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Research on Collaborative Innovation to Boost the Development of New Quality Productivity under the Background of Big Data

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Abstract:
Under the background of global economic integration and rapid development of technology, innovation has become an indispensable engine of economic growth and social progress. Collaborative innovation integrates the innovation resources, capabilities and information of multiple innovation subjects, and realizes the synergistic effect of innovation efficiency 1+1>2. The development of new quality productivity depends on new knowledge, new technology, artificial intelligence, big data and innovation ability, which is the product of collaborative innovation. In this study, collaborative innovation helps new quality productivity as the research object. By using the methods of literature review and big data analysis, the concepts of collaborative innovation and new quality productivity are defined, and the theoretical framework diagram and implementation path map of collaborative innovation strategy are constructed. This paper discusses the influence of collaborative innovation on the development of new quality productive forces. This paper puts forward a series of management implications to improve the productivity of new quality; empirical analysis shows that collaborative innovation not only increases the investment of R&D, shortens the time to market of new products, but also speeds up the speed of patent application, which significantly promotes the development of new productivity. It helps the development of new quality productive forces and provides empirical support for the sustainable development of economy and society.

Keywords: collaborative innovation; technological innovation; artificial intelligence; big data; new quality productivity.

INTRODUCTION

Collaborative innovation has become an important means for enterprises to achieve sustainable competitive advantage [1]. The high complexity and high risk of scientific and technological innovation constantly challenges the innovation ability of individual enterprises, which makes innovation activities more and more dependent on collaborative innovation among innovation subjects [2]. Enterprise innovation no longer depends only on internal innovation resources and capabilities, but through sharing innovation results with external partners to achieve complementary resources, complementary advantages, risk-sharing, and jointly achieve win-win innovation. The traditional linear innovation model is no longer suitable for the era of knowledge economy, but is replaced by an interdependent and mutually reinforcing collaborative innovation mode [3].

In the context of today's global economic integration, innovation has become the core force driving economic growth and social progress. Especially in the era of knowledge economy, the promotion of productivity no longer depends only on the traditional material capital and labor input, but more on the comprehensive application of knowledge, technology and innovation ability. In order to cope with the increasingly fierce global competition, countries have increased investment in innovation, and through a variety of innovation policies and innovation incentive mechanisms to promote the development of new quality productive forces. As a cross-organizational and cross-domain innovation model, collaborative innovation is becoming an important way to improve the productivity of new quality.

With the development of big data and information technology and the transformation of industrial structure, the intelligent, efficient and green ecology of the new industrial production process is taking shape [4]. In this ecosystem, multi-party innovation entities such as enterprises, research and development institutions, universities and governments work together to promote industrial technology upgrading and industrial restructuring, forming a more open, flexible and efficient innovation environment. In the face of complex and changing external environment, big data technology and its derivative big data, as an important driving force of the information age, are profoundly affecting the development of collaborative innovation and new quality productivity. New quality productivity is a new quality state of productivity with data elements as an important engine, and is an important focus to promote high-quality development [5].

Through win-win cooperation, resource integration and complementary advantages, collaborative innovation promotes enterprises to realize the R&D and application of new technologies, new products, new processes, big data and artificial intelligence, improve production efficiency, create higher value-added products and modern production and service levels,

promote the formation of new industrial ecology, and achieve sustainable development. Therefore, collaborative innovation is an important way for enterprises to improve new quality productivity.

OVERVIEW OF COLLABORATIVE INNOVATION

Collaborative Innovation

The word "synergy" comes from ancient Greece and means to work or cooperate together. In the Great Chinese Dictionary, "cooperation" is interpreted as "cooperation and coordination, cooperation and concerted action", and the word "cooperation" contains the meaning of "assistance, coordination and cooperation".

Joseph Schumpeter put forward the concept of innovation in his *"theory of economic development"*. He believes that innovation refers to the introduction of a combination of new production conditions and production factors into the production system, and its essence is to establish a new supply function to obtain potential production profits[6]. This theory emphasizes the importance of innovation to economic development, and inspires the later exploration and research of collaborative innovation. Ansoff defines the concept of synergy for the first time in *"diversification strategy"*, pointing out that synergy is a mutually promoting relationship between enterprises based on resource sharing, so as to ensure that the whole collaborative group can achieve maximum value and produce collaborative innovation effect of 1+1>2[7]. The theory of collaborative innovation holds that systematic optimization and cooperative innovation of innovation elements can better optimize the allocation of resources and improve the efficiency of innovation. It is characterized by the emphasis on cross-border cooperation, resource sharing and open innovation. The theory focuses on multi-party participation and joint creation of value, which is one of the important ways to promote the development of innovation. Since then, collaborative innovation has been discussed and empirically analyzed by many domestic and foreign scholars on its connotation, motivation, operating mechanism, influencing factors and so on [8]. Carry out collaborative innovation among enterprises and between enterprises and professional institutions, concentrate resources on research and development of core processes and key links, and improve the efficiency of research and development. The government, industry, university, research and application cooperate and interact deeply to promote the resource integration of multiple innovation subjects, as well as the innovation ecosystem of knowledge collaborative sharing [9]. Regional exchanges and coordination have been strengthened to promote the flow of regional innovation elements and resources [10].

Analysis of Collaborative Innovation Model

In the process of careful investigation of the existing collaborative innovation models, based on the empirical analysis of typical cases, this paper constructs a collaborative innovation dynamic model for the adaptability of different industrial fields. The construction of the model follows the systematic methodology, uses the analytic hierarchy process to determine the weight of the influencing factors, and uses system dynamics to simulate the synergistic effect under the change of different parameters. Through the comparative analysis of the real data and the simulation prediction results, the model parameters are modified to ensure that the model can accurately reflect the internal mechanism of industrial collaborative innovation.

In the data collection stage, the research team selected the collaborative innovation cases of more than 300 enterprises in the field of innovation and R & D from 2019 to 2023 from multiple online databases, ensuring the universality and representativeness of the sample data. With the help of the computational advantage of deep learning, the nonlinear characteristics of collaborative innovation are modeled. Different numbers of hidden layers and neurons are set in the model to determine the best network structure, and the goodness of fit is more than 0.95. The data ratio of training set and verification set is 8:2, which ensures the reliability of the model. In the selection of loss function, combined with the target characteristics of collaborative innovation, a compound loss function is designed, which can evaluate collaborative benefit and risk at the same time. Adam optimizer with decreasing empirical decay rate is applied in the optimization process, and the initial learning rate is set to 2e-4, $\beta_{1\,i}$s 0.88, β_2 is 0.986, in order to obtain more robust convergence performance.

In order to evaluate the prediction ability of the model, K-fold cross-validation (K-Fold Cross-Validation) is carried out, and the K value is set to 10 to ensure the stability and credibility of the evaluation results. The results show that the optimized model has strong prediction accuracy and good interpretation ability. In addition, in order to enhance the explanation of the model, partial least square regression analysis is used to reveal the internal relationship between collaborative innovation efficiency and internal dynamic capability.

Theoretical Framework of Collaborative Innovation

This study introduces the theory of multi-agent system, and points out that the main body of innovation includes but is not limited to enterprises, scientific research institutes, universities and governments. In the theoretical framework of collaborative

innovation in figure 1, the parallel process between agents is emphasized, that is, internal demand analysis and external environment exploration, which interact and evolve dynamically, which lays a foundation for the following resource integration and information technology allocation.

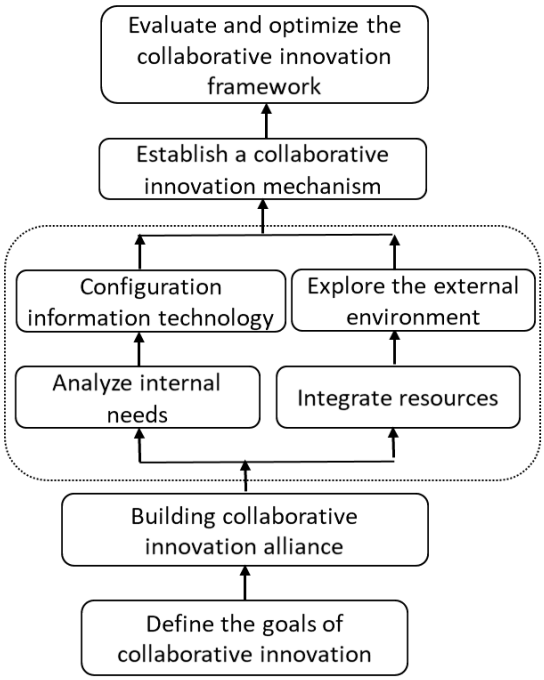

Figure 1. Theoretical framework of collaborative innovation

With the help of data matrix and network model, this paper further achieves a balance between qualitative and quantitative research to ensure that the theoretical framework of collaborative innovation is highly scientific and applicable. In Table 1, by comparing the significant changes in key indicators such as funds, personnel and new product development cycle before and after the adoption of collaborative innovation strategy, the data on the growth of R&D funding, the reduction of new product marketing time and the acceleration of patent application are particularly prominent, which further verifies the practical value of the collaborative innovation theoretical framework.

Table 1. Resource usage table before and after enterprise collaborative innovation

Dimensionality	Before collaborative innovation	After collaborative innovation	Range of change (%)
R&D investment (ten thousand yuan)	750000	1050000	40
R&D personnel allocation (personnel)	120	180	50
New product development cycle (month)	18	12	-33.33
New product launch time (month)	6	4	-33.33
The growth rate of patent applications (%)	15	35	133.33
Number of technology platforms (PCS)	2	5	150
Cost saving rate (%)	10	25	150
Growth rate of sales (%)	20	50	150
Profit growth rate (%)	15	45	200
Customer satisfaction increases (%)	5	15	200

Structural equation model and covariance structure analysis are used to accurately capture the complex interaction among many variables in collaborative innovation. When improving the configuration of information technology, how to affect the shortening of new product development cycle, a clear path relation coefficient is given in quantitative analysis.

The innovation of the research is that, with reference to the academic frontier literature, the "change range model" is put forward on the basis of the existing models, that is, the dynamic adjustment of R&D resources is analyzed to predict the performance of collaborative innovation. This model rarely appears in the previous research, has the originality and scientific nature of breaking through the traditional theoretical framework, and provides specific and quantitative strategic suggestions for practice.

OVERVIEW OF NEW QUALITY PRODUCTIVITY

The Connotation of New Quality Productive Forces

Scientific and technological innovation can give birth to new industries, new models and new momentum, which is the core element of the development of new productive forces [11]. In today's era of knowledge economy, the connotation of new quality productive forces has been continuously deepened and expanded. New quality productivity is a kind of advanced productivity quality which accords with the new development concept and has the characteristics of high technology, high efficiency and high quality. The connotation of new quality productivity is mainly reflected in the following aspects.

Technological innovation

Technological innovation is an important part of new productivity. It can improve production efficiency and product quality, thus promoting economic growth and enterprise development.

Management innovation

With the development of social economy and the expansion of enterprise scale, the traditional management model can no longer meet the needs of enterprise development. Therefore, we must constantly carry out management innovation to improve the organizational efficiency and operation effect of enterprises.

Organizational innovation

With the intensification of market competition and the continuous change of consumer demand, enterprises must constantly adjust their organizational structure and cultural atmosphere to improve organizational vitality and innovation ability.

Marketing innovation

With the increasingly fierce market competition, enterprises must constantly carry out marketing innovation to improve the market competitiveness of products and meet the needs of consumers.

Talent innovation

Talents are the core resources for the development of enterprises. Enterprises must constantly train and attract outstanding talents and improve their innovation ability and competitiveness through talent innovation.

The connotation of new quality productivity covers many aspects, such as technology, management, organization, marketing and talents, which interact and promote each other and jointly promote the development of enterprises and social economy. The new quality productivity promotes the optimization of economic structure and the improvement of efficiency through technological innovation and mode change, which is an important driving force of contemporary economic development and social progress.

Factors For the Development of New Productive Forces

Collaborative innovation is considered to be one of the important factors to promote the development of new quality productive forces. It promotes the continuous emergence of technological innovation, product innovation and business model innovation, so as to inject new impetus into economic development, accelerate the dissemination and application of knowledge and technology, and promote the integration and sharing of multi-party resources. It is precisely due to the promotion of collaborative innovation, the productivity of human society has been continuously improved, and the mode of production and economic structure are also constantly changing.

Big data, Internet technology, information technology and the improvement of artificial intelligence technology are all indispensable elements for the development of new productivity. The interaction and mutual promotion of these factors promote sustained economic growth and social progress. Therefore, we should pay attention to these factors of development, strengthen policy guidance and industrial support, and promote the continuous improvement of new quality productive forces.

Factors Affecting the Productivity of New Quality

The promotion of new quality productivity is the only way for the development of modern enterprises, and its fundamental driving force lies in the interaction and comprehensive influence of many factors. Based on the seven categories of organizational cooperation ability, knowledge sharing mechanism, technological research and development level, market competitiveness,

policy and regulatory environment, innovation ability and innovation support system, the study constructs the table of influencing factors of new quality productivity in Table 2, and makes statistics and analysis on the relevant data.

Table 2. Analysis of influencing factors of new quality productivity

Influencing factor	Specific index	Index interpretation	Data source	Year	Mean value	Standard deviation	Maximum value	Minimum value
Organization and cooperation ability	Number of cooperative enterprises	The number of enterprises participating in collaborative innovation	Industry database	2023	186.7	32.4	250	120
	Number of cooperative projects	Number of collaborative innovation projects completed	Industry database	2023	57.3	12.5	80	40
Knowledge sharing mechanism	Knowledge sharing frequency	Frequency of knowledge sharing in collaborative innovation process	Questionnaire survey	2023	4.2	0.8	5	3
	Implicit knowledge conversion rate	Percentage of conversion from tacit knowledge to explicit knowledge	Questionnaire survey	2023	63.25%	10.6%	80%	50%
Technology research and development level	R&D investment	Collaborative innovation R&D investment amount (ten thousand yuan)	Financial statement	2023	3050	450	4000	2000
	Number of invention patent applications	The number of applications for invention patents in collaborative innovation	Patent Office	2023	130	25	180	90
Market competitiveness	Speed of new products to market	Average number of days from completion of development to market	Market research	2023	210	20	240	180
	Market share	Market share of collaborative innovation products	Sales data	2023	25.8%	3.5%	30%	20%
Policy and regulatory environment	Quantity of policy support	Number of government support policies for collaborative innovation	Official announcement	2023	12	2	15	10
	Legal dispute rate	The rate of legal disputes in collaborative innovation	Judicial statistics	2023	7.3%	2.1%	12%	5%
Innovation ability	Product development cycle	The average number of days from the start of R&D to the completion of R&D	Internal record	2023	370	50	420	320
	Number of awards for technological innovation	The number of technological innovation awards obtained in collaborative innovation	Industry selection	2023	5.8	1.7	8	4
Innovation support system	Return on investment	Average return on investment of collaborative innovation investment	Financial statement	2023	18.6%	4.3%	25%	15%
	Number of personnel training projects	Number of personnel training projects related to collaborative innovation	Educational institution	2023	9.4	3	15	5
Social and cultural atmosphere	Openness and cooperation Index	Open and cooperative attitude rating (1-10)	Questionnaire survey	2023	8.2	1.1	10	6
	Innovation activity	Index of the frequency of social participation in innovation activities	Social investigation	2023	7.6	0.9	9	6

The ability of organizational cooperation

The data show that the number of enterprises participating in collaborative innovation and the number of collaborative innovation projects completed have an important promoting effect on the improvement of productivity. this is fully reflected in the two indicators of the number of cooperative enterprises and the number of cooperative projects in the new quality productivity factor analysis table.

knowledge sharing mechanism

The data analysis results of knowledge sharing frequency and tacit knowledge conversion rate reveal that close and frequent knowledge exchange and efficient knowledge transformation are very important for the shaping of new quality productivity. The mechanism of knowledge sharing not only accelerates the flow of innovative information, but also greatly improves the team's ability to solve complex problems. Promote knowledge transfer and sharing among technology innovators so as to improve the knowledge spillover performance of collaborative innovation alliances [12].

The level of technological research and development

Through the quantitative analysis of the R&D investment and the number of invention patent applications, it can be found that the R&D investment directly affects the results of technological innovation, which is also one of the key factors for enterprises to achieve sustainable competitive advantage.

THE RELATIONSHIP BETWEEN COLLABORATIVE INNOVATION AND NEW QUALITY PRODUCTIVITY

Scientific and technological innovation is the core element of activating new quality productive forces, industrial innovation is the key carrier of forming new quality productive forces, and scientific and technological innovation and industrial innovation are the two wings and driving wheels of developing new quality productive forces.

The Role of Collaborative Innovation in Promoting New Quality Productivity

Collaborative innovation is an important driving factor for the promotion of new quality productivity. It can bring about the sharing of knowledge resources, the cross-integration of technology, and the improvement of innovation ability. Through cooperation and sharing, the innovative ideas of various innovative subjects have been expanded and enriched, thus promoting the promotion of new quality productivity.

Knowledge sharing

The cooperation between different enterprises and organizations can enable them to share their own R & D achievements and innovative experiences, avoid repeated R & D and save resources. This kind of sharing can not only improve the efficiency of innovation, but also promote the generation and dissemination of new knowledge, and provide more ideas and support for the promotion of new quality productivity.

Technology integration

The cooperation between innovation subjects in different fields can exchange and integrate the technologies of all parties, thus resulting in new technologies that are more innovative and competitive. The cross-integration of this technology can provide more diversified and advanced technical support for the new quality productivity and promote the upgrading and transformation of the industry.

The improvement of innovation ability

In the process of collaborative innovation, each side can learn each other's innovation methods and ideas and improve their own innovation consciousness and level. The improvement of this innovative ability can provide stronger support for the promotion of new quality productivity and promote the all-round development of the industry.

Collaborative innovation promotes the reallocation and integration of production factors and promotes the formation and promotion of new quality productivity. Promote the flow and exchange of innovative elements, accelerate the dissemination and application of knowledge and technology, and create conditions for the development of new productive forces. Promote the sharing and cooperation of internal and external resources, enhance the innovation ability and market competitiveness of enterprises, so as to promote the continuous improvement of new quality productivity.

Cooperative Innovation Mechanism in New quality Productivity

When exploring the collaborative innovation mechanism in the new quality productivity, the methodology of comprehensive analysis is used to conceptualize the cultivation and promotion of the new quality productivity into a dynamic intertwined system. Among them, the role of collaborative innovation is placed in the core position. The new quality productivity formula P{productivity}=f(C{Collaborative}, R{resources}, T{technology}, I{innovation}).

$$P_{productivity} = f(C_{Collaborative}, R_{resources}, T_{technology}, I_{innovation},) \quad (1)$$

The formula is used to quantitatively describe the relationship between new quality productivity and collaborative innovation, resource allocation, technological development and innovation capability. Through this formula, the contribution of collaborative innovation to productivity growth can be analyzed and quantified.

Structural equation model (SEM) was used for empirical analysis to ensure the depth of data analysis and the accuracy of conclusions. The panel data covering industry, service industry and high-tech industry are selected, and the AMOS software is used to estimate the parameters and test the hypothesis of the model.

In the construction of the theoretical framework, we absorb and integrate multiple theoretical perspectives such as dynamic capability theory, system innovation theory and network theory, and construct a hierarchical collaborative innovation and new quality productivity model. This model not only includes internal resource allocation and technological capability improvement, but also focuses on cross-enterprise, cross-industry and even country-to-country interaction and cooperation.

Empirical Analysis

In the empirical analysis between collaborative innovation and new quality productivity, a mixed methodology is adopted to combine quantitative analysis with qualitative case studies to ensure the reliability and depth of the research results. The composition model of industry-university-research collaborative innovation performance system is constructed in figure 2, which is used as the theoretical framework to evaluate the effect of collaborative innovation. The model absorbs the theory of innovation system and the concept of industry-university-research cooperation, and selects four indicators: research and development input, knowledge output, technology transfer and market performance for quantitative analysis. The empirical steps are as follows: firstly, 362 questionnaires involving enterprises, universities and scientific research institutions related to industry-university-research collaborative innovation are collected through questionnaires and in-depth interviews, and the structural equation model is used to analyze the questionnaire data. evaluate the contribution of each index to the overall performance of collaborative innovation.

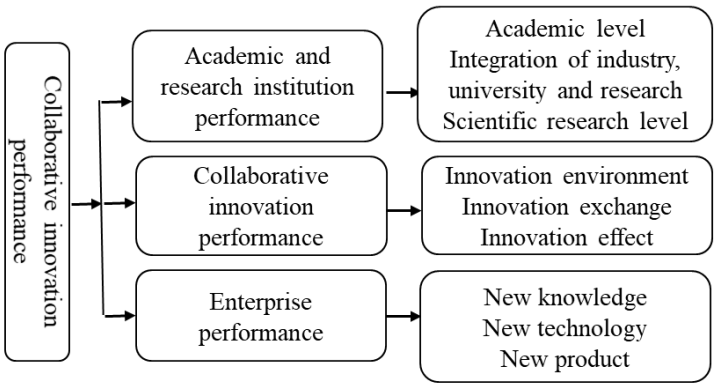

Figure 2. Composition of industry-university-research collaborative innovation performance system

The sample randomly selects the items with outstanding performance in collaborative innovation as the sample to ensure the representativeness and strategy diversity of the sample. In order to increase the depth and accuracy of data analysis, the original data are normalized and the distribution of key data is descriptively analyzed.

Quantitative analysis

Some samples are intercepted for in-depth case studies in order to better understand the collaborative innovation mechanism behind the statistical data. Each sample is coded to sort out the key events, participant behavior and policy background in the process of collaborative innovation. Content analysis and event sequence analysis are used to explore the causal relationship between collaborative innovation and the development of new quality productive forces. Figure 3 is shown in the path analysis chart.

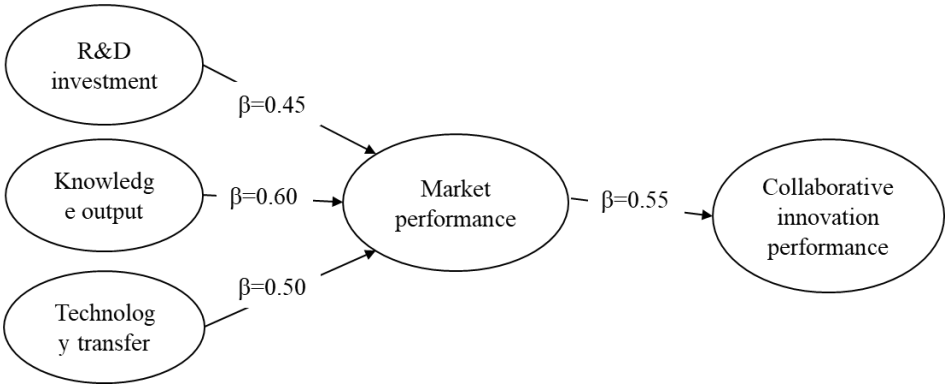

Figure 3. Path analysis diagram

Knowledge creation drives technological innovation, and gives birth to new technologies through the accumulation and innovation of knowledge. Technological innovation promotes market application, that is, technological breakthroughs enable new products or services to enter the market. Market applications promote new quality productivity, and successful applications in the market can significantly improve overall productivity.

Contribution analysis

At the level of technology implementation, this paper puts forward targeted strategies to implement collaborative innovation, including increasing the frequency of interaction among innovative subjects, sharing key resources and equipment, implementing customized preferential fiscal and tax policies, and so on. The study also reveals the important role of collaborative innovation in promoting the balanced development of regional economy and enhancing national innovation capacity. As shown in the contribution table in Table 3.

Table 3. Contribution table

Index	Standardized path coefficient (β)	Standard error (SE)	Confidence interval (CI)	p-value
R&D investment	0.45	0.05	[0.35, 0.55]	<0.01
Knowledge output	0.60	0.04	[0.52, 0.68]	<0.01
Technology transfer	0.50	0.06	[0.38, 0.62]	<0.01
Market performance	0.55	0.05	[0.45, 0.65]	<0.01

The influence of each index on the overall performance of collaborative innovation (standardized path coefficient) in Table 3, and provides relevant statistical information, such as standard error, confidence interval and p value.

The causal relationship between collaborative innovation and the development of new quality productivity

(1) causality path map

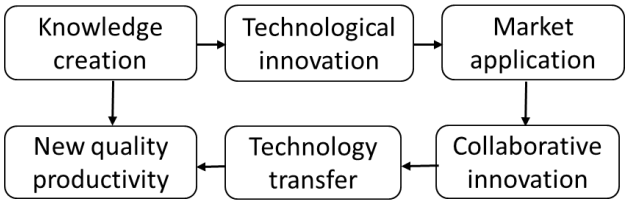

Figure 4. Causality path map

Figure 4 shows the influence path of different stages of collaborative innovation on the development of new quality productivity. The arrows in the picture show the direction of influence, showing the relationship between knowledge creation, technological innovation, market application and new quality productivity.

（2）event sequence analysis table

Table 4 event sequence analysis table

Table 4. Details the key events, time nodes, participant behavior and the policy background behind the case, as well as the impact of these factors on new quality productivity.

Critical event	Year	Participant behavior	Policy background	Effect on new quality productivity
Knowledge sharing conference	Q1 2023	Enterprises、 universities	Government policy support	Increase willingness to cooperate on innovation
Technology transfer agreement signed	Q2 2023	Enterprises、 research institutions	New technology promotion policy	Promote technology application
Innovative product market launch	Q3 2023	Enterprises、 market institutions	Market access policy optimization	Expand market influence

Through quantitative and qualitative analysis, we can effectively show how collaborative innovation promotes the development of new quality productivity through different stages and mechanisms, and provide comprehensive research results through quantitative and qualitative methods.

MANAGEMENT REVELATION

Strengthen The Construction of Collaborative Innovation Mechanism

Collaborative innovation is an important driving force to promote the development of productive forces in the new era, and strengthening the construction of collaborative innovation mechanism is of great significance to improve the level of new quality productivity. In the aspect of strengthening the construction of collaborative innovation mechanism, strategies and implementation need to be carried out from many levels to promote the integrated development of collaborative innovation and new quality productive forces.

Strengthen the construction of collaborative innovation platform

By building a research and development platform for collaborative innovation and sharing, we can promote the sharing of innovation achievements and technological resources, achieve the optimal allocation of resources, and improve the competitiveness of new quality productivity. At the same time, we should establish an open and shared innovation platform, break down industry barriers, promote cross-border cooperation, promote the cross-integration of knowledge systems in different fields, and provide more possibilities for cross-border innovation of new productivity.

Strengthen the mechanism of knowledge sharing

In the process of promoting collaborative innovation, we should establish a sound intellectual property protection mechanism, encourage innovative subjects to carry out legal and compliant intellectual property exchange and sharing, and protect the legitimate interests of innovative achievements. At the same time, a mechanism for sharing intellectual property rights should be established to encourage enterprises, colleges and universities, and scientific research institutions to cross-license and share intellectual property rights in cooperative innovation, so as to promote the rapid transformation and application of innovative achievements.

Optimize the policy environment

Government departments should increase policy support and introduce more open and inclusive policies and measures to provide a good policy environment for collaborative innovation. At the same time, we should establish an incentive mechanism for collaborative innovation, guide enterprises and innovators to increase R & D investment, encourage the transformation of scientific and technological achievements into new quality productive forces, and promote the market application of innovative achievements.

Strengthen personnel training and team building

Cultivate high-level talents with collaborative innovation consciousness and innovation ability, strengthen team building, build cross-disciplinary and cross-industry innovation teams, promote cooperation and exchanges in different fields and industries, break down discipline barriers, promote cross-border innovation, and provide talent and intellectual support for the integrated development of new quality productive forces.

Strategies for Promoting New Quality and Productivity

Under the background of fierce competition in the global economy, promoting the promotion of new quality productivity has become a common challenge for enterprises and organizations of all countries. In order to achieve this goal, it is necessary to formulate effective strategies and put them into practice.

Collaborative innovation

In the current era of knowledge economy, innovation has become the key to the success of enterprises in the market competition. Collaborative innovation can gather the wisdom and resources of all parties, accelerate the innovation process and improve the efficiency of innovation. Therefore, by establishing an open innovation platform, enterprises can promote the sharing and integration of internal and external resources, and achieve collaborative innovation, so as to promote the promotion of new quality productivity.

Introduction and application of technology

New knowledge and new technology can often greatly improve production efficiency, reduce production costs and improve product quality. Therefore, through the introduction of advanced production technology and equipment, enterprises can enhance the automation of the production line and optimize the production process, so as to achieve the improvement of new quality productivity.

Personnel training and incentive mechanism

Talent is the key factor to promote productivity, and an excellent staff team will bring innovative thinking and efficient work to the enterprise. Therefore, enterprises can continuously increase the investment in staff training to improve the comprehensive quality and skill level of employees. At the same time, it can also stimulate employees' enthusiasm and creativity through the incentive mechanism, and further improve production efficiency and product quality.

Big data and artificial intelligence technology

With the development of technology such as the Internet of things, a large amount of production data has been produced. Through the analysis and mining of these big data, enterprises can better understand the problems and bottlenecks in the production process, adjust the production plan in time, and improve production efficiency. At the same time, the application of artificial intelligence technology can also achieve a high degree of automation and intelligence of the production process, so as to improve the level of productivity.

Policy Recommendations and Implementation Paths

In the process of exploring how to collaborate innovation and stimulate new quality productivity, the design of implementation strategy is very important. This study designs the following measures through a systematic analysis of the current situation of industrial development and the needs of enterprise innovation.

Multiple collaborative goal-setting mechanism

In the process of determining policy objectives, a multi-coordinated goal-setting mechanism is adopted to ensure that policies are not only in line with the trend of macroeconomic development, but also respond to the specific needs of the micro market. To this end, the proposed policy objectives include not only promoting the optimization and upgrading of industrial structure, but also promoting the balanced development of regional economy and supporting the improvement of enterprises' technological innovation capability.

P-D-C-A cycle management mode

When designing specific measures, we should ensure the concreteness and enforceability of the measures and solve the existing obstacles and difficulties pertinently. The design adopts P-D-C-A (plan-do-check-action) cycle management mode, so that it can quickly respond to the needs of external environment changes and internal operation updates. Before implementing the measures, we should evaluate the resources and conditions, including financial funds, talent team, technical basis and other factors to ensure that the policy has the basis and guarantee for implementation.

Feasibility evaluation of decision-making

When all the preparatory work is completed, it enters the key link of decision-making-feasibility assessment. In this link, if the evaluation results show that the policy objectives and design measures are fully in line with the actual conditions, the implementation stage of the policy will be officially launched. On the other hand, if the evaluation results show that there is a certain deviation or difficult to implement, adjust the objectives or measures to ensure that the policy can be effectively landed. Construct the path map of collaborative innovation strategy implementation in figure 5.

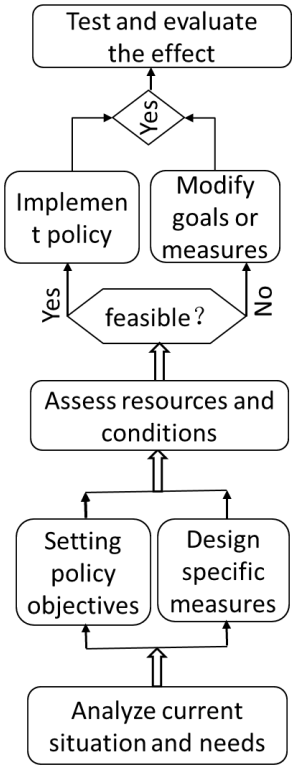

Figure 5. Implementation path map of collaborative innovation strategy

CONCLUSION

On the basis of this study, the following conclusions can be drawn:

Collaborative innovation is an important way to promote the development of new quality productive forces

The subjects of collaborative innovation promote the optimal allocation of innovation elements and bring brand-new competitive advantages to enterprises through cross-border cooperation, knowledge sharing and resource integration. At the same time, collaborative innovation can also accelerate the transformation and application of scientific and technological achievements, promote industrial development, and thus promote the promotion of new quality productivity.

Scientific and technological innovation is the core driving force of new productivity

With the continuous progress and development of science and technology, new technologies, new processes, new materials, big data, artificial intelligence and other technologies can continue to emerge, injecting new power into production activities. These scientific and technological innovations can not only improve production efficiency and reduce production costs, but also open up new market space, expand new industrial chains, and provide strong support for the formation of new quality productive forces. Take innovation as the first driving force to help the formation of new high-tech productive forces.

Industrial upgrading is the inevitable choice to promote the development of new productive forces

With the development of economy and the reform of industry, the traditional industry is gradually facing the dilemma of market-saturated product homogenization competition. On the other hand, industrial upgrading can promote the optimization of industrial structure and the upgrading of industrial chain by introducing new technology, cultivating new business type and enhancing industrial added value, so as to promote the continuous improvement of new quality productivity.

Collaborative innovation is an important way to promote the development of new quality productive forces. We should give full play to the role of the market mechanism, increase investment and support for innovation elements, create a good environment for innovation, and promote new quality productivity to a new leap forward.

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