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Integrating Top Management's Intellectual Capital with Technology Innovation Performance of High-Tech Enterprises: A Conceptual Study

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Abstract

In today's knowledge-based economy, an enterprise's intellectual capital (IC) has become the main source of its competitive advantage and plays a very important role in enhancing its technology innovation performance (TIP). However, there is extremely limited research on the impact of the intellectual capital of the top management team on the technology innovation performance of Chinese high-tech SMEs, which are the main contributors to driving economic development. Based on resource-based view (RBV) theory and upper echelon theory (UET), the aim of this study is to explore the mechanism of the influence of IC on TIP of the executive team of Chinese high-tech SMEs. Senior managers of eligible high-tech SMEs in Jiangsu Province, China will participate in the online survey. Two new constructs, intellectual property protection (IPP) and technology commercialization (TC), will be added as moderating variables in this study. The data obtained from the questionnaire will provide new evidence from a Chinese perspective that the top management teams of high-tech SMEs use their IC more effectively to improve the TIP of their firms under the positive moderating effect of IPP and TC.

Keywords: Intellectual Capital, Technology Innovation Performance, Top Management Team, High-tech Enterprises

Introduction

Technological innovation becomes essential for high-tech businesses looking to survive, grow, and gain a competitive advantage in today's dynamic global market (Guo, 2024). Only companies that prioritize constant innovation will ultimately stand out in the increasingly fierce global competition (Rehman et al., 2021). Improving technology innovation performance (TIP) is one of the best options for companies to maintain a sustainable competitive advantage as well as the trend of economic growth (Cefis & Marsili, 2011). With the advent of the knowledge-based economy, the focus of competition for enterprises is no longer limited to the competition for tangible resources but is gradually shifting to the competition for intangible resources such as skills, intelligence, social network resources, and

knowledge, that is, intellectual capital (IC) (Sardo & Serrasqueiro, 2018). Research has indicated that there exists a positive relationship between IC and TIP (Ali et al., 2023; Alrowwad et al., 2020; Rehman et al., 2021). Besides, High-tech small and medium-sized enterprises (SMEs) are thought to be the new engine for China's economic expansion (Petti et al., 2017). However, due to the limited size of the enterprise and the number of personnel, for high-tech SMEs, the majority of IC comes from the top management team (TMT), who are also the decision-makers of the enterprise's innovation strategy (Díaz-Fernández et al., 2015; Hambrick & Mason, 1984). Thus, how to effectively use the IC of the TMT to enhance TIP is a pressing issue.

Additionally, technology commercialization (TC) capability is an inevitable choice for high-tech SMEs to opposite market demand and enhance their competitive advantage, and it is also a basic requirement for enterprises in the age of innovation, which plays a vital role in the improvement of their TIP (Mo, 2017; Zhang et al., 2021). Furthermore, intellectual property protection (IPP), as a kind of institutional environment for enterprises, is closely related to their innovation activities and their TIP. The technological progress and innovation of enterprises cannot be achieved without patent protection, and the existence of a patent system can promote TIP (Czarnitzki & Toole, 2011). Also, the OECD (1997) notes that the patent system plays an increasingly complex and important role in stimulating innovation, technology diffusion, and firm output.

Previous studies mostly focused on the input of tangible resources such as research and development (R&D) expenses by high-tech SMEs but ignored the promotion of intangible resources such as IC on TIP (Rehman, et al., 2021; Xu & Li, 2019). Another problem is that the TIP of China's high-tech enterprises is at a low level. Moreover, the TMT is at the heart of a high-tech SME‘s governance structure, while the composition of the TMT and the various characteristics of its members can act as an IC resource for the firm, providing it with a competitive advantage and creating value (Berezinets et al., 2016). Jiangsu Province is in a leading position in China in many aspects such as economic development, population distribution, high-tech enterprise development, and technological innovation. At the same time, high-tech SMEs have problems in IC management and TIP management. Thus, this study mainly focuses on high-tech SMEs in Jiangsu Province, China, and the main purpose is to examine the relationship between TMT’s IC and TIP, where TMT’s IC mainly comprises TMT’s human capital (THC), TMT’s social capital (TSC), and TMT’s organizational capital (TOC), and the moderating role of TC and IPP among high-tech SMEs in China.

Literature Review

Underpinning Theories

The core view of Resource-based view (RBV) theory is that the key for an enterprise to obtain sustainable competitive advantage lies in the heterogeneous resources owned by the enterprise, which are heterogeneous, irreplaceable and immobile (Barney et al., 2001). The RBV theory supported that enterprises promote sustainable development and generate core competitiveness through resource selection, creation, re-creation, resource combination, resource management and other links (Pereira & Bamel, 2021; Varadarajan, 2020). Compared with tangible resources, intangible resources are more heterogeneous and non-replicable. IC, as an important intangible resource, can improve the TIP of enterprises (Rehman, et al., 2021).

Moreover, for high-tech SMEs, intellectual property rights are extremely important heterogeneous resources.

In addition, Upper echelon theory (UET) fully affirms that upper echelon, especially the TMT, as the most powerful people in the organization, has a crucial influence on strategic choices and organizational performance (Hambrick & Mason, 1984). UET explains the behaviour of top managers under limited conditions and studies indicate that compared with large companies, the strategic management capabilities of the TMT of SMEs have a greater impact on corporate performance (Kraiczy et al., 2015). Therefore, this study attempts to combine RBV and UET to explore how the TMT of high-tech SMEs can effectively manage IC and improve TIP. This study will introduce technology commercialization (TC) and intellectual property protection (IPP)as moderating variables.

Technology Innovation Performance (TIP)

Technology innovation is the essential guarantee of economic development and the driving force behind economic growth (Liu et al., 2021; Zhu et al., 2018a). TIP is reflected in the results of an enterprise's technological innovation inputs and outputs, which generally refer to technological achievements including new products, new patents, new processes, etc (Kash & Rycoft, 2000). The academic community has conducted in-depth research on the influencing factors of TIP and formed rich research results. According to previous studies, the main factors affecting TIP can be divided into three categories: technological innovation process factors, organizational factors, and external environmental factors (Zhu et al., 2018). Scholars have begun to study the positive effects of enterprise heterogeneity of resources and capabilities on TIP from the perspective of strategic management (Ali et al., 2023; Rehman, et al., 2021; Xu & Li, 2019). In addition, the complexity of the technological innovation process of enterprises determines that it is difficult to measure the TIP of enterprises using objective indicators. Therefore, scholars have mostly used high-quality scales to measure corporate TIP employing questionnaires (Bontis, 1998; Rehman et al., 2021; Subramaniam & Youndt, 2005). Although the number of China's technology-based SMEs has increased year by year, the TIP they create is still significantly behind that of developed countries. Thus, how to improve TIP through effective IC management is an urgent problem to be solved.

Intellectual Capital of the Top Management Team (TMT's IC)

In the era of the knowledge economy, IC is considered to be a crucial research achievement to solve the issues related to enterprise knowledge, and research in this field is becoming more and more abundant (Giacosa et al., 2017). Firms should pay more attention to the role of IC in enhancing innovation capabilities and further improving innovative performance (Rehman, Elrehail, et al., 2021; Tayles et al., 2007). The most common IC classification in the academic circle is based on the three-factor concept, mainly including human capital, structural capital, and social capital (Delgado-Verde et al., 2011). However, the survival and development of any organization is not only influenced by internal resources but also requires a constant exchange of resources with the external environment, which is a dynamic management process. The TMT can dynamically create new value for the company in the form of IC (Berezinets et al., 2016).

Research on the IC of TMT has its roots in the study of the personal qualities and abilities of team members to create value for the firm. However, there has been relatively little research on the IC of TMT. This paper proposes a three-dimensional view of the IC of TMT, i.e. the TMT's IC consists of the TMT's human capital (THC), the TMT's social capital (TSC), and the TMT's organizational capital (TOC) (Figure 1).

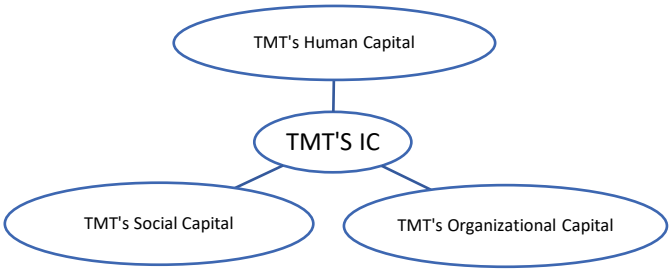

Figure 1. Structural Diagram of TMT's IC

Scholars generally agree that the human capital of the TMT is the sum of the skills, experience, education, and knowledge possessed by team members (Hillman & Dalziel, 2003; Jensen & Zajac, 2004; Berezinets et al., 2016). These elements can drive the TMT to develop a more effective strategy, which can influence the growth of the business. In addition, educational qualifications and professional skills are also important characteristics of human capital (Berezinets et al., 2016). According to research, TMT members are able to make more relevant decisions based on their education, skills knowledge, and specific work experience when a company is operating in difficult times (Dalziel et al., 2011), and are better able to provide creative solutions than other employees or stakeholders in the company (Wincent et al., 2010). As a result, TMT members' educational qualifications and professional skills, as their unique human capital, enable them to perceive and analyze a wealth of internal and external information, enabling them to perform their functions effectively (Carpenter & Westphal, 2001).

Considering the conditions of executive team governance efficiency and corporate performance, the social capital of the TMT can be divided into external social capital and internal social capital (Pérez-Calero et al., 2016). External social capital refers to executive team members' access to information, influence, and other key resources through connections with the external environment such as suppliers, customers, government, etc. Internal social capital refers to the connections between executive team members (Ke et al., 2007). Besides, the TMT can gain information, influence, and support from its social network, which can accelerate the process of making and adjusting team management decisions, thus contributing to improved corporate performance (Larcker et al., 2013). Therefore, the interpersonal network of TMT members is also an important component of social capital.

In studying the value of the TMT, scholars have found that in addition to the two elements of human and social capital, team practices, policies, and procedures are a set of intangible resources that can build competitive advantage (Alias et al., 2014). Differences in the internal processes or systems of different corporate teams can affect the efficiency of team governance across companies, and systems such as the operational processes, policies, and culture of the TMT can facilitate the effective use of its human and social capital (Krause et al., 2017). It follows that the organizational capital of the TMT affects the efficiency of team

governance, which in turn contributes to corporate value creation. As a result, an organization's institution-building, culture, and operational processes are generally considered to be essential elements of organizational capital (Sekhar et al., 2015).

Technology Commercialization (TC)

Commercialization refers to the process of practical production and sales, product development, and market introduction, and the commercialization of technology is a series of activities that are carried out for commercial purposes in the commercialization chain, adding value to the technology at each stage (Cooper & Kleinschmidt, 1990). The ultimate aspect of TC is to bring a product or service to market and bring economic benefits to the firm, so scholars in the early days mainly studied the impact of TC on firm performance. Chen (2009) examines the impact of TC on performance along three dimensions: the speed of commercialization, the breadth of the technology, and the scope of the market. Products that are first to market can gain market share and generate revenue for the firm earlier than competitors. However, the process of TC is subject to many technological, business, and social uncertainties (Hall et al., 2011). The high and increasing cost of developing new technologies can have a negative impact on performance if the price advantage cannot be maintained during the commercialization of the technology (Chen, 2009). This paper will use TC as a moderating variable between the dependent and independent variables.

Intellectual Property Protection (IPP)

Intellectual Property Rights (IPR) is a special economic resource, which mainly exists in the form of patent rights, copyright, and trademark rights (Liu, 2023). For high-tech SMEs, patent rights are the main component of their IPR and a means for enterprises to effectively manage their innovation achievements (Zhao & Wang, 2015). Therefore, this study believes that for high-tech SMEs, patent rights can better represent the IPR of enterprises. IPP in this research mainly refers to the protection of patents. In addition, IPP, as an important element of the institutional environment, has gained the attention of scholars. Carson and John (2013) believe that a higher level of IPP can help counteract speculative behavior such as knowledge leakage and technology imitation, protect the economic benefits of R&D and innovation activities, and increase the incentive for firms to undertake R&D and innovation activities. Conversely, a lower level of IPP increases the risk and cost of conducting R&D activities, shortens the life cycle of new products, and ultimately weakens a firm's innovation performance (Kafouros et al., 2015). Therefore, companies need to pay more attention to the protection of intellectual property rights, i.e. patent rights, in the process of using their own tangible or intangible resources to create innovative performance. IPP is chosen as the moderating variable between the independent and dependent variables in this paper.

Conceptual Framework

In short, this section presents the conceptual framework of this study based on the research questions and objectives as well as the literature review. This study focuses on the relationship between TMT's IC and TIP. Based on a review of the literature on IC, the IC of TMT is divided into three components, namely THC, TSC, and TOC. There are five constructs in this study, namely THC, TOC, and TSC as exogenous variables, TC and IPP as moderating variables and TIP as endogenous variables. Therefore, the conceptual framework of this study is shown in Figure 2 below. This study hopes to use empirical methods to prove that THC, TSC, and TOC have a positive impact on TIP, and the moderating role of TC and IPP.

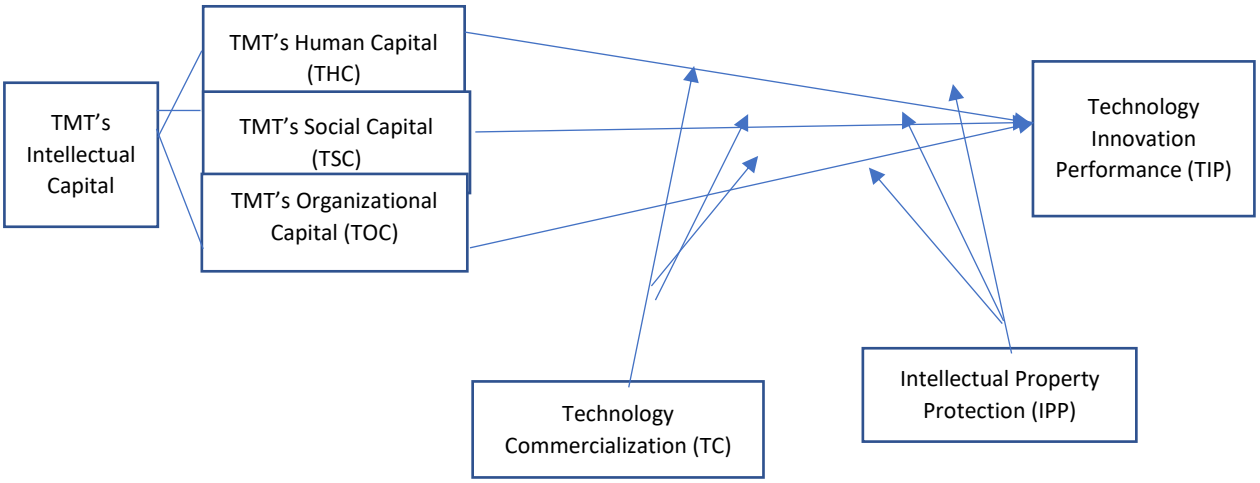

Figure 2. The Proposed Conceptual Framework

Methodology

Positivist philosophy was chosen for this study. This study aims to specifically explain the relationship between IC, IPP, TC and TIP of TMT of high-tech SMEs, and the moderating effects of IPP and TC will also be tested. When researchers wish to explore the interactions between two or more variables, they should opt for quantitative research methods (Creswell & Creswell, 2017). Therefore, quantitative research was considered to be the most appropriate research method for this study. Furthermore, the choice of appropriate data analysis tools by the researcher is key to the scientific validity of the theoretical hypothesis. The data for this study will be collected by means of an online questionnaire, and relevant descriptive statistics, data reliability and validity tests, correlation analysis and multiple regression analysis are carried out on the returned questionnaire data. The data from the questionnaires in this study will be analyzed using both Statistical Package for Social Science (SPSS) and SmartPLS statistical software.

Conclusion

The framework proposed in this study gives an essential link between the IC of the TMT of high-tech SMEs and TIP. From a theoretical point of view, this study contributes to the construction of richer theoretical links in the study of the relationship between IC and TIP. Intellectual capital, as an intangible resource of a company, is one of the main sources of core competitiveness gained by high-tech SMEs. Previous research has considered IC as an antecedent variable of innovation (Blanco-Alcántara et al., 2019; Bontis, 2001; Chen et al., 2004;). However, they overlooked the impact of different components of IC on innovation performance and what mechanisms of influence different components have on TIP through what kinds of firm behavior. Especially for high-tech SMEs, most of the IC is held in the members of the executive team, and there is less research on the relationship between the different dimensions of TMT's IC and TIP. In addition, this study also contributes to the development of academic literature related to the IC of the TMT and TIP, and the moderating role of IPP and TC in the executive teams of Chinese high-tech SMEs. Thus, the internal level of IC in this study starts by examining the mechanisms by which different IC of the TMT affects TIP.

Besides, this study also has great practical significance for the improvement of TIP of high-tech SMEs in China. The innovation capability and TIP of high-tech SMEs has a significant

impact on China's overall innovation capability. However, most high-tech SMEs lack an understanding of IC, and ignore the importance of knowledge resources, as well as their low ability to use and integrate IC, resulting in their technological innovation capability relying only on the investment of material resources such as R&D expenses. Furthermore, this study provides a basis for Chinese high-tech SMEs to objectively evaluate the relationship between their patent management, commercialization capabilities, and technological innovation performance, which will help them to emphasize and strengthen the protection of their patents and intellectual property rights, as well as to enhance their technology commercialization capabilities, thereby improving their TIP.

Overall, this study sorts out the relevant literature on the IC of TMT, TC, IPP, and TIP, and tries to provide a framework for understanding and examining the relationship between the IC of TMT, TC, IPP, and TIP of high-tech SMEs. This model lays the foundation for future research work. Meanwhile, the author is designing a questionnaire to collect data from respondents from different high-tech SMEs. It is believed that this research can make executives of high-tech SMEs in China pay more attention to IC and find effective ways to improve TIP.

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