

Knowledge Management of E-Commerce Enterprises on Organizational Innovation Capability and Performance

-- A Reference Guide for Start-Up Enterprises in Shandong Province

Xun Wang *

Adamson University, Manila, 1000, Philippines

* Corresponding author: Xun Wang (Email: 263834977@qq.com)

Abstract: This study focuses on the research objects of start-up e-commerce enterprises in Shandong Province, with "knowledge management innovation capability innovation performance" as the entry point. Exploring the detailed and rich impact path of knowledge management on enterprise capabilities and innovation performance. Specifically, this study combines literature and theoretical analysis to explore the following four aspects: The impact of knowledge management on innovation capability; The impact of knowledge management on innovation performance; The intermediary impact mechanism of innovation performance; The intermediary influence mechanism of knowledge management. This study used a survey questionnaire method to empirically test the research hypothesis, and conducted in-depth analysis and reasonable explanations of the research results. The following research conclusions were drawn: Knowledge management has a positive impact on the innovation capability of start-up e-commerce enterprises in Shandong Province; Knowledge management has a positive impact on the innovation performance of start-up e-commerce enterprises in Shandong Province; Innovation capability plays a mediating role in the impact of knowledge management on innovation performance; Knowledge management plays a mediating role in the impact of innovation capability on innovation performance.

Keywords: Knowledge management, Innovation ability, Innovation performan.

1. Introduction

1.1. Background of the Study

In recent years, e-commerce has flourished globally with the rapid development of Internet technology. E-commerce, which conducts business transactions electronically, has not only changed traditional business models but also had a profound impact on the global economy. E-commerce is characterized by the virtualization of transactions, the decentralization of markets, and the automation of operations, making business activities more innovative and efficient.

According to statistics, from 2010 to 2023, global e-commerce sales have nearly tripled, reaching a size of nearly \$6.3 trillion. The Asian market is particularly significant, with China being the largest e-commerce market leading in total sales volume and showcasing advanced technology and models in electronic payments, logistics, and online-to-offline integration.

The rapid growth of e-commerce has not only driven the online transformation of traditional retail formats but also spurred new business models such as electronic markets, social e-commerce, and cross-border e-commerce. These models provide lower market entry barriers for small and medium-sized enterprises, offering them opportunities to find a foothold in the global market. The widespread application of e-commerce has also promoted the intelligence and automation of logistics systems, reducing transaction times, lowering costs, and enhancing user experience.

Knowledge management has had a profound impact on e-commerce. In the era of information, data has become one of the most important assets for companies, and the unique data-driven model of e-commerce companies further reinforces this point. Knowledge management plays a crucial role in the

e-commerce process, involving not only the collection, storage, analysis, and application of data but also serving as the cornerstone for building competitive advantages and driving innovative developments for companies.

But in fact, e-commerce enterprises face a series of challenges in knowledge management, especially for startups, such as knowledge sharing and inheritance, organizational culture construction, talent cultivation, etc. (Yannic Meier, Anne-Laure Mention, Nicolas Friederici, Marianne Gloet, 2020). With the in-depth development of Internet technology, especially the wide application of new technologies such as big data, cloud computing and artificial intelligence, e-commerce will move towards a new stage of intelligence and convenience. Knowledge management has put forward new challenges and requirements for enterprises (Yu Dengke, Zhang Wanjun, 2022). How to efficiently integrate and use knowledge resources will become the key to the sustainable innovation and competitiveness of e-commerce enterprises. Resources will be the key to continuous innovation and maintaining competitiveness for e-commerce companies.

For e-commerce companies, due to limited resources and innovation capabilities, relying solely on the company itself is difficult to achieve sustainable innovation and development. It is necessary to establish extensive connections with external social networks to help companies acquire the scarce learning resources required for innovative activities (Xu Guanglei, 2021). So, the interconnected relationship between learning and knowledge and the demand for employee innovation capabilities are more intense, significantly influencing the enhancement of the company's innovation capabilities. The innovation of e-commerce companies requires efficient utilization and allocation of inter-organizational learning, continuously enhancing organizational creativity through the knowledge management

process, which is the essence of e-commerce. Therefore, e-commerce companies can efficiently achieve the integration and development of internal resources through the knowledge management process, and fully utilize inter-organizational learning to acquire new resources, which may impact the innovation capabilities of e-commerce companies.

As Xiaohua Xin et al. (2021) pointed out in their research, small and medium-sized enterprises should build a knowledge-oriented corporate culture, promote continuous organizational learning in various departments, drive business process optimization and knowledge innovation. In addition, small and medium-sized enterprises should integrate and use knowledge through advanced data analysis technologies to promote internal and external knowledge transformation into innovative performance, establishing a competitive advantage that is difficult to replicate. In other words, the ultimate result of knowledge management is innovation (Li Yongfu et al., 2019).

However, the current situation of e-commerce companies in China, especially in Shandong, does not seem optimistic. The significant difference in actual situation is mainly due to the constraint of a closed innovation model on e-commerce companies. Innovation enables service companies to gain sustainable competitive advantages (Dayan and Ndubisi, 2019). Recently, service innovation has become a top priority in service and innovation research (Acharya et al., 2020).

Innovation can be considered as an organizational capability because it is an action of deploying resources, possessing new capabilities that create value (Yang et al., 2009). While there is a growing interest in knowledge management and innovation capabilities, research on the outcomes of corporate innovation strategies is very limited, especially in developing countries (Ode and Ayavoo, 2019).

There is even less research on the relationship between enterprise knowledge management and innovation capability. Mahmoud Mohammad Migdadi (2020) believes that the impact of knowledge management practices (KMP) on organizational performance (OP) is mainly achieved through the mediating variable of knowledge assets (IC), emphasizing the importance of knowledge management and linking it to IC. Salman Iqba et al. believe that knowledge management does have a mediating role, maintaining the traditional direct connection between human resource practice and organizational innovation.

Previous research on the impact of knowledge management on innovation performance in enterprises has mostly focused on high-tech enterprises and small and medium-sized enterprises (Zhan Shaowen et al., 2020) as research samples, and relevant research on e-commerce enterprises is still blank. This study will fill this gap. In future research, the impact of knowledge management on the innovation capability of enterprises will be explored, providing recommendations and guidance for the development of future e-commerce enterprises.

1.2. Literature Review

Most scholars have studied the innovation situation of enterprises from the perspective of patents and papers: Tang Song (2020) believes that the number of patented inventions is a reflection of the actual role of the production factors of enterprises, which can be used to comprehensively and objectively evaluate the level of technological innovation of enterprises; Xie Zhong (2020) discussed the positive impact of patents on the development performance of new products

through the empirical research on Chinese high-tech enterprises. The study found that there is a significant positive relationship between the number and quality of patents and the new product development performance, indicating that patents play an important role in promoting the innovation and new product development in high-tech enterprises; Sun, Y (2019) analyzed the correlation between scientific paper output and patent applications from the field of nanoscience and engineering, and discussed the relationship between scientific research and innovation output; Wang, Y (2020) identifies the technology development trend and market demand through the analysis of patent literature, so as to guide the process of innovative product design, and provides practical suggestions on how to combine patent analysis with innovative design to promote product innovation.

On this basis, Xing Dinghan (2021) selected the number of R&D personnel, R&D intensity, and number of patents in R&D to evaluate a company's R&D capabilities, and analyzed their changes to measure the company's innovation capabilities.

Chinese state-owned enterprises face problems such as low R&D investment intensity, obstacles in innovation system and mechanism, and lack of market incentives, resulting in a significant gap between their innovation capabilities and the world's leading level (Chen Yun, 2020). The reasons for this situation vary from scholar to scholar. Yang Zhenning (2020) believes from a macro perspective that the relevant policies and industrial systems issued by the government will greatly affect the innovation ability of enterprises; Chen Jingwei and Jiang Nengpeng (2020) believe that during the period of economic transformation, due to the imperfect institutional factors, the unreasonable allocation of factors in the capital market hinders the improvement of innovation vitality and efficiency of enterprises, thereby restricting their technological innovation ability; Cheng Yuan et al. (2021) pointed out that investment and financing constraints not only seriously affect the innovation investment decisions of small and medium-sized enterprises, but also greatly reduce their technological innovation capabilities.

In terms of how to improve innovation capabilities, scholars have also proposed some solutions: Wang Yanan and Dai Wentao (2019) believe that internal control can increase investment in innovation resources, reduce uncertainty risks, and promote enterprise innovation by reducing agency conflicts, narrowing information gaps, and other methods; Yang Yanlin and Hu Xi (2021) found through the application of panel threshold models that tax incentives can significantly improve the innovation performance of enterprises.

Luo Qinglang et al. (2020) proposed that, among the many methods of measuring innovation ability, data mining and big data analysis will become the "input-output method", "comprehensive index method" commonly used at that time, and "DEA efficiency analysis method" of measuring innovation ability in the future.

On the contrary, some scholars measure innovation effectiveness from the perspective of input and output. For example, Yang Qing and Gao Jiqiao (2021) found that a dual ownership structure has a certain promoting effect on innovation input and output, but an imbalanced ownership structure can have a counterproductive effect; Li Lin et al. (2021) conducted a study on Chinese A-share listed companies from 2013 to 2018 and empirically found a significant positive correlation between innovation investment and corporate performance. That is, the greater the

innovation investment, the better the financial performance of the company.

The academic circle is generally divided into two dimensions to describe the core content of knowledge management. On the one hand, it emphasizes knowledge management to help create, store, share and use the organization (CAI Ruilin, 2020); on the other hand, it emphasizes sharing knowledge through interpersonal communication. This strategy is to use the dialogue of social network, to achieve the purpose of sharing knowledge through human contact and help (Zhong Ming, 2017; Zhao Kang, 2019). Practice has proved that the purpose of knowledge management is to take knowledge as the most important resource, and to obtain, control and use it as much as possible, so as to improve the competitiveness of enterprises and benefit the development of enterprises (Sun Yu, Zhao Liang, 2019).

With the development of The Times, scholars' research is also advancing with The Times. Chong Guan, (2019) discussed the trends and challenges of knowledge management in the digital age; Yan Zhang (2021) and others studied the application potential of AI technology in knowledge management and the impact of AI on the practice and development of knowledge management. These provide important reference and guidance for the knowledge management of artificial intelligence in the digital age.

Almost all scholars recognize the role of knowledge management, but the research perspective is different. Shan Daohua et al. (2022) took the promotion case of national excellent teaching achievements in Nanjing as the research object, Analyze the role of knowledge management in the promotion of teaching results; Ye Ying (2019) combines the background of the era of big data, We believe that knowledge management includes four processes: knowledge production, knowledge accumulation, knowledge exchange and knowledge application, Based on this, to explore the application of knowledge management technology tools, Then construct knowledge management model; Peng Hua et al. (2022) expressed knowledge management ability from three dimensions: knowledge acquisition, knowledge sharing and knowledge utilization, Manufacturing enterprises and some related enterprises as the research objects, Empirically explore the relationship between knowledge management ability and innovation performance, The mediating role of knowledge management ability is also analyzed.

While other scholars discuss knowledge management from the perspective of knowledge graph. For example, Sun Jien, Wang Jinlong, Ding Guoru et al. (2021) proposed the use of knowledge graph theory and technology, The method of constructing the intelligent knowledge management framework; Shi Xiaoling and Tan Peibo (2021) proposed to use knowledge graph and computing technology and other technical methods to build an enterprise knowledge management platform, And based on the enterprise knowledge management platform to build the corresponding

knowledge system, Provide relevant knowledge services for each business system; Li Gang, Li Yinqiang, Wang Hongtao, et al. (2022), use knowledge graph, big data technology and computer network technology to build a knowledge management system for cross-regional enterprises; Zhang Yun (2021) proposed that through big data mining and analysis algorithms, Data mining and analysis of the database, Then summarize the rules to produce knowledge, And push the knowledge through the knowledge management platform and the expert system; Liu Zhuo, Yu Suihuai, Chu Jiajie et al. (2022) proposed a new dual filtering mode of knowledge, It is able to effectively define the phase nature and the target nature of cognition, So as to provide personalized knowledge services for enterprises; Jiang Zhou, Jin Xiaoming, and Zhang Weiya (2022) discuss how to acquire tacit knowledge, Through the verification and structural ways to quickly build the enterprise knowledge management system.

Through reading relevant literature, it is found that some scholars have studied the impact of knowledge management on individual performance and work efficiency. For example, Zhao Jingjie et al. (2020), facing enterprises in Chinese Mainland, believe that the process of knowledge management has a positive impact on enterprise innovation. Appropriate knowledge management can cultivate the strategic thinking of organizational employees, broaden their horizons, create a powerful environment for the organization, enable the organization and its members to have a keen insight into the market, and then continue to explore new markets; Yu Dengke and Zhang Wanjun (2022) also tested the relationship between organizational knowledge capital, knowledge management ability, and performance based on big data analysis of enterprise survey questionnaires, proving that organizational knowledge capital has a positive guiding effect on individual performance; Li Wenju and Yang Nan (2020) believe that standardizing knowledge in a knowledge management system can effectively improve employee work efficiency.

1.3. Hypothesis

Based on the above SOP, the following null hypotheses will be tested:

Ho1: Knowledge Management does not affect Innovation Capability of start-up E-commerce enterprises in Shandong Province.

Ho2: Knowledge Management does not affect Innovation Performance of start-up E-commerce enterprises in Shandong Province.

Ho3: Innovation Performance does not mediate how Knowledge Management affect

Innovation Capability of start-up E-commerce enterprises in Shandong Province.

Ho4: Knowledge Management does not mediate how Innovation capability affect Innovation Performance of start-up E-commerce enterprises in Shandong Province.

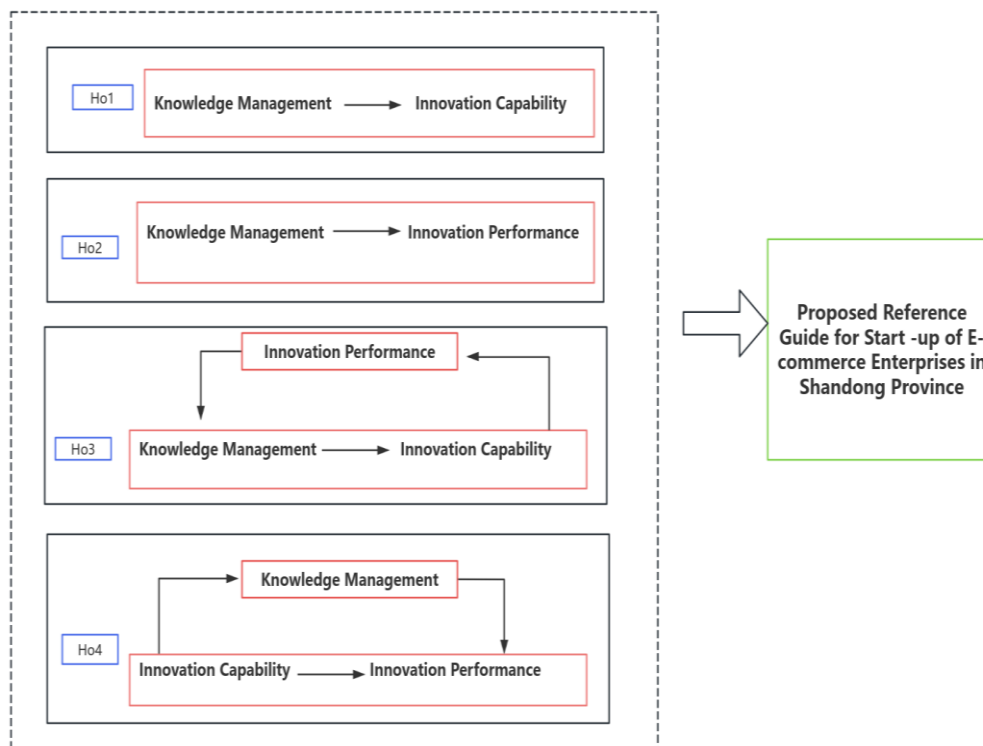


Figure 1. Author's Conceptual Framework

2. Method

2.1. Research Design

This study employs the idea of empirical research to empirically test research hypotheses, and uses variable related hypotheses as the design basis. Firstly, a quantitative description was given on the innovation capability of start-up e-commerce enterprises in Shandong Province. Then, influencing factors were proposed, including knowledge creation, knowledge sharing, and knowledge utilization. Regression analysis was used to analyze the directions that affect the innovation capability of start-up e-commerce enterprises in Shandong Province. Finally, suggestions were made on how to improve the innovation capability of start-up e-commerce enterprises in Shandong Province.

How to improve the innovation capability of start-up e-commerce enterprises in Shandong Province is the core of this study, with a focus on the relationship between knowledge management processes (knowledge creation, knowledge sharing, knowledge utilization) and the innovation capability of start-up e-commerce enterprises in Shandong Province. This study integrates previous literature experience and finds that the main manifestation of innovation capability for start-up e-commerce enterprises in Shandong Province is innovation performance.

This study conducted preliminary data collection by arranging the questionnaire, repeatedly considering the questions, and using an efficient survey questionnaire method. By reading a large amount of relevant literature, the variable measurement method of this study was reasonably determined to ensure the reliability, effectiveness, and accuracy of the feedback obtained after the survey questionnaire was distributed. By collecting pretest questionnaires, conducting descriptive statistics, and analyzing reliability and validity, the correctness of the research design approach is ensured. The final formal test data was analyzed and processed through SPSS.

2.2. Data Management

The data for this study mainly came from questionnaire collection. The main purpose of this survey is for scientific research. After the interviewee understands the true purpose of the entire process, the information filled in can indicate their true intentions and subjective opinions. We will strictly keep confidential the information related to the interviewee, and filling out the survey questionnaire will not have any negative impact on the interviewee. In this way, it can maximize the authenticity and reliability of the collected survey questionnaires, which have certain scientific research value.

To ensure the comprehensiveness and accessibility of the data, we contacted relevant government departments to obtain a list of representative enterprises in the local area. The relevant departments helped distribute paper survey questionnaires and conducted on-site visits to representative enterprises. We also distributed survey questionnaires and commissioned people around us to distribute them.

In this study. We adhere to data management protocols for input, validation, and cleaning to reduce errors and inconsistencies. All collected data will be protected and stored in a central database for the exclusive use of researchers. In order to maintain the confidentiality of research data, necessary techniques such as encoding names are used to anonymize the research data. In addition, a backup and archiving system has been established to prevent data loss.

2.3. Respondents

After selecting the research company, 10 survey questionnaires will be distributed to each research company, and respondents will be randomly selected from these companies. To select interviewees, they must meet the following criteria:

Firstly, they must be key stakeholders related to the company's knowledge management practices, whether as managers or leaders directly responsible for knowledge

management, or any executives supervising the innovation and development of the enterprise.

Secondly, they must currently be employed by the e-commerce enterprise they have chosen. These standards will ensure that respondents can truly share their first-hand experience in knowledge management practices and corporate innovation capabilities based on their work experience in these e-commerce companies.

2.4. Research Instrument

One of the widely used research methods in the field of management is empirical research, and questionnaire survey method is an essential and important part of the empirical research process, through which a lot of effective information can be obtained. Therefore, in order to obtain more effective conclusions, the question design of the survey questionnaire must have the highest possible rationality, standardization, and completeness, which directly affects the results of the survey. The research tool of this study is a self-made comprehensive questionnaire aimed at collecting relevant information on knowledge management and corporate innovation capabilities required to complete the study. It

consists of three parts. The first part is an overview of the company and the consent of the respondents. The second part is about the company's knowledge management practices, and the third part is about the innovation situation of these companies. The questions in the second and third parts are based level 4 Likert scales.

3. Results

This section presents the results for each issue identified in the study. The results were obtained based on the analysis of the collected survey questionnaires. In this study, a total of 300 survey questionnaires were distributed, of which one was invalid (due to being collected on behalf of someone else, one questionnaire had incomplete information and was not used). Therefore, the sample size collected for this study is 299, and all analyses in this chapter are based on these 299 samples.

3.1. Level of Innovation Capability and Innovation Performance

3.1.1. Respondents' perceived level of innovation capability

Table 1. Respondents' perceived level of innovation capability

Innovation Capability	Weighted Mean	Std. Deviation	Descriptive Interpretation
The company currently has a large number of patents	2.09	0.45	Moderately Low
The company currently has a large number of software copyrights	2.10	0.54	Moderately Low
The company conducts product development or innovation based on patented technology.	2.27	0.59	Moderate
The company has its own research team or cooperative institutions, actively participating in academic research and publishing papers	2.29	0.76	Moderate
Composite Mean	2.187	0.59	Moderate

Table 2. Respondents' perceived level of Innovation Performance

Innovation Capability	Weighted Mean	Std. Deviation	Descriptive Interpretation
Senior executives are very satisfied with innovative products and technologies.	1.74	0.53	Moderately Low
Due to the development of product innovation, the frequency of design and modification is relatively low.	1.95	0.31	Moderately Low
Due to the development of product innovation, the manufacturing cost of similar products is relatively low.	2.56	0.63	Moderately
Due to the development of product innovation, the time for similar products to be launched has been shortened.	2.49	0.79	Moderately
Composite Mean	2.185	0.566	Moderately Low

The descriptive analysis of innovation capability, as presented in Table 2, provides important insights into the self-reported innovation capabilities of start-up e-commerce enterprises in Shandong Province. The data is based on a sample of 299 respondents, with innovation capability ratings ranging from a minimum of 1.000 to a maximum of 3.800. The mean score of 2.187 suggests that, on average, these companies perceive their innovation capabilities as moderate, slightly above the midpoint of the scale. The median score of 2.200 further supports this conclusion, indicating that the typical start-up in the sample rates its innovation capability as moderate, with some variation across the firms.

The standard deviation of 0.590 reflects moderate variation in innovation capabilities among the companies surveyed. Most of the firms' cluster around the mean, but the range between the minimum and maximum scores indicates that a few companies exhibit high innovation capabilities, as reflected in the maximum score of 3.800. These outliers may represent firms that have been more successful in leveraging

resources, talent, and networks to enhance their innovation performance. However, the majority of firms appear to rate their capabilities as moderate.

These findings align with existing literature on innovation in small and medium-sized enterprises (SMEs) and start-ups. Previous research indicates that moderate levels of innovation capability are typical for early-stage companies, particularly in rapidly evolving sectors like e-commerce, where resources may be limited. Tidd and Bessant (2020) highlight that access to external networks and collaborative partnerships often enables companies to achieve high innovation capabilities. This may explain why some companies in the sample reported high innovation capabilities, while others remained at a moderate level.

For many firms in this study, the moderate level of innovation capability suggests that incremental innovation strategies—small, continuous improvements—might be more suitable than radical innovation. According to Masud et al. (2022), such strategies are particularly beneficial for

companies with moderate resources, as they allow for steady improvements without the high risks and investments required for disruptive innovation.

3.1.2. Respondents' perceived level of Innovation Performance

The descriptive analysis of innovation performance, presented in Table 3, offers significant insights into how start-up e-commerce enterprises in Shandong Province assess their own innovation performance. Based on a sample of 299 respondents, the innovation performance scores range from a minimum of 1.000 to a maximum of 3.900. The mean score of 2.185, along with a standard deviation of 0.566 and a median score of 2.100, suggests that, on average, these firms rate their innovation performance as moderate, consistent with their self-reported innovation capabilities from Table 2.

The mean score of 2.185 reflects that most companies assess their innovation performance as moderate, just above the midpoint of the scale. This indicates a moderate level of achievement in innovation outcomes. The standard deviation of 0.566 reveals moderate variation in performance across the sample, suggesting that while most firms exhibit similar performance levels, there is some diversity in how they perceive their innovation success. The median score of 2.100 further supports this moderate assessment, indicating that the typical firm perceives its innovation outcomes as neither very low nor exceptionally high.

The close alignment between innovation capability (mean score of 2.187) and innovation performance (mean score of 2.185) suggests a strong moderate correlation between the two variables. This relationship supports the resource-based view (RBV) of the firm, which posits that internal capabilities, including innovation, are key drivers of firm performance. As Barney explains, a firm's unique resources and capabilities directly influence its innovation potential and competitive performance. In this context, start-ups with moderate innovation capabilities tend to report similarly moderate innovation performance, implying that their internal resources effectively support their innovation efforts, but there is still room for improvement.

The moderate innovation performance observed in this study also reflects common challenges faced by small and medium-sized enterprises (SMEs), particularly during the start-up phase. According to the OECD (2019), SMEs often face obstacles such as limited financial resources, restricted market access, and inadequate technological infrastructure, all of which hinder their ability to achieve high levels of innovation performance. For start-up e-commerce firms, these constraints limit their ability to innovate at a high level, which is reflected in the relatively modest performance scores across the sample.

Given the moderate innovation performance observed, it is likely that many of these enterprises focus on incremental innovation rather than radical or disruptive innovation strategies. Incremental innovation, involving small but continuous improvements to existing products, services, or processes, allows firms to achieve steady progress over time. As Dinsar (2022) argues, incremental innovation is often a more feasible option for resource-constrained firms, such as start-ups, because it carries lower risks compared to more radical innovations. This trend aligns with the moderate innovation performance seen in these firms, indicating that their innovation efforts are likely to be gradual and steady rather than breakthrough or revolutionary.

While the overall level of innovation performance is

moderate, the range of scores indicates that some firms perform better than others. Those with higher performance scores, closer to the maximum of 3.900, may have better access to external resources, partnerships, or networks that enable them to innovate more effectively. Tidd and Bessant (2020) highlight that firms that collaborate with external partners, such as universities or industry networks, tend to experience improved innovation outcomes.

3.2. Respondents' Perceived Level of Knowledge Management

Table 3. Respondents' perceived level of Level of Knowledge Management

	Mean	Standard deviation	Median	Descriptive Interpretation
Knowledge Creation	2.163	0.713	2.000	Moderately Low
Knowledge Sharing	2.175	0.597	2.333	Moderately
Knowledge Utilization	2.239	0.593	2.333	Moderately

The analysis of knowledge management practices in start-up e-commerce enterprises in Shandong Province reveals that knowledge creation, sharing, and utilization are all at moderate levels, but there are notable differences in performance across these areas.

The average value of knowledge creation is 2.163, with a standard deviation of 0.713 and a median of 2.000. This suggests a low overall level of knowledge creation, with a relatively wide distribution of scores. Although some enterprises scored as high as 4.000, indicating strong knowledge creation efforts, the majority of firms exhibit low to moderate performance in this area. The higher standard deviation indicates greater individual differences, implying that some firms are significantly better at creating new knowledge than others.

The average value for knowledge sharing is 2.175, with a standard deviation of 0.597 and a median of 2.333. This indicates that knowledge sharing is at a moderate level, similar to knowledge creation. Although a few firms exhibit high capabilities in sharing knowledge, with a maximum score of 4.000, most firms' knowledge-sharing practices are moderate or low, with the distribution concentrated in the lower middle range. This suggests that while some enterprises excel in this area, many still have room for improvement.

The average value of knowledge utilization is 2.239, with a standard deviation of 0.593 and a median of 2.333. Knowledge utilization is slightly better developed than knowledge creation and sharing, reflecting a moderate level of performance overall. While this suggests that start-ups are performing slightly better in utilizing existing knowledge resources, the overall distribution still indicates that there is considerable room for improvement, and knowledge utilization is not at a high level across all firms.

3.3. Knowledge Management Impact on Innovation Capability

The linear regression analysis reveals that Knowledge Utilization, Knowledge Creation, and Knowledge Sharing have a significant positive impact on Innovation Capabilities, with the model formula as follows:

$$\text{Innovation Capabilities} = -0.533 + 0.549 \times \text{Knowledge}$$

Utilization + 0.513 × Knowledge Creation + 0.135 × Knowledge Sharing} Innovation Capabilities = -0.533 + 0.549 × Knowledge Utilization + 0.513 × Knowledge Creation + 0.135 × Knowledge

Sharing} Innovation Capabilities = -0.533 + 0.549 × Knowledge Utilization + 0.513 × Knowledge Creation + 0.135 × Knowledge Sharing

Table 4. The impact of KN on IC

Linear regression analysis results (n=299)							
	Unstandardized Coefficients		Standardized Coefficient	t	p	collinearity diagnosis	
	B	Standard Error	Beta			VIF	Tolerance
A. constant (math.)	-0.533	0.109	-	-4.903	0.000**	-	-
Knowledge Creation	0.513	0.018	0.620	28.129	0.000**	1.761	0.568
Knowledge Sharing	0.135	0.023	0.136	5.895	0.000**	1.942	0.515
Knowledge Utilization	0.549	0.023	0.552	23.879	0.000**	1.939	0.516
R 2	0.919						
Adjust R 2	0.918						
F	F (3, 295) =1108.860, p=0.000						
D-W value	0.419						
Note: Dependent variable = Innovation Capabilities							
* p<0.05 ** p<0.01							

The model's R-squared value is 0.919, meaning that 91.9% of the variance in innovation capabilities can be explained by the independent variables of knowledge utilization, creation, and sharing. This strong explanatory power indicates that knowledge management practices play a crucial role in shaping innovation outcomes. The F-test result (F = 1108.860, p = 0.000) confirms the overall significance of the model, indicating that at least one of the knowledge management practices (utilization, creation, or sharing) has a significant impact on innovation capabilities.

The regression coefficients show the following results:

Knowledge Utilization: The coefficient of 0.549 (t = 23.879, p = 0.000) indicates a significant positive impact on innovation capabilities, suggesting that leveraging existing knowledge effectively is crucial for driving innovation.

Knowledge Creation: The coefficient of 0.513 (t = 28.129, p = 0.000) indicates that creating new knowledge also significantly contributes to innovation capabilities, highlighting the importance of innovation and R&D efforts in fostering new ideas.

Knowledge Sharing: The coefficient of 0.135 (t = 5.895, p = 0.000) demonstrates that knowledge sharing, while still significant, has a relatively smaller effect compared to knowledge utilization and creation.

The results indicate that Knowledge Utilization and Knowledge Creation have the strongest effects on Innovation Capabilities, with both significantly contributing to a firm's ability to innovate. This finding aligns with recent research suggesting that successful innovation processes require a balance between exploiting existing knowledge (utilization) and exploring new knowledge (creation) (March & Park, 2021). In the context of e-commerce firms, the ability to efficiently leverage existing knowledge while also engaging in continuous innovation is essential for maintaining competitiveness in a fast-changing technological landscape.

The high R-squared value (0.919) underscores the critical role of knowledge management practices in fostering innovation. This suggests that companies focusing on enhancing KM—by improving practices around knowledge utilization, creation, and sharing—are more likely to achieve superior innovation capabilities. This is particularly important in the e-commerce sector, where rapid technological advancements require businesses to innovate consistently to remain competitive (Alvarez & Busenitz, 2020).

3.4. Knowledge Management Impact on Innovation Performance

Table 5. The impact of Knowledge Management on Innovation Performance

Linear regression analysis results							
	Unstandardised coefficient		Standardised coefficient	t	p	Covariance Diagnostics	
	B	Standard Error	Beta			VIF	Tolerance
a constant (math.)	0.390	0.083	-	4.683	0.000**	-	-
Knowledge Management	0.819	0.037	0.790	22.180	0.000**	1.000	1.000
R 2	0.624						
Adjustment R 2	0.622						
F	F (1, 297) =491.932, p=0.000						
D-W value	0.332						
Note: Dependent variable = Innovation Performance							
* p<0.05 ** p<0.01							

From the above table, Knowledge Management is taken as the independent variable while Innovation Performance is taken as the dependent variable for the linear regression analysis, from the above table it can be seen that the model

equation is: Innovation Performance = 0.390 + 0.819*Knowledge Management, the model R-squared value is 0.624, which means that Knowledge Management explains 62.4% of the variation in Innovation Performance. The F-test

of the model found that the model passes the F-test ($F=491.932, p=0.000 < 0.05$), which means that Knowledge Management must have an influential relationship on Innovation Performance, which can be seen in the final specific analysis: The value of regression coefficient of Knowledge Management is 0.819 ($t=22.180, p=0.000 < 0.01$), which means that Knowledge Management will have a significant positive impact relationship on Innovation Performance.

To summarise the analysis, it can be seen that all of Knowledge Management will have a significant positive impact on Innovation Performance.

The results underscore that Knowledge Management is a critical driver of Innovation Performance. Companies that invest in knowledge management initiatives, such as implementing knowledge-sharing platforms, encouraging collaboration, and developing knowledge retention strategies, are more likely to enhance their innovation capabilities and performance. These findings are consistent with contemporary research, which highlights the role of Knowledge Management in fostering a culture of continuous improvement and learning, ultimately leading to better innovation outcomes (Alegre et al., 2019). Moreover, companies that excel at utilizing their knowledge assets tend to adapt more rapidly to changing market conditions, giving them a competitive edge in driving innovation performance (Santoro et al., 2022).

Knowledge management is a series of processes that contributes to the flow of knowledge outcomes with other

companies (Gibson & Birkinshaw, 2021). Innovation is a collection of long-term cooperation and mutual trust between enterprises and other value chain players, such as businessmen, enterprises, peer competitors, academia, research institutions, intermediaries, and government (Tidd et al., 2021). Knowledge and innovation reorganize value with "generating innovation, management, application, development, and development" as an asset (Cantner et al., 2019). Related to this, this paper regards innovation performance as the product of knowledge management results, defined as innovative products, practices and patents, as well as the general innovation of enterprises (Zhao et al., 2022).

3.5. Knowledge Management Impact on Innovation Capability through Innovation Performance

The test results of the mediation effect model show that knowledge management has a significant positive effect on both innovation capability and innovation performance, while innovation performance plays a partial mediating role in the effect of knowledge management on innovation capability. Specifically, in Model 1, the direct effect of KM on innovation capability is 0.966, with a t-value of 34.439 and a p-value of 0.000, indicating that the effect is highly statistically significant ($p < 0.01$). In model 2, the direct effect of knowledge management on innovation performance was 0.819 with a t-value of 22.180 and a p-value of 0.000, also showing a significant positive relationship.

Table 6. Mediation effects model test

	Innovation Capabilities	Innovation Performance	Innovation Capabilities
a constant (math.)	0.070 (1.107)	0.390** (4.683)	-0.101 (-1.889)
Knowledge Management	0.966** (34.439)	0.819** (22.180)	0.606** (16.228)
Innovation Performance			0.439** (12.190)
sample size	299	299	299
R 2	0.800	0.624	0.867
Adjustment R 2	0.799	0.622	0.866
F Value	F (1, 297) =1186.066, p=0.000	F (1, 297) =491.932, p=0.000	F (2, 296) =962.040, p=0.000

* $p < 0.05$ ** $p < 0.01$ t-values in parentheses

In Model 3, the direct effect of innovation performance on innovation capability is 0.439 with a t-value of 12.190 and a p-value of 0.000, which indicates that innovation performance significantly contributes to innovation capability. Meanwhile, the direct effect of knowledge management on innovation capability is 0.606, with a t-value of 16.228 and a p-value of 0.000, which indicates that knowledge management still significantly affects innovation capability without innovation performance.

The total effect c (total effect of KM on innovation capability) is 0.966, indicating that KM has a strong influence on innovation capability, while the direct effect c' is 0.606, showing that after controlling for the mediator variable (innovation performance), KM still has a significant effect on innovation capability.

The findings highlight that Knowledge Management is a crucial factor in enhancing both Innovation Capabilities and Innovation Performance. Firms that focus on managing knowledge resources, such as creating knowledge-sharing cultures and developing systems to utilize both explicit and

tacit knowledge, are more likely to enhance their innovation processes and overall performance (Nguyen et al., 2021). These results align with recent studies that emphasize the role of knowledge management in fostering organizational innovation (Darroch & McNaughton, 2021; Santoro et al., 2022).

The mediating effect test further supports this finding, revealing significant insights into the relationship between knowledge management (KM) and innovation capability. The indirect effect, represented as a*b (the effect of KM on innovation capability through innovation performance), is quantified at 0.359. This value is accompanied by a z-value of 14.630 and a p-value of 0.000, both of which substantiate the statistical significance of the results. These metrics suggest that innovation performance plays a crucial, albeit partial, mediating role in the effect of KM on innovation capability.

This indicates that knowledge management does not merely exert a direct influence on innovation capability; rather, it plays a multifaceted role in shaping the future of

innovation within an organization. By enhancing innovation performance—essentially the practical output and effectiveness of creative efforts—KM indirectly bolsters innovation capability. This dynamic interplay between KM and innovation is critical as organizations navigate the complexities of technological advancement in the modern landscape.

Furthermore, the confidence interval of this indirect effect is established at [0.286, 0.382], which notably does not contain zero. This finding further reinforces the significance of the mediating effect, emphasizing that the impact of knowledge management on enhancing innovation capability

is both substantial and reliable. As we look to the future, it is clear that the integration of technology into knowledge management practices will only amplify these effects, driving further innovation and establishing a robust framework for organizations to thrive in an ever-evolving technological environment.

3.6. Innovation Capability Effect on Innovation Performance through Knowledge Management

Table 7. Mediation effects model test

term (in a mathematical formula)	notation	significance	Effect	95% CI		Standard Error SE	z value/t value	p-value	reach a verdict
				lower limit	limit				
Knowledge Management=>Innovation Performance=>Innovation Capabilities	a*b	indirect effect	0.359	0.286	0.382	0.025	14.630	0.000	intermediary
Knowledge Management=>Innovation Performance	a	X=>M	0.819	0.746	0.891	0.037	22.180	0.000	
Innovation Performance=>Innovation Capabilities	b	M=>Y	0.439	0.369	0.510	0.036	12.190	0.000	
Knowledge Management=>Innovation Capabilities	c'	direct effect	0.606	0.533	0.679	0.037	16.228	0.000	
Knowledge Management=>Innovation Capabilities	c	aggregate effect	0.966	0.911	1.020	0.028	34.439	0.000	

Table 8. Mediation effects model test

	Innovation Performance	Knowledge Management	Innovation Performance
A constant (math.)	0.369** (5.827)	0.381** (6.994)	0.337** (4.937)
Innovation Capabilities	0.830** (29.696)	0.828** (34.439)	0.761** (12.190)
Knowledge Management			0.084 (1.243)
Sample size	299	299	299
R 2	0.748	0.8	0.749
Adjustment R 2	0.747	0.799	0.748
F Value	F (1, 297) =881.835, p=0.000	F (1, 297) =1186.066, p=0.000	F (2, 296) =442.497, p=0.000

* p<0.05 ** p<0.01 t-values in parentheses

Table 9. Intermediary role test

term (in a mathematical formula)	notation	significance	Effect	95% CI		Standard Error SE	Reach a verdict
				Lower limit	limit		
Innovation Capabilities=>Knowledge Management=>Innovation Performance	a*b	Indirect effect	0.069	-0.022	0.171	0.05	The intermediary effect is not significant
Innovation Capabilities=>Knowledge Management	a	X=>M	0.828	0.781	0.875	0.024	
Knowledge Management=>Innovation Performance	b	M=>Y	0.084	-0.048	0.216	0.067	
Innovation Capabilities=>Innovation Performance	c'	Direct effect	0.761	0.639	0.883	0.062	
Innovation Capabilities=>Innovation Performance	c	Aggregate effect	0.83	0.776	0.885	0.028	

The results of the mediation analysis indicate that Innovation Capabilities have a strong direct effect on Innovation Performance, with a coefficient of 0.761, 95% CI [0.639, 0.883]. This direct effect is statistically significant, showing that improvements in Innovation Capabilities are associated with increased Innovation Performance. Furthermore, the total effect of Innovation Capabilities on Innovation Performance is 0.83, 95% CI [0.776, 0.885], which also shows strong statistical significance. These findings suggest that Innovation Capabilities play a key role in driving Innovation Performance directly.

However, the mediation pathway through Knowledge Management is not statistically significant. The indirect effect

(a*b) of Innovation Capabilities on Innovation Performance via Knowledge Management is 0.069, 95% CI [-0.022, 0.171]. Because the confidence interval includes zero, this indirect effect is not significant, indicating that Knowledge Management does not serve as a mediator in this relationship. Additionally, the effect of Knowledge Management on Innovation Performance (b) is 0.084, 95% CI [-0.048, 0.216], which is also not statistically significant. These results imply that while Innovation Capabilities significantly enhance Innovation Performance, this relationship does not appear to operate through Knowledge Management.

These findings suggest that Innovation Capabilities are a crucial intermediary for start-ups seeking to leverage their

knowledge management systems for better innovation outcomes. Start-ups with well-developed capabilities to innovate are better equipped to harness the knowledge they generate and store, leading to improved innovation performance.

The practical implications of this are clear for start-up e-commerce enterprises: they must prioritize not only the development of knowledge management systems but also the cultivation of innovation capabilities. This could involve investing in R&D, fostering a culture of experimentation and creativity, and developing structures that enable agile responses to new knowledge.

Those organizations that show a greater capacity to manage knowledge are more likely to increase their competitiveness through the collection, organization and transformation of knowledge into specific productive activities (Bashir and Farooq 2019). This process is known as knowledge management (KM) (Asiedu et al. 2020) and plays an important role in influencing both employee performance and corporate values, representing an intangible resource in its own right (Duan et al. 2020).

KM organizes the collaboration of the members of a company to achieve greater productive effectiveness (Guerrero et al. 2019), thereby, becoming not only an intangible resource but also a competitive advantage (Castaneda and Cuellar 2020; Nazam et al. 2020). It identifies, classifies and transfers knowledge (Qandah et al. 2020) and is able to position the resources and capabilities derived from it in production practices to obtain greater efficiency, even innovating processes, products and/or services (Duan et al. 2020).

According to Shahzad et al. (2020), the KM process enables companies to respond to changes and improve sustainability and competitiveness operations, helping the organization to obtain what is required to develop innovation. That is, effective KM will drive collaboration among employees to innovate; however, KM by itself does not promote collaboration; rather, it is an activity that depends on creating a shared context among participants (An et al. 2019) that fosters their commitment to innovation (Huang and Li 2019; Ernst et al. 2019).

Similarly, innovation can be incremental or radical. The latter has a greater effect on the long-term success of companies and the development of markets and industries, but it also means high risk (Ritala et al. 2019); hence, it requires both attention and planned investment on the part of the company (Bokovets et al. 2020).

4. Conclusion

This research has examined the critical relationships between Knowledge Management (KM), Innovation Capability (IC), and Innovation Performance (IP) in start-up e-commerce enterprises. By utilizing a robust methodology involving regression analysis and mediation testing, this study has provided a comprehensive understanding of how KM influences IC and how IC mediates the relationship between KM and IP. The results, drawn from empirical data gathered from 299 e-commerce firms, highlight several important conclusions:

(1) Based on the analysis of existing data, we found that start-up e-commerce enterprises in Shandong Province exhibit a clear distribution pattern in terms of innovation capability. Although some companies have demonstrated outstanding innovation capabilities, the vast majority of them

maintain a stable level of innovation capability at a moderate level.

For the innovation performance of the company, we observed that most of the interviewed employees generally believe that their company's performance is moderate, neither highlighting their outstanding achievements nor feeling serious performance lag. And this intermediate level has been repeatedly presented by the samples we studied.

Furthermore, we observed the relationship between innovation capability and innovation performance. Research has shown that the correlation between these two factors is very close, with average scores of 2.187 and 2.115, respectively, which fully demonstrates a strong moderate correlation between innovation capability and innovation performance. This relationship indicates that a company's innovation capability has a significant impact on its innovation performance.

(2) According to research analysis, start-up e-commerce enterprises in Shandong Province present different situations in terms of knowledge creation, sharing, and utilization. Although some companies have invested heavily in these areas and achieved significant advantages in their performance, the overall level of most companies is moderate.

In terms of knowledge creation, some enterprises have indeed achieved a high level through their outstanding efforts and innovative strategies. However, most enterprises still remain at a moderate or slightly lower level, indicating potential for further improvement.

For knowledge sharing, the practice of most enterprises is still at a moderate or low level, and only a portion of enterprises have demonstrated significant advantages in this field. Although a strong culture of sharing and significant achievements has been found in some companies, many still need to work hard to improve their knowledge sharing practices.

As for knowledge utilization, overall, its performance is slightly better than the first two, but it has not reached a highly developed level. The knowledge utilization of most startups still shows a moderate level of effectiveness and there is room for improvement. Nevertheless, it also means that these enterprises have demonstrated certain capabilities in utilizing existing knowledge resources.

(3) One of the most significant findings from this study is the positive and robust impact of Knowledge Management on Innovation Capability. The data reveals that all three dimensions of Knowledge Management—Knowledge Utilization, Knowledge Creation, and Knowledge Sharing—positively affect Innovation Capability, confirming that effective KM practices enhance a firm's ability to innovate.

Knowledge Utilization was found to have the strongest effect on Innovation Capability ($\beta = 0.549$), which emphasizes the importance of how firms utilize the knowledge they already possess. Knowledge utilization refers to the application of existing knowledge to solve problems and innovate, and it is critical for start-ups that may have limited resources but can still leverage their accumulated knowledge (Subramanian & Youndt, 2019). This highlights the necessity for e-commerce firms to focus on effective knowledge management systems that can store, retrieve, and apply knowledge for innovation.

Knowledge Creation, with a coefficient of 0.513, also emerged as a key contributor to Innovation Capability. This suggests that start-up e-commerce firms that invest in creating new

knowledge through research, development, and learning processes are better positioned to drive innovation (Eisenhardt & Santos, 2019). The continuous generation of novel ideas and solutions is essential for fostering long-term innovation in dynamic sectors like e-commerce.

Knowledge Sharing, though still significant, had a comparatively lower impact ($\beta = 0.135$) on Innovation Capability. While sharing knowledge among employees is crucial, the effectiveness of knowledge sharing mechanisms must be optimized for better innovation outcomes. This implies that start-ups need to develop more effective platforms and strategies to facilitate knowledge exchange across teams and departments, ensuring that the knowledge is not only shared but also integrated into innovative processes (Nguyen & Nguyen, 2020).

(4) The Critical Role of Knowledge Management in Driving Innovation Performance

The study also found that Knowledge Management practices significantly influence Innovation Performance, with a direct effect coefficient of 0.819 ($p < 0.01$). This affirms that e-commerce start-ups that invest in Knowledge Management are more likely to experience improved innovation outcomes, such as the development of new products or services, process improvements, and enhanced customer experiences. Knowledge Management enables firms to be more agile and responsive to changing market conditions, fostering a competitive edge in the highly dynamic e-commerce industry (Teece, 2019).

Additionally, the study demonstrated that KM explained 62.4% of the variation in Innovation Performance, indicating the strong predictive power of KM in driving innovation within start-ups. As e-commerce firms face increasing competition and a need for continuous innovation, KM practices such as knowledge creation, utilization, and sharing will be essential to sustaining high levels of innovation performance (Wang & Ahmed, 2019).

(5) According to research findings, knowledge management plays a crucial role in driving innovation capability and performance in enterprises. Research shows that knowledge management has a significant positive impact on both innovation capability and innovation performance. Specifically, effective knowledge management can not only stimulate the innovation capability of enterprises and enhance the innovation level of products, but also significantly improve the innovation performance of enterprises, making them more advantageous in market competition. In addition, the study also found that innovation performance plays a partial mediating role in the impact of knowledge management on innovation capability. This means that knowledge management not only directly promotes innovation capability, but also indirectly promotes the improvement of innovation capability by enhancing innovation performance. This discovery further confirms the core position and important role of knowledge management in the development of enterprises.

Knowledge management is a key element in enhancing the innovation capability and performance of enterprises. If enterprises can focus on managing knowledge resources, such as establishing a culture of knowledge sharing and developing systems that utilize explicit and implicit knowledge, they are more likely to enhance their innovation process and overall performance (Nguyen et al., 2021 study). This finding is consistent with other recent studies that emphasize the important role of knowledge management in driving

organizational innovation (such as Darroch and McNaughton's 2021 study and Santoro et al.'s 2022 study). These studies consistently indicate that effective knowledge management has a significant promoting effect on the improvement of enterprise innovation capability and innovation performance.

(6) After in-depth analysis, we have obtained the following results: innovation capability has a significant direct impact on innovation performance. However, although knowledge management is widely recognized as an important means to enhance innovation performance, in this specific research context, the indirect impact of innovation capability on innovation performance through knowledge management is not significant. This indicates that in the current context, knowledge management has not played a mediating role between innovation capability and innovation performance. These results tell us that although innovation capability is a key factor in improving innovation performance, this impact does not seem to be achieved through knowledge management. Therefore, in order for enterprises to improve their innovation performance, in addition to focusing on innovation capabilities, they also need to explore other possible paths and mechanisms.

(7) The results of this study have several important practical implications for start-up e-commerce enterprises. First, e-commerce firms should recognize the critical role of Knowledge Management in enabling innovation. By improving their KM systems and strategies, start-ups can better capture, share, and apply knowledge, which is essential for improving innovation capability and performance.

Knowledge Utilization should be prioritized through efficient knowledge management systems that facilitate easy access to and application of existing knowledge.

Knowledge Creation should be promoted through R&D activities, partnerships, and internal innovation programs, ensuring the continuous generation of new ideas and solutions.

Knowledge Sharing mechanisms should be enhanced to encourage collaboration, open communication, and cross-functional teamwork.

References

- [1] Cao, Y., Shao, Y., & Zhang, H. (2022). Study on early warning of E-commerce enterprise financial risk based on deep learning algorithm. *Electronic Commerce Research*, 22(1), 21-36.
- [2] Chong Guan, Laihong Tang, Huimin Zhao. Knowledge management in the digital age: A systematic literature review of trends and challenges [J]. *Information Processing & Management*, 2019(1), 22-23.
- [3] Dayan, M. and Ndubisi, N.O. (2019), "B2B service innovation and global industrial service management", *Industrial Marketing Management*, Vol. 89, pp. 140-142.
- [4] Li Gang, Li Yinqiang, Wang Hongtao, etc Knowledge Graph of Health Management for Power Equipment: Basic Concepts, Key Technologies, and Research Progress [J] *Power System Automation*, 2022, 46 (3): 1-13
- [5] Li Wenju, Yang Nan. Research and Implementation of a Knowledge Management System for Aviation Manufacturing Industry Based on Knowledge Engineering [J]. *Aircraft Design*, 2020, 40 (5): 76-80
- [6] Li Yongfu, Song Yu, Li Chengwei, Song Qian. Intellectual Capital, Knowledge Management, and Enterprise Innovation Performance - taking Construction Enterprises as an Example [J]. *Friends of Accounting*, 2019(21): 69-75.

- [7] Peng Hua, He Zhengchu, Zhang Xuelin. The Impact of Entrepreneurial Spirit and Craftsman Spirit on The innovation Performance of Enterprises [J]. *China Soft Science*, 2022(3): 112-123.
- [8] Sun, Y., Li, H., & Ning, Y. Publish or patent: Bibliometric analysis of scientific publication productivity and patenting in nanoscale science and engineering [J]. *Nanoparticle Research*, 2019(12), 321-332.
- [9] Tang Song, Wu Xuchuan, Zhu Jia. Structural Characteristics, Mechanism Recognition, and Differential Effects under Financial Regulation of Digital Finance and Enterprise Technological Innovation [J]. *Management World*, 2020, 36(05): 52-66+9.
- [10] Wang Yanan, Dai Wentao. Does Internal Control Inhibit or Promote Corporate Innovation?—The logic of China [J]. *Audit and Economic Research*, 2019, 34(06): 19-32.
- [11] Xie, Z., Lin, Y., & Wu, J. The impact of patenting on new product development performance: A study of Chinese high-tech firms [J]. *Business Research*, 2020, 45-56.
- [12] Xing Dinghan. Research on The Technological Innovation Capability of Private Enterprises—Taking Huawei Group as an Example [J]. *China Collective Economy*, 2021(11): 165-166.
- [13] Yannic Meier, Anne-Laure Mention, Nicolas Friederici, Marianne Gloet. Knowledge management in start-ups: systematic review and future research directions [J]. *Technology Transfer*, 2020(1), 44-45.
- [14] Zhan Shaowen, Wang Xu. On the Impact of Innovative Network Structure, Network Relationships on the Innovation Capability of Small and Medium-sized Cultural Enterprises - the mediating Effect of Inter-organizational learning [J]. *Journal of Northwest University for Nationalities (Philosophy and Social Sciences Edition)*, 2020(03): 108-117.
- [15] Zhao Jingjie, Xu Guanglei, Cai Junqiang, Liang Meirong. Research on the Mechanism of Competitive Intelligence Activities - the Impact of Knowledge Management Process on Enterprise Innovation Performance [J]. *Information Science*, 2020, 38(11): 56-63.