

MODEL OF THE MEDIATING ROLE OF KNOWLEDGE INTEGRATION STRATEGY BETWEEN STRUCTURAL CAPITAL AND INNOVATION CAPABILITY OF HI-TECH ENTERPRISES IN CHINA

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ABSTRACT

This research paper aims to propose a model elucidating the mediating role of knowledge integration strategy in enhancing the innovation capability of high-tech enterprises in China. It seeks to understand how leveraging diverse knowledge sources within organizations can lead to the creation of new insights, solutions, and innovations, thereby augmenting competitive advantage and fostering innovation. The research employs a mixed-method approach encompassing a comprehensive literature review, qualitative interviews, and in-depth case studies. This methodological framework allows for a multifaceted exploration of the relationship between structural capital, innovation capability, and knowledge integration strategy in the context of hi-tech enterprises operating in China. The findings underscore the pivotal role of structural capital in facilitating innovation within high-technology enterprises. Structural capital, comprising infrastructure, resources, and networks, serves as a critical enabler for generating new products and market opportunities. Moreover, the study reveals that knowledge integration strategies, such as knowledge fusion, inter-firm governance, and social capital, play a mediating role in enhancing the relationship between structural capital and innovation capability. These strategies act as conduits for effectively combining and leveraging diverse knowledge sources, thereby driving innovation within organizations.

Keywords: Knowledge integration; Structural capital; Innovation capability

INTRODUCTION

Innovation plays a pivotal role as a strategic element, facilitating the attainment of enduring success and a sustainable competitive edge by organizations. The possession of the requisite abilities and talents is closely linked to this (Rajapathirana and Hui, 2018)(Zastempowski, 2022). Innovation is the process of generating and implementing novel ideas within organizations with the assistance of external and internal resources. In order to achieve market competitiveness, businesses innovate and develop new

products and models. Consequently, this results in the evolution of development methodologies and the amplification of economic advantages, which ultimately fosters sustained expansion.

Science and technology serve as catalysts for the economic progress of a nation. Talented individuals' creative thinking development is a top priority in Western nations. Developed nations exhibit a global leadership position in equipment research and development, methodological construction, and the efficient conversion of technology into productivity. China, being a developing country, is persistently augmenting its innovative capabilities in an effort to establish itself as a preeminent inventive nation. This is a pivotal strategic goal in the pursuit of national progress and a substantial determinant in the augmentation of overall national power.

High-tech enterprises are economic entities that place a significant emphasis on knowledge and are predominantly engaged in the production and development of high-tech goods. In addition to offering technical service consulting and other associated services, they are driven by a dedication to pioneering performance. According to De Carolis (2010)(Su et al., 2023), high-technology sectors are characterized by rapid progress in science and technology, which requires businesses to act quickly in order to sustain a competitive edge and introduce innovative products to the market. Moreover, in contrast with low-tech knowledge, high-tech knowledge is generally more intricate, encompassing a greater extent of implicit understanding and numerous interconnected elements or components (Schilling, 2011)(Traore et al., 2023). Generally, a high-tech enterprise is an establishment that is predicated on innovation and strives to enhance its innovation performance in order to remain operational. In light of market internationalization, economic globalization, and the swift advancement of scientific and technological innovation, technological enterprises must enhance their consciousness of innovation and expeditiously convert product and technological innovation into innovative performance in order to preserve their competitive advantages. Among all business sectors, high-tech companies exhibit the highest level of activity (Zastempowski, 2022). They have emerged as a new economic force on account of their rapid expansion and unique innovation. They elevate the nation's innovative capacities and scientific and technical benchmarks in a crucial strategic manner. Develop into a formidable catalyst for the sustained expansion and ingenuity of the Chinese national economy (Purwati et al., 2021).

A substantial volume of professional knowledge has been produced by universities, suppliers, consumers, and scientific research institutes as a result of the continuous scientific and technological advancements in our nation. The capacity of organizations to assimilate and integrate external knowledge has garnered growing interest and significance. It is crucial for organizations, especially technology-driven small and medium-sized businesses that necessitate frequent updates of products and knowledge, to prioritize external knowledge (Hoopes and Postrel, 1999). It is imperative that they promptly assimilate and emulate a substantial volume of external information, transform it into internal storage, and implement it to enhance the innovation performance of the organization. When the external market and technological environment experience significant shifts, the knowledge stock and resources possessed by small and medium-sized technological enterprises become inadequate to withstand competitive pressures. In such cases, the enterprise will initiate proactive response measures by exploring external knowledge and embarking on the next phase of organizational learning. Throughout the process

of transformation and utilization, the enterprise integration capability is cyclically deployed to improve innovation performance.

In the dynamic landscape of high-technology enterprises in China, the challenge lies in effectively leveraging diverse knowledge sources to foster innovation and sustain competitiveness. This research endeavors to address the gap in understanding the mediating role of knowledge integration strategy in enhancing innovation capability within such enterprises. By elucidating the significance of structural capital and exploring the mechanisms through which knowledge integration strategies facilitate innovation, this study seeks to provide insights for organizations striving for sustainable growth and success in this rapidly evolving industry.

Despite existing literature on innovation and knowledge management, there remains a gap in understanding the specific mechanisms through which knowledge integration strategies mediate the relationship between structural capital and innovation capability within the context of hi-tech enterprises in China. This study aims to bridge this gap by providing a comprehensive model that elucidates these dynamics, thereby contributing to the existing body of knowledge in this field.

RESEARCH QUESTIONS

- 1.How does structural capital influence the innovation capability of hi-tech enterprises in China?
- 2.What are the key knowledge integration strategies employed by these enterprises?
- 3.To what extent do knowledge integration strategies mediate the relationship between structural capital and innovation capability?

OBJECTIVE

- 1.To analyze the impact of structural capital on the innovation capability of hi-tech enterprises in China.
- 2.To identify and examine the primary knowledge integration strategies adopted by hi-tech enterprises in China.
- 3.To assess the extent to which knowledge integration strategies act as mediators in the relationship between structural capital and innovation capability within hi-tech enterprises in China.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Structural capital

Definition of structural capital

Structural capital consists of intangible assets that augment the worth and competitive advantage of a given entity. Legal documentation, operations, and physical and virtual structures that support the production, dissemination, and implementation of knowledge are included (Cuozzo et al., 2017).

Fundamental components of structural capital include:

Cuozzo et al. (2017) define intellectual property as copyrights, trademarks, patents, and trade secrets that protect the creative works, innovations, and designs of an organization. In addition to serving to distinguish an organization, intellectual property assets may also prevent competitors from entering the market.

The systems and processes of an organization: The documented and standardized processes, procedures, and protocols that direct the operations of an organization comprise structural capital. The aforementioned procedures are intended to enhance quality, consistency, and efficiency across various functions (Buenechea-Elberdin, 2017).

Databases and information systems: The knowledge management platforms, databases, and information systems that store and organize the explicit knowledge of the organization, including customer data, research findings, best practices, and industry insights, are considered structural capital (Dahiyat et al., 2023). These systems enhance the retrieval and dissemination of knowledge, thereby enhancing problem-solving and decision-making processes.

Structural capital is influenced by the shared values, norms, and behaviors that comprise an organization's culture. An organizational climate that fosters cooperation, ingenuity, and ongoing education has the potential to augment the efficiency and application of structural capital.

Relationships and networks: External networks, partnerships, and connections with clients, suppliers, and other stakeholders comprise structural capital. These connections grant the organization access to market opportunities, resources, and expertise, all of which contribute to its competitive advantage.

Dimensions of structural capital

(Kannan and Aulbur, 2004), in conjunction with Edvinsson and Malone (1997), delineate three key dimensions: Organizational Capital, Process Capital, and Innovation Capital. These dimensions underscore the pivotal role of organizational structure, streamlined processes, and a culture conducive to innovation in fostering organizational success. Building upon this foundation, (Bontis, 1998), (Engström et al., 2003) delve into Corporate Structure and Processes, Corporate Institutional Culture, and Organizational Learning in Enterprises. These dimensions emphasize the importance of aligning organizational processes, nurturing a supportive institutional culture, and fostering continuous learning within the organization. (Engström et al., 2003) offer a nuanced perspective with dimensions focusing on Efficiency and Effectiveness, Renewal and Development, Systems and Procedures, and Atmosphere. These dimensions highlight the significance of operational efficiency, innovation promotion, robust systems and procedures, and a positive organizational atmosphere conducive to creativity and productivity. In a comprehensive approach, (Pedro et al., 2018) introduce a wide array of dimensions encompassing Knowledge Management, Organizational Learning, Organizational Structures, Information Technology Systems, Efficiency of Structural Capital, Innovation Capacity, Organizational Culture, Environmental Protection and Management, Attracting and Retaining Staff, and Checking Results. These dimensions provide a holistic framework for evaluating various aspects of organizational capital and innovation, ranging from knowledge management to environmental sustainability and human resource management.

Innovation capability

Definition of innovation capability

Considerable scholarly attention has been devoted to the investigation of innovation as an essential approach to resolving challenges and maintaining a competitive advantage. According to (Holyfield and Lorah, 2023)(Purwati et al., 2021), innovation possesses the capacity to yield unique products, services, and additional results, thereby augmenting the performance of corporations and the returns they receive from the market. (Aljuboori et al., 2021) define innovation performance as the amalgamation of a firm's output performance and the integration of knowledge technologies into routine production operations for the purpose of fostering innovation. On the contrary, a number of scholars characterize innovation as a compilation of processes that produce original creations, while innovation performance encompasses all outcomes that result from this methodology. Rajapathirana and (Prajogo and Ahmed, 2006) underscore the role of organizational culture, advocating for the utilization of knowledge from diverse sources and active involvement of workers and customers in innovation processes.(Kannan and Aulbur, 2004) offer insights into tangible indicators such as patent applications, trademark registrations, and intangible asset value, providing measurable proxies for innovation and intellectual capital. Moving to dimensions outlined by (Al-Shammari and Almulla, 2023), the focus shifts to the efficient utilization of knowledge from various sources for rapid product development, fostering worker participation, evaluating external ideas, and adaptability to environmental changes, crucial for sustaining competitiveness. (Holyfield and Lorah, 2023) present dimensions related to sales based on design specifications, original equipment manufacturing, and in-house product development and branding, reflecting the diverse strategies employed by hi-tech firms.

Dimensions of innovation capability

(Chen et al., 2021) delve into cultural aspects such as commitment to learning, shared vision, open-mindedness, and intra-organizational knowledge sharing, underlining the importance of fostering an environment conducive to innovation. In a broader perspective, (Yang et al., 2018) introduce dimensions including service quality management, exploring new service routes, continuous improvement of operational systems, and incentivizing employee innovation, all crucial for sustaining competitiveness in the service sector.(Barbieri et al., 2021) provide a comprehensive framework encompassing vision, organizational intelligence, creativity, structure, culture, and technology management, capturing the holistic nature of innovation and organizational capability. (Adam and Alofaysan, 2023) further expands the discourse, introducing dimensions such as knowledge exploitation, entrepreneurial capabilities, risk management, networking, development, change management, and market and customer knowledge, reflecting the multifaceted nature of organizational capabilities.(Chunya Ren et al., 2023) offer dimensions spanning planning, marketing, innovation, R&D, operations, knowledge and skills, information and communication, and external environmental capability, providing a comprehensive framework for assessing organizational capabilities. Lastly, (Zastempowski, 2022) introduce dimensions focusing on learning, R&D, manufacturing, marketing, organizational, resource-exploitation, and strategic capabilities, encapsulating various facets of organizational prowess crucial for innovation and competitiveness.

Knowledge integration

The concept of knowledge integration capability has been subject to diverse interpretations among scholars, contingent upon their respective perspectives. Nevertheless, in essence, all scholars agree on its meaning (Hoopes & Postrel, 1999) (Adam and Alofaysan, 2023). Ensuring the organization's core competitiveness necessitates the collection, organization, and even creation of diverse types of information through member comprehension and assimilation.

Information is regarded as an immutable asset that is not immediately applied. The development of innovative thinking within a team is contingent upon the process of learning, assimilating, and retaining information that advances from mere perceptual awareness to logical reasoning (Alavi and Leidner, 2001). Knowledge integration, as defined by (Azari et al., 2020), is not a simple superimposition of knowledge but rather a dynamic coupling of knowledge elements facilitated by the dynamic flux of acquired information within the team. Mehrabani argues in his theory of knowledge absorption-based knowledge integration that knowledge integration can restructure the application of external resources and data once they have been comprehended.

Due to the Knowledge-based capabilities theory, some academicians have attempted to elevate the concept of knowledge integration to the level of organizational capacity. (Azari et al., 2020) define knowledge integration competency as the ability to generate and reorganize preexisting knowledge. As stated by (Brettel et al., 2011), the knowledge integration competence of an organization pertains to its ability to restructure the information held by each member in order to fulfil the requirements of a specific objective. In light of the characteristics of the digital economy, (Liu et al., 2023), (Yeboah, 2023), and (McIver et al., 2019) define knowledge integration capability in the era of information explosion as the ability to implement knowledge innovation and to filter, analyze, and organize disparate information and resource components from within and without the team.

The knowledge-based approach emphasizes the significance of knowledge as a resource for the sustainable innovation and competitive advantage of an organization. It is difficult to contribute to the disorganized and dispersed knowledge base of an organization. Organizations are required to consistently acquire, refine, and integrate external data with internal expertise in order to establish a novel knowledge system that could potentially function as the bedrock for their principal competitive edge (Grant, 1996) (Insiti and Clark, 1994).

According to transaction cost theorists (Williamson, 1985), the market mechanism is inadequate for transactions involving tacit information. As a consequence, hybrid forms of inter-firm governance are gaining prominence in the knowledge-based economy. Product innovation in a networked environment requires the incorporation of relevant knowledge from numerous dispersed, disparate organizations. The process of developing network products that requires the integration and synthesis of information from diverse, dispersed, and heterogeneous sources is commonly referred to as "knowledge integration" (Guo et al., 2022).

By facilitating the incorporation of specialized knowledge into business operations, knowledge integration is a critical determinant of a company's competitiveness (Insiti and Clark, 1994). Knowledge fusion, inter-firm governance, and social capital are all components of this process, which seeks to

generate new products and market opportunities via information exchange and communication across organizational boundaries (Azari et al., 2020).

The author compiled the literature of relevant scholars and organized knowledge integration according to one dimension, two dimensions, three dimensions and four dimensions. From Table 1. The author selected the dimensions of Xie Hongming et al. (2008) (Dhakal, 2022) as the dimensions of knowledge integration variables in this research.

Table 1
Dimensions of Knowledge integration

Dimensions	Scholar, Year	Measurement
1dimension	Mitchell (2006)	Acquisition of external knowledge and integration of internal knowledge
2dimension	Subramaniam (2006)	(1) Knowledge transfer (2) knowledge implementation
	Xie Hongming et al. (2008)	(1) Socialization capability (2) Cooperation capability
	Zhou and Li (2012)	(1) Market knowledge acquisition (2) Internal information sharing
	Revilla and Knoppen (2015)	(1) Shared meaning- making (2) Shared decision-making
	Wu Yong and Wei Zelong (2017)	(1) Stable integration (2) Radical integration
	Guo et al. (2022)	(1) Horizontal (HKIP) (2) Vertical process (VKIP)
	Xie Hongming et al. (2008)	(1) Socialization capability (2) Cooperation capability
	Zhou and Li (2012)	(1) Market knowledge acquisition (2) Internal information sharing
	Revilla and Knoppen (2015)	(1) Shared meaning-making (2) Shared decision-making
	Wu Yong and Wei Zelong (2017)	(1) Stable integration (2) Radical integration
	Guo et al. (2022)	(1) Horizontal (HKIP) (2) Vertical process (VKIP)
3 dimensions	De Boer, et al (1999)	(1) Systems capabilities (2) Coordination capabilities (3) Socialization capabilities
	Awazu(2004)	(1) Knowledge gathering capabilities (2) Knowledge transfer capabilities (3) Sensemaking capabilities
	Hashai and Almor (2008)	(1) Integration of internal R&D activities (2) Integration of internal production activities (3) Integration of internal marketing activities
	Frishammar et al. (2012)	(1) Integration of domain-specific knowledge (2) Procedural knowledge (3) General knowledge
	Singh and Power (2014)	(1) Internal knowledge integration (2) Knowledge integration with suppliers (3) Knowledge integration with customers
	Vanpoucke et al. (2014)	(1) Information sharing (2) Logistics responsiveness (3) Common resources
	Schoenherr and Swink (2015)	(1) Supplier knowledge integration (2) Customer knowledge integration (3) Competitor knowledge integration
4 dimensions	Swink et al. (2007)	(1) Strategic supplier integration (2) Strategic customer integration (3) Product-process technology integration (4) Company strategy integration

Source: Compiled by the author based on literature

Hypothesis Development

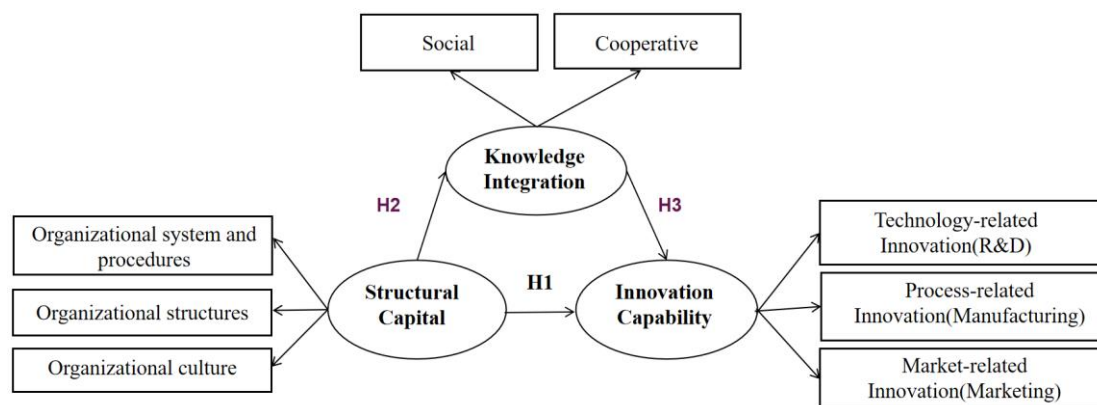
Reviewing relevant literature and research, the measures for every variable are 8 dimensions. The hypothesis development is as follows:

Hypothesis 1: Structural capital is positively associated with Innovation capability.

Hypothesis 2: Structural capital has a positive relationship with Knowledge integration.

Hypothesis 3: Knowledge integration is positively correlated with Innovation capability.

Figure 1
Overall Research Hypothesis Framework Diagram



METHODOLOGY

This research constitutes a mixed research design, incorporating both quantitative and qualitative methodologies. Its characteristics are as follows:

For the purpose of quantitative research, questionnaires were utilized to capture data for this study. Independent Variable: Structural innovation (1. organizational system and procedures, 2. organizational structures, and 3. organizational culture), Mediating Variable: Knowledge integration (1. social capability, 2. cooperative capability), and Dependent variables (technology-related innovation, process-related innovation, and Market-related innovation), To analyse the gathered data using statistical data analysis and Structural Equation Modelling (SEM).

The research used in-depth interviews to collect qualitative data. The researcher will use NVIVO to analyze the data. NVIVO is a qualitative data analysis (QDA) software that provides a platform for researchers to organize, analyze, and gain insights from qualitative data. NVIVO facilitates the systematic analysis of textual, audio, video, and image data, helping researchers uncover patterns, themes, and relationships in the qualitative research(Dhakal, 2022).

CONCLUSION AND FUTURE WORK

In conclusion, this concept paper proposes a framework to elucidate the mediating role of knowledge integration strategy between structural capital and innovation capability within hi-tech enterprises in China. Through an analysis of existing literature and conceptual discussions, the importance of structural capital in fostering innovation, as well as the key knowledge integration strategies employed by these enterprises, has been highlighted. Additionally, the potential mediating effect of knowledge integration strategies on the relationship between structural capital and innovation capability has been suggested. This paper lays the groundwork for future empirical research to validate and further explore these relationships in practical settings.

Future research endeavors should focus on empirically testing the proposed framework through quantitative analysis and case studies within hi-tech enterprises operating in China. This empirical validation would provide deeper insights into the specific mechanisms through which structural capital influences innovation capability and the mediating role of knowledge integration strategies. Additionally, longitudinal studies could be conducted to assess the dynamic nature of these relationships over time, considering the evolving nature of technology and market dynamics. Furthermore, comparative studies across different industries and geographical regions could offer valuable insights into the generalizability of the proposed framework. Lastly, exploring the implications of these findings for organizational practices and policymaking could contribute to enhancing the innovation ecosystem within hi-tech enterprises in China.

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