from 1.18 to 2.94, while tolerance values ranged from 0.34 to 0.85. These values fall within recommended methodological thresholds, indicating that multicollinearity was not a significant concern in the present analyses. The diagnostic results suggest that the independent variables retained sufficient statistical independence to permit reliable estimation of regression coefficients and interaction effects.

Confirmatory factor analysis

Confirmatory factor analysis indicated acceptable model fit: χ^2 (df = 224) = 318.45, CFI = .95, TLI = .94, RMSEA = .038, and SRMR = .041. These fit indices exceed commonly accepted thresholds, indicating strong measurement model adequacy and satisfactory representation of the latent constructs.

Table 3. Measurement Model Statistics

Construct	CR	AVE	Factor Loadings
External Advice-Seeking	.89	.67	.71-.88
Internal Advice-Seeking	.91	.69	.73-.90
Coordination Flexibility	.93	.76	.78-.92
Environmental Dynamism	.88	.64	.70-.86
BMI	.90	.68	.74-.89

All factor loadings exceeded .70 and were significant at $p < .001$. Composite reliability ranged from .82 to .93, while average variance extracted (AVE) ranged from .58 to .76, indicating satisfactory convergent validity and internal consistency reliability. The results further demonstrated satisfactory discriminant validity, as the square roots of AVE values exceeded inter-construct correlations in accordance with the Fornell-Larcker criterion. Collectively, these findings support the psychometric robustness of the measurement model.

Hypothesis testing

Hierarchical regression and structural equation modeling were used to test the hypotheses. Control variables were entered in Step 1, main effects in Step 2, and interaction terms in Step 3. This staged analytical procedure enabled examination of both direct and conditional relationships among governance mechanisms, managerial capabilities, and innovation outcomes.

CEO overconfidence, governance, and breakthrough innovation (H1)

CEO overconfidence showed a positive but non-significant main effect on breakthrough innovation ($\beta = .07$, $p = .14$). In contrast, board expertise ($\beta = .24$, $p < .001$) and board power ($\beta = .18$, $p < .01$) were positively associated with breakthrough innovation. The three-way interaction among CEO overconfidence, board expertise, and board power was significant ($\beta = .19$, $p < .002$).

Simple slope analysis indicated that CEO overconfidence was positively related to breakthrough innovation when board expertise and board power were high ($\beta = .31$, $p < .004$) but not when both governance dimensions were low ($\beta = -.04$, $p = .62$). These findings suggest that executive overconfidence does not independently generate superior innovation outcomes; rather, its effectiveness depends on governance structures capable of directing strategic risk-taking toward productive exploration.

H1 was supported.

External advice-seeking and breakthrough innovation (H2)

External advice-seeking capability was not significantly associated with breakthrough innovation ($\beta = .06$, $p = .18$). Although external advice-seeking demonstrated positive bivariate correlations with breakthrough innovation, its direct effect became non-significant within the multivariate model, suggesting that access to external knowledge alone may be insufficient to produce high-impact innovation outcomes without complementary organizational integration capabilities.

H2 was not supported.

Internal advice-seeking, coordination flexibility, and BMI (H3)

Internal advice-seeking significantly predicted coordination flexibility ($\beta = .46$, $p < .003$). Coordination flexibility significantly predicted business model innovation ($\beta = .39$, $p < .001$). When coordination flexibility was included in the model, the direct effect of internal advice-seeking on business model innovation became non-significant ($\beta = .06$, $p = .19$).

Bootstrapped mediation analysis using 5,000 resamples indicated a significant indirect effect (indirect effect = .18; 95% CI [.11, .27]). These findings indicate full mediation, suggesting that internal managerial interaction contributes to business model innovation primarily through enhanced coordination flexibility capabilities rather than through direct effects alone.

H3 was supported.

Coordination flexibility and business model innovation (H4)

Coordination flexibility capabilities were positively associated with business model innovation ($\beta = .39, p < .004$). This result highlights the importance of organizational adaptability and resource reconfiguration capabilities in enabling firms to implement and sustain business model transformation under dynamic environmental conditions.

H4 was supported.

Moderating role of environmental dynamism (H5)

Environmental dynamism strengthened the relationships within the exploration governance framework. The interaction between environmental dynamism and governance alignment was significant for breakthrough innovation ($\beta = .15, p < .02$). Similarly, the interaction between environmental dynamism and advice-seeking capabilities was significant for business model innovation ($\beta = .17, p < .03$).

Simple slope analyses indicated that the positive relationships proposed in the model became substantially stronger under higher levels of environmental dynamism. These findings suggest that governance alignment and managerial coordination capabilities become increasingly valuable when firms operate under conditions of technological turbulence, market uncertainty, and competitive volatility.

H5 was supported.

Model fit and explained variance

The final models explained 38% of the variance in breakthrough innovation and 41% of the variance in business model innovation. Structural equation modeling indicated good model fit ($CFI = .94, RMSEA = .041, SRMR = .045$).

The relatively high explained variance demonstrates the substantial predictive capacity of the proposed multi-level framework and supports the argument that exploration outcomes are jointly shaped by executive cognition, governance structures, and managerial capabilities.

DISCUSSION

This study set out to explain how firms convert exploratory intent into breakthrough innovation and business model innovation (BMI) by examining the joint roles of leadership cognition, governance structures, and managerial capabilities. The findings provide strong support for the multi-level governance perspective advanced in this research and offer important insights into how exploration processes are coordinated across organizational levels in dynamic environments. More broadly, the results suggest that innovation outcomes are not driven solely by executive risk-taking or organizational search intensity, but by the alignment of cognitive, governance, and managerial mechanisms that collectively shape exploratory effectiveness.

The findings indicate that CEO overconfidence does not independently drive breakthrough innovation. Instead, its positive effects emerge only when boards possess both expertise and structural power. This result reinforces the paradoxical nature of executive overconfidence documented in prior research (Malmendier & Tate, 2005; Chen et al., 2015) and demonstrates that governance structures play a critical role in channeling executive risk-taking toward productive strategic outcomes. Without effective governance oversight, executive optimism may increase the likelihood of excessive experimentation, strategic overcommitment, and inefficient resource allocation. Conversely, governance structures possessing strong expertise and influence can direct executive boldness toward opportunities with greater transformative potential.

By showing that overconfidence becomes beneficial under conditions of governance alignment, the findings extend upper echelons theory (Hambrick & Mason, 1984) and corporate governance research (Hillman & Dalziel, 2003). Rather than viewing boards solely as monitoring mechanisms designed to constrain managerial behavior, the findings suggest that boards function as strategic choice architects capable of shaping how executive cognition translates into organizational action. This perspective shifts the role of boards from passive oversight bodies to active governance participants that influence the strategic quality and effectiveness of exploratory decision-making. The results therefore highlight the importance of governance quality in transforming cognitive biases into strategic advantages capable of generating breakthrough innovation.

Contrary to expectations, external advice-seeking did not exhibit a direct relationship with breakthrough innovation. This finding is theoretically important because it suggests that access to external knowledge alone may be insufficient to generate high-impact innovation outcomes. Although external networks expose managers to diverse perspectives, emerging trends,

and novel opportunities (Borgatti & Cross, 2003), the transformation of such knowledge into breakthrough innovation may require complementary organizational capabilities such as absorptive capacity, technological expertise, strategic integration mechanisms, and internal coordination processes.

This finding refines prior research on search breadth and external knowledge acquisition (Katila & Ahuja, 2002) by indicating that knowledge access does not automatically translate into radical innovation outcomes. In highly dynamic environments, firms may acquire substantial amounts of external information without possessing the organizational mechanisms necessary to integrate, interpret, and apply that knowledge effectively. Consequently, exploration breadth alone may not guarantee breakthrough innovation unless firms also possess strong internal capabilities for knowledge recombination and strategic implementation.

The absence of a direct effect may also reflect the complexity and uncertainty associated with breakthrough innovation itself. External advice networks can expose firms to heterogeneous information and competing strategic signals, potentially increasing ambiguity rather than immediately improving innovation outcomes. Accordingly, external advice-seeking may contribute indirectly to innovation by enhancing organizational learning, opportunity recognition, or adaptive flexibility rather than exerting a direct linear effect on breakthrough innovation performance. This interpretation helps explain why prior empirical findings regarding external knowledge acquisition and innovation effectiveness have often been inconsistent.

The findings further demonstrate that internal advice-seeking enhances coordination flexibility, which in turn enables business model innovation. This full mediation effect highlights the importance of internal knowledge integration and cross-functional coordination in implementing strategic transformation. Business model innovation requires organizations to redesign value creation logic, realign operational processes, integrate diverse organizational resources, and coordinate activities across multiple functional areas (Foss & Saebi, 2017). Internal advice networks facilitate these processes by improving communication quality, strengthening access to firm-specific expertise, and enhancing coordination across organizational boundaries.

This result supports the dynamic managerial capabilities perspective (Adner & Helfat, 2003; Helfat & Martin, 2015) by demonstrating how managerial social capital contributes to adaptive reconfiguration processes. Rather than treating dynamic capabilities as abstract organizational attributes, the findings highlight the micro-level managerial behaviors through which firms achieve strategic adaptation and business model transformation. The results therefore provide a more behaviorally grounded explanation of how managerial interaction patterns contribute to organizational flexibility and innovation implementation.

Environmental dynamism strengthened relationships across the exploration governance framework, indicating that alignment among leadership cognition, governance structures, and managerial capabilities becomes increasingly important under conditions of uncertainty and rapid change. In dynamic environments, reliance on established routines and existing knowledge becomes progressively riskier, while adaptive search processes and flexible coordination capabilities become more valuable (Schilke, 2014). The findings suggest that executive boldness, governance oversight, and managerial coordination capabilities jointly enable firms to respond more effectively to technological turbulence and competitive disruption.

This result reinforces dynamic capabilities research (Teece, 2007) by demonstrating that adaptive success depends not only on the existence of organizational capabilities but also on their alignment across organizational levels. Environmental dynamism appears to amplify both the benefits of coordinated exploration and the risks associated with fragmented decision-making structures. Firms lacking alignment among executive leadership, governance systems, and managerial coordination mechanisms may struggle to convert exploratory initiatives into sustained innovation under rapidly changing environmental conditions.

Taken together, the findings suggest that innovation outcomes are shaped less by isolated strategic decisions and more by the coordination of decision-making processes across hierarchical organizational levels. Breakthrough innovation emerges when governance structures effectively guide executive risk-taking and managerial exploration extends into novel domains. Business model innovation arises when coordination flexibility enables firms to reconfigure organizational resources and adapt value creation systems in response to environmental change. Environmental dynamism further intensifies the importance of these relationships by increasing uncertainty while simultaneously enhancing the strategic value of adaptive governance and managerial capabilities.

Overall, the study demonstrates that exploration should be understood as a multi-level governance process rather than a singular organizational activity. By emphasizing the interaction among leadership cognition, governance oversight, and managerial microfoundations, the findings provide a more integrated explanation of how firms govern exploration and convert strategic risk-taking into sustained innovation and adaptive competitiveness in dynamic environments.

THEORETICAL CONTRIBUTIONS

This study contributes to research on strategic leadership, corporate governance, organizational exploration, and dynamic capabilities by offering a multi-level explanation of how firms convert exploratory intent into breakthrough innovation and business model innovation (BMI). By integrating previously disconnected theoretical perspectives and identifying the mechanisms through which exploration decisions are governed and implemented, the study advances understanding of how innovation emerges under conditions of environmental dynamism and strategic uncertainty. More specifically, the findings contribute to theory by demonstrating that innovation outcomes depend not only on individual organizational capabilities or executive characteristics, but also on the alignment of governance and managerial processes across hierarchical organizational levels. First, this study extends upper echelons theory by demonstrating that the effects of CEO overconfidence on innovation outcomes depend on governance alignment. Prior research has documented both the advantages and risks associated with executive overconfidence, portraying it as a double-edged cognitive bias capable of encouraging bold strategic action while simultaneously increasing the likelihood of strategic failure (Malmendier & Tate, 2005; Chen et al., 2015). However, existing work has primarily examined overconfidence as an independent predictor of firm outcomes without sufficiently considering the governance conditions under which executive cognition becomes strategically beneficial or detrimental.

The present findings show that CEO overconfidence does not independently generate breakthrough innovation. Instead, its benefits emerge only when boards possess both relevant expertise and structural power, enabling them to direct executive risk-taking toward productive exploration. This finding shifts theoretical attention from executive cognition alone to the interaction between cognition and governance structures, suggesting that the strategic consequences of executive biases are contingent upon governance quality and oversight effectiveness. By demonstrating that governance alignment conditions the value of executive overconfidence, the study reconceptualizes boards not merely as monitoring bodies but as strategic choice architects that shape how cognitive biases translate into innovation outcomes. This perspective enriches upper echelons theory by introducing governance alignment as a critical boundary condition influencing the effectiveness of executive strategic behavior. Second, the study advances research on organizational exploration by conceptualizing exploration as a multi-stage governance process rather than a singular firm-level decision. Traditional exploration research distinguishes between exploration and exploitation while emphasizing experimentation, search breadth, and organizational learning (March, 1991; Katila & Ahuja, 2002). However, empirical findings regarding exploration effectiveness have often been inconsistent, particularly under conditions of environmental dynamism.

By distinguishing between decisions related to exploration propensity and exploration breadth, and by locating these decisions at different organizational levels, this study clarifies why exploration outcomes vary substantially across firms. Senior executives influence strategic willingness to engage in exploration, governance mechanisms shape the direction and discipline of exploratory investment, and managerial actors determine how exploration is coordinated and implemented across organizational domains. Accordingly, the findings suggest that exploration effectiveness depends less on search intensity alone and more on the alignment of decision-making processes across hierarchical levels.

This multi-stage perspective refines exploration theory by explaining how exploration decisions are structured, coordinated, and governed within organizations. The study therefore moves beyond traditional firm-level conceptualizations of exploration and provides a more process-oriented understanding of how organizations manage uncertainty and innovation simultaneously. Third, the study refines understanding of search breadth and external knowledge acquisition by demonstrating that external advice-seeking does not directly produce breakthrough innovation. Prior research has generally argued that access to diverse external knowledge enhances innovation by expanding exploratory search and enabling novel knowledge recombination (Katila & Ahuja, 2002). The present findings indicate that access to external knowledge alone may be insufficient for generating high-impact innovation outcomes.

This result suggests that the value of external knowledge depends on complementary organizational capabilities that enable firms to interpret, integrate, and apply external insights effectively. The findings therefore challenge assumptions that broader external search automatically improves innovation performance and instead emphasize the importance of internal integration and absorptive mechanisms. By highlighting the limitations of external advice-seeking as a direct driver of breakthrough innovation, the study encourages a shift from viewing knowledge access as inherently beneficial to understanding the organizational conditions under which external knowledge contributes to radical innovation outcomes.

Furthermore, the findings help explain why prior empirical research examining external search breadth and innovation effectiveness has frequently produced mixed results. External knowledge exposure may increase strategic opportunities while simultaneously increasing informational complexity and coordination demands, thereby requiring strong internal capabilities for effective implementation.

Fourth, the study contributes to the dynamic managerial capabilities perspective by identifying managerial advice-seeking and coordination flexibility as microfoundations enabling business model innovation. Dynamic capabilities research emphasizes sensing, seizing, and reconfiguring opportunities as central mechanisms supporting organizational adaptation (Teece, 2007), yet the managerial and behavioral processes through which these capabilities emerge remain insufficiently specified.

The findings demonstrate that internal advice-seeking enhances coordination flexibility, which subsequently enables business model innovation. This clarifies how managerial social capital facilitates the integration of organizational knowledge and the reconfiguration of processes necessary for business model transformation. Rather than treating dynamic capabilities as abstract organizational attributes, the study identifies specific managerial interaction patterns and coordination mechanisms that support adaptive transformation.

By demonstrating the mediating role of coordination flexibility, the study provides a behavioral and relational foundation for dynamic capabilities theory. This contribution is particularly important because it explains how micro-level managerial behaviors aggregate into organization-level adaptive capabilities capable of supporting strategic renewal and innovation.

Finally, this study contributes to research on organizational adaptation by integrating leadership cognition, governance structures, and managerial microfoundations into a unified theoretical framework. Prior research has frequently examined these elements independently, resulting in fragmented explanations of innovation outcomes and adaptive performance. The present findings indicate that innovation emerges from alignment across organizational levels and that environmental dynamism amplifies the importance of such alignment.

This integrated perspective advances theory by shifting attention away from isolated drivers of innovation toward the coordination of decision-making processes across hierarchical levels. The findings suggest that adaptive innovation is fundamentally a governance challenge requiring alignment among executive cognition, board oversight, managerial coordination, and organizational flexibility. In doing so, the study provides a more comprehensive explanation of how firms govern exploration and achieve sustained innovation under conditions of uncertainty, complexity, and rapid environmental change.

Collectively, these contributions advance understanding of how firms transform strategic risk-taking into adaptive innovation outcomes by coordinating exploration processes across leadership, governance, and managerial domains. The study therefore offers a more integrated and multi-level explanation of innovation effectiveness in dynamic organizational environments.

PRACTICAL IMPLICATIONS

The findings of this study offer important practical implications for executives, boards of directors, policymakers, and organizations seeking to strengthen innovation performance under conditions of uncertainty, technological disruption, and competitive volatility. More broadly, the results suggest that successful innovation depends not only on strategic ambition but also on the alignment of governance structures, leadership cognition, and managerial coordination capabilities.

The findings indicate that CEO overconfidence can support breakthrough innovation only when governance structures provide informed strategic oversight and guidance. This suggests that firms should not necessarily attempt to suppress executive boldness or risk-taking orientation. Instead, organizations should ensure that boards possess the expertise, independence, and structural influence necessary to channel executive confidence toward productive strategic exploration. Boards with industry-specific, technological, innovation, and digital transformation expertise are better positioned to evaluate complex innovation initiatives, assess strategic uncertainty, and guide long-term exploratory investments. Strengthening board independence, improving director competence in emerging technologies, and enhancing board participation in strategic deliberations can improve the quality of exploratory decision-making while reducing the risks associated with excessive executive optimism.

The findings further highlight that boards function not only as monitoring mechanisms but also as strategic partners in innovation governance. Firms pursuing transformative innovation should therefore design governance systems that allow directors to contribute actively to strategic exploration and organizational adaptation processes. Practices such as innovation-focused board committees, strategic foresight sessions, director participation in digital transformation initiatives, and regular governance reviews can improve strategic alignment and support more effective innovation governance. Greater board involvement in technology oversight and long-term strategic planning may also enhance organizational responsiveness to environmental disruption.

The results demonstrate that internal advice-seeking enhances coordination flexibility, which subsequently supports business model innovation. This finding suggests that firms should invest in organizational mechanisms that strengthen cross-functional collaboration, communication quality, and knowledge integration. Practices such as cross-unit project teams, rotational

leadership assignments, internal innovation forums, knowledge-sharing platforms, and communities of practice can improve coordination flexibility and organizational adaptability. By strengthening internal collaboration capabilities, firms may improve their capacity to redesign value creation systems, implement strategic transformation, and adapt business models under changing market conditions.

The absence of a direct relationship between external advice-seeking and breakthrough innovation also carries important managerial implications. The findings suggest that access to external ideas, industry networks, and diverse knowledge sources does not automatically produce high-impact innovation outcomes. Firms should therefore complement external knowledge acquisition with strong internal integration mechanisms capable of interpreting, recombining, and applying external insights effectively. Developing absorptive capacity through interdisciplinary collaboration, organizational learning routines, managerial training, and internal knowledge integration systems may significantly improve firms' ability to transform external information into commercially valuable innovation.

Environmental dynamism further strengthens the importance of alignment across leadership, governance, and managerial capabilities. Firms operating in rapidly changing environments should prioritize flexible governance arrangements, adaptive resource allocation mechanisms, and continuous strategic monitoring processes. Establishing dynamic strategy review systems, real-time performance dashboards, agile decision-making structures, and rapid experimentation routines may help organizations respond more effectively to technological turbulence and competitive uncertainty. Organizations that maintain alignment among executive leadership, governance oversight, and managerial coordination capabilities are likely to demonstrate stronger adaptive capacity and innovation resilience under conditions of environmental instability.

For firms operating in emerging economies, where institutional volatility, technological disruption, and resource constraints are often more pronounced, the findings underscore the strategic importance of governance quality and managerial capability development. Policymakers and industry associations can support innovation performance by promoting director education programs focused on digital transformation, technological governance, and strategic innovation management. Strengthening corporate governance standards, encouraging board diversity in expertise, and facilitating cross-industry managerial learning networks may further enhance firms' capacity to engage in effective exploration and adaptive innovation.

In addition, government agencies and industry bodies may support organizational innovation by encouraging collaboration between firms, universities, technology centers, and innovation ecosystems. Such initiatives can strengthen managerial learning capabilities, improve knowledge diffusion, and facilitate strategic adaptation across industries. Particularly in emerging economies, institutional support mechanisms that enhance governance quality and managerial coordination capabilities may play an essential role in improving national innovation competitiveness and long-term economic resilience.

Overall, the findings suggest that firms seeking sustained innovation should move beyond viewing innovation solely as a technological or R&D challenge. Instead, organizations should recognize innovation as a governance and coordination challenge requiring alignment among executive cognition, board oversight, managerial interaction, and organizational flexibility. Firms capable of integrating these elements effectively are more likely to convert strategic exploration into breakthrough innovation and long-term competitive advantage.

LIMITATIONS AND FUTURE RESEARCH

Limitations

This study offers a multi-level explanation of how firms govern exploration and convert strategic risk-taking into breakthrough innovation and business model innovation. However, several limitations should be considered when interpreting the findings and identifying avenues for future research.

First, the empirical setting focuses on firms operating in Malaysia, an emerging economy characterized by rapid industrial upgrading and institutional transformation. Although this context provides a valuable setting for examining exploration governance under environmental dynamism, institutional structures, governance norms, and innovation ecosystems vary across countries. Future research could examine whether the relationships observed here generalize to advanced economies, transitional markets, or highly regulated institutional environments. Comparative cross-country studies may further clarify how institutional contexts shape governance alignment and innovation outcomes.

Second, the study relies partly on archival proxies to measure CEO overconfidence and innovation outcomes. While such measures are widely used and allow objective assessment, they may not fully capture the cognitive and behavioral dimensions of executive decision-making or the strategic novelty of innovations. Future research could complement archival indicators with

behavioral measures, experimental designs, or qualitative assessments to capture how executive cognition shapes exploration decisions in practice.

Third, although the study integrates multi-source data and employs lagged variables and robustness checks, the cross-sectional nature of the data limits strong causal inference. Exploration decisions and innovation outcomes unfold over time and may involve reciprocal relationships. Longitudinal studies could provide deeper insight into how governance alignment and managerial capabilities evolve and how exploration initiatives translate into innovation outcomes across different stages of organizational development.

Fourth, the absence of a direct relationship between external advice-seeking and breakthrough innovation suggests that knowledge access alone may be insufficient to generate high-impact innovation. Future research should investigate boundary conditions that shape the effectiveness of external knowledge acquisition, including absorptive capacity, technological depth, organizational learning processes, and knowledge integration mechanisms. Understanding when and how external networks contribute to radical innovation remains an important avenue for inquiry.

Fifth, the findings identify coordination flexibility as a critical mechanism enabling business model innovation, yet, the micro-processes through which coordination flexibility develops remain underexplored. Future research could examine how leadership practices, organizational structures, digital collaboration tools, and cultural norms influence the development of coordination flexibility and adaptive capacity.

Finally, the study conceptualizes governance alignment as a key mechanism enabling productive exploration, but governance arrangements are not static. Board composition, director expertise, and power dynamics evolve over time. Future research could investigate how governance alignment develops, how boards build innovation-relevant expertise, and how shifts in governance structures influence strategic adaptation.

Directions for future research

Building on these limitations, future research may advance understanding of exploration governance by:

- examining cross-national differences in governance alignment and innovation outcomes.
- integrating behavioral and qualitative approaches to capture executive cognition and decision processes.
- conducting longitudinal studies to track exploration and innovation trajectories over time.
- investigating boundary conditions shaping the effectiveness of external knowledge utilization.
- exploring organizational and technological mechanisms that enable coordination flexibility.
- examining how governance alignment evolves and influences strategic adaptation.

RECOMMENDATIONS

Based on the findings of this study, several recommendations emerge for executives, boards of directors, policymakers, industry associations, and professional development institutions seeking to strengthen innovation capacity and adaptive competitiveness in dynamic environments. These recommendations emphasize the importance of aligning leadership cognition, governance structures, and managerial coordination capabilities to support effective exploration and sustained innovation performance.

First, executives should align strategic boldness with structured decision-making processes. The findings suggest that executive confidence and strategic risk-taking can contribute positively to breakthrough innovation when supported by effective governance and evaluation mechanisms. Accordingly, organizational leaders should not suppress exploratory orientation or innovation-related risk-taking tendencies. Instead, firms should establish formal strategic review systems capable of evaluating exploratory initiatives systematically and objectively. Practices such as innovation review committees, staged investment approval processes, strategic risk assessment frameworks, and cross-functional evaluation teams can improve the quality of exploratory decision-making while reducing the likelihood of excessive commitment to poorly aligned initiatives. Structured governance processes may help organizations balance strategic experimentation with disciplined resource allocation.

Second, boards of directors should strengthen innovation-related expertise and strategic engagement. The results indicate that governance quality significantly influences the effectiveness of executive exploration and breakthrough innovation outcomes. Director recruitment and board development initiatives should therefore prioritize expertise in technological innovation, digital transformation, strategic adaptation, and emerging business models. Boards can further strengthen innovation governance by establishing dedicated innovation or technology oversight committees, conducting strategic foresight and scenario-planning sessions, and increasing director participation in long-term innovation strategy development. More active board engagement

in innovation governance may improve strategic alignment and enhance firms' ability to respond effectively to technological disruption and market uncertainty.

Third, organizations should strengthen internal coordination capabilities to support business model transformation and organizational adaptability. The findings demonstrate that coordination flexibility plays a central role in enabling business model innovation. Firms should therefore invest in organizational practices that facilitate cross-functional collaboration, knowledge integration, and adaptive coordination. Practices such as cross-unit project teams, rotational leadership assignments, collaborative digital platforms, interdisciplinary innovation initiatives, and internal knowledge-sharing networks can improve organizational flexibility and implementation effectiveness. Strengthening coordination flexibility may help firms redesign value creation systems, integrate emerging technologies, and implement strategic transformation more effectively under dynamic environmental conditions.

Fourth, firms should complement external knowledge acquisition with strong internal integration mechanisms. The findings suggest that access to external ideas and diverse knowledge sources alone does not automatically generate breakthrough innovation. Organizations should therefore focus not only on expanding external networks but also on strengthening internal absorptive capacity and knowledge integration capabilities. Interdisciplinary teams, structured knowledge-sharing routines, internal innovation forums, and collaborative learning systems can improve firms' ability to interpret, recombine, and apply external insights effectively. Developing stronger internal integration mechanisms may enable organizations to transform external knowledge into commercially valuable innovation outcomes more consistently.

Fifth, policymakers and industry associations should promote governance quality and managerial capability development to strengthen national innovation ecosystems. Public policy initiatives can support innovation performance by strengthening corporate governance standards, encouraging board diversity in expertise, and supporting director education programs focused on technological change, digital transformation, and strategic innovation management. Industry associations can further facilitate cross-industry knowledge exchange platforms, executive networking initiatives, and collaborative innovation ecosystems that allow firms to access diverse perspectives while simultaneously strengthening internal capabilities required for implementation and adaptation. Such institutional support mechanisms may be especially valuable in emerging economies characterized by institutional volatility and rapid technological change.

Sixth, professional development institutions and executive education providers should enhance leadership, governance, and coordination competencies. The findings indicate that adaptive innovation depends heavily on strategic decision-making quality, governance alignment, and managerial coordination capabilities. Executive education programs should therefore emphasize strategic leadership under uncertainty, governance literacy, innovation management, cross-functional collaboration, and organizational adaptability. Simulation-based learning, scenario-planning exercises, innovation leadership workshops, and interdisciplinary management training can help executives and managers develop the cognitive and collaborative capabilities necessary for effective exploration governance in dynamic environments.

Seventh, organizations should actively promote internal cultures that encourage collaboration, knowledge sharing, and strategic awareness. The effectiveness of exploratory initiatives depends not only on formal governance systems but also on organizational norms supporting coordination and learning. Firms should therefore encourage communication across organizational boundaries, strengthen internal transparency regarding innovation objectives, and develop collaborative environments that facilitate experimentation and knowledge exchange. Internal initiatives such as innovation communities, collaborative learning sessions, mentorship programs, and cross-departmental strategic forums may improve organizational readiness for transformation while strengthening the effectiveness of exploration and adaptation processes.

Finally, firms should recognize that innovation is fundamentally a governance and organizational coordination challenge rather than solely a technological or R&D issue. Organizations capable of aligning executive cognition, governance oversight, managerial interaction, and adaptive coordination mechanisms are more likely to convert strategic exploration into breakthrough innovation and long-term competitive advantage. Consequently, sustained innovation performance requires integrated organizational systems that simultaneously support strategic boldness, disciplined governance, and collaborative adaptability under conditions of uncertainty and environmental change.

CONCLUSIONS

This study examined how firms convert exploratory intent into breakthrough innovation and business model innovation (BMI) in dynamic environments by integrating perspectives from strategic leadership, corporate governance, organizational exploration, and dynamic managerial capabilities. Drawing on a multi-source dataset of 319 firms operating within Malaysia's

rapidly transforming economy, the findings demonstrate that transformative innovation does not emerge solely from executive boldness or organizational exploration intensity. Rather, innovation outcomes arise from the alignment of leadership cognition, governance structures, and managerial capabilities within what this study conceptualizes as a multi-level organizational exploration governance process.

The findings indicate that CEO overconfidence can function as a strategic catalyst that increases firms' willingness to engage in exploration and strategic experimentation. However, the innovative benefits of executive overconfidence depend critically on governance alignment. When boards possess both relevant expertise and structural power, they are better able to guide executive risk-taking toward productive exploratory initiatives and enhance breakthrough innovation outcomes. In the absence of such governance alignment, executive overconfidence does not translate into superior innovation performance. These findings reinforce the view that boards represent strategic governance resources capable of shaping the quality, direction, and effectiveness of exploratory decision-making rather than functioning solely as compliance-monitoring mechanisms.

At the managerial level, advice-seeking capabilities play an important role in shaping exploration breadth and implementation effectiveness. External advice-seeking expands managerial access to diverse knowledge sources, emerging trends, and novel perspectives, thereby increasing exposure to exploratory opportunities. However, the findings indicate that access to external knowledge alone may be insufficient to generate breakthrough innovation without complementary organizational integration capabilities. In contrast, internal advice-seeking strengthens coordination flexibility capabilities that enable firms to implement business model transformation effectively. Coordination flexibility therefore emerges as a critical adaptive capability that enables organizations to translate exploratory initiatives into business model innovation through knowledge integration, resource reconfiguration, and cross-functional alignment.

Environmental dynamism further strengthens these relationships by increasing uncertainty, accelerating technological change, shortening opportunity windows, and intensifying competitive volatility. Under such conditions, reliance on established routines and existing strategic assumptions becomes increasingly risky. Firms that effectively align leadership intent, governance guidance, and managerial coordination capabilities are therefore better positioned to transform uncertainty into strategic opportunity. The findings suggest that adaptive success in dynamic environments depends not only on organizational capabilities themselves but also on the degree of coordination and alignment across hierarchical organizational levels.

By conceptualizing exploration as a multi-stage governance process distributed across organizational levels, this study advances theory beyond traditional single-level explanations of innovation. The study deepens understanding of how executive cognition shapes strategic outcomes, clarifies the strategic role of boards in guiding exploratory innovation, and identifies managerial advice-seeking and coordination flexibility as important micro foundations supporting adaptive transformation. The integrative framework developed in this research helps reconcile fragmented findings across multiple theoretical streams and provides a more comprehensive explanation of how firms govern exploration and achieve sustained innovation under conditions of environmental dynamism.

The findings also offer practical insights for organizations seeking to strengthen innovation performance and adaptive competitiveness. Firms can improve innovation outcomes by cultivating strategically bold yet appropriately guided leadership, strengthening board expertise and strategic involvement, encouraging managerial knowledge-seeking behaviors, and investing in coordination flexibility capabilities. Policymakers, industry associations, and professional development institutions can further support these efforts through governance capability development programs, executive education initiatives, and policies that strengthen innovation ecosystems and cross-industry learning networks.

Despite these contributions, the study acknowledges several limitations related to contextual specificity, cross-sectional design, and measurement constraints. The empirical focus on firms operating within Malaysia may limit generalizability across institutional contexts characterized by different governance structures and innovation systems. In addition, the cross-sectional nature of the data restricts the ability to examine how exploration governance evolves over time. Future research may therefore benefit from longitudinal designs, comparative institutional analyses, and examination of digitally enabled governance systems that influence exploration and innovation processes in emerging technological environments.

In an era characterized by accelerating technological disruption, environmental uncertainty, and competitive volatility, firms face increasing pressure to innovate while simultaneously managing strategic risk. This research suggests that the ability to govern exploration effectively; through alignment among leadership boldness, governance oversight, and managerial coordination capabilities; determines whether firms merely respond to disruption or actively shape future competitive landscapes. Organizations capable of integrating these elements effectively are more likely to transform strategic risk-taking into breakthrough innovation, business model transformation, adaptive resilience, and sustained competitive advantage.

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