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Technological innovation, investment strategies, and innovation capabilities: Basis for small, medium enterprises competitiveness framework

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Abstract

In a competitive global market, this dissertation investigated how Chinese Small and Medium Enterprises (SMEs) can gain an edge. It explores how technological innovation, investment strategies, and innovation capabilities all play a critical role. By examining these factors and their interactions, the research proposed a framework to help Chinese SMEs achieve a competitive advantage. This study explored the technological innovation, investment and innovation capabilities of Chinese SMEs in the new economic situation in order to maintain competitiveness and achieve sustainable development. This employed descriptive research methods, utilizing questionnaire surveys to gather data from a representative sample. The collected data underwent regression analysis to identify relationships between variables. The highly significant correlations across all variables suggest a robust and statistically sound association. There was a statistically significant relationship between technological innovation and technology investment strategies. This suggests that as the technology investment strategies increase, there is a corresponding increase in technological innovation within the observed data. There is also a strong and statistically significant positive relationship between technological innovation and innovation capability. This suggests that organizations with a strong capacity for innovation (e.g., resources, processes, culture) are more likely to achieve higher levels of technological innovation. It is also revealed that there is a strong and statistically significant positive relationship between technology investment strategies and innovation capability. This suggests that organizations that invest strategically in technology are more likely to develop the capabilities necessary for successful innovation. In essence, this analysis highlighted the potential of strategic technology investments to cultivate a strong foundation for innovation within organizations. By helping SMEs identify their strengths and weaknesses in terms of technological innovation, investment strategies, and innovation capabilities, the framework can guide them in allocating resources more effectively. This could involve prioritizing investments in specific technologies, streamlining innovation processes, or fostering a more innovation-friendly culture.

Keywords: technological innovation, investment strategies, innovation capabilities, competitiveness framework

Technological innovation, investment strategies, and innovation capabilities: Basis for small, medium enterprises competitiveness framework

1. Introduction

Small and medium enterprises (SMEs) are the backbone of the Chinese economy. They represent a massive force, boasting over 140 million businesses and contributing a staggering over 60% of China's GDP (Li et. al.,2013). SMEs are the driving force behind a significant portion of China's economic success. They are responsible for creating a massive 79% of new jobs Li et. al., (2013) and generating a substantial 50% of tax revenue. They are also responsible for a remarkable 70% of technological innovation in the country (OECD, 2016). SMEs operate across various sectors, from manufacturing and construction to agriculture and service industries, this diversity fuels China's economic dynamism. Chinese SMEs have emerged as a dominant force in technological innovation, propelling China's rise as a global leader across various sectors. One of the defining strengths of Chinese SMEs lies in their inherent agility and adaptability. Their smaller size allows them to be more responsive to market demands and evolving technological trends. Unlike large corporations with established structures, SMEs can navigate the dynamic technological landscape with greater ease, fostering a vibrant environment for innovation.

Studies suggest that SMEs are significant contributors to China's technological advancement, with estimates attributing 70% to 75% of technological innovation to these smaller enterprises (Li et. al.,2017; Wang et. al.,2018). This is evident in the rise of numerous innovative startups in China, particularly in areas like e-commerce, fintech, and artificial intelligence. However, this path to innovation is not without its roadblocks. A major hurdle for Chinese SMEs is the limitation of resources. Compared to larger enterprises, SMEs often lack the financial resources to invest heavily in cutting-edge research and development (R&D). This deficiency can hinder their ability to develop groundbreaking innovations or compete with established players in the market. Furthermore, attracting and retaining skilled personnel can be challenging for SMEs, as they may not be able to offer the same competitive salaries and benefits packages as larger corporations (Ahn, 2020; Wang et. al.,2018).

Limited access to financing further complicates the innovation process for SMEs. Traditional lenders often perceive SMEs as high-risk borrowers, making it difficult for them to secure loans for R&D activities. This lack of access to capital restricts their ability to translate innovative ideas into tangible products or services (Ahn, 2020). Despite these challenges, the Chinese government recognizes the vital role of SME innovation in the country's long-term economic success. To address these limitations, the government has implemented various policies and initiatives. These measures include tax breaks for R&D activities, creation of SME-specific technology parks, and providing financial aid through grants and subsidies (Ahn, 2020; Wang et. al.,2018). Additionally, the government is promoting collaboration between SMEs and universities or research institutions, facilitating knowledge transfer and fostering a more robust innovation ecosystem.

The amount of capital an SME invests in technology directly impacts the level of risk associated with the investment. Large-scale investments in cutting-edge technologies can offer significant potential benefits, such as improved efficiency, enhanced product offerings, and a competitive edge (Yoo et al., 2018). However, these large investments also carry a higher risk of failure. New technologies may not yield the anticipated results, or they might become obsolete quickly, leading to wasted resources (Ahn, 2020). SMEs often have limited financial resources compared to larger corporations. This can make them more cautious investors, opting for smaller, incremental investments in established technologies (Phan et al., 2018). While these smaller investments carry lower risk, they may also yield diminishing returns in terms of innovation and competitiveness. Striking the right balance between risk and reward is crucial for SMEs. One approach involves adopting a staged investment strategy. Initially, SMEs can invest smaller amounts in pilot projects or proof-of-concept trials to test the feasibility and potential impact of new technologies (Ahn, 2020). Based on the results of these pilots, SMEs can

then make informed decisions about scaling up their investment or pursuing alternative technologies. The benefits of technology investment for SMEs extend beyond immediate financial returns. Investments can lead to improved operational efficiency, reduced production costs, and enhanced product quality (Wang et. al.,2019). Additionally, technology adoption can strengthen a company's brand image and attract a wider customer base (Yoo et al.,2018). These indirect benefits can ultimately translate into increased profitability and long-term success.

Several strategies can help SMEs mitigate the risks associated with technology investments. Building strong partnerships with technology providers can offer valuable expertise and support during the implementation process (Ahn, 2020). Additionally, leveraging government incentives, such as tax breaks or grants, can alleviate the financial burden of technology investments (Li et. al.,2010). One of the defining strengths of Chinese SMEs lies in their inherent agility and adaptability (Wang et. al.,2018). Their smaller size allows them to respond swiftly to market demands and emerging technological trends. This agility fosters a dynamic environment conducive to innovation. Studies reveal that SMEs contribute significantly to China's technological advancements, with estimates attributing 70% to 80% of new product introductions stemming from these enterprises (Liu et al., 2020). This is evident in the burgeoning number of innovative startups in China, particularly in sectors like artificial intelligence, e-commerce, and fintech. However, despite these strengths, Chinese SMEs face significant challenges in building and sustaining their innovation capabilities. A major hurdle is the limitation of resources, particularly financial capital (Ahn, 2020). Compared to larger corporations, SMEs often lack the funds necessary to invest heavily in cutting-edge research and development (R&D) activities. This financial constraint restricts their ability to develop groundbreaking innovations or compete effectively with established players (Xu et. al.,2019).

Another challenge is the scarcity of skilled personnel. Attracting and retaining top talent can be difficult for SMEs, as they may not be able to offer the same competitive salaries and career advancement opportunities as larger corporations (Ahn, 2020). This lack of skilled human capital can hinder the innovation process and limit the ability of SMEs to translate ideas into tangible products or services. Limited access to financing further complicates the innovation process for SMEs. Traditional lenders often perceive SMEs as high-risk borrowers, making it challenging for them to secure loans for R&D activities (Ahn, 2020). This lack of access to capital restricts their ability to invest in the resources and infrastructure necessary for sustained innovation. Despite these challenges, there are opportunities for Chinese SMEs to strengthen their innovation capabilities. The Chinese government recognizes the vital role of SME innovation in the country's long-term economic success. These initiatives include tax breaks for R&D activities, the creation of SME-specific technology parks, and the provision of financial aid through grants and subsidies. Additionally, the government is promoting collaboration between SMEs and universities or research institutions, facilitating knowledge transfer and fostering a more robust innovation ecosystem (Ahn, 2020).

This research investigated how Chinese SMEs, a key driver of China's technological revolution, finance and develop their innovative capabilities. By analyzing their investment strategies and internal strengths/weaknesses, the research aims to inform policy decisions that bridge funding gaps and create supportive ecosystems for these companies. This will ultimately benefit China's economic growth and global competitiveness through advancements in technological innovation. By exploring these interconnected aspects, the research can yield valuable insights with practical applications for fostering a dynamic and innovative landscape for Chinese SMEs.

Objectives of the Study - This study explored the technological innovation, investment and innovation capabilities of Chinese SMEs in the new economic situation to maintain competitiveness and achieve sustainable development. Specifically, this described the current status of technological innovation in Chinese SMEs in the new economy in terms of the type of innovation, the pace of innovation and the sources of innovation; determined the technology investment strategies of SMEs in terms of investment amount, investment risk and investment benefit; assessed the capacity of SMEs to innovate in terms of leadership, processes and culture; tested the significant relationship among technological innovation, technological investment and innovation

capability; and developed a framework to promote technological innovation in SMEs.

2. Methods

Research Design - This study adopted a mixed-methods approach, which integrates qualitative and quantitative research methods. This combined approach offers a more comprehensive understanding of the phenomenon under investigation compared to using a single method. Within this framework, the study employed a descriptive research design. Descriptive research design focuses on systematically describing and interpreting the characteristics of a population or phenomenon. It aims to observe and document the current state of affairs, providing a detailed picture of the present. This design often utilizes random sampling methods to select a representative sample of participants from the target population. This ensures the findings can be reasonably generalized to the larger group. Descriptive research frequently relies on closed-ended questions. These questions limit respondents to pre-defined answer choices, allowing researchers to gather quantifiable data. This data can then be easily analyzed using statistical methods. To achieve the research objectives, descriptive studies often utilize survey questionnaires. These questionnaires can be distributed online, through mail, or even in person. The specific method depends on the research design and target population. By responding to the survey questions, participants provide valuable insights into the phenomenon of interest.

Participants of the Study - This study leveraged a multi-pronged approach to recruit participants from Small and Medium Enterprises (SMEs) across various industries. This strategy ensures a representative sample and allows for a comprehensive understanding of technological innovation within SMEs. The first phase involved conducting a pre-survey of 20 SMEs from diverse industries. Researchers design questionnaires specifically tailored to gather data on four key areas: Technological Innovation which explores the types and frequency of technological innovation implemented by SMEs. Technological Investment, wherein questions delve into the investment strategies and resources SMEs allocate to technological advancement. Innovation Atmosphere which assessed factors that cultivate an environment conducive to innovation within the SME, and innovation capability which measures the capacity of SMEs to develop and implement new technologies. To complement the quantitative data, the study involved field surveys in 100 SMEs across different industries, convenient sampling was used. These in-depth visits allow researchers to observe firsthand the innovation process within SMEs, gain insights into the specific challenges and successful experiences of SMEs regarding technological innovation, conduct interviews with key personnel to gather qualitative data on their perspectives and strategies, analyze documents relevant to innovation practices within the SMEs.

The research not solely rely on primary data collected from participants. To enrich the analysis, researchers gathered and analyzed secondary data. This included relevant statistical data like government or industry reports containing statistical information on SME innovation trends; industry reports which serve as insights into the specific innovation landscape within different industries and market data which influence SME innovation needs and opportunities. By integrating data from surveys, field observations, interviews, document analysis, and secondary sources, this study achieved a well-rounded understanding of technological innovation within SMEs. This comprehensive approach provided a foundation for exploring, analyzing, and ultimately constructing a model that explains the impact of technological innovation on the competitiveness and sustainable development of SMEs in the new economy.

Instrument of the Study - This study prioritized the accuracy and consistency of its findings by employing a two-step evaluation process for the questionnaires. To ensure content relevance and accuracy, experts in the field reviewed the questionnaires. This expert review process strengthened the content validity of the questionnaires, meaning they effectively measure the intended concepts of technological upgrading, supplier collaboration, and market demand. Following the expert reviews, a pilot test was conducted with 20 randomly selected participants from an elderly care service company (not the target population). Data from the pilot test were analyzed using Cronbach's Alpha, yielding a score of 0.90, exceeding the standard for good to excellent reliability. This high Cronbach's Alpha score indicates strong internal consistency, meaning the individual questions within each

questionnaire measure the same underlying construct effectively.

The study utilized three distinct questionnaires, each focusing on a key aspect. This comprehensive approach ensures a detailed assessment of technological innovation, technology development strategies and assessing SME's capacity to innovate. Additionally, each questionnaire adheres to the multi-item measurement principle, incorporating at least five questions per dimension. This multi-item approach provides a more robust picture of each concept by capturing its nuances and minimizing the influence of random errors. All questionnaires in the study utilized the well-established Likert scale. This 4-point scale (1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree) allows for nuanced data collection. Respondents can express their level of agreement with each statement, providing a richer understanding of their perceptions within the investigated areas (technological upgrading, supplier collaboration, market demand). Overall, the implemented measures enhanced the validity and reliability of the questionnaires. The content validity is ensured through expert review, and the internal consistency is confirmed by the high Cronbach's Alpha score. Utilizing multiple questionnaires with multi-item measurement and the Likert scale allows for a comprehensive and nuanced assessment of the target constructs.

Table 1

Reliability Results

Variables	No. of Items	α value	Interpretation
Technological Innovation			
Type of Innovation	5	0.858	Good
Pace of Innovation	5	0.869	Good
Sources of Innovation	5	0.862	Good
Overall	15	0.863	Good
Technology Development Strategies			
Investment Amount	5	0.814	Good
Investment Benefit	5	0.847	Good
Investment Risk	5	0.885	Good
Overall	15	0.848	Good
Capacity to SME's Innovate			
Leadership	5	0.902	Excellent
Process	5	0.905	Excellent
Culture	5	0.834	Acceptable
Overall	15	0.880	Good

Legend >0.9=Excellent; >0.8=Good; >0.7=Acceptable; >0.6=Questionable; >0.5=Poor; <0.5=Unacceptable

Data Gathering Procedure - The research utilized a well-designed questionnaire as the primary tool for collecting data. This questionnaire underwent a rigorous development process to ensure its reliability and validity. The questionnaire has been meticulously crafted under the guidance of the advisor. This stage involves defining clear research objectives and translating them into targeted questions. The questionnaire likely includes a mix of closed-ended questions with pre-defined answer choices and open-ended questions that allow for more nuanced responses.

The questionnaire underwent multiple revisions to ensure clarity, comprehensiveness, and ease of use for respondents. Pilot testing with a small sample group can be helpful in identifying any ambiguities or areas for improvement. Before widespread distribution, the questionnaire was subjected to a reliability test. This test assesses whether the questionnaire consistently produces the same results when administered to similar groups of respondents. Common reliability tests include Cronbach's alpha, which measures internal consistency of the questions. Once the questionnaire is finalized, data collection commenced. To ensure a representative sample of employees from SMEs in Beijing China, convenient sampling method was employed. This method utilizes a random selection process to choose participants, minimizing bias and ensuring the findings can be reasonably generalized to the larger population. The research leveraged professional software for questionnaire distribution. This software facilitates efficient and unbiased random sampling. It can also automate processes like sending invitations, collecting responses, and managing data. Following data collection, the gathered information

underwent comprehensive analysis. Quantitative data from closed-ended questions can be analyzed using statistical methods to identify trends, patterns, and relationships. Open-ended responses were analyzed thematically to extract key themes and insights from participants' perspectives.

Data Analysis - This study employed a diverse set of statistical methods to analyze the collected data and extract meaningful insights. The specific methods chosen tailored to the research objectives and the nature of the data gathered through the questionnaires. Frequency Distribution was used to describe the distribution of variables within the data set. It revealed how often each category or response option appears in the data, providing a basic understanding of the data's overall structure. Weighted Mean calculated the average of the data points, but it allows for incorporating a weight for each data point. This weighting can be used to account for situations where some responses may be considered more important than others. Pearson Product-Moment Correlation Coefficient was employed to measure the strength and direction of the linear relationship between two continuous variables. It revealed if two variables tend to change together and in what direction (positive or negative correlation). Regression Analysis, on the other hand, was used to assess the relationship between a dependent variable (the variable one is trying to explain) and one or more independent variables (the factors believed to influence the dependent variable). Regression analysis allows for the prediction of the dependent variable based on the values of the independent variables. Analysis of Variance (ANOVA) was used to compare the means of two or more groups within the data. ANOVA helps determine if statistically significant differences exist between these groups The chosen statistical methods have been implemented using SPSS, a widely used statistical software package. SPSS allows for efficient data entry, manipulation, and analysis. It provides a user-friendly interface for conducting the various statistical tests described above. The analysis was conducted in a step-by-step manner, with each method building upon the previous one. This comprehensive approach ensure that the research extracts the most valuable insights from the collected data.

Ethical Consideration - Given this scope, the research prioritized minimizing potential risks for participants throughout the research process. This employed a multi-pronged approach to achieve this goal. Integrating Stress Assessment to which the researcher has incorporated elements within interviews and surveys to assess the potential stress levels experienced by participants. This proactive approach allows for identifying and mitigating any undue stress during data collection. For example, the interview structure might be designed to be conversational and allow for breaks as needed. Surveys might offer skip logic to avoid irrelevant questions that could cause discomfort. Also, Questionnaires with Care wherein the researcher has meticulously designed and tested the questionnaire to identify any potential adverse effects it might have on respondents. This includes using clear and concise language, avoiding sensitive topics, and offering a variety of response options to minimize feelings of pressure. Pilot testing with a small sample group can further ensure the questionnaire is respectful and well-received by participants.

Further, Transparency in Confidentiality Measures transparently informed the participants of the measures taken to ensure confidentiality throughout the investigation. This includes clearly explaining how responses will be anonymized and that no personal information will be disclosed in the final report or publications. Ethical Research Conduct which made sure that the entire research process adheres to the core principles of respect, reciprocity, and fairness. This ensures the well-being and ethical treatment of all participants. Respect involves treating participants with dignity and courtesy throughout the research process. Reciprocity involves offering participants something of value in return for their time and contribution, such as a summary of the research findings. Fairness ensures that the benefits and risks of participation are distributed equitably. By implementing these comprehensive strategies, the research aims to minimize any potential risks for participants while still collecting valuable data for the study. This commitment to participant well-being and ethical research practices is paramount to ensuring a successful and responsible research endeavor.

3. Results and discussion

Table 2

Summary Table on Technological Innovation in the New Economy

Key Result Areas	Composite Mean	VI	Rank
Type of Innovation	3.23	Agree	1
Pace of Innovation	3.17	Agree	3
Sources of Innovation	3.19	Agree	2
Grand Composite Mean	3.20	Agree	

Legend:3.50-4.00=StronglyAgree;2.50-3.49=Agree;1.50-2.49=Disagree;1.00-1.49=Strongly Disagree

The unanimous agreement validates the importance of considering all three domains as interconnected pillars of effective technological innovation. This ranking suggests a prioritization of the type of innovation over the sources and pace of innovation. Companies are most concerned with the nature of the innovation they develop. This could indicate a focus on radical versus incremental innovation and see if they are aiming for groundbreaking disruptions or improvements to existing technologies. Also, technological versus Business Model Innovation, or if they are innovating at the product/service level or the way they operate the business. Chesbrough, (2003) emphasizes the importance of focusing on the type of innovation needed for success, whether developed internally or acquired externally. Christensen, (1997) highlights the disruptive nature of certain types of innovation and the need for companies to adapt their strategies accordingly.

While not the top priority, companies still value identifying and leveraging the origins of their innovations. This may involve internal R&D (Are they primarily relying on in-house expertise), Open Innovation (Do they actively collaborate with external partners), and Industry Trends (Are they keeping a close eye on what competitors and the broader industry are doing). Chesbrough (2003) advocates for a balanced approach, considering both internal and external sources of innovation. Lin et al., (2020). explores the role of competitor intelligence (understanding competitor activities) as a source of innovation.

The speed at which companies develop new technologies appears to be the least important factor in this ranking. This might suggest a focus on Quality over Speed which prioritizes innovations that have a long-term impact over rushing out quick fixes and Strategic Implementation which ensures that new technologies are well-integrated into existing operations for greater effectiveness**.** Cooper (2001) **e**mphasizes the importance of a well-defined product development process that balances speed with quality. Markides (2006) highlights the need for strategic planning alongside innovation efforts to ensure new technologies deliver on their promises.This ranking suggests a strategic approach to innovation where companies prioritize understanding the type of innovation they need and leveraging various sources for its development, while maintaining control over the pace of implementation. They might be aiming for high-quality, strategically focused innovations rather than just being the fastest market.

Table 3

Summary Table on Technology Investment Strategies

Key Result Areas	Composite Mean	VI	Rank
Investment Amount	3.11	Agree	3
Investment Risk	3.13	Agree	2
Investment Benefit	3.20	Agree	1
Grand Composite Mean	3.15	Agree	

Legend:3.50-4.00=Strongly Agree;2.50-3.49=Agree;1.50-2.49=Disagree;1.00-1.49=Strongly Disagree

Table 3 shows summary of Technology Investment Strategies. It shows that all the domains in assessing technology investment strategies are agreed with the grand composite mean of 3.15. All items were assessed by the respondents and among the domain's investment benefit got the highest composite mean of 3.20. SMEs might prioritize achieving specific benefits (ranked 1st) even if the associated investments carry some level of risk (ranked 2nd). This could indicate a willingness to take calculated risks to achieve desired outcomes. The

investment amount ranking 3rd suggests that SMEs might favor strategies that deliver significant benefits (ranked 1st) without requiring a huge financial outlay (ranked 3rd). This could be due to resource constraints or a preference for testing innovative approaches before scaling up.

Teece et al. (2020) explored the concept of dynamic capabilities, which involve a firm's ability to sense opportunities, seize them, and reconfigure resources. The authors argue that technological innovation is a key driver of dynamic capabilities. By enabling firms to adapt to changing environments and offer unique value propositions, technological innovation can ultimately lead to a stronger brand reputation and competitive advantage. Khan et al. (2020) investigated the relationship between innovation capability, brand reputation, and customer loyalty in the service sector. Innovation capability refers to a firm's ability to develop and implement new ideas. Firms with higher innovation capability tend to have stronger brand reputations. This suggests that innovation can enhance a service provider's image and customer perception. The study proposes that innovation can lead to a better brand reputation by improving customer experiences. Innovative service delivery can lead to more satisfied and loyal customers. Also, signaling a commitment to progress and quality. A reputation for innovation suggests a company is forward-thinking and dedicated to providing high-quality services. Meanwhile, differentiation in a competitive marketplace unique and innovative services, companies can stand out from competitors.

Table 4

Summary Table on Innovation Capability

Key Result Areas	Composite Mean	VI	Rank
Leadership	3.18	Agree	2.5
Processes	3.18	Agree	2.5
Culture	3.22	Agree	1
Grand Composite Mean	3.19	Agree	

Legend:3.50-4.00=Strongly Agree;2.50-3.49=Agree;1.50-2.49=Disagree;1.00-1.49=Strongly Disagree

Table 4 shows summary on innovation capability, it shows that all the domains in assessing innovation capability are agreed with the grand composite mean of 3.19. All items were assessed by the respondents and among the indicators culture got the highest composite mean of 3.14. This suggests a strong emphasis on creating an environment that fosters creativity, collaboration, and risk-taking behaviors necessary for successful innovation. Innovation is not just about technological advancements or having good ideas. It's also about creating an environment where those ideas can flourish. A strong innovation culture can encourage creativity by valuing new ideas and approaches, the culture fosters an environment where employees feel comfortable taking risks and thinking outside the box. This also promotes collaboration. Innovation often requires diverse perspectives and expertise. A strong culture encourages collaboration across departments and levels, allowing for knowledge sharing and the creation of better solutions. This also includes support risk-taking. Innovation often involves some degree of risk. A strong culture encourages calculated risks and provides support to employees who pursue new ideas, even if they do not always succeed.

Knowing the specific aspects of the culture that ranked highest would provide a more nuanced understanding. These might include leadership behaviors, communication practices, reward systems, or tolerance for failure. A strong innovation culture needs to be aligned with the organization's overall strategy and goals. It's important to measure the effectiveness of the culture in driving innovation outcomes. This could involve tracking the number of new ideas generated, employee engagement in innovation initiatives, or the success rate of innovation projects.

Chang et al. (2020) highlight the importance of a supportive culture that fosters psychological safety for employee creativity and innovation in China, Lee et al. (2021) in South Korea demonstrate how an innovative culture encourages open innovation practices, ultimately leading to improved firm performance. Similarly, Liao et al. (2019) suggest that a supportive culture in China can act through knowledge sharing to enhance employee innovative behavior. Ok et al. (2019) explore how specific leadership styles can work in tandem with a

supportive culture to improve employee creativity. Finally, Wang et al. (2019) highlight that a diverse leadership team in Chinese high-tech firms can foster a culture that values diverse perspectives and encourages innovative thinking throughout the organization. Collectively, these studies underscore the multifaceted nature of innovation culture, emphasizing the importance of fostering a supportive environment that encourages creativity, collaboration, knowledge sharing, and psychological safety to drive successful innovation within organizations. These studies highlight the multifaceted nature of innovation culture. They suggest that a supportive culture that fosters creativity, collaboration, knowledge sharing, and psychological safety plays a crucial role in driving innovation within organizations.

Table 5

Relationship Between Technological Innovation and Technology Investment Strategies

Variables	Rho	p-value	Interpretation
Type of Innovation			
Investment Amount	0.685**	< .001	Highly Significant
Investment Risk	0.698**	< .001	Highly Significant
Investment Benefit	0.672**	< .001	Highly Significant
Pace of Innovation			
Investment Amount	0.790**	< .001	Highly Significant
Investment Risk	0.737**	< .001	Highly Significant
Investment Benefit	0.705**	< .001	Highly Significant
Sources of Innovation			
Investment Amount	0.805**	< .001	Highly Significant
Investment Risk	0.810**	< .001	Highly Significant
Investment Benefit	0.761**	< .001	Highly Significant

***. Correlation is significant at the 0.01 level*

As seen in the table, the computed rho-values ranging from 0.672 to 0.810 indicate a strong to very strong direct relationship among the sub variables of technological innovation and technology investment strategies. There was a statistically significant relationship between technological innovation and technology investment strategies because the obtained p-values were less than 0.01.

The rho-values, fall under the category of "strong" to "very strong" positive correlations according to Spearman's rank correlation coefficient interpretation guidelines. This suggests that as the technology investment strategies increase, there is a corresponding increase in technological innovation within the observed data. Since the p-values are less than 0.01, there is no relationship between the two variables. This statistically significant result further strengthens the claim that the observed positive correlation is not due to chance. Based on these findings, the researcher concluded that there is a strong and statistically significant positive relationship between technological innovation and technology investment strategies. In other words, organizations that invest more heavily in technology investment strategies are likely to experience a higher level of technological innovation. Chang et al. (2020) highlight how IT investments in China enhance dynamic capabilities like process innovation, ultimately driving further innovation.

Khan et al. (2021) in Pakistan demonstrate that both R&D and IT investments have a positive and complementary effect on firm innovation. While Lin et al. (2019) do not directly explore the positive relationship, their study on Chinese manufacturers emphasizes the importance of investments for innovation, implying that financial constraints can hinder it. Additionally, Shonghong et al. (2021) suggest that knowledge management practices, often facilitated by technology investments, can contribute to technological innovation. Finally, Yoo et al. (2020) point out that developing digital innovation capabilities, which often requires technology investments, leads to increased innovation. Collectively, these studies showcase how strategic investments in technology play a crucial role in enabling and fostering technological innovation within organizations. These studies showcase the increasing focus on technology investment as a driver of innovation. They highlight the importance of IT investments, R&D investments, and knowledge management practices, often facilitated by technology, in fostering innovation capabilities.

As seen in table 6, the computed rho-values ranging from 0.690 to 0.782 indicate a strong direct relationship among the sub variables of technological innovation and innovation capability. There was a statistically significant relationship between technological innovation and innovation capability because the obtained p-values were less than 0.01.

Table 6

Relationship Between Technological Innovation and Innovation Capability

Variables	rho	p-value	Interpretation
Type of Innovation			
Leadership	0.766**	< .001	Highly Significant
Processes	0.707**	< .001	Highly Significant
Culture	0.690**	< .001	Highly Significant
Pace of Innovation			
Leadership	0.759**	< .001	Highly Significant
Processes	0.738**	< .001	Highly Significant
Culture	0.746**	< .001	Highly Significant
Sources of Innovation			
Leadership	0.780**	< .001	Highly Significant
Processes	0.782**	< .001	Highly Significant
Culture	0.744**	< .001	Highly Significant

***. Correlation is significant at the 0.01 level*

The rho-values fall under the category of "strong" positive correlations according to Spearman's rank correlation coefficient interpretation guidelines. This suggests that as innovation capability increases, there is a corresponding increase in technological innovation within the observed data. Since the p-values are less than 0.01, there is no relationship between the two variables. This statistically significant result further strengthens the claim that the observed positive correlation is not due to chance. Based on these findings, we can conclude that there is a strong and statistically significant positive relationship between technological innovation and innovation capability. This suggests that organizations with a strong capacity for innovation (e.g., resources, processes, culture) are more likely to achieve higher levels of technological innovation. Overall, this analysis highlights the importance of fostering a strong innovation capability within organizations to achieve successful technological innovation. While Chiu et al. (2020) focus on green product innovation, it highlights that strong organizational foundations, fostered by elements like culture and knowledge management, benefit various innovation capabilities.

Similarly, Luo et al. (2020) demonstrate how organizational support, a key aspect of innovation capability, encourages knowledge sharing, ultimately contributing to technological innovation. Wang et al. (2021) delve deeper into knowledge integration capability, another crucial element, highlighting how it fosters product innovation performance. Wu et al. (2021) explore how effective leadership can cultivate a culture that encourages knowledge sharing, leading to higher innovation performance. Finally, Zhang et al. (2019) emphasize the role of knowledge management practices in enhancing an organization's ability to adapt to a dynamic environment, which ultimately strengthens its technological innovation capability. Collectively, these studies showcase how building a strong innovation capability through various elements fosters a fertile ground for successful technological innovation within organizations. These studies showcase the multifaceted nature of innovation capability. They suggest that various aspects, such as organizational culture, knowledge management, employee support, and leadership, all contribute to an organization's overall innovation capability, which in turn drives technological innovation.

Table 7

Relationship Between Technology Investment Strategies and Innovation Capability

Variables	Rho	p-value	Interpretation
Investment Amount			
Leadership	0.779**	< .001	Highly Significant
Processes	0.777**	< .001	Highly Significant
Culture	0.751**	< .001	Highly Significant
Investment Risk			
Leadership	0.816**	< .001	Highly Significant
Processes	0.824**	< .001	Highly Significant
Culture	0.781**	< .001	Highly Significant
Investment Benefit			
Leadership	0.802**	< .001	Highly Significant
Processes	0.777**	< .001	Highly Significant
Culture	0.738**	< .001	Highly Significant

***. Correlation is significant at the 0.01 level*

As seen in the table, the computed rho-values ranging from 0.738 to 0.824 indicate a strong to very strong direct relationship among the sub variables of technology investment strategies and innovation capability. There was a statistically significant relationship between technology investment strategies and innovation capability because the obtained p-values were less than 0.01.The rho-values, fall under the category of "strong" to "very strong" positive correlations according to Spearman's rank correlation coefficient interpretation. This suggests that organizations with more robust technology investment strategies tend to have a higher level of innovation capability. Since the p-values are less than 0.01, there's no relationship between the two variables. This statistically significant result strengthens the claim that the observed positive correlation is not due to chance. Findings show that there is a strong and statistically significant positive relationship between technology investment strategies and innovation capability. This suggests that organizations that invest strategically in technology are more likely to develop the capabilities necessary for successful innovation. In essence, this analysis highlights the potential of strategic technology investments to cultivate a strong foundation for innovation within organizations. However, it is important to consider the broader context, potential for reciprocal relationships, and the specific types of technology investments being made.

Li et al. (2021) directly explores the link between technology investment and innovation capability in Chinese high-tech firms, Xu et al. (2020) take a more specific approach, examining how digital investments influence IT innovation within Chinese manufacturing. Zhang et al. (2020) offer a complementary perspective by analyzing the impact of government subsidies, a related concept that fuels innovation capability in Chinese manufacturing enterprises. Although Chen et al. (2019) and Luo et al. (2019) investigate the performance of Chinese companies, their focus is not on the technology investment-innovation capability relationship. Chen et al. (2019) assess how such investment impacts listed companies' performance, while Luo et al. (2019) examine the other direction, exploring how innovation capabilities affect manufacturing companies' performance.

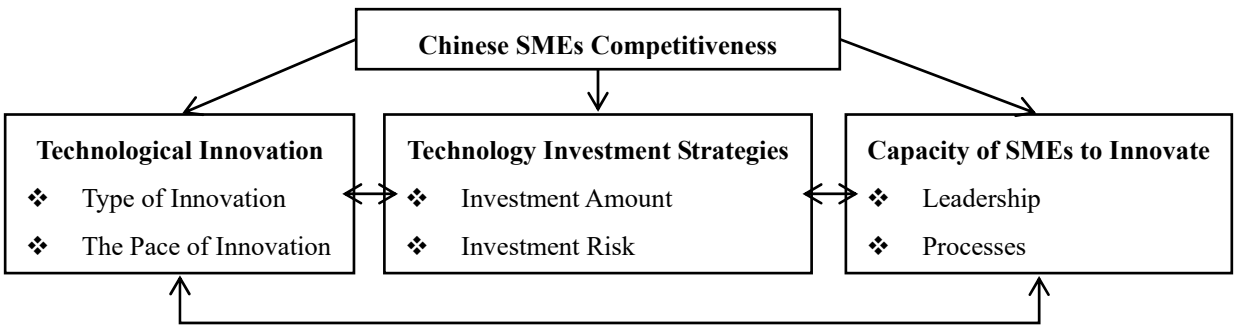

Figure 1. Chinese Small and Medium Enterprises Competitiveness Framework

The framework outlines three key factors that influence a Chinese SME's competitiveness: technological

innovation, technology investment strategies, and capacity of SMEs to innovate. Technological Innovation refers to the ability of a company to develop new ideas and put them into practice. In the context of the framework, this refers to the types of innovation a company undertakes, the pace of innovation, and the sources of innovation. Technology Investment Strategies refers to how a company allocates resources for technological innovation. The framework identifies areas to consider such as investment amount, investment risk, and investment benefit. Capacity of SMEs to Innovate refers to a company's ability to turn an idea into a commercially viable product or process. The framework suggests that this capability is influenced by a company's leadership, processes, and culture Government policies can significantly influence the technological innovation of SMEs. Studies have found that government support through funding, tax breaks, and subsidies can encourage SMEs to invest in research and development, Luo et al (2019) and Lin et. al.,(2018). E-commerce platforms have become a vital tool for Chinese SMEs to compete in the global marketplace. Studies have shown that SMEs that leverage e-commerce can increase their sales and brand awareness (Wu et al., 2018 & Zhang et. al.,2020). Collaboration between SMEs and universities or research institutions can help SMEs gain access to new technologies and expertise. Studies have found that collaboration can lead to the development of new products and processes.

4. Conclusion and recommendation

The survey results indicate a moderate level of agreement among respondents regarding technological innovation within Chinese SMEs. This observation applies to the types of innovation pursued, the speed at which innovation occurs, and the sources from which these innovations originate. The survey suggests a moderate level of agreement among respondents on the existence of technology investment strategies within SMEs in terms of investment amount, risk tolerance, and perceived benefits. The survey results indicate a moderate level of agreement among respondents regarding the innovation capacity of SMEs in terms of leadership, processes, and culture. There is a highly significant relationship between technological innovation, technological investment and innovation capability. Chinese SMEs Competitiveness Framework has been developed to guide SMEs towards more effective innovation practices. Policymakers may design programs that support the development of a more robust innovation ecosystem for Chinese SMEs. SME's may take the initiative to promote specific innovation types, accelerate innovation pace, or use of new innovation sources. To ensure the effectiveness of the Chinese SMEs Competitiveness Framework, pilot implementation with a select group of SMEs from various industries is recommended. For future researchers, they may examine how well current strategies translate into actual investment decisions and achieved benefits.

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