Addressing the loss of exploratory innovation: the roles of organizational foresight and strategic orientation

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Abstract

Purpose – This study aims to explore how to overcome and address the loss of exploratory innovation, thereby achieving greater success in exploratory innovation. This phenomenon of loss occurs when enterprises decrease their investment in and engagement with exploratory innovation, ultimately leading to an insufficient amount of such innovation efforts. Drawing on dynamic capabilities, this study investigates the relationship between organizational foresight and exploratory innovation and examines the moderating role of breakthrough orientation/financial orientation.

Design/methodology/approach – This study used survey data collected from 296 Chinese high-tech companies in multiple industries and sectors.

Findings – The evidence produced by this study reveals that three elements of organizational foresight (i.e. environmental scanning capabilities, strategic selection capabilities and integrating capabilities) positively influence exploratory innovation. Furthermore, this positive effect is strengthened in the context of a high-breakthrough orientation. Moreover, the relationships among environmental scanning capabilities, strategic selection capabilities and exploratory innovation become weaker as an enterprise's financial orientation increases, whereas a strong financial orientation does not affect the relationship between integrating capabilities and exploratory innovation.

Research limitations/implications – Ambidexterity is key to successful enterprise innovation. Compared with exploitative innovation, it is by no means easy to engage in exploratory innovation, which is especially important in high-tech companies. While the loss of exploratory innovation has been observed, few empirical studies have explored ways to promote exploratory innovation more effectively. A key research implication of this study pertains to the role of organizational foresight in the improvement of exploratory innovation in the context of high-tech companies.

Originality/value – This paper contributes to the broader literature on exploratory innovation and organizational foresight and provides practical guidance for high-tech companies regarding ways of avoiding the loss of exploratory innovation and becoming more successful at exploratory innovation.

Keywords Exploratory innovation, Loss of exploratory innovation, Organizational foresight, Breakthrough orientation, Financial orientation, High-tech companies

Paper type Research paper

1. Introduction

The current business environment is technologically oriented, and the associated market demand is highly dynamic, a situation that poses various challenges for the prosperity or even survival of enterprises. To address these business challenges, Google has implemented a strategy of encouraging its engineers to allocate 20% of their time to cutting-edge and innovative projects, and this strategy has proven to be highly successful in the commercial market (Chen, 2017). This situation highlights the importance of enterprises' ability not only to use exploitative innovation to refine their existing knowledge, update their current products and consolidate existing markets but also to use exploratory innovation to develop new products, explore new markets and design new operational processes (He and Wong, 2004; Lavie *et al.*, 2010; March, 1991). Thus, the literature on innovation and strategic management has noted that a simultaneous and balanced focus on exploration innovation and exploitation innovation is necessary for enterprises (Andriopoulos and Lewis, 2009; O'Reilly and Binns, 2019; Randall *et al.*, 2017).

However, the reality is that many enterprises (e.g. IBM, Kodak and Nokia) are more skilled at exploiting existing technologies and markets and often struggle to engage in exploratory innovation (Christensen, 2013; Hill and Birkinshaw, 2012; Shibata *et al.*, 2022). Even if well-managed, large and mature enterprises often succeed in exploitation innovation, they fail at exploration innovation (Birkinshaw and Gupta, 2013; Chen, 2017; March, 1991). An important root cause of this dilemma is

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that exploratory innovation and exploitative innovation follow different managerial logics, and enterprises are not aware of the need to deploy different management practices in this context (Chen, 2017; O'Reilly and Binns, 2019). Exploratory innovation often extends beyond the existing market, and the process of such innovation is complicated and fuzzy; accordingly, it is difficult for this process to generate direct benefits (Gama *et al.*, 2022; Lavie *et al.*, 2010; March, 1991). As a result, because of their successful experience and previously established routines, enterprises tend to underestimate the necessity of exploratory innovation at the planning stage and focus solely on exploitative innovation (Andriopoulos and Lewis, 2009; Atuahene-Gima, 2005; Shibata *et al.*, 2022). This shift redirects attention from exploration to exploitation, which weakens investment and engagement in exploratory innovation during initial planning. Thus, we introduce the following term: "the loss of exploratory innovation" (Randall *et al.*, 2017). This deficiency stems from the disruption of the initial balance between exploration and exploitation, leading to insufficient exploratory innovation (Randall *et al.*, 2017; Zhu *et al.*, 2021). While earlier literature highlights the crucial significance of simultaneous development in exploration and exploitation (Ju and Elliott, 2023; Lavie *et al.*, 2010; O'Reilly and Tushman, 2008), the prominent manifestation of the loss of exploratory innovation in practice implies a shift in focus – prioritizing the prevention of such loss to more effectively boost exploratory innovation in an ex ante view. This suggests that researchers should scrutinize these terms with fresh perspectives, shifting from the traditional ambidexterity to an independent investigation aimed at preventing the loss of exploratory innovation and achieving greater success in exploratory innovation. Notably, high-tech companies are technology- or knowledge-based and are characterized by heavier research and development (R&D) investments, a shorter span of product lifecycles and more uncertainty in terms of market demand (Abbate *et al.*, 2021; Duan *et al.*, 2021; Qian and Li, 2003), which results in such companies facing a greater risk of the loss of exploratory innovation (Randall *et al.*, 2017). As a result, it is crucial to place increased emphasis on how high-tech enterprises can avoid such losses and attain higher success in exploratory innovation.

Research on dynamic capabilities suggests that enterprises can promote exploratory innovation by integrating, constructing and reconfiguring both internal and external resources (Constant *et al.*, 2020; O'Reilly and Tushman, 2008; Teece *et al.*, 1997). These capabilities enable organizations to gain a competitive advantage, which requires enterprises not only to create and adapt methods of innovation and operation but also to perceive and predict future directions (Teece *et al.*, 1997). Additionally, research on disruptive innovation claims that incumbents struggle to sustain their development along the trajectory outlined by disruptive technologies because directedness toward the mainstream market limits their investments in innovation (Christensen, 2013; Hynes and Elwell, 2016). This situation, in turn, makes it difficult for enterprises to predict the future potential value of the market and to cope with structural disadvantages. Existing studies suggest that incumbents can regain innovation advantages by strengthening their continuous perception and by proactively anticipating and capturing disruptive technology trajectories (Christensen *et al.*, 2018; Petzold *et al.*, 2019). Researchers argued that organizational foresight refers to a set of capabilities that can help raise awareness of an enterprise's future, detect weak signals and formulate actions (Paliokaitė and Pačėsa, 2015; Rohrbeck and Schwarz, 2013; Schwarz *et al.*, 2020). By forecasting and scanning future trends, organizational foresight helps enterprises capture more opportunities and minimize risks in ambiguous and uncertain environments (Gordon *et al.*, 2020; Marinković *et al.*, 2022; Rohrbeck *et al.*, 2015). However, the subsequent literature on organizational foresight lacked rich insights into how exactly this factor impacts exploratory innovation. More specifically, quantitative research on the role of organizational foresight in enterprises' ability to perceive future opportunities or risks and enhance their competitiveness with the aim of reducing losses and promoting exploratory innovation has received little attention in the literature. Moreover, high-tech companies face greater challenges as technology is updated more quickly and their existing knowledge thus rapidly becomes obsolete (Hernandez *et al.*, 2010). Therefore, high-tech companies increasingly rely on the use of organizational foresight to make strategic decisions regarding their future competitiveness (Andriopoulos and Gotsi, 2006; Gordon *et al.*, 2020). Insights drawn from the literature regarding the use of organizational foresight to enhance exploratory innovation in high-tech companies remain insufficiently conclusive. Therefore, we require a better understanding of the impact of organizational foresight on exploratory innovation in the context of high-tech companies.

Organizational foresight is expected to be a key factor in the success of exploratory innovation. However, this claim may not be valid in all cases. Taking Kodak as an example, although Kodak anticipated the decline of the traditional film business and explored new markets in medical care, optics, audio-visual equipment, IT and other technical fields, most new businesses failed because of a lack of persistence (Shibata *et al.*, 2022). Another example is Siemens, which found it necessary to abandon its ingrained beliefs to reverse the continued decline in its market share in the molecular imaging market. Siemens has been rethinking the direction of its future development as well as quickly scanning and iterating new ideas, subsequently changing its R&D process. Currently, Siemens' E.CAM platform dominates 80% of the molecular imaging market (Appleyard *et al.*, 2020), a success that has been attributed to the enterprise's capacity to use organizational foresight. The divergent results obtained by Kodak and Siemens highlighted the fact that the impact of organizational foresight on exploratory innovation is not yet fully understood. As a result, Gordon *et al.* (2020) called for more research to identify the boundary conditions that could impact the relationship between organizational foresight and exploratory innovation. In this respect, competitive advantage theory emphasizes the need for enterprises to define a corresponding strategic orientation in their pursuit of outstanding performance with regard to new technologies (Morgan and Strong, 2003; Tutar *et al.*, 2015). Therefore, the notion of strategic orientation provides a theoretical explanation of why organizations that have similar resources or face similar situations nevertheless exhibit different levels of innovation performance and occupy different competitive positions (Covin and Lumpkin, 2011; Jaworski and Kohli, 1993). Strategic orientation reflects the strategies used by enterprises to achieve superior business

performance (Sainio *et al.*, 2012). Different types of strategic orientation influence the competitive direction of enterprises (Kortmann, 2015; Tutar *et al.*, 2015; Wales *et al.*, 2020). According to the paradox of ambidexterity, strategic orientation can be divided into breakthrough orientation and financial orientation (Andriopoulos and Lewis, 2009), which influence the nature and direction of exploratory innovation (Gurtner and Reinhardt, 2016). Although scholars have confirmed that the interaction between breakthrough and financial orientation represents a positive factor for idea generation (Andriopoulos and Lewis, 2009), they have given relatively little attention to the inconsistency of the independent impacts of these factors on exploratory innovation. Specifically, previous research has not provided a clear answer regarding the role of breakthroughs and financial orientations in the relationship between organizational foresight and exploratory innovation in the context of high-tech companies. Therefore, we need a more detailed and comprehensive understanding of which types of orientation are most conducive to fostering exploratory innovation through organizational foresight.

To address these gaps, the present paper focuses on two research questions. First, we investigate the ways in which organizational foresight affects exploratory innovation in the context of high-tech companies. Second, with regard to high-tech companies, we focus on the ways in which breakthrough orientation and financial orientation influence the relationship between organizational foresight and exploratory innovation. By collecting data from a survey of 296 Chinese high-tech companies to answer these questions, we provide substantive insights into the ways in which organizational foresight can be made more effective at reducing losses and promoting exploratory innovation. The results highlight the importance of addressing the loss of exploratory innovation by responding to the call for more research to specify the conditions in which organizational foresight boosts exploratory innovation (Gordon *et al.*, 2020; Paliokaitė and Pačėsa, 2015). Moreover, these results provide an incentive for managers, particularly those working in high-tech companies, to use exploratory innovation effectively in a complex and volatile business environment. Finally, we discuss the limitations of this study and offer suggestions for future research.

2. Literature review and theoretical background

2.1 Exploratory innovation

To meet the challenge entailed by disruptive change and achieve sustainable growth, enterprises must excel at both exploitation and exploration (O'Reilly and Tushman, 2008). In the context of exploitation, enterprises focus on refining, enhancing and extending existing technologies and processes to meet the needs of the existing market (Lavie *et al.*, 2010; March, 1991). Conversely, in the case of exploration, enterprises engage in experimentation, search and discovery with the aim of creating new competences that enable them to adapt to external changes and meet the needs of emerging markets (Lavie *et al.*, 2010; March, 1991). In this context, it is necessary to orchestrate and balance exploration and exploitation simultaneously (Gibson and Birkinshaw, 2004; Gupta *et al.*, 2006; He and Wong, 2004). In fact, if an enterprise is willing to engage in exploration, this situation can have a negative impact on the enterprise's profitability; in contrast, if the enterprise tends to engage in exploitation, it can ignore the development of new business growth, which is not conducive to long-term competition (Atuahene-Gima, 2005). Therefore, balancing and coordinating exploitation and exploration with the goal of achieving ambidexterity is key for enterprises to improve their performance with regard to technological innovation (Gibson and Birkinshaw, 2004; Lavie *et al.*, 2010; O'Reilly and Tushman, 2013). Because exploitation and exploration follow different logics and call for different management practices, a key question pertains to the ways in which high levels of exploitation and exploration can be achieved simultaneously, which is necessary to ensure the long-term survival or prosperity of the enterprise. Previous research has developed and distinguished four types of ambidextrous organizations that can enable organizations to implement exploration and exploitation simultaneously while avoiding tension or conflict. These types include sequential ambidexterity (Turner *et al.*, 2013), structural ambidexterity (Tushman and O'Reilly, 1996), contextual ambidexterity (O'Reilly and Tushman, 2013) and managerial ambidexterity (Mom *et al.*, 2009).

Previous studies have provided theoretical insights into the harmonious development of exploration and exploitation; however, the reality is that enterprises excel at exploitation innovation and often fail to engage in exploration innovation (Gupta *et al.*, 2006; Randall *et al.*, 2017; Shibata *et al.*, 2022; Zhu *et al.*, 2021). For example, Randall *et al.* (2017) found that while enterprises are willing to balance exploratory and exploitative innovation projects during the planning phase, approximately 20% of enterprises' time and manpower are ultimately reallocated from exploration to exploitative innovation projects during the development phase. This phenomenon has been receiving increasing attention from scholars and academics (Randall *et al.*, 2017; Shibata *et al.*, 2022; Zhu *et al.*, 2021). To explain this phenomenon, we coin the following term: "the loss of exploratory innovation." This concept refers to a deviation from the originally planned proportion of exploration, which indicates an inadequate investment and engagement in exploratory innovation (including manpower, timeline, finance, etc.), ultimately leading to an insufficient amount of exploratory innovation (Randall *et al.*, 2017; Zhu *et al.*, 2021). This bias compromises the long-term interests of enterprises, causing them to fall into the "success trap" and impeding their sustained survival in turbulent market environments. The causes of this phenomenon are multifaceted. First, the benefits of exploratory innovation are long-term and uncertain (March, 1991), and investment in exploratory innovation may even cannibalize existing businesses (O'Reilly and Binns, 2019). When enterprises obtain access to beneficial processes and resources through exploitative innovation, they tend to avoid pursuing high-risk exploratory innovation projects, even if they have ample resources at their disposal (Shi *et al.*, 2020). Therefore, to mitigate risks, enterprises tend to impose mature, short-term performance criteria on exploratory innovation while investing resources in exploitative innovation to ensure reliable revenues and profits (O'Reilly and Binns, 2019). This cautious strategy has resulted in the failure of exploratory innovation (Chen, 2017). Second, research on integration mechanisms has shown that both formal and informal integration are key to

overcoming the exploration–exploitation paradox; however, such integration may lead to higher risks of cross-contamination, thereby limiting the development of exploration (Hansen *et al.*, 2019). Third, although enterprises have made strategic preparations for exploratory innovation in the planning phase, the relevant agents (such as sales staff) focus on enhancing their short-term individual compensation, which is incompatible with the enterprises' principal goal and leads to the emergence of opportunistic behavior (Randall *et al.*, 2017). Consequently, the rates of exploratory innovation exhibited by such enterprises decrease significantly (Randall *et al.*, 2017). Moreover, in the context of high-tech companies, the pursuit of new businesses or new ways of doing business in a situation of continuously changing demand and supply with regard to new technological solutions increases the risk of exploratory innovation failure (Bosch-Sijtsema and Bosch, 2015; Qian and Li, 2003).

Insufficient cultivation and utilization of exploration result in the loss of exploratory innovation, which hampers the sustained advancement of enterprises. However, the existing research provides only limited formal guidance on minimizing losses and enhancing exploratory innovation. Given the current prominence of the loss of exploratory innovation as a pivotal constraint on enterprise development, a shift in focus from the traditional emphasis on balancing exploration–exploitation to conducting an independent investigation into exploratory innovation becomes imperative. In other words, our focal point is on enhancing exploratory innovation to prevent the erosion of business competitiveness resulting from the loss of exploratory innovation. We believe that this represents a crucial yet previously neglected area in technology management and industrial marketing research. Its objective is to explore how current enterprises can enhance exploratory innovation effectively when facing challenges associated with the loss of exploratory innovation, thereby laying the preliminary groundwork and guidance for further advancing research in this realm.

2.2 Organizational foresight based on dynamic capabilities

According to dynamic capabilities theory, enterprises can gain a competitive advantage by focusing on sensing, seizing and transforming business opportunities, as well as rapidly bringing new products to market by constructing core capabilities (Teece, 2007; Teece *et al.*, 1997). This approach enables them to respond quickly to changing environments and gain a competitive edge. Organizational foresight involves a crucial set of capabilities that organizations must possess to sense and predict future events, seize potential opportunities to enhance their competitive advantage and reconfigure capabilities to use opportunities fully and deal with anticipated changes in the environment (Paliokaitė and Pačėsa, 2015; Schwarz *et al.*, 2020; Teece, 2007; Teece *et al.*, 1997). This notion refers to the search for technological opportunities and market perspectives that lie outside enterprises' existing field of business through the use of forward-looking reading, observation, perception and prediction of the future (Paliokaitė and Pačėsa, 2015; Rohrbeck *et al.*, 2015; Slaughter, 1997). Thus, organizational foresight has been viewed as a strategic practice that can lay the foundation for enterprises' perception of the future direction and implementation of key decisions in an uncertain environment (Adegbile *et al.*, 2017; Paliokaitė and Pačėsa, 2015; Paliokaitė *et al.*, 2014; Rohrbeck and Schwarz, 2013; Schwarz *et al.*, 2020). Research on organizational foresight has been based on the assumption that enterprises' strategic decisions are not guided solely by past experience; they also require consciously anticipating future tendencies (Day and Schoemaker, 2005) to promote organizational change or strategic updating (Paliokaitė and Pačėsa, 2015). Hence, organizational foresight is crucial with regard to enterprises' ability to access key resources and reduce risks and uncertainties (Rohrbeck *et al.*, 2015), and it is a key prerequisite for enterprises' ability to enhance their competitive advantages (Gordon *et al.*, 2020; Marinković *et al.*, 2022). Table 1 summarizes a representative review of research on organizational foresight.

Table 1 summarizes the key themes and characteristics of organizational foresight studies, encompassing research subject content, methodologies and research levels. The initial focus is on the subject matter of organizational foresight. Based on Table 1, we observe that the research on organizational foresight has evolved from early explorations of the underlying concept and its characteristics (e Cunha *et al.*, 2006; Ruff, 2006) to investigations of how such foresight can improve organizational competitiveness. These benefits include, but are not limited to, reducing uncertainty (Vecchiato and Roveda, 2010), attaining first-mover advantages (Vecchiato, 2015), improving innovation capability (Rohrbeck and Gemünden, 2011) and enhancing innovation performance (Adegbile *et al.*, 2017; Paliokaitė and Pačėsa, 2015). However, for many enterprises, using organizational foresight to engage in exploratory innovation that is characterized by experimentation and searching remains challenging. Despite its potential to serve as a remedy for minimizing losses and enhancing exploratory innovation, a thorough understanding of the impact of organizational foresight remains nascent.

Furthermore, the existing literature on organizational foresight research tends to rely primarily on case studies or anecdotal evidence (Heger and Rohrbeck, 2012; Rohrbeck and Gemünden, 2011; Rohrbeck and Schwarz, 2013; Vecchiato and Roveda, 2010), and quantitative research has often been overlooked. Although Paliokaitė and Pačėsa (2015) developed a scale for measuring organizational foresight and established its relationships with both exploratory and exploitative innovation, quantitative research on organizational foresight has remained limited to a few publications. The insights derived from case studies or anecdotal evidence cannot be considered substantively rigorous. Gaining a more comprehensive understanding of this crucial and underexplored quantitative domain of organizational foresight is imperative for effectively steering the development of exploratory innovation.

In addition, the previous studies listed in Table 1 investigated the role of organizational or strategic foresight in innovation based on individual or collective cognition (Day and Schoemaker, 2008) or organizational attributes (Paliokaitė and Pačėsa, 2015) and at the network level (Heger and Rohrbeck, 2012). Most previous research focused on examining the impact of organizational foresight on innovation in terms of organizational attributes, such as by reference to manufacturing companies (Yoon *et al.*, 2018) and multinational corporations (Rohrbeck and Schwarz, 2013), as well as specifically in the

Table 1 Representative research on organizational foresight

Type of research	Research level	Key insights pertaining to organizational foresight	Selected studies
Conceptual research	Individual or collective cognition level	The manner of embedding foresight into individual practices The key attributes of foresight used by leaders to achieve success	Slaughter (1997); Day and Schoemaker (2008)
	Organizational level	The origin, concept, evolution and characteristics of organizational foresight The roles of organizational foresight include gaining first-mover advantages, absorbing knowledge, enhancing innovation capabilities and addressing environmental uncertainty Investigation of the initial conditions, internal mechanisms, boundary conditions and outputs of organizational foresight	Day and Schoemaker (2005); e Cunha *et al.* (2006); Vecchiato (2015); Adegbile *et al.* (2017); Gordon *et al.* (2020); Marinković *et al.* (2022)
	Multilevel	Evolutionary path of organizational foresight A spectrum of advantages of organizational foresight for enterprises includes the enhancement of organizational perceptual, interpretive, responsive and adaptive capacities, as well as the promotion of organizational learning capacity Assessing the inherent value of organizational foresight at the levels of individuals, organizations, collectives and networks	Rohrbeck and Schwarz (2013); Rohrbeck *et al.* (2015)
Case study	Organizational level	Core attributes and dimensions of organizational foresight in specific industry contexts Driving factors of organizational foresight Roles and essential elements for initiating organizational foresight within enterprises	Ruff (2006); Vecchiato and Roveda (2010); Rohrbeck and Gemünden (2011); Haarhaus and Liening (2020)
	Network level	The role and mechanism of organizational foresight within the network context	Heger and Rohrbeck (2012)
Quantitative research	Individual or collective cognition level	Empirical testing of the positive impact of team foresight on product development speed and new product success	Açıkgöz *et al.* (2016)
	Organizational level	Developing the measurement scale for organizational foresight Empirical testing of the positive effects of organizational foresight on organizational ambidexterity, innovation performance and dynamic capabilities, as well as an examination of the mediating and moderating effects within corresponding conceptual frameworks	Amniattalab and Ansari (2015); Paliokaitė and Pačėsa (2015); Açıkgöz *et al.* (2016); Haarhaus and Liening (2020)
	Multilevel	Empirical testing of the positive impact of organizational-level foresight practices on individual-level foresight	Schwarz *et al.* (2020)

Source: Authors' own work

multinational automotive (Ruff, 2006) and telecommunications industries (Heger and Rohrbeck, 2012). Our study focuses on technology-based high-tech companies, which, although crucial, have received insufficient attention with regard to research on the use of organizational foresight to develop new products or services in the context of a shorter product lifecycle and higher R&D investments (Qian and Li, 2003).

Previous research has shown that organizational foresight consists of different dimensions (Haarhaus and Liening, 2020; Paliokaitė and Pačėsa, 2015; Rohrbeck and Gemünden, 2011). We build upon the conceptual model proposed by Paliokaitė and Pačėsa (2015), which posits that organizational foresight consists of three dimensions: environmental scanning capabilities, strategic selection capabilities and integrating capabilities. We selected this classification for three reasons. First, Paliokaitė and Pačėsa (2015) conceptualized organizational foresight as a capability, and the capability model is more appropriate for studying the organizational attribute of foresight (Paliokaitė and Pačėsa, 2015). As the core aim of this study is to explore the extent to which organizational foresight can reduce losses and promote exploratory innovation, which is an attribute of the organization, this classification is more suitable. Second, environmental scanning capabilities, strategic selection capabilities and integration capabilities emphasize the ways in which organizations sense potential opportunities and use internal resources and competencies to match and leverage external opportunities, ultimately transforming them into internal drivers of competitiveness. This classification of organizational foresight is in line with the central tenets of dynamic capability, which focus on using the "sensing–seizing–transforming" framework to create value (Teece, 2007). Therefore, this classification is well aligned with the dynamic capability theory on which we rely. Third, Paliokaitė and Pačėsa (2015) made outstanding contributions to the quantitative study of organizational foresight, and the measurement scale for the three dimensions of organizational foresight has been well validated and widely accepted by scholars (Adegbile *et al.*, 2017; Haarhaus and Liening, 2020). This classification provides a solid foundation for our empirical tests.

With regard to the three dimensions of organizational foresight identified by Paliokaitė and Pačėsa (2015), environmental scanning capabilities refer to learning activities that identify weak signals and provide valuable knowledge or

resources to organizations (Paliokaitė and Pačėsa, 2015; Rohrbeck and Schwarz, 2013). To avoid the inherent blindness with regard to organizational survival that results from the overutilization of past experience (Rohrbeck and Schwarz, 2013), enterprises must constantly use their environmental scanning capabilities to identify and interpret external or interdisciplinary information and respond to changes in emerging technologies and markets in a timely manner (Haarhaus and Liening, 2020). Strategic selection capabilities refer to enterprises' selective internalization of external resources to determine their preferred plans for change and to shape innovation opportunities (Paliokaitė and Pačėsa, 2015). Therefore, collecting and filtering meaningful and valuable knowledge from disordered information is key to achieving a match between internal strategy and external knowledge. Integrating capabilities entail the absorption and extraction of external knowledge (Rohrbeck and Gemünden, 2011), which are crucial for enterprises to create value and obtain competitive advantages. Simultaneously, the role of integrating capabilities depends not only on the enterprise's understanding of the external environment but also on efficient knowledge transfer within or between enterprises (Zahra and George, 2002). This capability allows managers to integrate resources pertaining to strategies, the climate and various stakeholders with the aim of enhancing innovation.

2.3 Role of strategic orientation

Competitive advantage theory shows that a key factor in enterprises' pursuit, achievement and maintenance of competitive advantage is the careful analysis of internal resources and market dynamics to shape their strategic orientation (Morgan and Strong, 2003; Tutar *et al.*, 2015). Strategic orientation is intended to create greater value for the organization by establishing the relevant structure, process and cultural activities in a manner that is aligned with expectations with the aim of reducing costs and ensuring superior business performance (Gatignon and Xuereb, 1997; Noble *et al.*, 2002). As a perspective on organizational observation and decision-making, strategic orientation answers the question of why organizations that face identical or similar situations nevertheless occupy different competitive positions (Covin and Lumpkin, 2011; Jaworski and Kohli, 1993). Therefore, strategic orientation provides insights that allow enterprises to improve their exploratory innovation. Because of the different approaches used to measure competitive advantage, there are different categories of strategic orientation, such as technological orientation (Gatignon and Xuereb, 1997), market orientation (Jaworski and Kohli, 1993), entrepreneurial orientation (Covin and Lumpkin, 2011), learning orientation (Gatignon and Xuereb, 1997), interaction orientation (Ambroise *et al.*, 2020) and cost orientation (Kortmann, 2015). Based on the paradox of ambidexterity, it is necessary to create a strategic vision that includes both a breakthrough orientation that emphasizes uncovering new opportunities and a financial orientation that focuses on the current benefits and costs of the market (Andriopoulos and Lewis, 2009; Gurtner and Reinhardt, 2016). The former orientation encourages enterprises to attain competitive advantages in a radical or discontinuous way, while the latter orientation pays more attention to enterprises' current income, profit and cost indicators in the decision-making related to innovation as well as the resulting implementation of innovation (Andriopoulos and Lewis, 2009; Gurtner and Reinhardt, 2016; Smith and Lewis, 2011). Although the literature has claimed that the interaction between breakthrough and financial orientation is key to stimulating ambidextrous idea generation and developing innovative ambidexterity (Kortmann, 2015), little is known regarding the ways in which these two types of orientation mitigate the loss of exploratory innovation independently. In addition, strategic orientation influences the direction and scope of organizational foresight (Chou and Yang, 2011; Feng *et al.*, 2020), thus raising the question of which orientation is most conducive to fostering exploratory innovation through organizational foresight. The scant explanations of this topic that have previously been provided highlight our incomplete understanding of the ways in which the exploratory innovation mechanism can lead to success. Therefore, in this research, we hope to identify breakthrough and financial orientation as boundary conditions that can explain why some enterprises exhibit successful exploratory innovation through organizational foresight while others do not.

3. Hypothesis development

3.1 Organizational foresight and exploratory innovation

One reason for the loss of exploratory innovation is that enterprises depend excessively on their prior successful experience and are unable to react to changes in a timely manner because of continuous changes in demand (Lavie *et al.*, 2010), which are more prominent in high-tech companies. Enterprises can use their environmental scanning capabilities to identify early signs of user demand preferences and technological solutions in a rapidly changing environment (Rohrbeck and Schwarz, 2013). Previous research has shown that the market demand for exploratory innovation is dynamic and heterogeneous, which requires enterprises to continually acquire new technical skills and market knowledge and involve potential stakeholders (Birkinshaw and Gupta, 2013; March, 1991; O'Reilly and Tushman, 2013). Enterprises with superior environmental scanning capabilities are better positioned to gather information that can provide ideas that can promote potential exploratory innovation and allow the enterprise to avoid engaging in short-sighted innovation behaviors (Adegbile *et al.*, 2017; Rohrbeck and Schwarz, 2013). Another valuable result of environmental scanning is that the constant search for external information makes enterprises' decisions more rational (Haarhaus and Liening, 2020; Paliokaitė and Pačėsa, 2015). Particularly for high-tech companies, whose technological prospects are uncertain, effective environmental scanning can not only reduce the risks of asymmetrical information but also offer future possibilities for the development of exploratory innovation (Rohrbeck *et al.*, 2015; Rohrbeck and Schwarz, 2013). Offering these possibilities can help enterprises identify the gap between their current state and their future objectives, thus enabling them to make strategic decisions in a rational manner (Haarhaus and Liening, 2020). Finally, scanning and monitoring competitors are also important ways in which enterprises can improve their competitiveness (Rohrbeck and Gemünden, 2011). The ongoing and in-depth scanning of competitors can help enterprises react quickly to changes and

reduce the ambiguity of the innovation process. Therefore, we formulate the following hypothesis:

H1. Environmental scanning capabilities positively impact exploratory innovation.

Relying solely on perceived change is not sufficient to mitigate the loss of exploratory innovation; enterprises also adapt to change proactively by using their strategic selection capabilities (Rohrbeck and Schwarz, 2013). Strategic selection capabilities for filtering and reconstructing scanned information are paramount for enterprises' ability to remain competitive (Paliokaitė and Pačėsa, 2015). In fact, not all external information is relevant to innovation, and the inflow of large amounts of information makes the innovation decisions of enterprises more complex (Gama *et al.*, 2022). Strategic selection capabilities can reveal meaningful signals within disorderly information and provide key support for matching external knowledge with internal innovation strategies. Meanwhile, strategic selection determines which external resources are internalized (Marinković *et al.*, 2022; Rohrbeck *et al.*, 2015). If the external resources that are internalized through such selection match the enterprise's long-term plan or radical project area, they can help stimulate the development of exploratory innovation (O'Reilly and Binns, 2019). In addition, effective strategic selection depends on the enterprise's sensitivity and reactivity to future development opportunities or threats (Day and Schoemaker, 2006). Thus, the effective interpretation, combination and reorganization of key external information such as technology trends, potential customers and business models can help enterprises improve their understanding of when to use external knowledge and how to formulate strategic priorities (Paliokaitė and Pačėsa, 2015). As a result, this capacity reduces the costs that enterprises incur by internalizing too early or too late, particularly with respect to the rapid rates of change in demand and supply associated with new technological solutions in high-tech companies (Duan *et al.*, 2021). Therefore, we formulate the following hypothesis:

H2. Strategic selection capabilities positively impact exploratory innovation.

The inability to integrate business resources effectively is one reason for the loss of exploratory innovation, and previous studies have found a positive relationship between absorptive capacity and exploratory innovation (Cohen and Levinthal, 1990; Enkel *et al.*, 2017; Lavie *et al.*, 2010; Rothaermel and Alexandre, 2008). We expect integrating capabilities to help enterprises address losses and promote exploratory innovation in high-tech companies. First, enterprises that commit to the task of reducing the loss of exploratory innovation must overcome their excessive dependence on existing resources (O'Reilly and Tushman, 2013), which is particularly urgent in the area of technology and in knowledge-based high-tech companies (Duan *et al.*, 2021). The integration of external knowledge allows enterprises to expand the breadth and depth of their knowledge base, provide a knowledge base to support exploratory innovation and reduce resistance to the discontinuity entailed by innovation and change. Second, reconfiguring knowledge using such integrating capabilities is beneficial for improving employee understanding and identifying innovation (Paliokaitė *et al.*, 2014). For example, Delphi and hackathons can be helpful by enabling managers to gather and share various opinions and insights from employees (Haarhaus and Liening, 2020). Such integration leads to an increase in organizational learning capacity (Zahra and George, 2002), which helps enterprises prepare for the development of innovation. Third, successful exploratory innovation requires not only that the R&D team be proficient in domain-specific knowledge but also that the members of the team effectively understand and use procedural knowledge such as knowledge pertaining to subsystems, process innovation and niche markets (Nordqvist and Frishammar, 2019). The effective integration and reconstruction of various types of knowledge, ranging from externally searched to internally inherent, allows enterprises to navigate innovative development in a dynamic competitive environment efficiently. Therefore, we formulate the following hypothesis:

H3. Integrating capabilities positively impact exploratory innovation.

3.2 Moderating roles of breakthrough orientation and financial orientation

A strong breakthrough orientation is a fundamental prerequisite for innovative organizations (Sainio *et al.*, 2012), a rule to which high-tech companies are no exception. Breakthrough orientation creates a new knowledge base in a radical, proactive and adventurous manner (Gurtner and Reinhardt, 2016), thus enabling enterprises to anticipate new technologies and enhance their market positions. First, if an enterprise has a strong breakthrough orientation, it pays more attention to the task of seeking rare potential technology opportunities that have not been explored in its industry than to that of scanning existing competitors and the current market (Gurtner and Reinhardt, 2016). This focus motivates enterprises to capitalize on emerging opportunities more quickly than their competitors and shapes their expectations to feature a strong focus on technology dynamics, thereby providing a strategic basis for enterprises to develop exploratory innovation. Second, the stronger an enterprise's breakthrough orientation is, the more it focuses on novel knowledge outside its existing market (Andriopoulos and Lewis, 2009), thus forcing enterprises to invest more effort into the tasks of filtering and evaluating opportunity-led ideation beyond their existing knowledge base (Seo and Park, 2022). In this case, the analysis and selection of new information broadens the scope of the enterprise's knowledge of customer expectations or new entrants to the market (Sainio *et al.*, 2012). Therefore, a breakthrough orientation offers unique advantages with respect to a deeper assessment and understanding of the market potential of new products, thereby helping enterprises make deliberate plans for exploratory innovation. Third, the weaker the enterprise's breakthrough orientation is, the more it relies on the integration of its existing knowledge base and the less willing it is to incorporate new knowledge into product design (Cohen and Levinthal, 1990; Jansen *et al.*, 2009), which is not conducive to exploratory innovation. In contrast, enterprises with a stronger breakthrough orientation are more likely to absorb and integrate novel knowledge, thereby improving their learning capacity (Zahra and George, 2002) and motivating

them to develop disruptive ideas that contradict established industry or organizational logic (Chou and Yang, 2011). This approach helps enterprises increase the likelihood of developing new products that meet customers' hidden needs and thus ensure long-term competitiveness. In summary, enterprises with a stronger breakthrough orientation are more likely to predict radical or discontinuous technological trends and market demand, which drives them to pursue more prospects aimed at exploratory innovation. Thus, an enterprise's breakthrough orientation is an important boundary condition for the improvement of its exploratory innovation. Therefore, we formulate the following hypotheses:

H4a. The stronger an enterprise's breakthrough orientation is, the stronger the positive relationship between environmental scanning capabilities and exploratory innovation.

H4b. The stronger an enterprise's breakthrough orientation is, the stronger the positive relationship between strategic selection capabilities and exploratory innovation.

H4c. The stronger an enterprise's breakthrough orientation is, the stronger the positive relationship between integrating capabilities and exploratory innovation.

Unlike a breakthrough orientation, a financial orientation concentrates on the immediate benefits offered by new products (Kortmann, 2015). Therefore, we suggest that a financial orientation weakens the relationship between organizational foresight and exploratory innovation performance. First, enterprises that place more emphasis on current benefits and costs pay more attention to short-term market demand for new products (Randall *et al.*, 2017). This orientation forces enterprises to cater to the expectations of their mainstream customers excessively; accordingly, environmental scanning capability causes enterprises to fall into the dilemma of being "held captive by current customers" (Sainio *et al.*, 2012). This situation further compromises enterprises' developmental plans for exploratory innovation. Second, strategic selection is a means of filtering information and shaping opportunities (Paliokaitė and Pačėsa, 2015). When enterprises have a stronger financial orientation, they tend to act more conservatively to reduce risks and uncertainties, resulting in their acquisition of more information about increasing their existing market share and reducing the costs of incorporating new technologies into their knowledge base (Gupta *et al.*, 2006; Randall *et al.*, 2017). This organizational inertia makes it difficult for such enterprises to introduce strategic changes to address threats (Lavie *et al.*, 2010) and delays the process of exploratory innovation. Third, enterprises with a stronger financial orientation engage in integration and incorporation based on their existing knowledge. Specifically, this orientation allows enterprises to improve and adjust product attributes and technological processes based on their existing knowledge in an incremental way instead of absorbing new external knowledge, thereby impeding the learning process associated with exploration (Seo and Park, 2022). Moreover, the trend toward a financially oriented interpretation of information increases the potential conflict among different functional departments (e.g. R&D versus finance and marketing) (Randall *et al.*, 2017), thereby inhibiting the decision-making process associated with exploratory innovation and further disrupting radical plans for the future. In summary, a financial orientation focuses on the current profits of the enterprise or the costs of new products, thus shifting the focus of organizational foresight from the long term to the short term. A stronger financial orientation indicates that enterprises are more likely to make unsatisfactory decisions regarding their investments in innovation projects over the long term, which has a negative impact on exploratory innovation. Therefore, we formulate the following hypotheses:

H5a. A stronger financial orientation decreases the positive effect of environmental scanning capabilities on exploratory innovation.

H5b. A stronger financial orientation decreases the positive effect of strategic selection capabilities on exploratory innovation.

H5c. A stronger financial orientation decreases the positive effect of integrating capabilities on exploratory innovation.

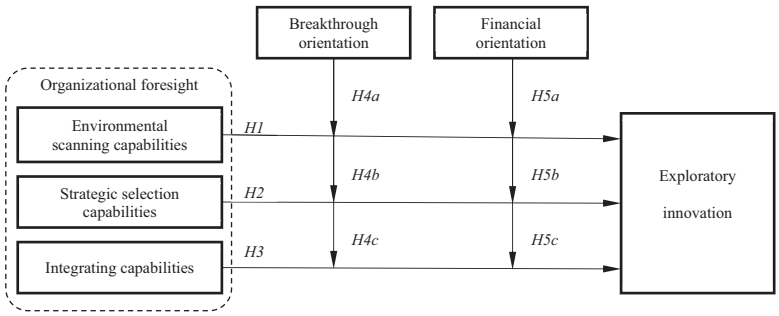
Figure 1 provides an overview of our research model.

4. Methodology

4.1 Sample and data collection

To test the hypotheses proposed above, we used a structured questionnaire to collect data from a sample of Chinese high-tech companies. This context of Chinese high-tech companies was suitable for four reasons. First, Chinese high-tech companies have made remarkable achievements in innovation in numerous fields. According to the "Global Innovation Index 2022" report released by the World Intellectual Property Organization (WIPO), China ranks first in nine subindexes, including innovation input, innovation output and the number of patent applications filed by residents, in which context high-tech companies make the majority of these contributions. Second, the Chinese Government's increasing focus on innovation has fostered the rapid development of high-tech companies. With governmental support, the number of high-tech companies in China reached 330,000 in 2021, and R&D investment accounted for 70% of the country's enterprise investment. Compared to other types of companies, such as low- and medium-technology firms, small and medium-sized enterprises and companies operating in established manufacturing industries, high-tech companies invest more heavily in exploratory innovation (Abbate *et al.*, 2021; Hernandez *et al.*, 2010). Third, high-tech companies in China have advanced from imitation and incremental innovation to independent and original innovation. For example, Huawei, Gree, Baidu, Midea and other enterprises use their own innovative capabilities to design and develop new products to meet the future needs of their clients worldwide. Their fruitful experience in innovation constitutes an appropriate sample for our research. Finally, we selected Chinese high-tech companies as our sample because, although these companies have grown rapidly in recent years, they still have room for improvement in terms of exploratory innovation. Specifically, while Chinese high-tech companies have achieved several innovative outcomes, their efficiency in R&D investment has not shown

Figure 1 Research model



Source: Authors' own work

significant and sustained improvement compared to the efficiency of such companies in developed countries such as the United States (Han *et al.*, 2017). According to the 2021 China Statistical Yearbook on High Technology Industry, the proportion of basic research funding in high-tech companies to GDP was 0.25% in 2020, which is lower than that of funding for applied research (0.48%) or experimental development (0.33%). This situation reflects the loss of exploratory innovation for Chinese high-tech companies to some degree. In summary, compared with other samples, Chinese high-tech companies are growing more quickly, making more achievements and being more focused on exploratory, innovative projects. However, the fact that their R&D investment efficiency has not improved significantly also reflects the potential for the loss of exploratory innovation to some extent. This sample is thus consistent with our research scope and provides a foundation for further quantitative analysis.

We drew our sample from a list of high-tech companies in China (www.innocom.gov.cn/). With regard to the identification of Chinese high-tech companies, the characteristics of the sampled enterprises included the following: R&D investment accounted for 5% or more of sales income; professional staff engaged in product development and basic research accounted for 10% or more of the enterprises' overall workforce; the enterprise had been registered for more than one year; and the field in which the enterprise operated was advanced technology. We randomly selected 953 enterprises from the list and made inquiries with executives in multiple ways, i.e. face-to-face, via email and over the telephone, to obtain their agreement to participate. At that time, we also asked these executives questions about organizational foresight and exploratory innovation activities to ensure their competence with regard to completing the questionnaire; 385 executives who met the requirements for the sampled enterprises were willing to participate in the surveys. Two rounds of questionnaires were distributed via email from December 2018 to January 2019 and from May 2019 to August 2019. The respondents included senior and middle managers as well as front-line employees engaged in R&D management, strategic management, new product development (NPD), operations, production and procurement. After removing incomplete and unavailable questionnaires, 296 questionnaires were ultimately identified (for a response rate of 31.06%). In addition, most high-tech companies focus on business-to-business (B2B), so the sample that we have selected includes a large number of enterprises engaged in B2B, such as Huawei Technologies Co., Ltd., Shaanxi Fast Auto Drive Group Co., Ltd. and Shanghai Yasheng Automobile Manufacturing Co., Ltd. Table 2 shows the details of the sampled enterprises.

4.2 Questionnaire design and measures

A strict questionnaire design process was used to ensure the scientificity of this study. We first selected mature English-language scales as the basis for questionnaire design based on a literature review. Subsequently, we invited three PhD candidates who were familiar with innovation management and strategic management to translate the scale into Chinese. Two research degree students then translated the scale back into English to ensure linguistic coherence. In addition, we invited seven managers who were involved in NPD and innovation management in high-tech companies to test and refine the Chinese scale. Based on a semi-structured interview that took place over a period of approximately 1.5 h, we revised some sentences and phrases in the scale based on the comments and suggestions provided by these managers to make it more suitable for the Chinese context. The formal questionnaire was eventually finalized, and all items were measured on a five-point Likert scale ranging from "strongly disagree" to "strongly agree."

Dependent variable. We measured exploratory innovation using the scale developed by Jansen *et al.* (2009). This scale mainly reflects the extent to which a new product or service is developed and the extent to which it is deployed in a new market.

Independent variables. Organizational foresight consists of three subcomponents that include 18 items in total: environmental scanning capabilities, strategic selection capabilities and integrating capabilities. We adopted the scales developed by Paliokaitė and Pačėsa (2015) and Amniattalab and Ansari (2015) and modified them to suit the context of high-tech companies. Specifically, environmental scanning capabilities are measured primarily in terms of time horizon, depth and strong and weak ties. Strategic selection capabilities are measured in terms of analysis, vision and planning. Integrating capabilities are measured in terms of leadership, coordination and knowledge base.

Moderating variables. The measurement of breakthrough orientation and financial orientation was based on the scale

Table 2 Profile of sampled enterprises

Sample characteristics	Category	No.	%
Firm size	<100 employees	40	13.51
	100–300 employees	154	52.03
	301–500 employees	68	22.97
	>500 employees	33	11.15
Firm age	1–3 years	69	23.31
	3–5 years	124	41.89
	5–8 years	81	27.36
	More than 8 years	22	7.43
Industry sector	IT/software	55	18.58
	Biotechnology/pharma	58	19.59
	New materials	49	16.55
	New energy	42	14.19
	Automobiles and components	45	15.20
	Technology hardware/equipment	47	15.88
Ownership	State-owned or collective enterprise	174	58.78
	Private enterprise	90	30.41
	Joint venture enterprise	24	8.11
	Others	8	2.70
Respondents' tenure in their current position	Less than 2 years	36	12.16
	2–5 years	146	49.32
	5–10 years	81	27.36
	More than 10 years	33	11.15
Respondents' level of education	Junior college or below	68	22.97
	Undergraduate degree	173	58.45
	Master's degree or above	55	18.58

Source: Authors' own work

developed by Gurtner and Reinhardt (2016), which was modified by reference to the scale of innovation orientation and cost orientation developed by Kortmann (2015). Breakthrough orientation reflects the strategic focus of an enterprise on novel and discontinuous potential opportunities, while financial orientation reflects a focus on the enterprise's control over the revenues, profits and costs associated with new products.

Control variables. We included three firm-level control variables in this research, i.e. firm size, firm age and industry sector, to reduce the likelihood of misleading findings (Gurtner and Reinhardt, 2016). First, larger enterprises have more resources, which provides the conditions necessary to allocate resources to exploratory innovation. However, organizational inertia also increases as size increases (Hannan and Freeman, 1984), which encourages enterprises to use existing opportunities along their current track rather than explore new opportunities (Jansen *et al.*, 2009). Therefore, we measured firm size in terms of the number of full-time employees. Second, older enterprises are more inclined to make use of their prior successful experience and routine practices and thus favor exploitation over exploration (Lavie *et al.*, 2010; Sørensen and Stuart, 2000). Hence, we controlled for firm age. Finally, the attention and effort that enterprises devote to exploratory innovation vary across industries (Gibson and Birkinshaw, 2004; Kortmann, 2015; Raisch and Birkinshaw, 2008). As a result, we included industry dummy variables to control for external effects.

5. Analysis and results

5.1 Common method bias and nonresponse bias

To mitigate the threat of common method bias, our first step was to assure respondents that their answers were anonymous and that their questionnaires would remain confidential; in addition, the items pertaining to the independent and dependent variables were divided among different parts of the survey prior to the administration of the questionnaire. Second, we conducted Harman's single-factor test (Podsakoff and Organ, 1986), and the results indicated that the six factors had eigenvalues greater than 1, explaining 63.340% of the total variance altogether, while the first factor explained only 26.270% of the total variance. However, because of the limitations of this method, our third step was to introduce an unmeasured latent method factor into the measurement model (Podsakoff *et al.*, 2003). The initial six-factor model [$\chi^2 = 432.142$, df = 362, χ^2/df = 1.194, comparative fit index (CFI) = 0.980, Tucker-Lewis index (TLI) = 0.978, incremental fit index (IFI) = 0.981 and root mean square error of approximation (RMSEA) = 0.026] and the unmeasured latent method factor model (χ^2 =396.618, df = 333, χ^2/df = 1.191, CFI = 0.982, TLI = 0.978, IFI = 0.982 and RMSEA = 0.025) exhibited no significant differences. In conclusion, our results were not affected by common method bias.

As we performed the two rounds of questionnaire distribution and collection, it was necessary to conduct a *t* test for potential nonresponse bias (Armstrong and Overton, 1977) to ensure the sample's reliability. The early and late samples

were tested, and no significant differences were noted between the two types of samples (two-tailed t-test, $p > 0.05$). As a result, nonresponse bias was not an issue for our research.

5.2 Reliability and validity

The reliability was tested with reference to Cronbach's alpha and composite reliability (CR). As shown in Table 3, the Cronbach's alpha and CR values for all variables exceeded 0.7, indicating that each variable exhibited satisfactory reliability. Factor loading and average variance extracted (AVE) were used to evaluate convergent validity. A confirmatory factor analysis also indicated acceptable model fit ($\chi^2 = 432.142$, df = 362, χ^2/df = 1.194, CFI = 0.980, TLI = 0.978, IFI = 0.981 and RMSEA = 0.026). Table 3 shows that the factor loadings of all

Table 3 Measurement scales and validity assessment

Scales used in the survey	Factor loadings	Cronbach's alpha	CR	AVE
Exploratory innovation		0.818	0.823	0.539
We accept demands that go beyond existing products and services	0.674			
We commercialize products and services that are completely new to our company	0.802			
We frequently take advantage of new opportunities in new markets	0.772			
We regularly use new distribution channels	0.679			
Environmental scanning capabilities		0.903	0.903	0.571
We often consider future conditions over the next 2 years or a longer period	0.740			
We are scanning all areas (technological, political, competitor, customer and sociocultural environments)	0.694			
We scan for developments in markets and/or industries in which we are not currently involved	0.801			
We also consider new issues, trends and technologies whose relevance to our business cannot yet be assessed	0.793			
We attend meetings at which opportunities can be found, such as trade exhibitions and scientific conferences	0.776			
We have an active network of contacts with the scientific and research community	0.739			
We work jointly with suppliers or customers to develop solutions	0.741			
Strategic selection capabilities		0.828	0.834	0.504
We analyze potential future conditions in detail	0.660			
We forecast potential future conditions	0.675			
We set long-term objectives that are consistent with our vision and values	0.621			
We develop activity plans that optimize progress toward the organizational strategy	0.707			
We apply rigorous measurements of business performance against goals and objectives	0.862			
Integrating capabilities		0.858	0.859	0.505
We provide regular incentives (e.g. recognition by senior management and/or financial rewards) to promote a wider vision	0.686			
Bringing external information into the company is encouraged by top management	0.687			
The activities of different departments are well coordinated	0.765			
Every employee is expected to establish and maintain formal and informal networks with other units	0.684			
In our company, information is shared freely across functions and hierarchical levels	0.729			
Continued organizational learning is encouraged, and there is sufficient time/opportunity to improve one's skills and capabilities	0.709			
Breakthrough orientation		0.816	0.820	0.533
We value being the first to produce new products, enter new markets and develop new technologies	0.721			
We are committed to being a pioneer in industry innovation rather than a follower	0.709			
We are always aggressive with regard to obtaining competitive advantages instead of being forced by environmental pressure to maintain established products and markets	0.803			
We regularly follow up on technological, markets and adjacent technological advancements that may lead to a complete breakthrough in our activities	0.683			
Financial orientation		0.752	0.753	0.505
We pay more attention to the proportion of sales of new products in total sales	0.691			
We continuously seek to profit from new product sales	0.741			
We pay more attention to the proportion of the total costs of new products in revenue	0.698			

Source: Authors' own work

variables included in the model exceeded the recommended value of 0.6 and that the AVE values were above 0.5; accordingly, the convergent validity was satisfactory. To test the discriminant validity further, the square root of the AVE was compared with the correlation coefficient of the corresponding variables. The results showed that the former values were higher than the latter values (Table 4), thus indicating that the criterion for discriminant validity was reasonably satisfied. Table 4 provides an overview of descriptive statistics and correlations.

5.3 Hypothesis testing

As our analysis involved both direct and moderating effects, we tested our hypotheses using hierarchical regression analysis to avoid confounding the main and moderating effects (Baron and Kenny, 1987). To avoid the problem of multicollinearity, we mean-centered all variables and then multiplied the mean-centered variables to construct interaction terms. In addition, we calculated the variance inflation factor (VIF) to evaluate the multicollinearity in further detail. The results showed that all VIF values were much lower than the threshold of 5, thus suggesting that multicollinearity was not a serious issue for this study. Table 5 presents the results of the regression analysis.

Model 2 shows that environmental scanning capabilities ($\beta = 0.332$; $p < 0.001$), strategic selection capabilities ($\beta = 0.311$; $p < 0.001$) and integrating capabilities ($\beta = 0.221$; $p < 0.001$) have significant positive effects on exploratory innovation, thus supporting *H1*, *H2* and *H3*.

Model 4 reports the moderating effect of breakthrough orientation. The results indicate that environmental scanning capabilities × breakthrough orientation ($\beta = 0.154$; $p < 0.01$), strategic selection capabilities × breakthrough orientation ($\beta = 0.149$; $p < 0.01$) and integrating capabilities × breakthrough orientation ($\beta = 0.103$; $p < 0.05$) have significant positive effects on exploratory innovation, thereby supporting *H4a*, *H4b* and *H4c*. To clarify the moderating effects of breakthrough orientation as posited by *H4a*, *H4b* and *H4c*, Figure 2 plots the moderation at both high (+1SD) and low (−1SD) levels.

Model 5 verifies the moderating effect of financial orientation. The results show that the effects of environmental scanning capabilities × financial orientation ($\beta = -0.120$; $p < 0.01$) and strategic selection capabilities × financial orientation ($\beta = -0.102$; $p < 0.01$) on exploratory innovation are positive, while the effects of integrating capabilities × financial orientation ($\beta = -0.001$; $p > 0.05$) on exploratory innovation are not significant. Therefore, *H5a* and *H5b* are supported, while *H5c* is not supported. To clarify the moderating effects as posited by *H5a* and *H5b*, Figure 3 plots the moderation at both high (+1SD) and low (−1SD) levels.

5.4 Robustness test

We performed additional robustness tests to support our results. Based on the literature on exploratory innovation (Hubner *et al.*, 2022; Lennerts *et al.*, 2020; Xiao *et al.*, 2022), we conducted two robustness tests. First, we added new control variables to test the robustness of the hypotheses proposed above. Demand complexity, technological uncertainty and competitiveness were chosen as the new control variables. These characteristics of the enterprise and the environment are not only important factors affecting innovation (Lennerts *et al.*, 2020) but also consistent with the situation of high-tech companies (Abbate *et al.*, 2021; Qian and Li, 2003). Each control variable was measured using one item: the item for demand complexity was "Customers demand increasingly better quality and reliability in the products and services that they buy"; the item for technological uncertainty was "Technological change in our industry is rapid"; and competitiveness was represented by the reverse-scored item "Competition is well established and entrenched." All three variables were measured on a five-point Likert scale. Second, we randomly selected 200 samples for regression analysis. The robustness test results presented in Tables 6 and 7 show that the significance and direction of the effects did not change. Therefore, our results are robust, and our hypotheses are further supported.

6. Conclusion and discussion

6.1 Discussion of results

Although scholars have emphasized the fact that more exploratory innovation is conducive to business prosperity (Randall *et al.*, 2017; Shibata *et al.*, 2022), research clarifying the mechanism by which losses can be reduced and exploratory innovation can be promoted in the context of high-tech companies remains necessary. Motivated by recent calls from organizational foresight researchers for more empirical research to be conducted in this context (Gordon *et al.*, 2020; Paliokaitė and Pačėsa, 2015), we set out to answer our first research question regarding the impact of organizational foresight on exploratory innovation in the context of high-tech companies. With regard to this question, our basic hypothesis was that three dimensions of organizational foresight, namely, environmental scanning capabilities, strategic selection capabilities and integrating capabilities, all have positive influences

Table 4 Descriptive statistics, correlations and discriminant validity test

Variables	Mean	SD	1	2	3	4	5	6
1. Exploratory innovation	3.577	0.660	*0.734*					
2. Environmental scanning capabilities	2.987	0.749	0.480**	*0.756*				
3. Strategic selection capabilities	3.072	0.543	0.471**	0.215**	*0.710*			
4. Integrating capabilities	3.484	0.541	0.465**	0.397**	0.333**	*0.711*		
5. Breakthrough orientation	3.607	0.569	0.182**	0.075	0.151**	0.112	*0.730*	
6. Financial orientation	2.681	0.693	−0.195**	−0.047	−0.131*	−0.152**	−0.094	*0.711*

Notes: The square roots of the AVE are shown on the diagonal; *$p < 0.050$; **$p < 0.010$
Source: Authors' own work

Table 5 Results of the regression analysis

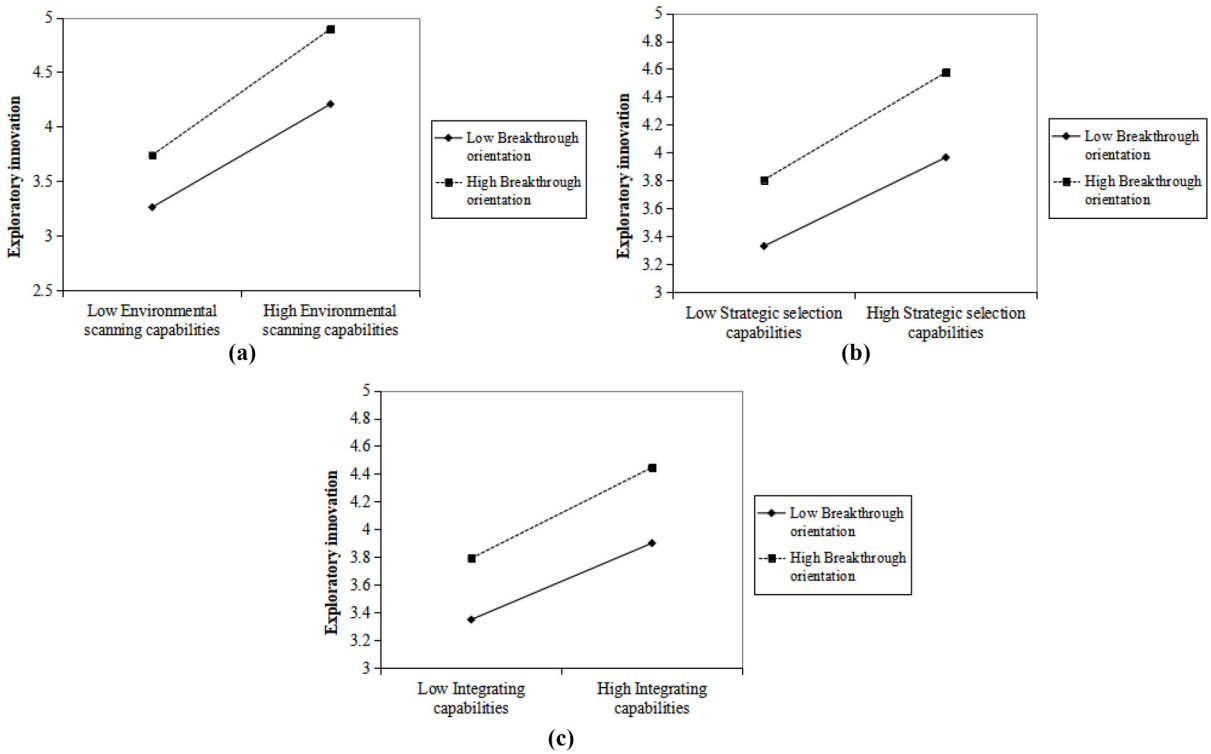
Variables	Exploratory innovation				
	Model 1	Model 2	Model 3	Model 4	Model 5
Control variables					
Firm size	0.039	0.025	0.026	0.034	0.008
Firm age	−0.110	−0.072	−0.070	−0.091*	−0.080
Industry sector					
IT/software	−0.172*	−0.065	−0.061	−0.075	−0.074
Biotechnology/pharma	−0.018	0.034	0.042	0.007	0.036
New materials	−0.062	−0.047	−0.045	−0.087	−0.057
New energy	−0.070	−0.035	−0.028	−0.052	−0.042
Automobiles and components	−0.077	−0.060	−0.048	−0.059	−0.046
Technology hardware/equipment	−0.025	0.018	0.028	−0.017	0.021
Main effects					
Environmental scanning capabilities		0.332***	0.333***	0.290***	0.315***
Strategic selection capabilities		0.311***	0.292***	0.206***	0.270***
Integrating capabilities		0.221***	0.201***	0.116**	0.188***
Breakthrough orientation			0.087	0.122**	0.083
Financial orientation			−0.093*	−0.097*	−0.101*
Interaction effects					
Environmental scanning capabilities * Breakthrough orientation				0.154**	
Strategic selection capabilities * Breakthrough orientation				0.149**	
Integrating capabilities * Breakthrough orientation				0.103*	
Environmental scanning capabilities * Financial orientation					−0.120**
Strategic selection capabilities * Financial orientation					−0.102**
Integrating capabilities * Financial orientation					−0.001
R^2	0.035	0.429	0.446	0.493	0.474
Adjusted R^2	0.008	0.407	0.421	0.463	0.444
F	1.292	19.363***	17.410***	16.868***	15.652***

Notes: $^{*}p < 0.050$; $^{**}p < 0.010$; $^{***}p < 0.001$
Source: Authors' own work

on exploratory innovation. As expected, our results show that organizational foresight is positively related to exploratory innovation in high-tech companies. More precisely, environmental scanning capability drives enterprises to recognize valuable sources and sense opportunities, thus allowing them to adjust their strategies more quickly in an evolving environment. Strengthening strategic selection capabilities leads to better decision-making; that is, considering which external resources are consistent with the innovation positioning of enterprises can make their decisions more rational. Integrating capabilities are viewed as essential for updating knowledge and distinguishing enterprises from their competitors. Therefore, our results highlight not only the importance of nurturing organizational foresight for exploratory innovation (Adegbile *et al.*, 2017; Paliokaitė and Pačėsa, 2015; Rohrbeck and Schwarz, 2013) but also ways of effectively managing the loss of exploratory innovation in high-tech companies.

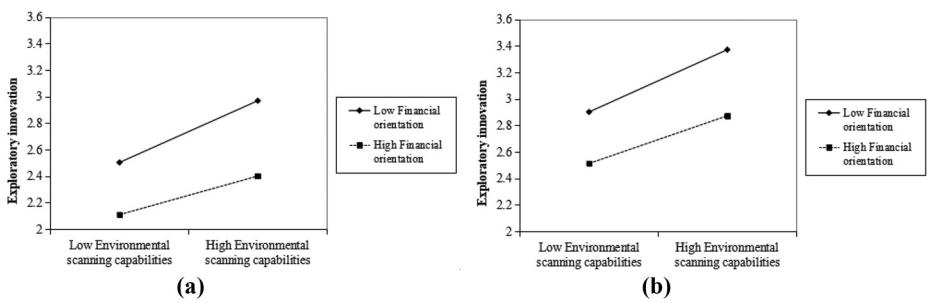
With regard to our second research question, we sought to determine whether breakthrough orientation and financial orientation are important boundary conditions associated with the relationship between organizational foresight and exploratory innovation in high-tech companies. As expected, our results show that the stronger the enterprise's breakthrough orientation is, the greater the impact of the environmental scanning capabilities, strategic selection capabilities and integrating capabilities of high-tech companies on their exploratory innovation. The tendency toward a breakthrough orientation prompts enterprises to anticipate novel, discontinuous and radical technologies, which prevents them from underestimating exploratory innovation projects because of inertia. Considering the insights drawn from the literature (Gurtner and Reinhardt, 2016; Seo and Park, 2022), our findings are plausible. In addition, our results show that the impact of environmental scanning capabilities and strategic selection capabilities on exploratory innovation decreases when financial orientation is stronger. Consistent with the literature, a financial orientation encourages organizational foresight to focus on immediate costs and benefits (Andriopoulos and Lewis, 2009); accordingly, this short-sighted form of foresight impedes exploratory innovation. Surprisingly, however, the moderating effect of such a financial orientation on the relationship between integrating capabilities and exploratory innovation was not significant in our sample. One possible explanation for this finding is that, under the influence of a financial orientation, enterprises tend to integrate internal knowledge incrementally to meet existing market demands. However, the process of integrating existing knowledge may motivate deep thinking with regard to new and radical ideas (Berraies *et al.*, 2021; Enkel *et al.*, 2017; Kok and Biemans, 2009); thus, the moderating effect is not significant. Our results

Figure 2 Moderating effects of breakthrough orientation



Notes: (a) Two-way interaction between environmental scanning capabilities and breakthrough orientation; (b) two-way interaction between strategic selection capabilities and breakthrough orientation; (c) two-way interaction between integrating capabilities and breakthrough orientation
Source: Authors' own work

Figure 3 Moderating effects of financial orientation



Notes: (a) Two-way interaction between environmental scanning capabilities and financial orientation; (b) two-way interaction between strategic selection capabilities and financial orientation
Source: Authors' own work

help unravel the complex relationship between organizational foresight and exploratory innovation in high-tech companies by revealing the moderating effects of breakthrough and financial orientation in this context.

6.2 Theoretical contributions

With these findings, the present study contributes to our theoretical understanding of the fields of innovation management and strategic management.

First, we propose a greater emphasis on directing more literature toward independent research on exploratory innovation rather than the ambidexterity perspective. Because of organizational inertia and current performance pressures (Atuahene-Gima, 2005; O'Reilly and Binns, 2019; Shibata *et al.*, 2022), enterprises frequently face dilemmas resulting in the loss of exploratory innovation, which diminishes the proportion and share of exploratory innovation in practical implementation (Randall *et al.*, 2017; Zhu *et al.*, 2021). Although current research focuses on how to orchestrate and

Table 6 Robustness checks including additional control variables

Variables	Exploratory innovation				
	Model 1	Model 2	Model 3	Model 4	Model 5
Control variables					
Firm size	0.053	0.582	0.028	0.035	0.012
Firm age	−0.116	−1.540	−0.070	−0.090	−0.080
Industry sector					
IT/software	−0.183*	−0.058	−0.053	−0.062	−0.065
Biotechnology/pharma	−0.019	0.041	0.049	0.020	0.045
New materials	−0.070	−0.043	−0.039	−0.081	−0.051
New energy	−0.081	−0.028	−0.021	−0.039	−0.033
Automobiles and components	−0.079	−0.053	−0.041	−0.048	−0.037
Technology hardware/equipment	−0.019	0.025	0.034	−0.007	0.029
Demand complexity	−0.036	−0.016	−0.014	−0.025	−0.021
Technological uncertainty	−0.152*	−0.003	0.010	0.014	0.002
Competitiveness	0.001	0.002	−0.003	0.026	0.002
Main effects					
Environmental scanning capabilities		0.332***	0.335***	0.294***	0.316***
Strategic selection capabilities		0.311***	0.292***	0.202***	0.269***
Integrating capabilities		0.220***	0.202***	0.117*	0.188***
Breakthrough orientation			0.088	0.125**	0.083
Financial orientation			−0.093*	−0.096*	−0.101*
Interaction effects					
Environmental scanning capabilities × Breakthrough orientation				0.155**	
Strategic selection capabilities × Breakthrough orientation				0.153**	
Integrating capabilities × Breakthrough orientation				0.108*	
Environmental scanning capabilities × Financial orientation					−0.119**
Strategic selection capabilities × Financial orientation					−0.103**
Integrating capabilities × Financial orientation					−0.002
R^2	0.058	0.430	0.446	0.494	0.474
Adjusted R^2	0.022	0.401	0.414	0.459	0.438
F	1.590	15.067***	14.008***	14.144**	13.058**

Notes: *$p < 0.050$; **$p < 0.010$; ***$p < 0.001$
Source: Authors' own work

balance exploration and exploitation simultaneously (Ambroise *et al.*, 2020; O'Reilly and Tushman, 2013; Turner *et al.*, 2013; Tushman and O'Reilly, 1996), the issue of addressing loss and enhancing exploratory innovation remains neglected. Our research responds to the call for research made by Randall *et al.* (2017) and elucidates this phenomenon of loss. This provides an ex ante view to overcome the loss dilemma and more effectively foster exploratory innovation. By introducing organizational foresight and examining its impact on exploratory innovation, we contribute to the literature on ambidexterity and exploratory innovation. This insight enriches a deeper understanding of the challenges encountered in corporate innovation and industrial marketing contexts, along with strategies for sustaining competitiveness within an unstable market environment.

Second, based on the literature on dynamic capabilities-based organizational foresight, we theorize about and examine the positive effects of organizational foresight on exploratory innovation in the context of high-tech companies. While the issue of the loss of exploratory innovation has previously been raised (Randall *et al.*, 2017), it remains necessary to document this notion more effectively and understand how to mitigate and avoid it. To address this gap, we note that organizational foresight, as the prospective capacity to perceive the future and react to external changes (Paliokaitė and Pačėsa, 2015; Rohrbeck and Schwarz, 2013), provides theoretical insights that can help address the loss of exploratory innovation. Meanwhile, against the backdrop of high-tech companies, which are characterized by shorter product lifecycles and more ambiguous market prospects (Qian and Li, 2003), a better choice would be to promote a high level of organizational foresight to enable them to seize opportunities effectively. Hence, quantitative results help us understand the impact of organizational foresight on exploratory innovation more accurately. Furthermore, as our sample mainly comprises high-tech enterprises involved in B2B activities, this effort has enhanced the relevance of organizational foresight in the realm of B2B marketing. Our findings provide scholars specializing in B2B marketing a significant chance to cultivate organizational foresight capabilities, enabling proactive prediction of the B2B market landscape, recognition of latent customer needs, and identification of innovative opportunities within rapidly evolving circumstances. Moreover, organizational foresight can engage stakeholders such as customers and suppliers, facilitating their early involvement in exploratory

Table 7 Robustness checks of 200 random samples

Variables	Exploratory innovation				
	Model 1	Model 2	Model 3	Model 4	Model 5
Control variables					
Firm size	0.065	0.022	0.026	0.037	0.017
Firm age	−0.173*	−0.096	−0.096	−0.150	−0.111*
Industry sector					
IT/software	−0.028	0.007	0.003	−0.026	−0.036
Biotechnology/pharma	0.038	0.058	0.061	0.006	0.028
New materials	0.022	0.001	−0.004	−0.089	−0.043
New energy	−0.004	−0.014	−0.016	−0.069	−0.057
Automobiles and components	−0.017	−0.038	−0.038	−0.078	−0.028
Technology hardware/equipment	0.038	0.049	0.048	−0.003	0.019
Main effects					
Environmental scanning capabilities		0.332***	0.337***	0.272***	0.314***
Strategic selection capabilities		0.261***	0.245***	0.139*	0.217***
Integrating capabilities		0.267***	0.260***	0.153*	0.190**
Breakthrough orientation			0.068	0.125*	0.070
Financial orientation			−0.036	−0.057	−0.045
Interaction effects					
Environmental scanning capabilities × Breakthrough orientation				0.165**	
Strategic selection capabilities × Breakthrough orientation				0.150**	
Integrating capabilities × Breakthrough orientation				0.231***	
Environmental scanning capabilities × Financial orientation					−0.178***
Strategic selection capabilities × Financial orientation					−0.133*
Integrating capabilities × Financial orientation					−0.036
R^2	0.041	0.456	0.462	0.555	0.524
Adjusted R^2	0.001	0.424	0.424	0.516	0.482
F	1.010	14.233***	12.220***	14.171***	12.510***

Notes: $^{*}p < 0.050$; $^{**}p < 0.010$; $^{***}p < 0.001$
Source: Authors' own work

innovation efforts and consequently paving the way for novel theoretical approaches to relationship management in B2B literature.

Third, we bring a new perspective to the study of the boundary conditions associated with organizational foresight by introducing two important but often neglected contingency factors, i.e. breakthrough orientation and financial orientation. Gordon *et al.* (2020) called for more research to clarify the moderating or mediating effects of organizational foresight on innovation. We consider this research to be an important theoretical contribution in this context because quantitative research on the boundary conditions associated with the relationship between organizational foresight and exploratory innovation remains limited, and neglecting these boundary conditions may influence the impact of organizational foresight on exploratory innovation. Based on competitive advantage theory and the paradox of ambidexterity, we explore the differential moderating effects of breakthrough orientation and financial orientation. Our empirical results therefore extend the work of Paliokaitė and Pačėsa (2015) and confirm the role of contingency in this context, thereby refining our understanding of the extent to which organizational foresight ultimately results in higher performance with regard to exploratory innovation.

Fourth, to the best of the authors' knowledge, no previous studies have analyzed the direct effect of organizational foresight on exploratory innovation in high-tech companies or the contingency effects of breakthrough orientation and financial orientation on these relationships in the context of high-tech companies. As the business environment faced by high-tech companies is highly volatile and ambiguous (Duan *et al.*, 2021; Kok and Biemans, 2009; Qian and Li, 2003), it is essential for these enterprises to understand and explore ways of improving their competitiveness and achieving long-term prosperity. Therefore, our research is valuable with regard to promoting the success of exploratory innovation in high-tech companies.

Last, but equally paramount, as our sample primarily focuses on B2B, it has contributed to advancing research into exploratory innovation within the B2B domain to some extent. The primary customers of B2B are organizations, as opposed to consumers, leading to a more complex demand for innovative products (Zhang and Xiao, 2020). To better cater to the customized needs of their current consumers, B2B enterprises often embed themselves within a network of long-term relationships with their customers and other stakeholders (Purmonen *et al.*, 2023; Solís-Molina *et al.*, 2022). Nevertheless, these enterprises, while managing their relationship networks and customer knowledge, are highly susceptible to the loss of exploratory innovation because of the prioritization of short-term market benefits (Randall *et al.*, 2017). Hence, our findings

provide valuable insights into how these enterprises overcome the loss of exploratory innovation and leverage organizational foresight and breakthrough orientation to successfully achieve exploratory innovation.

6.3 Managerial implications

Practitioners can gain numerous insights from our findings. Specifically, our findings suggest that the promotion of exploratory innovation benefits from organizational foresight. Hence, organizational foresight appears to be an appropriate approach to the increasing ambiguity and complexity of the business environment with regard to the direction of innovation, particularly in high-tech companies. To enhance these capabilities and improve their ability to identify the benefits of exploratory innovation with regard to minimizing the risks associated with insufficient exploratory innovation, managers must focus on developing and enhancing their environmental scanning, strategic selection and integration capabilities. First, enterprises should regularly review and scan their environment. This task not only requires managers to increase their scanning and collection of leading-edge technology and commercial intelligence but also to initiate dialog among high-tech companies, suppliers and industry exhibitions. Effective communication among enterprises not only serves as a panacea for maintaining cooperation but is also a crucial action for identifying exploratory technologies and obtaining new external knowledge. Therefore, managers must maintain close relationships with their marketing teams, as those teams are closer to suppliers and customers and can access leading-edge ideas in a timely manner. Second, managers should encourage operational and environmental analysis and introduce internal innovation processes based on their identification of the value of external information. This approach can help in the task of choosing directions for the enterprise's future development and priorities for the enterprise's future exploratory innovation. Tools such as blueprints or scenario planning should be used to select such information and incorporate it into the internal innovation process. This approach promotes the flexibility of enterprises and allows them to adjust and update their business targets based on feedback and emerging trends. Notably, in the digital age, enterprises have access to more advanced methods such as machine learning, digital platforms and artificial intelligence, which can facilitate the dynamic analysis and planning of business goals (Marinković *et al.*, 2022). Finally, to deploy integration capability within the organization more effectively and strengthen the absorption and utilization of external exploratory knowledge, managers must not only create a culture that encourages collaboration and knowledge sharing but also focus on interactions across different departments. In particular, interface management involving market sales, service departments and R&D departments may be crucial because the first two departments may overemphasize the short-term results of innovation and thereby neglect or stifle the development of exploratory innovation. Therefore, various types of both formal and informal cross-border integration, such as job rotation, Delphi and hackathons, should be used to establish links and take advantage of the complementary knowledge of different departments or teams in the most effective manner.

The second managerial implication is based on the moderating effects of breakthrough and financial orientation; that is, managers and practitioners should not pursue innovative activities without taking the situation into account but should rather make decisions carefully and design their strategic orientation on the basis of a breakthrough orientation. To accomplish this task, they must be more adventurous, actively pursue core technologies that could lead to overall breakthroughs and explore potential demand outside the enterprise's current market to enable the enterprise to obtain a competitive position in a high-tech industry. In addition, in our sample of high-tech companies, some enterprises are primarily financially oriented. In these cases, we suggest that managers and policymakers should use their financial orientation prudently and gradually shift toward a breakthrough orientation. If a high-tech company focuses on financial orientation, which emphasizes current costs and profits, it should understand that because of the familiarity trap, it will lose its competitiveness in the future. Managers and policymakers must therefore be conscious of this compromise and the associated trade-off. To make enterprises' initial financial orientation more suitable for the transition to a breakthrough orientation, managers can also establish separate innovation units that feature different orientations (Jansen *et al.*, 2009; Tushman and O'Reilly, 1996). This strategy of adopting a separate architecture for these two types of orientation is similar to structural ambidexterity, which progressively encourages breakthrough thinking and enables managers to realize the long-term benefits of a breakthrough orientation, thus enabling them to transform the enterprise's orientation more fully and thus promote exploratory innovation more effectively.

Additionally, our findings provide practical value to enterprises involved in B2B marketing and relationship management. Business relationships do not exist in isolation but are rather embedded within open and interconnected industrial marketing networks (Purmonen *et al.*, 2023). B2B enterprises can operationalize organizational foresight in co-creative innovation, customer communities and online open platforms by scanning customer needs, evaluating less promising new product projects and integrating co-creative knowledge. These practices, guided by organizational foresight, enable enterprises to better assimilate and absorb knowledge from relational networks, stimulating knowledge sharing as opposed to relying solely on existing knowledge. At the same time, we propose that B2B enterprises embrace a more open, adventurous and breakthrough-oriented approach as a guiding principle for their innovation strategy. Such an orientation can alleviate the negative impacts of organizational inertia stemming from long-term collaborations, thereby facilitating the improved identification of latent needs within the domain of B2B marketing.

6.4 Limitations and directions for future research

Our findings, although they make important contributions to the innovation and strategic management literature, face certain limitations. The task of examining these issues in further detail, such as in other contexts or from a longitudinal perspective, undoubtedly has additional research potential.

First, our study uses a sample drawn from China to understand the role played by organizational foresight in exploratory innovation; accordingly, our results may not be generalizable to other countries. Future research could consider a variety of different countries with different cultural and economic characteristics or even make cross-country comparisons to broaden our findings.

Second, this study was conducted in the context of high-tech companies; accordingly, we call for future research to focus on other contexts, such as mature enterprises, small and medium-sized enterprises or specific industries. In addition, future research should be cautious when generalizing these results to a variety of different contexts.

Third, although our findings are robust, cross-sectional data limit our ability to offer convincing explanations of the causality of exploratory innovation over time. In general, exploratory innovations take years to progress from planning to successful implementation (Hansen *et al.*, 2019; Randall *et al.*, 2017). Longitudinal research can provide guidance in this context by refining our understanding of the effects of organizational foresight on exploratory innovation over time.

Fourth, we divide strategic orientation into breakthrough orientation and financial orientation based on the paradox of ambidexterity and consider the moderating effects of both factors on the relationship between organizational foresight and exploratory innovation. In future research, this model could be tested with reference to other orientations, such as learning orientation and entrepreneurial orientation, and the incorporation of other contingency factors into this model in future research is also encouraged to extend these findings.

Fifth, our aim was to explore how organizational foresight can reduce losses and promote exploratory innovation in light of both dynamic capabilities and competitive advantage theory. In the future, alternative perspectives can be explored to help enterprises overcome the innovation dilemmas they currently face. For example, the theory of disruptive innovation suggests that incumbents may face structural disadvantages in the event of a disruption, as they often rely on the ongoing optimization of existing technologies to strengthen their customer base (Christensen and Bower, 1996; Christensen *et al.*, 2018; Hynes and Elwell, 2016). If disrupted enterprises can redefine the boundaries of technology and implement a strategy of redevelopment or technological breakthrough, they can regain their competitiveness (Christensen *et al.*, 2018). As such, it may be beneficial to examine the core issues of this research from the perspective of disruptive innovation theory in the future.

Sixth, from the perspectives of industrial marketing and customer engagement, the marketing capability of creating value for customers constitutes the core of addressing both current and potential needs – a capacity that is equally vital to product innovation (Fletcher-Chen *et al.*, 2017; Purmonen *et al.*, 2023; Zhang and Xiao, 2020). With the proliferation of emerging market research, gaining a more comprehensive understanding of the elements of exploratory innovation in marketing becomes especially crucial. For instance, O'Cass *et al.* (2014) divided exploration into exploratory product innovation, exploratory marketing and their interaction, testing their divergent impacts on new product performance. Thus, an important area deserving future investigation involves applying organizational foresight in B2B marketing. With this approach, the way in which organizational foresight interacts with marketing strategies or market orientation to improve the customer value proposition is explored. This requires a focus on integrating an organizational foresight mindset into B2B marketing strategies, encompassing the prediction of market trends, gaining insights into market opportunities, optimizing customer experience management and adopting a comprehensive multi-channel marketing approach. These practices can help managers enhance their ability in marketing management to identify customer customization needs more accurately.

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