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The Relationship between Organizational Learning, Technological Innovation, and Organizational Innovation Capability - A Case Study of High-tech Enterprises in the Guangdong Hong Kong Macao Bay Area

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Abstract

This quantitative research objective is to focus on the core advantages of high-tech enterprises' organizational innovation capability, takes organizational learning and technological innovation as the driving factors, and focuses on the two dimensions of organizational innovation capability: organizational technological innovation and organizational management innovation, and takes organizational innovation capability as the dependent variable, the independent variables are organizational learning (commitment to learning , shared vision, shared knowledge) and technological innovation (technological innovation input, technological innovation intermediate output), and the intermediary variables are cross-boundary behaviors (ambassador activity, task coordinator activity, scout activity). The reliability and validity of the developed organizational innovation ability improvement scale were verified. According to the proposed assumptions, design and improve the measurement scale of organizational innovation capability improvement and related variables, and use correlation analysis, regression analysis, and structural equation as the main methods of data validation to detect and measure the measurement scale of each concept and test the research assumptions involved in the research model. Secondly, this study mainly studies the relationship between organizational learning, technological innovation, and organizational innovation capability of high-tech enterprises. The hypopaper of the relationship between organizational learning, technological innovation, cross-boundary behavior, and organizational innovation capability of high-tech enterprises is put forward. Build a scientific model of the influence mechanism of "organizational learning technological innovation – cross-boundary behavior – organizational innovation capability", and empirically test and measure the theoretical model and hypopaper by constructing an equation model and theoretical research methods. The results of this study prove that organizational learning and technological innovation have a positive impact on organizational innovation capability, while cross-boundary behavior plays a mediating role in organizational learning and technological innovation on organizational innovation capability.

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Introduction

High-tech enterprises are economic units that rely mainly on knowledge innovation and technological innovation. They are the main force of national innovation and development and are related to the future of national high-tech innovation. They are also one of the core innovative forces in national transformation and innovation. The core innovation capabilities of high-tech companies are technological innovation capabilities and management innovation capabilities. The value, non-competitiveness, and difficulty of imitation of their technological innovation capabilities and management innovation capabilities require heterogeneous knowledge and resources, which means that they need to acquire, integrate, and innovate knowledge. The basic idea of endogenous development of enterprises, and proposed that the internal knowledge and innovation capability of the company, which regards neoclassical economics as a “black box”, is the fundamental cornerstone of the company's development; the key importance of the internal resource foundation of enterprises in obtaining and maintaining competitive advantages, and proposed that enterprise capabilities include resource-based theory, enterprise capability theory, and enterprise knowledge theory; research shows that endogenous innovation can actively promote the technological innovation performance of enterprises (An, 2020; Ancona, 1990; Bao & Zhou, 2021; Bo, 2006; Cao et al., 2019; Cha et al., 2004).

Looking back at past research, the internal knowledge acquisition ability of enterprises has become the resource of current enterprise competitive advantages and has also become the center and focus of research on enterprise capability theory and enterprise knowledge theory. Moreover, in the past development process of enterprises, many scholars and managers recognized the importance of knowledge, but only focused on the external aspects of the enterprise, mostly relying on external introduction or learning. However, the uniqueness of the competitive advantage is of paramount importance. In today's era of rapid technological iterations and updates, much so-called core knowledge can be easily plagiarized. At the same time, in the age of Internet information, the convenience of platform connectivity may lead to the possibility of knowledge leakage. And only the internal capability of enterprises to continuously acquire and integrate core knowledge is unique, and some integration of intangible heterogeneous knowledge and resources within the enterprise is also the only long-term accumulated core knowledge and capability that cannot be surpassed by others, reflecting the core advantage or innovation capability of the organization (An, 2020; Ancona, 1990; Bao & Zhou, 2021; Bo, 2006; Cao et al., 2019; Cha et al., 2004).

From a knowledge perspective, the implicit and explicit knowledge that exists within a company is an untapped asset. Moreover, in the age of Internet information, it has become a reality that one person can bring down a company or make earth-shattering changes to a company. The innovation capability of enterprises is fundamental to obtaining and maintaining a competitive advantage, and the foundation of innovation is knowledge, especially the "hidden knowledge under the iceberg" that exists in every corner of the enterprise, which is the source of the core competitiveness hidden in the enterprise. Especially for high-tech enterprises, every small improvement and innovation will bring better capability improvement and make them get a better market. Therefore, how enterprises get better innovation advantages through management innovation by acquiring, integrating, innovating, transforming, and utilizing implicit knowledge becomes the key. The acquisition and management of internal knowledge in enterprises cannot simply copy Western models. It is necessary to explore management methods that are suitable for enterprises based on China's national conditions and personnel characteristics. Moreover, in the era of co-competition, continuous innovation and dynamic thinking can maximize the energy and potential of all employees, which is the basis for realizing

the value of all employees. This study mainly explores the mediating role of cross-boundary behavior in the relationship between organizational learning, technological innovation, and organizational innovation capability. It is hoped that this study can provide managers with a new perspective in current management practices and expand an innovative perspective, thus providing useful additions and references for theoretical development and management practices. (An, 2020; Ancona, 1990; Bao & Zhou, 2021; Bo, 2006; Cao et al., 2019; Cha et al., 2004)

Problem Statement

The era of volatility, uncertainty, complexity, and ambiguity (Hereinafter referred to as VUCA) is a moment of change in a dynamic and uncertain environment, where the competition of technological iteration and innovation has become the primary condition pursued and fought for by countries and enterprises. Technological innovation has been elevated to a national strategy. In the report of the 19th National Congress, the innovation strategy of "leading the transformation and upgrading of the real economy with innovation" was clearly proposed, emphasizing that China's technology innovation strategy is driven by two wheels (science and technology innovation and institutional innovation) and two wheels are coordinated together and continuously powered. In the report of the 20th National Congress in 2022, it was reiterated that science and technology is the first productive force, talent is the first resource and innovation is the first driving force. Faced with the turbulent international environment and international trade disputes, high-tech enterprises need to maintain their core competitive advantages and increase technological innovation, and technological innovation depends on the stock of new knowledge, requiring the realization of the "Mass entrepreneurship and innovation" value system for all employees. Enterprise innovation obtains heterogeneous resources and knowledge, which has broken the tradition of relying solely on external channels and shifted the focus to the internal resources of the enterprise. Through existing internal resources and information channels, internal resources are unearthed and stimulated, and external connections are established. (Bao & Zhou, 2021; Bo, 2006; Cao et al., 2019; Cha et al., 2004).

First, the uncertain environment of informatization requires enterprise knowledge innovation. With the acceleration of innovation, enterprises need to open up new perspectives in acquiring knowledge endowments and heterogeneous resources. Currently, a few well-known domestic enterprises have seized this opportunity, and stimulated more potential resources through the influence and cooperative effect created by internal organizational learning and technological innovation.

Second, in the information age, everyone needs more opportunities and platforms and requires innovative knowledge management. In the information age, it is easy for everyone to connect with each other and with the entire planet. It is relatively easy for everyone to obtain external knowledge and resources. In addition, for some overqualified employees within the enterprise, the enterprise needs to stimulate their group potential and facilitate their cross-boundary behavior, so that the knowledge, skills and experience outside their work and responsibilities and the external resources they possess can be realized across borders, the enterprise's knowledge stock can be increased, and knowledge integration, fusion and interaction can be fused into valuable assets. At the same time, the cross-boundary movement of overqualified employees can have a stimulating and empowering effect, which requires companies to explore the relationship between them and expand new perspectives.

Third, currently, there are relatively few Chinese and foreign scholars studying cross-boundary behavior. There is little research on the mediating role of cross-boundary behavior in the

relationship between organizational learning, technological innovation, and organizational innovation capability in innovation development enhanced by organizational innovation capability. The cross-boundary behavior of overqualified employees within the enterprise has been practiced and achieved some success in very few enterprises, and further analysis is needed. In addition, the new cross-boundary empowerment ecology generated and constructed by cross-boundary behavior as a mediator variable is unexplored, which requires further exploration from this perspective to bring more perspectives and space for enterprise innovation management. (Bao & Zhou 2021; Bo 2006; Cao et al. 2019; Cha et al. 2004).

Research objectives

In the era of rapid technological iteration, uncertainty and dynamism, enterprises must always equip all employees with innovative thinking and frequently apply change thinking to face all developments, adopt the full-staff value strategy to obtain total factor resources, and provide strong guarantees to enhance enterprises' core competitiveness. Organizational learning, technological innovation and organizational innovation capability are the three core elements of enterprise innovation and development. However, for enterprises to ensure their core competitive advantages and achieve long-term sustainable development, they need to acquire more heterogeneous resources and knowledge. If too many financial and material resources are focused on external factors while neglecting the exploration and stimulation of internal resources, it will be counterproductive. Internal employees of the enterprise are most familiar with the production process and techniques. Even small suggestions and optimizations can potentially bring new opportunities to the enterprise. However, there are large gaps in the research on the cross-boundary behavior of individuals within the enterprise, and on the role and the effectiveness of impact of cross-boundary behavior influenced by organizational learning and technological innovation at home and abroad. So this study takes high-tech enterprises as the research object and combines theoretical literature review and analysis with empirical research to explore the research path and mechanism of the mediating effect of cross-boundary behavior on organizational learning, technological innovation and organizational innovation capability in high-tech enterprises. It analyzes the relationship between various variables, explores the mediating relationship of cross-boundary behavior, and provides strategies and suggestions for enhancing organizational innovation capability through the synergistic effect of organizational learning and technological innovation, providing a new perspective for enterprise innovation. The specific research objectives are as follows:

First, verify the specific relationship between organizational learning, technological innovation, organizational innovation capability, and cross-boundary behavior in an uncertain environment. The research of organizational learning, technological innovation affecting cross-boundary behavior and organizational innovation capability and the research of the mediating role of cross-boundary behavior among organizational learning, technological innovation and organizational innovation capability are the basic contents of this study and the basic prerequisites for further research on the action mechanism and boundary conditions.

Second, the impact relationship and mechanism of cross-boundary behavior on the improvement of organizational innovation has been proved, but it is mostly focused on team cross-boundary, while the empirical analysis of individual cross-boundary, especially for the cross-boundary impact of existing resources-overqualified employees in the company, is still lacking. This study mainly uses the theories of corporate innovation and knowledge innovation, person-environment fit, and S-O-R theory, and introduces cross-boundary behavior as a mediator variable to examine its mediating role among organizational learning, technological innovation, and organizational innovation capability, hoping to discover the specific paths of

organizational learning and technological innovation on cross-boundary behavior through the analysis of the mediating mechanism. Meanwhile, this study will also explore the coordinated effect relationship between cross-boundary behavior, organizational learning, and technological innovation, in order to explore the mediating role of cross-boundary behavior in improving organizational innovation capabilities and the internal new ecology constructed by cross-boundary behavior.

Third, this study takes organizational learning and technological innovation as independent variables, focusing on the relationship between the three dimensions of organizational learning (commitment to learning, shared vision, and shared knowledge) and the two dimensions of technological innovation (technological innovation inputs and technological innovation intermediate outputs) on organizational innovation capability, as well as the synergistic effect relationship with cross-boundary behavior. Through empirical analysis, the mutual adjustment effect between enterprise cross-boundary behavior, organizational learning, and technological innovation is verified, thus more comprehensively understanding the boundary conditions and influences of organizational learning, technological innovation, and cross-boundary behavior.

Fourth, at the practical level, through specific empirical analysis and summary of research results, it is hoped that the findings of the study can provide specific reference values and theoretical practices for the improvement of organizational innovation capabilities of today's high-tech enterprises in the era of information and digital competition and find a fast and efficient method of knowledge innovation management for high-tech enterprises. (Bao & Zhou 2021; Bo 2006; Cao et al. 2019; Cha et al. 2004).

Among them, the exploration of the action mechanism and influence conditions between organizational learning, technological innovation and employees' cross-boundary behavior, as well as the investigation of the mechanism of cross-boundary behavior on organizational innovation capability is the focus and difficulty of this study. Due to the author's limited ability, insufficient time and lack of financial resources, there are many shortcomings in the above research, and there is still a need to further expand the space and field of research in the future.

Research questions

Research questions of this study can be described as: 1. How to maintain optimal organizational innovation capability in an uncertain environment? Uncertainty and sudden change are the norm in the VUCA era. Optimal organizational innovation is the key to ensuring that companies are not eliminated in this changing environment and remain in the business world forever. High-tech enterprises, with knowledge as the core, acquire knowledge stock and knowledge increment through organizational learning to provide new assets and values for maintaining optimal organizational innovation capability, which is the key factor for maintaining optimal organizational innovation capability. 2. Is there a coordinated effect between organizational learning, technological innovation, and cross-boundary behavior? Technological innovation is the reuse and reinvention of knowledge and is a relatively critical link in organizational innovation capabilities. Organizational learning is the foundation of technological innovation. The impact of organizational learning and technological innovation stimulates cross-boundary behavior within the enterprise. At the same time, the organizational innovation atmosphere created by organizational learning and technological innovation can easily stimulate the innovative vitality of the enterprise and can also empower employees within the enterprise to invest more enthusiasm in organizational learning, and then integrate innovative knowledge and skills. 3. What is the intermediate mechanism for promoting the enhancement of organizational innovation capability through cross-boundary behavior? Cross-boundary

behavior plays a mediating role in the impact of organizational learning and technological innovation on organizational innovation capability. The influence and cultural atmosphere and environment created by organizational learning and technological innovation will stimulate cross-boundary behavior of overqualified employees within the enterprise, allowing their implicit knowledge to be transformed into explicit knowledge through organizational learning, integrating explicit knowledge within the enterprise to obtain new knowledge stock, and once again stimulating technological innovation and enhancing organizational innovation capability. 4. Can cross-boundary behavior promote the enhancement of organizational innovation capabilities? Cross-boundary behavior of overqualified employees is an effective and efficient strategy for acquiring knowledge, resources, and technology within the company. Overqualified employees are a potential resource that companies have overlooked in the past, and they are also the weakest link in the talent development and training process that companies need to change. It is necessary to guide and establish the stimulation of the existing manpower of the enterprise, especially the overqualified employees, based on the characteristics of the overqualified employees and the human and environment fit theory and S-O-R theory, and let the overqualified employees interact and integrate the knowledge through cross-boundary behavior to produce the knowledge coupling effect, thus allowing their own knowledge to gain re-value. 5. Can cross-boundary behavior build an internal empowerment ecosystem, and what is the model? The cross-boundary behavior of overqualified employees and the value and results created by cross-boundary behavior will subtly empower the enterprise, and the positive energy generated by the results of cross-boundary behavior will encourage more people and teams to join in. With the advent of the Internet information age, people's internal and external connections are relatively convenient and efficient through electronic information. In this positive cross-boundary cultural atmosphere, people often inadvertently engage in cross-boundary behavior. Thus, building a new ecology of empowerment within the enterprise with cross-boundary behavior as the focus, providing more and newer integrated resources for organizational innovation capabilities.

Scope of study

This study takes high-tech enterprises in the Guangdong-Hong Kong-Macao Greater Bay Area (Hereinafter referred to as "Greater Bay Area") as the research object, and sorts out the results of previous scholars' research, designs a questionnaire to obtain sample data and then conducts statistical analysis. The main research scope includes three aspects:

First, the field of theory. The era of informatization is an era of competition and cooperation, an era of accelerated renewal and iteration of sharing, co-creating and win-win technology. The development of enterprises depends on core advantages and the acquisition of heterogeneous knowledge. In the new era, information, data, and new knowledge have become key assets for enterprises. Although organizational learning and technological innovation are very important for acquiring external knowledge for enterprises, this study focuses on the integration of existing internal resources, and the integration of external knowledge is not the focus of this study. This study focuses on the two independent variables of organizational learning and technological innovation, as well as the mediator variables of cross-boundary behavior as strategic theory research. On this basis, this study adopts theories of firm innovation, knowledge innovation, person-environment fit, S-O-R, and path research to enrich the theoretical scope of this study.

Second, the application boundary. This study takes the organizational innovation capability of high-tech enterprises as the entry point, explores how the two factors of organizational

learning and technological innovation promote the improvement of organizational innovation capability, and deeply studies the mediating effect of cross-boundary behavior as a mediator variable in the relationship between organizational learning, technological innovation and organizational innovation capability, providing a new perspective for management innovation and development of enterprises, and expanding the application boundary of research.

Third, the object of study. Based on a review and summary of relevant domestic and foreign literature, this study clarifies the shortcomings of existing research findings and conclusions related to organizational innovation capability, and points out that the focus of knowledge innovation, integration, and acquisition by firms should be on the cross-boundary behavior of overqualified employees combined with specific needs in the current uncertain environment. At the same time, it is pointed out that organizational learning and technological innovation have a synergistic effect on the influence of cross-boundary behavior, and the new ecological role of cross-boundary behavior in enhancing organizational innovation capability is also identified, thus exploring the influence relationship between organizational learning, technological innovation, and organizational innovation capability.

Literature review

Dependent Variable: Organizational Innovation Capability

Innovation capability, also known as innovative ability, was first proposed, and studied by Joseph Alois Schumpeter, the father of modern innovation theory. It refers to the ability of enterprises to create new combinations since existing ones. On this basis, domestic and foreign scholars have also broadened the research space of innovation capability from different perspectives and dimensions, structures and abilities, characteristics, etc. The innovation capability of enterprises is the ability to break established frameworks and refers to the ability of enterprises to improve their own production capacity and technological innovation capability through the absorption and utilization of knowledge. The perspective of acquiring knowledge that organizations can achieve innovation and breakthroughs in technology bottlenecks and seek innovation through searching, integrating, and re-creating external knowledge, which is an effective path for entrepreneurs. The impact of external human resource knowledge search technology and ambidextrous innovation of enterprises on innovation effects that enterprises must be able to effectively collect valuable information and use the information stock to provide a driving force for innovation capability, thus improving innovation. The knowledge search will drive enterprise technological innovation, and information search has a positive impact on enterprise technological innovation. (Bao & Zhou 2021; Bo 2006; Cao et al. 2019; Cha et al. 2004) also believed that when small and medium-sized enterprises face technological barriers and talent shortages during their growth process, they need to establish their own learning functions and systems, tap and integrate existing knowledge to create new value, rearrange and combine them to achieve new value creation, effectively improve the enterprise's predicament, and thus improve the enterprise's innovation capability. From the perspective of cluster networks that establishing cluster networks helps to share knowledge between enterprises and acquire new knowledge. Through linkage to create interoperability, interoperability to promote communication, and communication to achieve shared knowledge, to achieve shared value and knowledge integration, but also to promote more members to join the cluster network. Good communication and exchange and interaction enable differentiated knowledge to flow and spread between organizations and facilitate enterprises to obtain the resources needed for their own innovation (Bao & Zhou, 2021; Bo, 2006; Cao et al., 2019; Cha et al., 2004).

. Analysis showed that the key driving factor for building innovation in the company is the ability of management personnel; the insight and understanding of senior management on internal information and external environment will promote innovation development and have a positive impact on innovation capability. The influence relationship in the process of innovation capacity enhancement of high-tech enterprises by collecting data such as technological innovation results and inputs and outputs of 94 high-tech manufacturing enterprises in Wenzhou region in 2017, and the comprehensive benefits, overall technological innovation resource allocation, and overall technological innovation effects measured by DEA model. The researchers proposed that unreasonable resource allocation (innovation resource organization, innovation mode, innovation capacity, etc.) of high-tech manufacturing enterprises would negatively affect innovation capacity enhancement; the industrial cluster network positively affects innovation capacity, and enterprises need to establish enterprise alliances, use virtual platforms, and establish online cooperation platforms to share resources such as talents, information, and equipment to improve technological innovation capacity. The analytic hierarchy process and entropy weight method to establish a composite weighting-based evaluation model for the ability of high-tech industries. The development of innovation capabilities of small and medium-sized enterprises must enhance the ability of high-tech industries from the perspectives of technology innovation input, innovation output, technology innovation services, innovation absorption and dissemination.

The key areas in which knowledge transformation enhances corporate innovation, and their findings suggest that absorptive capacity has a bridging function and thus mediates the impact on knowledge transformation and innovation outcomes. Technological transformation is a key strategic factor in enhancing the capabilities of small and medium-sized enterprises, and knowledge stock is considered the main resource for innovation realization Enterprises can mine, integrate, and stimulate internal knowledge to achieve a doubling of knowledge stock, promote knowledge integration and innovation, and enhance their innovation capabilities through deep stimulation of existing knowledge. (Bao & Zhou, 2021; Bo, 2006; Cao et al., 2019; Cha et al., 2004)pointed out from the perspective of the impact of enterprise factors on enterprise innovation, and the role of the enterprise technology innovation environment on enterprise technology innovation behavior, that the organizational technology innovation environment has a positive effect on enterprise technology innovation behavior, enterprises can obtain more resources that can support technological innovation in enterprises with a good technological innovation environment, and the rich technological innovation culture atmosphere within the enterprise has an inspiring and promoting effect on the construction of innovative talent teams, better innovation mechanisms, investment, and acquisition of innovative resources, etc. Other scholars at home and abroad have their own strengths and weaknesses in researching the improvement of organizational innovation capability from different perspectives, and some of them are summarized in the following table.

Technological Innovation

The innovation process refers to the sum of production activities from a company's mastery of one or more production knowledge and skills to the development and industrialization of new products, which is the target innovation process for companies to understand market orientation and enhance core competitiveness. It goes through the stages of initial conception, research and development, and commercialization. At present, innovation capability is not only an important foundation for the rapid growth of high-tech industries, but also an important driving force for promoting national innovation development and the rapid growth of high-tech enterprises. The improvement of enterprises' core competitiveness is achieved through technological advances, and innovation capability has become the main driving force for

sustainable economic and social growth. Enterprises have become the main body of innovation, so the improvement of technological innovation capability of high-tech enterprises is a hot topic that needs the attention of current and future enterprises and scholars.

The enterprise technological innovation refers to the process in which enterprises search, integrate, create, and transform heterogeneous knowledge with practical value in a certain business environment, thereby innovating the production technology, process, business capabilities, and management level of the enterprise. Another perspective to analyze the relationship between corporate innovation and core competencies. The enterprise technological innovation capability is a model of virtuous cycle of growth with innovation as the main purpose formed by enterprises through their own acquisition of knowledge, integration of knowledge, transformation, and utilization of knowledge, which allows them to create core competitive capabilities and advantages for better enterprise development momentum. The technological innovation is a series of activities from the generation of ideas to production design, trial production, production, marketing, and commercialization, and it is also a process of knowledge conversion and application, which is essentially the generation and application of technology. Creation of commercial value, and there are product innovation, process innovation, and process innovation in the process of technological innovation. (Bao & Zhou, 2021; Bo, 2006; Cao et al., 2019; Cha et al., 2004).

Innovation is a repetitive cycle, starting from the initiation stage, through the development stage, and the practice stage. pointed out in their research that leadership behavior and organizational support have a positive impact on the enthusiasm and active participation of employees in innovation. Based on the self-determination theory, (Bao & Zhou, 2021; Bo, 2006; Cao et al., 2019; Cha et al., 2004) pointed out that the cultivation of external support can stimulate employees' participation in innovative activities, while the psychological sense of security created by the environment promotes employees' perceived situational experience and may potentially influence employees' innovation capability to share and integrate knowledge.

Cross-boundary Behavior

This further motivates the company's employees to innovate in areas such as products, operation management, and services, and have new creative ideas. There is a considerable degree of excess of professional knowledge, skills and experience of a larger number of personnel in the enterprise compared to the work they perform. (Bao & Zhou 2021; Bo 2006; Cao et al. 2019; Cha et al. 2004) found through research that by providing reasonable guidance and incentives, companies can encourage overqualified employees to demonstrate more creativity in their work. The concept of Boundary Spanning Behavior (BSB) was first proposed by researchers such as Ancona (1990), which reflects the phenomenon of institutions or groups forming mutual connections and sustained interactions with external entities to achieve certain overall goals. Wei et al. (2018) pointed out that cross-boundary behavior refers to the behavior of employees within the enterprise who actively participate in work activities other than work and responsibilities, which is a further reflection of individual capabilities. Cross-boundary behavior refers to activities carried out by individuals to achieve goals or to establish connections with external actors and is the most common cooperative task related to different stakeholders (Ancona, 1992). Also, it is a series of resources and information interaction and collaboration on the boundaries within different organizations and organizational units. Cross-boundary actions are usually aimed at unstructured problems, and require good professional knowledge, technical skills, and literacy, which can enable talented people who are perceived

as over-qualified to use their creative talents to the full. Marrone J A's (2007) research shows that cross-boundary action refers to the action of members maintaining contact and interaction with external communities or talents, assisting the group in achieving overall development goals. The cross-boundary behavior of employees can not only enhance the leadership of enterprises, but also enhance their own reputation, because boundary spanners integrate and merge the relationships between organizational entities such as enterprise employees, executives, and peripheral workers, and play a key role in the "structural holes" or "structural bridges" on the internal boundaries of the organization. The essence of cross-boundary behavior is to promote the two-way transmission and interaction of information and technology between the organization and the external environment, improve the efficiency of organizational communication, and make cross-boundary contacts to obtain the necessary knowledge and skills. In the process of self-regulation, individuals will also display certain methods or preferences, namely regulatory focus. This type of individual places more emphasis on positive outcomes in their behavior, and their desired goal state is aspiration and completion. However, about the role of individuals in creative development, experts generally believe that individuals with a promotion-focus orientation are more likely to express creative ideas and viewpoints, have a wider and more abstract space for expression and more risk preference, and have a stronger sense of creativity. There is a positive correlation between promotion-focus regulatory orientation in organizations and the creativity of individual innovation activities. The promotion-focus regulatory orientation enhances the regulatory factors of the relationship between informative evaluation and creative performance. The regulatory effect of characteristic regulatory focus on the mutual correlation between transformational leadership and member creativity and believed that the interaction of regulatory focus between transformational and characteristic leaders would reduce the negative impact of transformational leadership on member creativity. (Bao & Zhou 2021; Bo 2006).

Management Theory

Meeting the needs of new customers requires not only exploratory innovation, but also disruptive innovation. And from a future perspective, relying solely on external innovation for development yields few results and requires a dual innovation collaborative spiral development model, with endogenous innovation power positively influencing organizational innovation capability. Enterprise organizational activities can expand and update the stock of knowledge; Knowledge sharing and integration promote the acquisition of knowledge and broaden the knowledge dimension for organizational innovation capability enhancement; Heterogeneous knowledge is a necessary condition for innovation and is the core of innovation capability construction; Insufficient heterogeneous resources are not conducive to using knowledge to enhance innovation capability; to improve innovation success, it is necessary to promote the integration and acquisition of implicit knowledge and information; Stimulating organizational learning is a way to break away from excessive dependence on external knowledge for enterprises. In other words, knowledge sharing is a win-win model and a better strategy for achieving value symbiosis. the cognitive aspect of the corporate consciousness environment will bring a potential impact on employees. From the perspective of environmental fit, divided fit into two categories: supplementary fit and complementary fit. The consistency and similarity of personal traits, values and environment represent the typical characteristics of supplementary fit, while the combination of employees' personal abilities and work environment needs and the combination of employees' personal needs and work environment supply represent the complementary fit. (Bao & Zhou, 2021; Bo, 2006).

By sorting out research surveys on person-organization fit from 1985 to 2006, pointed out that the subjective person-organization fit measurement subject has three most important sources of factors, in order of theoretical concepts (unity and complementary fit, demand-abilities and demand-supply concept), social organization characteristics (social organization attributes, social organization changes), and matching connotations of fit (values, characteristics, goals, and KSAs). The person-organization fit theory is derived from the person-environment fit theory.

The S-O-R theory was proposed by Mehrabian (1974) based on the Stimulus-Response (S-R) theory, which refers to the Stimuli-Organism-Response theoretical model. Individuals can also be influenced by an external stimulus (S), which can interfere with the mental cognition and emotional state of individual organisms (O) and can lead to a series of psychological reactions in the form of internal and external behavioral responses (R). (Bao & Zhou 2021; Bo 2006). research shows that S-O-R explains a series of reactions generated by the consciousness and emotions of organisms based on the current environment, as well as the impact on the subsequent activity prediction formed by the organism after the response. The foundation of Russell's research to more areas, especially the online retail industry, to analyze the factors influencing consumers' perception of the online shopping environment and shopping behavior.

This study is based on enterprise innovation theory and knowledge management theory, person-environment fit theory, and S-O-R theory. It is difficult to innovate in the era of knowledge economy to improve enterprise innovation relying on limited; enterprises can gain more innovative knowledge and experience through collaboration with external parties and by crossing borders; based on organizational learning helps enterprises to deploy resources and fit external changes to cope with external shocks, it also needs to discard old knowledge and promote awareness and change; technological innovation requires diversified knowledge creation, knowledge networks and cooperation networks are needed to be embedded in innovation activities, and diversified knowledge of enterprises is the basis for enhancing competitiveness. The 20th National Congress report of the Communist Party of China once again pointed out that innovation is the primary driving force, and technological innovation is the source of power for promoting economic innovation. Cross-boundary behavior has a positive regulatory effect on knowledge innovation, which is the integration and exchange of resources and information at the organizational boundary; cross-boundary ability can improve the cognitive flexibility and knowledge absorption and utilization ability of enterprises and cross-boundary employees are typical representatives of overqualified employees within the enterprise, which is crucial for enterprises to obtain rich knowledge and resources. Therefore, enhancing organizational innovation capability requires better organizational learning and technological innovation, and focuses on overqualified employees' cross-boundary behavior and the stimulating and empowering effects it has, thus promoting cross-boundary knowledge acquisition and integrated innovation of all employees. Through organizational learning (commitment to learning, shared vision, shared knowledge), technological innovation (technological innovation input, technological innovation intermediate output), and cross-boundary behavior synergy, the influence relationship with organizational innovation capability is explored. (Bao & Zhou, 2021; Bo, 2006).

Methodology

Research Design

As previously analyzed, organizational innovation capability, organizational learning, technological innovation, and cross-boundary behavior are all multidimensional variables that cannot be directly observed and can only be measured by designing survey questionnaires and

selecting observed variables based on previous research by scholars. The relationship between organizational innovation capability, organizational learning, technological innovation, and cross-boundary behavior can be examined using structural equation modeling to test the relationship effects between the four variables and to test the mediating relationship of cross-boundary behavior between organizational learning, technological innovation, and organizational innovation capability.

First, the definition of the research object. Based on the research theme and purpose of this study, the organizational innovation capability of high-tech enterprises in the Guangdong-Hong Kong-Macao Greater Bay Area is taken as the object of empirical research, and the general scope, interval, and data collection of the research are defined accordingly. As mentioned earlier, the study of sociological variables can be challenging, requiring the collection of data through questionnaire surveys and the validation of research propositions through relevant argumentation and data testing.

Second, empirical sample selection. Empirical research is a relatively scientific approach to conducting scientific research, and the selection of an empirical sample must be generally representative. The selected samples studied in this article are all high-tech enterprises within the Greater Bay Area. They are the driving force of social and economic development and technological innovation, and they can relatively represent the objective and scientific requirements of organizational innovation ability, organizational learning, technological innovation, and cross-boundary behavior relationship research of high-tech enterprises. This study conducts data correction and verification processing on indicators such as organizational innovation ability, organizational learning, technological innovation, and cross-boundary behavior of high-tech enterprises.

Third, construct a structural equation model and analyze and test the model. Based on the characteristics of the research questions and research objectives, this study constructs a structural equation model to investigate the mediating effect of cross-boundary behavior on the relationship between organizational learning, technological innovation, and organizational innovation capability. There are generally eight main steps in structural equation modeling analysis: ① conceptualization of the model, that is, proposing an initial theoretical model based on theoretical assumptions, and determining the latent and observed variables in the model. First, analyze the mechanism of the impact of organizational learning and technological innovation on organizational innovation capability, and then introduce cross-boundary behavior as a mediator variable to explore the mediating role of cross-boundary behavior in the relationship between organizational learning, technological innovation, and organizational innovation capability. ② Construction of path diagram: clarify the latent and observed variables on the basis of the initial theoretical model; ③ Confirmation of model: clarify the nature and number of parameters to be estimated in the model; ④ Model identification: judge whether the parameters in the model can be identified according to the identification conditions of the structural equation model; ⑤ Model estimation: select the appropriate parameter estimation method according to the distribution characteristics of the data; ⑥ Model evaluation: evaluate the structural equation model from three aspects: parameter test (6) Model evaluation: evaluate the structural equation model from three aspects: parameter test, model test and analytical ability; (7) Model revision: the structural equation results may be contradictory to the hypopaper proposed in the theoretical model, and need to be revised accordingly; (8) Model Cross-validation: analyze whether the estimated model or the revised model is suitable for different samples from the same overall.

Finally, the collected data is verified to obtain empirical conclusions. Based on the previous empirical results, and based on the concepts and meanings of the variables represented by the data and the relationships reflected by the variables, the impact mechanism of cross-boundary behavior in mediating the relationship between organizational learning, technological innovation and organizational innovation capability is analyzed and demonstrated in depth, and the corresponding research conclusions and management implications are proposed based on the empirical results, and the groundwork for the subsequent research is laid.

Data collection

This study is based on the relationship between organizational learning, technological innovation, and organizational innovation capabilities of high-tech enterprises, and empirical research needs to be conducted through questionnaire surveys for observations and research in management and sociology. In the initial stage of the questionnaire design, relevant studies on the relationship between organizational learning, technological innovation, cross-boundary behavior and organizational innovation capability were sorted out in detail, and the measurement indexes and scale items used by many domestic and foreign scholars were borrowed. At the same time, the initial questionnaire of this study was developed by communicating and discussing with supervisors and internal personnel of high-tech enterprises in different industries based on the questions of this study, and was revised twice; The purpose of developing the initial questionnaire is to test the reliability of the initial questionnaire in order to develop a formal questionnaire that formally satisfies empirical testing and analysis.

Target population

Based on the research theme and purpose of this study, the organizational innovation capability of high-tech enterprises in the Guangdong-Hong Kong-Macao Greater Bay Area is taken as the object of empirical research, and the general scope, interval, and data collection of the research are defined accordingly. As mentioned earlier, the study of sociological variables can be challenging, requiring the collection of data through questionnaire surveys and the validation of research propositions through relevant argumentation and data testing.

Sampling frame and sampling location

This study surveyed employees and managers of high-tech companies in the Greater Bay Area through online and WeChat questionnaires. The data was mainly collected with the help of MBA and DBA classmates from high-tech companies. To make the research data more referenceable, classmates and friends from high-tech enterprises such as DJI, Huawei, TCL, Desay SV, EVE Energy, Merry Technology, and Boji Pharmaceutical in the Greater Bay Area were selected. To ensure everyone's participation, red envelope incentives were also used appropriately to encourage participation and careful reading of the questions, maximizing the value of the data collection.

Sampling size

As of the finalization of the paper, a total of 413 respondents' survey data were collected. After excluding invalid questionnaires with some errors or affected by time factors, there were 381 valid data, accounting for 92.2%. Moreover, the survey was conducted by means of WeChat to select high-tech enterprises in a targeted manner, mainly including Shenzhen DJI, Shenzhen Huawei, Guangzhou Boji Medical, TCL, EVE Energy, Desay SV and Merry Technology, etc. The survey period started from mid-September 2021 to March 31, 2022, and lasted for more than six months, and this data provides a solid basis for the continuous research and exploration of this study.

Questionnaire design and instrumentation

This study uses a questionnaire survey method to collect empirical research data, and in terms of questionnaire design principles, it also refers to and borrows from the methods of previous scholars and experts. (Bao & Zhou 2021; Bo 2006).divided the design of questionnaires into five specific steps: first, determine what issues the plan needs to measure; second, develop the questionnaire; third, determine the wording of the questionnaire. Fourth, arrange the questions items in the questionnaire in an appropriate order; fifth, pre-test the questionnaire. To ensure the quality of the survey data and the reliability of the survey questionnaire, this paper designed a survey questionnaire based on the recommendations of scholars mentioned earlier, which mainly includes the following four processes: The four variables of this study, organizational innovation capability, organizational learning, technological innovation, and cross-boundary behavior, are measured using multiple items. The scale adopts the common design form of empirical research in management and uses the 5-point Likert scoring method for each item. Assignment of specific issues: 1—Strongly disagree, 2—Disagree, 3— Neither disagree nor agree, 4—Agree, 5—Strongly agree.

Based on reviewing domestic and foreign scholars' literature on organizational innovation capability, organizational learning, technological innovation, and cross-boundary behavior, this study sorted out and analyzed the variables involved in empirical analysis in past literature. When designing specific questions, as much as possible, to follow those scales that have been tested in empirical studies and have high reliability and validity; In order to better facilitate the study, the questions in this study were also slightly modified by drawing on previous measurement dimensions, with the aim of making the analysis of empirical data more robust. Therefore, after further analysis of the connotations of the variables and the preparation of specific questions for this study, the first draft of the questionnaire was finally formed.

The initial draft of the questionnaire was discussed with the four supervisors at the paper guidance seminar, and the rationality and specific problem item descriptions and wording of the questionnaire dimensions were discussed multiple times. The four supervisors gave many suggestions and guidance, and the survey questionnaire was first revised under their suggestions and guidance. Then, it was further communicated with colleagues and classmates from related companies such as BojiMed, Huawei, DJI, TCL, Desay SV Automotive, and Merry Electronic Technology to understand their innovation situation and opinions on the survey. Based on the communication and conversation with them, some question items descriptions of the questionnaire were revised for the second time, and the scale was revised after the pre-test to form the final questionnaire.

Organizational innovation capability is the core competitiveness of enterprises, and it is also a key factor for enterprises to maintain technological and technical advantage. Organizational innovation capability is an important indicator for evaluating the effectiveness of technological innovation activities in the field of strategic management. However, due to the complexity of the process and the uncertainty and dynamism of the results in innovation activities, etc., the present literature has not developed a unified and widely recognized indicator system for measuring the innovation capability of enterprises. Different scholars measure from different perspectives or from single indicators and multiple indicators. A single indicator to measure the innovation capability of firms is quite complex, and it is also difficult to measure the diversity and complexity of firms' innovation capability. So many scholars use multiple indicators to measure the innovation capability of enterprises. It is believed that multiple indicators can more comprehensively and accurately reflect the effectiveness of enterprise

innovation capability. The innovation capability of innovative enterprises is mainly measured by five key indicators: innovation input capability, innovation output capability, innovation market capability, technological innovation capability, and innovation management capability. This study mainly conducts in-depth research from two dimensions of technological innovation capability and innovation management capability.

Reliability Analysis

The reliability can reflect the stability of the measurement results of the scale. The reliability of the scale corresponds to the degree of reliability of the scale, that is, the greater the reliability, the higher degree of reliability of the scale. After the factor analysis is completed, in order to further test the reliability of the scale, a reliability analysis is required. Cronbach's Alpha is usually used for reliability tests, that is, the coefficient of internal consistency.

(1) Reliability analysis of organizational learning scale

Table 3-1 Reliability Analysis of Organizational Learning Scale

Driving Factor	Indicator Symbols	Cronbach's Alpha if Item deleted	Cronbach's Alpha Value
Commitment to Learning	OL1	0.913	0.923
	OL2	0.909	
	OL3	0.904	
	OL4	0.900	
	OL5	0.847	
Shared Vision	OL6	0.920	0.939
	OL7	0.918	
	OL8	0.928	
	OL9	0.921	
	OL10	0.906	
Shared Knowledge	OL11	0.905	0.920
	OL12	0.905	
	OL13	0.903	
	OL14	0.896	
	OL15	0.897	

Data source: collated by this research.

The Cronbach's alpha coefficients for the organizational learning scale and each dimension are greater than 0.7, indicating that the reliability of each dimension and scale is high.

(2) Reliability analysis of technological innovation scale

The Cronbach's alpha coefficients of the technological innovation scale and the dimensions are greater than 0.7, indicating that the reliability of each subscale and the total scale is high.

Table 3-2 Reliability Analysis of the Technical Innovation Scale

Indicators	Symbols	Cronbach's Alpha if Item deleted	Cronbach's Alpha Value
Technological Innovation Input	TI1	0.911	0.931
	T12	0.914	
	T13	0.910	
	T14	0.911	
	T15	0.921	
	T16	0.914	

Technological Innovation Intermediate Output	TI7	0.905	0.939
	TI8	0.902	

Data source: collated by this research.

(3) Reliability analysis of cross-boundary behavior scale
The Cronbach's alpha coefficients of the cross-boundary behavior scale and the dimensions are greater than 0.7, indicating that the reliability of each subscale and the total scale is high.

Table 3-3 Reliability Analysis of Cross-Boundary Behavior Scale

Dimension	Indicator Symbol	Cronbach's Alpha if Item deleted	Cronbach's Alpha Value
Ambassador Activity	CB 1	0.879	0.904
	CB 2	0.879	
	CB 3	0.875	
	CB 4	0.895	
	CB 5	0.872	
	CB 6	0.874	
	CB 7	0.874	
Task Coordinator Activity	CBB 8	0.875	0.898
	CBB 9	0.853	
	CBB 10	0.869	
	CBB 11	0.876	
Scout Activity	CB 12	0.907	0.924
	CB 13	0.889	
	CB 14	0.888	
	CB 15	0.917	

Data source: collated by this research.

(4) Reliability analysis of organizational innovation capability scale
The Cronbach's Alpha of the “driving factor” is 0.879, indicating that the feasibility of each subscale and total scale is high, and the overall validity and quality of the questionnaire are reliable.

Table 3-4 Reliability Analysis of Organizational Innovation Capability Scale

Dimension	Indicator Symbol	Cronbach's Alpha if Item deleted	Cronbach's Alpha Value
Organizational Technological Innovation Capability	OI1	0.951	0.960
	OI2	0.952	
	OI3	0.953	
	OI4	0.950	
Organizational Management Innovation Capability	OI5	0.925	0.939
	OI6	0.905	
	OI7	0.902	

Data source: collated by this research.

Correlation analysis of variables
Correlation analysis is mainly a statistical analysis method that studies the degree of correlation between two or more variables. Through correlation analysis, the correlation level

between two or more variables and the correlation characteristics between variables can be found. The correlation analysis is mainly judged by using the Pearson correlation coefficient. The Pearson correlation coefficient ranges from -1 to 1, and the closer the absolute value of the correlation coefficient is to 1, the stronger the correlation between the two variables; the closer the absolute value of the Pearson correlation coefficient is to 0, the weaker the correlation between the two variables. When the correlation coefficient is greater than 0, it means that there is a positive correlation between the two variables, and their directions of change remain the same. That is, one variable increases with the increase of the other variable when other conditions are constant; when the correlation coefficient is less than 0, it indicates a negative correlation between the two variables, and its direction of change is opposite. That is, one variable decreases with the increase of the other variable when other conditions are constant. For construct validity, exploratory factor analysis (EFA), KMO test, and Bartlett's test methods are mainly used to test whether each variable has sufficient discriminant validity and convergent validity. The relevant judgment criteria are also based on the standards pointed out by Kaise and Rice (1974): If the KMO value is 0.5-0.6, it means that it is not suitable for factor analysis; if the KMO value is 0.6-0.7, it means that it is barely suitable for factor analysis; if the KMO value is 0.7-0.8, it means that it is suitable for factor analysis; if the KMO value is 0.8-0.9, it means that it is very suitable for factor analysis; if the KMO value is above 0.9, it means that it is extremely suitable for factor analysis; generally speaking when the KMO is 0.5-1.0, the validity is acceptable. For convergent validity, it is generally expressed by extracting the common factor in the scale and using the factor loading to indicate the degree of relevance to the scale. Usually, in factor analysis, the higher the value of factor loading, the higher the convergence, and if the factor loading is greater than 0.5, it is considered to meet the requirement of convergent validity. Validity judgment criteria are shown in Table 3-18.

Table 3-5 Evaluation Criteria of KMO

Indicators	Indicator value	Judgment Criteria
KMO	<0.5	Not suitable for factor analysis
	0.5-0.6	Not well suited for factor analysis
	0.6-0.7	Barely suitable for factor analysis
	0.7-0.8	Suitable for factor analysis
	0.8-0.9	Good for factor analysis
	>0.9	Ideal for factor analysis

Findings

Demographic Profile

Table 4-6 Distribution of the Source Provinces of the Respondents

Source/Province	Number of people	Percentage (%)
Shenzhen	96	25.2%
Guangzhou	89	23.4%
Dongguan	63	16.5%
Huizhou	39	10.2%
Foshan	31	8.1%
Zhuhai	22	5.8%
Zhongshan	19	5.0%
Zhaoqing	8	2.1%
Shantou	6	1.6%
Zhanjiang	3	0.8%
Hong Kong	3	0.8%
Macau	2	0.5%
Total	381	100

Table 4-7 Distribution of Years of Establishment of Survey Respondents

Year of Establishment	Number of questionnaires (persons)	Percentage (%)
1-3 years	31	8.1
3-5 years	42	11.0
5-10 years	59	15.5
More than 10 years	249	65.4
Total	381	100.0

Table 4-8 Distribution of Number of Employees in Sample Enterprises

Number of employees (people)	Number of questionnaires	Percentage (%)
1-100	112	29.4
101-500	83	21.8
501-1000	33	8.7
More than 1000 people	153	40.2
Total	381	100.0

Table 4-9 Distribution of Position of the Survey Respondents

Position	Number of people	Percentage (%)
General Staff	85	22.3
Grassroots managers	61	16.0
Middle management	123	32.3
Senior Management	112	29.4
Total	381	100.0

Table 4-10 Distribution of Educational Backgrounds of Survey Respondents

Educational background	Number	Percentage (%)
College degree or below	108	28.3
Bachelor's degree	149	39.1
Master's degree	97	25.5
Doctoral degree or above	27	7.1
Total	381	100.0

Table 4-11 Industrial Distribution of Surveyed Enterprises

Industry Type	Number	Percentage (%)
Electronics & Microelectronics	184	48.3
Environmental Technology	47	12.3
New Materials	40	10.5
New Energy	39	10.2
Opto-Mechatronics Integration	28	7.3
Pharmaceutical and Medical Engineering	20	5.2
Biomedical Engineering Aerospace	13	3.4
	10	2.6
Total	381	100

Table 4-12 Nature of Business Ownership of Surveyed Enterprises

Enterprise type	Number	Percentage (%)
Private enterprises	217	57
Foreign-owned enterprises	100	26.2
State-owned enterprises	50	13.1
Joint Ventures	14	3.7
Total	381	100

Table 4-13 Distribution of Proportion of Technical Personnel in Surveyed Enterprises

Percentage of technical staff	Number	Percentage (%)
Less than 10%	119	31.2
10% - 20%	107	28.1
20% - 30%	85	22.3
More than 30%	70	18.4
Total	381	100

Table 4-14 Distribution of Years of Establishment of Enterprises

Years of establishment	Number	Percentage (%)
0-3 years	31	8.1
4-6 years	42	11
7-10 years	59	15.5
11 years and above	249	65.4
Total	381	100

Table 4-15 Annual sales of the companies in which the respondents participated in the survey

Annual Sales	Subtotal	Percentage (%)	Effective percentage (%)
Less than 5 million yuan	52	13.6	13.6
5 million yuan-10 million yuan	40	10.5	10.5
10 million yuan -50 million yuan	39	10.2	10.2
50 million yuan - 100 million yuan	39	10.2	10.2
100 million yuan or more	211	55.4	55.4
Total	381	100.0	100.0

Table 4-16 Descriptive Statistical Analysis

Variable items	Question	Mean	Standard deviation	Kurtosis	Skewness
Organizational Learning	OL1	4.29	0.988	1.922	-1.500
	OL2	4.24	0.990	1.362	-1.321
	OL3	4.09	1.031	0.428	-1.028
	OL4	4.18	0.948	0.966	-1.123
	OL5	4.08	1.027	0.419	-0.985
	OL6	4.00	0.992	0.393	-0.878
	OL7	3.92	1.042	0.059	-0.777
	OL8	4.03	0.982	0.656	-0.979
	OL9	3.89	1.021	0.125	-0.741
	OL10	3.91	1.050	0.030	-0.785
	OL11	3.94	1.032	0.436	-0.900
	OL12	4.02	0.976	0.397	0.868
	OL13	3.86	1.047	0.043	0.752
	OL14	3.89	0.998	0.085	0.747
	OL15	3.88	1.020	0.160	0.762
Technological Innovation	TI1	3.90	1.064	0.408	0.920
	TI2	3.86	1.065	0.165	0.803

	TI3	3.84	0.998	0.125	0.606
	TI4	3.60	1.058	0.183	0.502
	TI5	3.91	0.927	0.221	0.668
	TI6	4.02	0.919	1.046	0.977
	TI7	4.04	0.915	0.804	0.906
	TI8	4.07	0.932	0.662	0.912
Cross-boundary behavior	CB1	4.03	0.984	0.614	0.964
	CB2	3.92	0.979	0.062	0.715
	CB3	3.93	1.012	0.432	0.893
	CB4	4.00	0.925	0.654	0.858
	CB5	4.03	0.932	0.629	0.877
	CB6	3.99	0.958	0.714	0.922
	CB7	4.06	0.934	0.652	0.907
	CB8	3.92	1.010	0.092	0.756
	CB9	4.00	0.972	0.181	0.783
	CB10	3.87	0.965	0.275	0.699
	CB11	3.89	0.996	0.228	0.748
	CB12	3.71	1.047	0.259	0.536
	CB13	3.82	1.015	0.060	0.629
	CB14	4.07	0.946	0.641	0.942
	CB15	4.03	0.989	0.490	0.922
Organizational Innovation Capability	OI1	3.69	1.090	0.557	0.445
	OI2	3.72	1.085	0.507	0.518
	OI3	3.56	1.142	0.617	0.424
	OI4	3.55	1.136	0.596	0.415
	OI5	3.64	1.112	0.548	0.460
	OI6	3.64	1.138	0.671	0.455
	OI7	3.64	1.162	0.547	0.547
	OI8	3.71	1.145	0.486	0.587

Reliability and Validity

Reliability analysis of the scale

The reliability analysis of this study is mainly to test the internal consistency coefficient of the scale, mainly using Cronbach's alpha or Cronbach's α. Previous studies have concluded that a Cronbach's alpha coefficient greater than 0.7 is considered a scale with high internal consistency and good reliability; if the alpha coefficient is between 0.5 and 0.7, it is considered acceptable reliability; if the alpha coefficient is less than 0.5, the reliability is poor. When the alpha coefficient reaches 0.7 or more, it is considered ideal. See Table 3-12 for details.

Table 3-17 Reliability Evaluation Criteria

Intrinsic reliability coefficient	Indicator value	Evaluation results
Cronbach's Alpha coefficient	α>0.7	Ideal level
	0.5<α<0.7	Acceptable
	α <0.5	Low reliability

Validity analysis of the scale

Table 3-18 Reliability Analysis Results

Name of each scale and dimension		Number of items	Alpha Coefficient	Cronbach's Alpha if Item deleted
Organizational Learning	Commitment to Learning	5	0.926	0.965
	Shared Vision	5	0.939	
	Shared Knowledge	5	0.920	
Technological Innovation	Technological Innovation Input	6	0.931	0.947
	Technological Innovation Intermediate Output	2	0.865	
Cross-boundary behavior	Ambassador Activity	7	0.894	0.958
	Task Coordinator Activity	4	0.898	
	Scout Activity	4	0.924	

Organizational Innovation Capability	Organizational Technological Innovation Capability	4	0.960	0.970
	Organizational Management Innovation Capability	3	0.939	

Data source: collated by this research.

Table 3-13 shows Cronbach's alpha coefficients for each variable and each variable's sub-dimensions. It can be seen that Cronbach's α of each variable is greater than 0.7, which also proves that the scale designed by the research to measure latent variables is reasonable and reliable. It also confirms the high stability of the consistency of the large sample survey instrument, and the scale can be used for further empirical research. In general, the internal consistency coefficient should be above 0.5.

Conclusion

With the acceleration of technological iteration and the background of the VUCA era, maintaining the organizational innovation capability and core competitiveness of high-tech enterprises has become a direction that many scholars and managers are constantly researching and exploring. However, there are very few studies like this study, and even some studies with the slightest involvement are limited to the essence, and their potential influence has not been expanded and deepened. This study takes the organizational innovation capability of high-tech enterprises as the research object and constructs a theoretical model research framework for the relationship between organizational learning, technological innovation, cross-boundary behavior, and organizational innovation capability through literature research and empirical analysis. The mediating role of cross-boundary behavior in the relationship between organizational learning, technological innovation and organizational innovation capability is explored, which not only summarizes the research of previous scholars, but also expands to new levels. Therefore, based on the summary of the empirical analysis results in the previous section, this paper summarizes as follows.

First, there is a two-level relationship in the role of organizational learning on the improvement of organizational innovation capacity. The result and essence of organizational learning are the foundation of organizational innovation capability, and the inevitable way to improve organizational innovation capability. In the process of organizational learning, the commitment to learning, shared vision, and shared knowledge of organizational learning are interrelated factors that contribute to the acquisition of knowledge and the enhancement of organizational innovation capabilities. As the corporate demand for heterogeneous resources and knowledge rises to a strategic level, it requires innovation in corporate management. Vision sharing should be proactive and lead to inspiring the whole staff to embody the value, so that vision sharing becomes more proactive than shared vision. Regarding the influence beyond the essence of organizational learning, it is a management innovation measure that needs to inspire and empower other employees' shared knowledge through the correct direction and platform mechanism during the process of employees' knowledge sharing. In a corporate culture atmosphere full of empowerment and shared knowledge, employees' potential knowledge and value can be maximized.

Second, technological innovation is a key factor in enhancing the technological innovation capability of organizational innovation capability. There is a significant positive influence relationship between technological innovation and organizational innovation capabilities, which is also the embodiment of core technological innovation ability in organizational innovation ability. Technological innovation is a process of integrating, innovating, transforming, and utilizing knowledge, and various abilities will be invisibly improved in the

process of innovation. In an uncertain environment, technological innovation must also be dynamic. We should not only focus on technological innovation, but also pay attention to its potential impact. Innovation management should guide and promote the value of all employees from this new perspective.

Third, the technological innovation input and the technological innovation intermediate output have potential influence and empowerment roles. Technological innovation input and technological innovation intermediate output are easy to influence the team or individual. Technological innovation input will make the team realize that the company pays attention and importance to technological innovation and will also create a positive atmosphere for internal technological innovation. Moreover, the increase of R&D funds and projects in innovation inputs will stimulate overqualified employees to participate in technological innovation, while the growth of intermediate outputs of technological innovation such as patents, results and revenue will also stimulate and influence the initiative of overqualified employees' cross-boundary behavior. In an innovation-focused environment, it's easy to get everyone to participate and reach cross-boundary behavior.

Fourth, the synergistic effect of cross-boundary behavior between organizational learning and technological innovation. Organizational learning and technological innovation have a certain influence outside the nature, which will stimulate overqualified employees to take the initiative to participate in cross-boundary actions, and the cross-boundary behavior of overqualified employees is easy to share the knowledge, skills, experience, and external link resources they have beyond their work and responsibilities to the team and the whole through the shared knowledge of organizational learning. In the process of sharing knowledge, the knowledge will be absorbed, integrated and re-innovated to become new knowledge for individuals or teams, and will increase the knowledge stock of the enterprise to ensure the success and possibility of technological innovation. If the process and results of technological innovation can be correctly guided by enterprise management, it will also potentially influence the cross-boundary behavior of personnel within the enterprise, encourage more people to participate in enterprise technological innovation, bring more heterogeneous resources and knowledge to technological innovation, and once again promote the process and efficiency of technological innovation.

Fifth, ambassador activity, task coordinator activity, and scout activity are inherent driers of cross-boundary behavior. Ambassador activity needs innovative management. Good communication will stimulate the effectiveness of ambassador activity. Moreover, enterprises' creation of interactive and convenient platforms will also promote the play of ambassador activity. At the same time, it also promotes the efficiency of task coordinator activity. Under an interactive, convenient, fair and open corporate management mechanism, the possibility of successful cooperation may double. Furthermore, it also encourages employees to perform cross-boundary behavior. First, sharing heterogeneous resources may bring value to the team. Second, actively interacting with external resources that the team possesses can bring possible innovative knowledge and information; in addition, cross-boundary behavior is easy to stimulate the enthusiasm and passion of others, achieving cross-boundary behavior for all staff. Sixth, in the era of knowledge and information, knowledge learning and interaction are more convenient. The learning and self-improvement of all staff will promote the absorption and innovation of knowledge by employees, and the growth and value enhancement of employees are also changing rapidly. The innovation of enterprise management should be adapted to the times and dynamics, to build an interactive platform, a symbiotic platform and a co-creation platform for knowledge sharing, and to give everyone an opportunity and a stage to showcase

their talents. If there is cooperation from corporate incentive mechanisms, it would be the icing on the cake.

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