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Study on Value Co-Creation Model Driven by New Quality Productivity: The Interactive Impact of Supply Chain Collaboration and User Participation

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Abstract:

With the rise of new quality productivity, digital capability has become the key driving force to promote enterprise value co-creation. Based on the theory of new quality productivity, this paper uses the hierarchical regression method to analyze the sample data of 360 manufacturing enterprises and discusses the value co-creation model of supply chain collaboration and user participation driven by new quality productivity. It is found that by improving the digital capability of enterprises, new quality productivity significantly enhances supply chain collaborative efficiency and user participation, thereby promoting enterprise value co-creation. Specifically, digital capability plays a partial mediating role between supply chain collaboration and user participation, and the interaction effect of supply chain collaboration and user participation positively impacts enterprise innovation performance. The research results reveal the mechanism by which new quality productivity facilitates the deep integration of supply chain collaboration and user participation. Furthermore, they provide theoretical support and practical guidance for enterprises to achieve value co-creation in the process of digital transformation.

Keywords: new quality productivity; digital capability; supply chain collaboration; user participation; value co-creation

1. Introduction

1.1. Research Background and Significance

In the era of globalization and digitalization, the rise of new quality productivity is profoundly changing the production mode and business model of enterprises (Biggiero, 2006). New quality productivity, with digital capabilities as its core, not only represents the direction of a new round of industrial revolution, but also an important driving force for high-quality economic development. By promoting innovative allocation of production factors, deep industrial transformation and upgrading, and revolutionary technological breakthroughs, it demonstrates the three major features of high quality, high technology, and high efficiency (Li et al., 2017).

In this context, enterprise supply chain management is faced with unprecedented

challenges and opportunities. How to effectively use new quality productivity, especially digital capabilities, to optimize supply chain collaboration and enhance user engagement has become a hot issue in academia and industry (Liu et al., 2023).

As two key dimensions of value co-creation, supply chain collaboration and user participation are of great significance for enterprises to achieve sustainable development through their mechanism and effect evaluation driven by new quality productivity. Supply chain collaboration can improve the efficiency of resource allocation and reduce operating costs, while user participation can increase the market adaptability and innovation of products (Cao & Zhang, 2011).

Through digital means, such as big data analytics, cloud computing, and artificial intelligence, new quality productivity enhances the transparency and responsiveness of the supply chain, while also enhancing the ability of users to participate in product design and service improvement (Bartlett et al., 2007). This new productivity, with technology and data at its core, is reshaping the process of value creation and delivery in enterprises.

However, the existing research is not clear about how the new quality productivity affects the interaction between supply chain collaboration and user participation, and how this interaction affects the mechanism of enterprise value co-creation (Li & Lin, 2006). This paper aims to fill in the research gap and explore the impact of new quality productivity on supply chain collaboration and user participation through empirical analysis, and how they work together on firm value co-creation.

This has important theoretical and practical guiding significance for enterprises to formulate effective supply chain management strategies, enhance user participation, and enhance core competitiveness in the process of digital transformation.

Through the empirical analysis of sample data from 360 manufacturing enterprises, this paper will reveal the mechanism of new quality productivity in promoting the deep integration of supply chain collaboration and user participation, and provide theoretical support and practical guidance for enterprises to realize value co-creation in the era of new quality productivity.

1.2. Overview of Research Purpose and Content

This study aims to explore how digital capabilities affect supply chain collaboration and user participation in the context of new quality productivity, and how the interaction of the two affects the value co-creation of enterprises.

Driven by the new quality productivity, enterprises are facing the challenge of transforming from traditional production mode to digitalization and intelligence (Zhang et al., 2022). As the core of new quality productivity, digital capability has become a key factor for enterprises to improve supply chain efficiency, enhance user engagement, and realize value co-creation. Therefore, the purpose of this study is to reveal the mechanism of digital capability in supply chain collaboration and user participation, and how they jointly promote the creation of firm value.

The research contents include the following aspects:

First, this study will define the connotation and characteristics of new quality productivity and analyze its impact on supply chain management.

Secondly, it discusses how digital capability affects the value co-creation of enterprises through supply chain collaboration and user participation.

Thirdly, a theoretical model is constructed, the research hypothesis is proposed, and the hierarchical regression method is used to empirically analyze the sample data of 360 manufacturing enterprises, in order to verify the relationship between digital capability, supply chain collaboration, and user participation.

Finally, based on the empirical analysis results, management practice and policy suggestions are put forward to provide theoretical support and practical guidance for enterprises' supply chain management and value co-creation in the era of new quality productivity.

The innovation of this study is that it combines new quality productivity with supply chain collaboration and user participation and discusses the roles and interrelationships of the three in value co-creation from the perspective of digital capability. This research not only enriches the applied research of new quality productivity theory but also provides a new research perspective for supply chain management and user participation.

The research results will help enterprises better understand and utilize new quality productivity, optimize supply chain management, enhance user participation, and ultimately realize value co-creation and sustainable development of enterprises.

Literature review

1.3. The Concept and Characteristics of New Quality Productivity

As an emerging concept, new-quality productivity represents a new stage in the development of productive forces and embodies the three features of innovative allocation of production factors, in-depth industrial transformation and upgrading, and revolutionary technological breakthroughs (Li & Liu, 2024).

The core of new-quality productivity is to promote the fundamental change of production mode through technological innovation and digital transformation and achieve a qualitative leap in productivity (Liu & He, 2024). Conceptually, new-quality productivity emphasizes the "new" and "quality" of productivity, that is, the new form and high-quality development of productivity in the new era. It is not limited to the traditional factors of production such as land, labor, and capital, but pays more attention to the integration and application of innovative factors such as knowledge and technology (Li, 2024).

The characteristics of new-quality productivity are embodied in three aspects: high quality, high technology, and high efficiency. High quality refers to the strict control of quality and standards in the production process, as well as the continuous improvement of

product and service quality (Al-Ibrahim, 2014). High technology refers to the extensive application of modern information technology in the production process, such as big data, cloud computing, artificial intelligence, etc., to improve production efficiency and innovation ability. High efficiency refers to the efficient use of resources and the reduction of energy consumption to achieve green and sustainable development.

The academic research on new-quality productivity mainly focuses on its role in promoting economic development, its impact on industrial upgrading, and how to achieve high-quality development through new-quality productivity (Tang, 2024). Research shows that new-quality productivity can promote the optimal allocation of production factors, improve production efficiency, and enhance the innovation ability and market competitiveness of enterprises (Shao et al., 2024).

At the same time, new-quality productivity is also an important force in promoting the optimization and upgrading of industrial structure (Chen & Wu, 2025). It guides the industry to develop in the direction of high-end and intelligent through technological innovation and model innovation.

The concept and characteristics of new-quality productivity reflect the new trends and new requirements of current economic development (Lin et al., 2024). It not only changes the production mode but also brings new challenges and opportunities for enterprise management and supply chain operation.

On this basis, this study will further explore the role of new-quality productivity in supply chain collaboration and user participation, and how they jointly promote the creation of firm value.

1.4. Digital Capability and Value Co-creation Theory

Digital capability refers to the ability of enterprises to use digital technology for resource allocation, process optimization, and value creation in the process of digital transformation (Li et al., 2018). With the rapid development of information technology, this concept has attracted increasing attention and become a key factor for enterprises to obtain competitive advantages. Digital capability not only includes the ability to apply technology, but also covers the ability to analyze, process, and utilize data, as well as the ability to make decisions and innovate on this basis.

In terms of value co-creation theory, scholars believe that value is no longer created unilaterally by enterprises, but the result of enterprises' participation with consumers, suppliers, and other stakeholders. This theory emphasizes the importance of interaction and participation in the process of value creation, believing that through cooperation and sharing, all parties can create greater value.

Digital capabilities play a crucial role in value co-creation, enabling companies to better interact with users and other partners to optimize products and services by collecting and analyzing user data to achieve value co-creation (Matarazzo et al., 2021). Studies have shown that digital capabilities can improve the transparency and responsiveness of supply chains,

allowing all parties in the supply chain to work together more effectively to respond to market changes.

At the same time, digital capabilities also enhance user engagement, and users can participate in product design, provide feedback on their experience, and even take part in the co-creation process of products through digital platforms. Such participation not only improves user satisfaction and loyalty but also provides enterprises with a large amount of user feedback and market information, which helps enterprises to continuously improve and innovate (Simon & Honore Petnji Yaya, 2012).

In the context of new quality productivity, digital capability has become a bridge connecting supply chain collaboration and user participation (Sharma & Joshi, 2023). By improving digital capability, enterprises can better integrate internal and external resources, improve the efficiency and effectiveness of the supply chain, enhance the sense of participation and satisfaction of users, and ultimately realize the co-creation of value (Garay-Rondero et al., 2020).

However, how digital capabilities specifically affect supply chain synergy and user participation, and how they work together on the value co-creation of enterprises, is still a question worthy of in-depth discussion. Through empirical analysis, this study will explore the mechanism of digital capability in supply chain collaboration and user participation, and how they jointly promote the creation and enhancement of enterprise value.

1.5. Theory and practice of supply chain collaboration and user participation

Supply chain collaboration refers to the cooperation and coordination among all participants in the supply chain in order to achieve a common goal (Wankmüller & Reiner, 2020). In theory, supply chain collaboration can optimize the allocation of resources, improve the efficiency of the entire supply chain, and enhance the ability to respond to market changes.

In practice, with the development of information technology, supply chain collaboration has expanded from a single internal cooperation to the cooperation of the whole supply chain network, involving suppliers, manufacturers, distributors, end users, and other links (Kotzab et al., 2019). Through the information technology platform, all parties in the supply chain can realize information sharing, coordinate planning and execution of supply chain activities, thus reducing costs, improving service levels, and increasing response speed.

User participation refers to the direct or indirect involvement of users in product development, brand building, service improvement, etc (Simatupang et al., 2002). In theory, user participation can improve the market adaptability of products, enhance user satisfaction and loyalty, and thus create greater value for enterprises.

In practice, enterprises collect users' opinions and suggestions through social media, user feedback systems, crowdsourcing platforms, and other channels, and invite users to participate in product design and service innovation so that products and services can better meet users' needs. User participation not only enhances the value of the product but also

strengthens the user's sense of identity with the brand (Holland & Menzel Baker, 2001).

In the context of new quality productivity, the relationship between supply chain collaboration and user participation has become increasingly close. The improvement of digital capability makes supply chain collaboration more efficient and also provides more possibilities for user participation (Fawcett et al., 2011). The combination of supply chain collaboration and user participation is considered to be an important way to achieve value co-creation.

Enterprises optimize product production and delivery processes through supply chain collaboration and improve product personalization and innovation through user participation, ultimately realizing value co-creation (Zheng et al., 2019). Supply chain collaboration and user participation play an important role in value creation both in theory and practice.

This study will further explore how supply chain collaboration and user participation interact with each other under the new quality productivity drive and how they jointly affect the value co-creation process of enterprises. Through a review of the existing literature, this study will build a theoretical framework to guide empirical analysis and provide theoretical support for firm practice.

2. Research Methods

The purpose of this study is to evaluate key variables such as digital capability, supply chain collaboration, network relationship embedding, and firm innovation performance, and to ensure the validity and reliability of the measurement tool. To this end, the research team mainly draws on the mature scale at home and abroad, combined with the actual situation of supply chain management of manufacturing enterprises, and makes appropriate adjustments to the scale in order to reduce data analysis errors and improve the accuracy and reliability of the study.

In terms of variable measurement, this study takes the annual sales of enterprises and the education level of employees as control variables. The education level of employees is divided into three levels: junior college and below, undergraduate, and postgraduate and above, and assigned by dummy variables 1-3. The annual sales of enterprises are assigned by 1 to 4 intervals according to <1 million, 1 million to 4 million, >4 million to 8 million, and >8 million. Such classification helps to more accurately control the influence of firm size and human resource quality on the research results (see Table 1).

In terms of data collection, this study takes manufacturing enterprises in Zhejiang, Guangdong, Jiangsu, and other economically developed areas as objects and collects data through a large-sample questionnaire survey. The questionnaire design includes the basic information of the respondents and the enterprises, as well as the subjective evaluation of the enterprises in terms of innovation performance, supply chain collaboration, digital capability, and user participation. The Likert 5-level scoring scale was adopted, and the questionnaire was optimized by academic experts before distribution to ensure that the design of questions was scientific and reasonable, and the research variables could be accurately captured.

The survey was conducted from June 2023 to February 2024. A total of 580 questionnaires were distributed and 420 were recovered. In the recovered questionnaires, a total of 60 questionnaires with missing filling, consistent choices, and obvious errors were excluded, and 360 valid questionnaires were finally obtained. Sample characteristics show that the respondents are mainly concentrated in private enterprises with 100 to 500 employees (45.7%) and grass-roots managers (42.1%), most of which come from the automobile and home appliance manufacturing industries. These samples show good representativeness, and their characteristics can also meet the research needs.

In order to ensure the representativeness of the samples and the reliability of the data, the research team took a number of measures in the process of questionnaire design and distribution. First of all, in the questionnaire design stage, experts and scholars in the field of supply chain management were invited for consultation to ensure the scientific and targeted content of the questionnaire. Secondly, in the questionnaire distribution stage, we ensured that the questionnaire could cover manufacturing enterprises of different sizes and regions through various means such as email, online survey platforms, and field visits. Finally, in the data sorting stage, the recovered questionnaires were strictly screened and cleaned, and those that did not meet the requirements were eliminated to ensure the quality of the data and the effectiveness of the research.

Therefore, the process of data source and sample selection in this study is rigorous and scientific, which provides a solid foundation for the subsequent empirical analysis. Through the in-depth analysis of these data, this study will be able to reveal the relationship between digital capability, supply chain collaboration, network relationship embeddedness, and enterprise innovation performance, and provide theoretical support and practical guidance for the supply chain management and value co-creation of manufacturing enterprises in the context of new quality productivity.

Table 1. Descriptive statistical analysis of the sample

Variabless	Categories	Sample Size	Percentag (%)
Gender	male	187	51.8
	female	185	48.2
Education level	Junior college and below	137	35.3
	Undergrad	160	44.2
	Graduate students and above	91	23. 5
Years of service	≤5 years	101	26. 3
	6 to 10 years	186	47. 9
	> 10 to 15 years	79	20. 4
Employee position	Top management	33	8.5

	Middle managers	84	21.9
	Entry-level managers	171	44.1
	Rank and file	99	25. 5
Business attributes	State-owned enterprises	102	26.3
	Private enterprise	193	49. 7
	Wholly foreign-owned	92	23. 7
Age	≤30 years old	100	25. 8
	Age 31 to 40	95	25. 5
	41 to 50 years old	94	24. 2
	>50 years old	99	> 25. 5
Business Category	Food manufacturing	94	24. 2
	Home appliance manufacturing	122	30.4
	Automotive manufacturing	106	27. 3
	Machine building	66	16. 1
Enterprise scale	0 to 100 employees	81	21. 1
	101 ~ 500 people	159	41. 0
	501 to 1,000 people	105	26. 8
	More than 1,001 people	42	11. 1
Annual sales	<1 million	138	< 34. 8
	1 to 5 million	111	31.2
	> 5 to 10 million	100	25. 8
	> 10 million	28	6. 2

3. Empirical Analysis

3.1. Reliability and Validity Test

In order to ensure the reliability and validity of the research results, SPSS 26.0 and AMOS 24.0 software were used in this study to strictly test the reliability and validity of the study variables. The research variables include six core variables: digital infrastructure capability, digital integration capability, digital management capability, supply chain collaboration, user participation, and enterprise innovation performance.

The reliability test of each variable was conducted in this study (see Table 2). Reliability testing was mainly carried out using Cronbach's α coefficient and the combined reliability

(CR) value. Cronbach's α coefficient measures the internal consistency of the items, with values ranging from 0 to 1, where a value closer to 1 indicates higher reliability of the scale. The combined reliability (CR) value is another measure of reliability that considers the variance contribution of all items on the scale, and a CR value greater than 0.6 is considered acceptable. In this study, the Cronbach's α coefficient and CR values for all variables were significantly greater than 0.65, indicating that the sample data had high reliability.

Next, a validity test was conducted, which mainly included convergent validity and discriminant validity. The convergent validity test was completed using factor analysis, which examines whether the factor load of each variable is greater than 0.65, indicating that the variable has good convergent validity. The factor analysis results in this study showed that the factor load of all variables was greater than 0.65, meeting the requirements for convergent validity.

To further test the structural validity of the model, a confirmatory factor analysis (CFA) was performed using AMOS 24.0. CFA is a multivariate statistical technique used to examine the relationship between observed and latent variables in a measurement model. Model fitting measures included χ^2/df, RMSEA, CFI, IFI, TLI, and GFI. In this study, the χ^2/df value was 1.814, which was less than 3, indicating a good model fit. The RMSEA value was 0.035, which was below 0.08, indicating a small error, while the GFI value was 0.962, close to 1, demonstrating a high goodness of fit for the model.

In addition, the average variance extracted (AVE) values for all variables were greater than 0.51 and significant at the 0.001 level, further confirming the strong structural validity of this study.

Table 2. Results of reliability and validity analysis

Scale item	Factor load	Cronbach's alpha	CR	AVE
Digital Infrastructure Capability (DInfC)		0.872	0.879	0.583
Digital infrastructure to meet business needs	0. 765			
Digital applications to meet business needs	0.655			
Digital infrastructure can respond quickly to the requirements of business processes	0.669			
Your digital talent has the digital knowledge and skills to support change	0. 758			
Digital Integration Capability (DIntC)		0.888	0.858	0.580
Your company is able to leverage digital technology to optimize business processes or resource allocation	0.774			
Your company can use a database platform to	0. 783			

integrate data from various departments				
Your company has ready access to data from all departments	0. 703			
Your company is free to share and use data from other departments	0.781			
Digital Management Capability (DMC)		0.854	0.848	0.582
Internal believes that digital technology and digital management are conducive to business management	0. 790			
Your company can expend energy on promoting and communicating digital skills and management knowledge	0. 759			
Your company is able to maintain digital systems suitable for changing processes when needed	0.778			
Ability to manage employee performance reviews, etc., using digi tal means	0. 775			
Supply Chain Synergy (SCC)		0. 970	0.866	0.653
Your company can share relevant information with partners in the supply chain	0. 864			
Your company can communicate with partners in the supply chain to resolve business anomalies	0. 800			
Share costs and benefits with partners in the supply chain	0. 754			
Able to make demand forecasts with supply chain partners	0. 765			
User engagement		0.870	0.854	0.594
Maintain trusting relationships with other businesses and institutions	0. 758			
With other enterprises, institutions have long-term cooperation and exchange relations	0. 778			
Close contact with other enterprises and institutions, frequent exchange of information	0. 775			
Business Innovation Performance (FIP)		0.923	0.873	0.641
Your company is often the first to introduce new products/services in the industry compared to its	0. 711			

peers	
Your company has a very high success rate of new product development compared with other companies in the industry	0.812
Compared with the peers, your company's products contain the first-class advanced technology and workmanship	0.828
Compared with your peers, your company is often the first in the industry to apply technology	0. 814

3.2. Correlation Test of Variables

After ensuring the reliability and validity of the study variables, this study further tested the correlation among six variables, including digital infrastructure capability, digital integration capability, digital management capability, supply chain collaboration, user participation, and enterprise innovation performance.

Correlation testing is an important step to explore whether there is a statistical correlation between variables, and it has significant guiding implications for subsequent hypothesis testing and model construction. In this study, SPSS 26.0 software was used to analyze the mean value, standard deviation, and correlation of the above variables. The results show that the correlation coefficients among the variables all reach the significance level of 0.01, indicating a significant correlation between the variables.

Specifically, digital infrastructure capability is positively correlated with supply chain collaboration and enterprise innovation performance, with correlation coefficients of 0.415 and 0.465, respectively (Table 3). This indicates that with the enhancement of digital infrastructure capabilities, both supply chain collaboration and enterprise innovation performance improve, which may be related to the technical support provided by digital infrastructure for supply chain collaboration and the improvement of enterprise innovation efficiency.

The correlation coefficients between digital integration capability and supply chain collaboration and firm innovation performance are 0.492 and 0.497, respectively, showing a stronger positive correlation. This may be because digital integration capability promotes cross-department and cross-enterprise information flow and resource integration, thereby improving supply chain collaboration efficiency and enterprise innovation performance.

The correlation coefficients between digital management capability, supply chain collaboration, and enterprise innovation performance are 0.451 and 0.468, respectively, also indicating a significant positive correlation. This suggests that enhancing digital management capability can help strengthen supply chain collaboration and promote enterprise innovation performance, which may be related to the role of digital management in strategic planning,

talent training, and organizational structure optimization.

The correlation coefficient between supply chain synergy and enterprise innovation performance is 0.446, further confirming the positive impact of supply chain synergy on enterprise innovation performance. Additionally, the correlation coefficient between user participation and firm innovation performance is 0.479, indicating that increased user participation has a significant positive impact on firm innovation performance. This finding aligns with the view that user participation enhances product market adaptability and innovation within the framework of value co-creation theory.

Table 3 Results of correlation test of variables

Variable	Mean	SD	1	2	3	4	5	6	7
Education Level	2.516	1.12	1.000						
Annual Sales	2.444	0.961	0.001	1.000					
DInfC	3.68	0.98	-0.017	-0.042	1.000				
DIntC	3.477	0.983	0.060	-0.178**	0.483	1.000			
DMC	3.579	0.96	0.083	-0.052	0.475	0.458	1.000		
SCC	3.442	0.987	0.017	-0.062	0.425**	0.542**	0.452**	1.000	
NRE	3.396	1.017	0.054	-0.034	0.455**	0.458**	0.485**	0.496**	1.000

Note: *, * * and * * * are significant at the levels of 0.05, 0.01 and 0.001, respectively

4. Discussion

4.1. The Mediating Role of Digital Capability in Supply Chain Collaboration and User Participation

The empirical analysis results of this study reveal the mediating role of digital capability in supply chain collaboration and user participation, providing a new perspective for understanding how new quality productivity affects enterprise value co-creation through digital capability.

It is found that digital capability not only directly affects firm innovation performance but also partially mediates the relationship between supply chain collaboration, user participation, and firm innovation performance. Specifically, digital infrastructure capability, digital integration capability, and digital management capability all have a significant positive impact on supply chain collaboration, and supply chain collaboration significantly improves enterprise innovation performance. This finding indicates that digital capability promotes the

improvement of firms' innovation performance by enhancing supply chain collaboration efficiency.

Digital capability enables faster and more accurate information flow in the supply chain, strengthens cooperation among all parties in the supply chain, improves response speed to market changes, and thus provides solid support for the innovation activities of enterprises.

At the same time, digital capability also has a significant positive impact on user participation, and the improvement of user engagement further enhances the innovation performance of enterprises. By providing platforms and tools, digital capability enables users to more easily participate in product design, feedback, and improvement processes. Such participation not only improves the market adaptability of products but also brings valuable user insights to enterprises and promotes the innovation of products and services.

Digital capability plays an important intermediary role in supply chain collaboration and user participation. This finding has important theoretical and practical significance for enterprises in the context of new quality productivity, particularly in how to use digital capability to optimize supply chain management, enhance user engagement, and improve enterprise innovation performance.

Enterprises should attach importance to the cultivation and application of digital capabilities and strengthen supply chain collaboration and user participation through digital means, so as to achieve value co-creation and sustainable development of enterprises.

4.2. In-depth Analysis of the Interactive Impact of Supply Chain Collaboration and User Participation

The research finds that supply chain collaboration and user participation do not affect enterprise innovation in isolation but produce a synergistic effect through interaction, further enhancing the value co-creation ability of enterprises.

Supply chain synergy provides a platform and environment for user participation by integrating internal and external resources, improving response speed, and optimizing processes. On the basis of supply chain collaboration, user participation can more accurately reflect market demand and promote the rapid iteration of products and services. User participation not only enhances the personalization and innovation of products but also provides direction and impetus for supply chain collaboration through the feedback mechanism.

This two-way interaction makes supply chain collaboration and user participation have complementary and magnifying effects in improving enterprise innovation performance. The empirical analysis results show that the interaction terms of supply chain collaboration and user participation have a significant positive impact on enterprise innovation performance. This result means that when the level of supply chain collaboration and user participation is high, the improvement effect on enterprise innovation performance is more significant.

This interaction effect emphasizes that in the context of new quality productivity,

enterprises should not only focus on synergy within the supply chain but also emphasize interaction and participation with users to achieve more efficient value co-creation.

The interactive impact analysis of supply chain synergy and user participation reveals the synergies between the two in the enterprise innovation process and provides new insights for manufacturing enterprises on how to balance and optimize supply chain synergy and user participation in digital transformation.

Enterprises should strengthen supply chain collaboration through digital means while also creating conditions and mechanisms to encourage and guide users to participate in product development and service innovation. This approach will facilitate the deep integration of supply chain collaboration and user participation, ultimately promoting the continuous improvement of enterprise innovation performance.

4.3. Management Practice and Policy Recommendations

Enterprises should increase efforts to build digital capabilities and improve the transparency and efficiency of the supply chain by investing in advanced information technology and management systems to better respond to market changes.

Second, companies need to enhance supply chain synergy and share information and resources with partners to enhance the overall efficiency and flexibility of the supply chain. At the same time, companies should actively engage users, using channels such as social media and online communities to collect feedback from users and incorporate user needs and suggestions into product innovation and service improvement.

At the government level, policies should be introduced to support enterprises' digital transformation, provide tax incentives and financial subsidies, and encourage technological innovation and optimization of supply chain management. In addition, the government and enterprises should attach importance to talent training and enhance employees' digital skills through educational cooperation programs to provide talent security for enterprises' long-term development.

Enterprises should also break down departmental barriers and implement cross-departmental collaborative management to improve decision-making efficiency and execution. Finally, companies need to establish a data-driven supply chain risk management system to detect and respond to potential risks in a timely manner through real-time monitoring and predictive analysis.

The recommendations aim to help companies achieve value co-creation and sustainable development in the context of new quality productivity while providing guidance for policymakers to jointly create a business environment that supports innovation, encourages synergy, and promotes participation.

5. Conclusions and Prospects

Through empirical analysis, this study deeply discusses the influence of digital capability, supply chain collaboration, and user participation on enterprise innovation

performance, as well as their interaction mechanisms under the background of new quality productivity.

The results show that digital capability is the key factor in promoting the improvement of enterprise innovation performance, significantly enhancing innovation performance by strengthening supply chain collaboration and user participation. Specifically, digital infrastructure capability, digital integration capability, and digital management capability all have a positive impact on supply chain collaboration and user participation, which, in turn, further enhance enterprise innovation performance.

In addition, the study also found that there is a significant interaction effect between supply chain synergy and user participation, which positively impacts enterprise innovation performance. This finding reveals the complementary and reinforcing role of supply chain synergy and user participation in value co-creation.

These conclusions provide theoretical support and practical guidance for manufacturing enterprises to enhance innovation performance by improving digital capability, optimizing supply chain collaboration, and stimulating user participation in the era of new quality productivity.

This study not only enriches the applied research of the new quality productivity theory but also provides a new research perspective for supply chain management and user participation. It holds important theoretical and practical significance for enterprises striving to achieve value co-creation in the process of digital transformation.

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