

A Review of Research on Digital Empowerment, Knowledge Collaboration and Collaborative Innovation

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Abstract: *In the era of digital economy and knowledge economy, digital empowerment and knowledge collaboration are of great significance for enterprises to gain competitive advantages and achieve high-quality development. In recent years, there have been heated discussions on digital empowerment, knowledge collaboration and enterprise innovation in academia. The purpose of this article is to summarise and analyse the influence mechanism of digital empowerment on enterprise collaborative innovation, and to explore the mediating role of knowledge collaboration. Through reading and combing the literature, it is found that the current research has deficiencies such as the imperfect division of variable dimensions and fewer empirical studies. Based on the above research status quo, an outlook on digital empowerment, knowledge collaboration and collaborative innovation is made from the three aspects of research content, research objects and organisational scenarios.*

Keywords: *digital empowerment; knowledge collaboration; collaborative innovation*

1. Introduction

Currently in the VUCA era, i.e., an environment where volatility, uncertainty, ambiguity and complexity coexist, it is difficult for enterprises to sustainably gain a competitive advantage in the current era on their own, therefore, enterprises need to co-operate with external subjects and the implementation of collaborative innovation is of great significance for enterprises to gain sustained competitiveness and achieve high-quality development. In the Overall Layout Plan for the Construction of Digital China, it is pointed out that the digital economy should be strengthened, enlarged and optimised. In the report of the 20th Party Congress, it is pointed out that innovation plays a strategic supporting role in building a modern economic system. In the era of digital economy, with the rapid development of digitisation, the Internet and artificial intelligence, the implementation of digital empowerment for innovation has become the key to efficient innovation for enterprises^[1]. The development of digitalisation makes enterprises break the organisational boundaries, accelerates the flow of information between enterprises, promotes the communication and cooperation between enterprises, and is more conducive to the realization of collaborative innovation.

In the context of the digital era, many large, medium and small enterprises in China are trying to use digital empowerment for enterprise development, combining digital empowerment and innovation. However, the integration of digital empowerment and collaborative innovation of the enterprises concerned is not deep enough. From the enterprise micro level, there is less literature on the impact of digital empowerment on collaborative innovation through empirical research, and less literature on the mechanism of digital empowerment on collaborative innovation through knowledge synergy. Therefore, this paper reviews the research on digital empowerment, knowledge collaboration and collaborative innovation.

2. Digital empowerment, knowledge synergy and collaborative innovation

2.1 Digital Empowerment and collaborative innovation

The term 'empowerment' originally originated from 'authorised empowerment', which means that in order to help a subject to achieve the intended goal more effectively, the subject is given some kind of action or energy. With the development of digitalisation, empowerment has taken on a contemporary meaning, and digital empowerment has emerged as a result. Faced with the current complicated market

competitive environment, it is difficult for enterprises to rely on their own resources and capabilities to gain continuous competitive advantages and achieve long-term development. The innovation model in the enterprise is gradually shifting from a single innovation to coordinated innovation. Coordinated innovation among enterprises can help enterprises achieve complementary resources, reduce costs, share innovation results, and share the risks of innovation, and quickly adapt to market changes to obtain greater economic profits. Digital empowerment is gradually combined with enterprise innovation, becoming an important resource for innovation, and an inevitable choice for enterprises to survive and develop in the fierce market environment. Through the application of digital technology, the development of digital platforms breaks organizational boundaries, helps organizations obtain more resources, accelerates the flow of information, forms a collaborative innovation network, promotes the generation of collaborative innovation behaviors, and improves collaborative innovation performance. Research on the impact of digitalization on innovation includes: Yang Zhen et al. from the perspective of innovation performance, studied the role of digitalisation in the empowerment of corporate R&D cooperation on innovation performance^[2]. Chi Maomao et al. explored the influence mechanism of enterprise innovation performance in the context of digital transformation, the study found that digital transformation affects enterprise innovation performance, and analysed the role of digital transformation as a necessary condition in enterprise innovation performance^[3]. Xinyu Wang et al. empirically showed that digital capability has a significant positive impact on enterprise innovation performance, and knowledge management plays a mediating role in it^[20]. Regarding digitalisation on green innovation, Sun Quansheng believes that the enhancement of digital technology can promote the efficiency of green technology innovation of enterprises^[4]. Tian Hongna et al. constructed a theoretical model of digital empowerment of green innovation, and the results indicated that digitalisation has a positive impact on green innovation^[5]. Regarding the relationship between digitalisation and innovation capacity, Zhou Hongxing and others use a series of methods such as instrumental variable method and Heckman two-stage model to conclude that digital transformation can improve the innovation capacity of enterprises, and analyse the mechanism of the role of enterprise financing constraints, human capital upgrading and government policy support from three perspectives^[6]. With regard to digitalisation on business model innovation, Wang Miao et al. showed that enterprise digital capability significantly and positively affects business model innovation, and the digital capability is divided into the ability to use digital technology and the ability to integrate digital resources^[7]. Therefore, based on theoretical analysis and literature reading, this paper argues that digital empowerment has a positive impact on collaborative innovation.

In summary, there are more studies on digital empowerment on enterprise innovation capability, innovation performance and green innovation, and fewer studies on enterprise collaborative innovation. Scholars believe that digital empowerment has a positive impact on enterprise innovation, fewer studies have been conducted through specific data analysis and the construction of models. In order to further analyze the impact of digital empowerment on collaborative innovation, this paper argues that digital empowerment has a positive impact on enterprise collaborative innovation.

2.2 Knowledge collaboration and collaborative innovation

In the knowledge era, knowledge is an important resource for inter-enterprise competition, and enterprises face the problem of how to effectively use knowledge resources. In the process of enterprise innovation, there is a large amount of knowledge information exists inside and outside the enterprise, enterprises want to effectively implement innovation activities, obtain good innovation effect, need to identify and analyse all kinds of explicit and tacit knowledge inside and outside the enterprise and integrate the use of knowledge, promote knowledge acquisition, sharing, movement, application and innovation, broaden the breadth and depth of knowledge resources through the knowledge synergy and improve the performance of innovation. Organisations or individuals within the enterprise acquire new knowledge from the external environment, integrate existing knowledge within the enterprise, and decode this knowledge, and make the knowledge flow between different organisations and individuals through certain channels, enterprise organisations and individuals acquire knowledge, and combine the acquired knowledge with their own reality, create new knowledge within the organisation, and apply the new knowledge to the innovation activities, which helps to improve the innovative performance of the enterprise. As the advanced stage of knowledge management, knowledge collaboration has been studied by many scholars in recent years, Kadenzing is recognised by scholars as the first to propose the concept of knowledge collaboration^[8], Chen Kunyu is regarded as an early scholar in China to make a detailed discussion of knowledge collaboration, and Tong Zehua is regarded as a representative of the concept of knowledge collaboration in domestic research^[9]. Scholars study the connotation, influencing factors, operating mechanisms, and the relationship between innovation performance. Liu Jiao et al. ^[10] pointed out that It is pointed out that for the alliance enterprises, the synergy of knowledge activities, reciprocal

collaboration and exchange and learning in the process of knowledge collaboration can promote the innovation performance of the subject. In the process of innovation, the acquisition of knowledge is the prerequisite for knowledge synergy. Knowledge transfer is guarantee. Knowledge creation is the thinking logic of the goal. Combined with the research of previous scholars, the collaboration of knowledge is divided into three dimensions: knowledge acquisition, knowledge transfer and knowledge creation.

As an intangible resource, knowledge, learning and acquisition of knowledge is an important issue for enterprises to implement innovation. The source of corporate knowledge includes the generation of internal knowledge and the acquisition of external knowledge, and a lot of knowledge information appears in the process. Knowledge acquisition is a new knowledge of organizations or individuals in the enterprise to obtain the external environment, integrate existing knowledge within the enterprise, and decoding these knowledge to help the development of innovative activities and help enterprises achieve innovative goals. Lin et al. [11] believes that market knowledge and customer knowledge acquisition and management play an intermediary role between market -oriented and service innovation performance. Companies that can gain, share, and use knowledge can better understand the market dynamics and create new Products to meet customers and market demand. Zhu Xiumei et al. [12] show that knowledge acquisition and knowledge integration have a significant positive impact on the performance of new product development. Zhang Baocang [13] shows that both explicit and implicit resource acquisition have a positive correlation with the performance of cooperative innovation. Liu Wenxia et al. [14] shows that cognitive trust and emotional trust not only directly affected collaborative innovative performance, but also obtained indirect impact on it through knowledge. Therefore, this paper argues that knowledge acquisition has a positive impact on enterprise collaborative innovation.

Knowledge transfer is the process of knowledge through certain channels and the flow of individuals through certain channels, which makes up for the knowledge gap of organizational innovation, expands the width and depth of knowledge, and is conducive to improving the innovation efficiency of the organization. Knowledge transfer helps different enterprises and different departments within enterprises to obtain more knowledge, effectively use knowledge, strengthen mutual exchanges and cooperation, and facilitate the implementation of innovation activities. Thomas [15] studied that the knowledge transfer activity of enterprises in the cooperation partners affects the development performance of new products. Zhao Shukuan and Yue Zhenming [16] pointed out that knowledge transfer can help enterprises make up for the knowledge gap, increase the breadth and depth of knowledge, increase the speed of learning, shorten the innovation cycle of new products and technology, reduce the research and development costs of enterprises, increase the innovation of enterprises Performance. Therefore, this paper argues that knowledge transfer has a positive impact on enterprise collaborative innovation.

Knowledge creation refers to the process of knowledge obtained by corporate organization and individual integration, combined with its own actual situation, creates new knowledge in the organization and applies new knowledge to innovative activities. Knowledge creation occurs on the basis of knowledge acquisition and knowledge transfer, and knowledge creation is also an important guarantee for enterprises to implement innovative activities. Existing literature studies have obtained knowledge creation positive influence organization innovation. Zhu nana and Xu Yihong [17] Taking knowledge creation as a mediating variable, it is concluded that it plays a mediating role between TMT network characteristics and ambidextrous innovation. Ren Huipeng et al. [18] believed that only by continuously updating and creating knowledge can the enterprise maintain strong competitiveness in the development process, and conclude that corporate knowledge creation is positively correlated with business model innovation. Therefore, this paper argues that knowledge creation has a positive impact on enterprise collaborative innovation.

In summary, as a high -level stage of knowledge management, there are many existing research but relatively scattered. In summary, as an advanced stage of knowledge management, different scholars have different definitions of knowledge collaboration and different research directions for knowledge collaboration. By analyzing the impact of digital empowerment on knowledge collaboration and the impact of knowledge collaboration process on collaborative innovation, this paper divides knowledge collaboration into three dimensions: knowledge acquisition, knowledge transfer and knowledge creation, and better studies its impact on enterprise collaborative innovation.

2.3 The mediating role of knowledge synergy

Drawing on knowledge base theory, the diverse knowledge that exists inside and outside the enterprise constitutes the resources needed for enterprise development, and the use of integrating resources in the internal and external environments of the enterprise can effectively promote

collaborative innovation in the enterprise. Digitalization affects the technology, knowledge and resources required for innovation by facilitating the interaction of internal enterprise members and the degree of connection with external subjects, thus affecting the efficiency of enterprise innovation. Digital technology facilitates enterprises to acquire, analyze and integrate key knowledge inside and outside the enterprise on a larger scale, extract useful knowledge, promote the full application of knowledge among different subjects, lay the foundation for innovation, promote collaborative innovation between enterprises and external subjects, and enhance innovation performance. In addition, the digital platform helps to break the organizational boundaries and increase the opportunities for the mutual integration of different knowledge resources among enterprises, which broadens the organizational boundaries and thus promotes the collaborative innovation performance of enterprises. Dong Hailin and Chen Juhong explored the intrinsic mechanism of the impact of big data analytics capability on service innovation in manufacturing enterprises through a questionnaire survey of manufacturing enterprises^[19], and big data capability has a significant contribution to knowledge acquisition capability, knowledge sharing capability and service innovation performance; knowledge dynamic capability including knowledge acquisition capability and knowledge sharing capability significantly contributes to the performance of service innovation and plays a partly mediating role. Based on a survey of science and technology-based SMEs, Xinyu Wang et al^[20] investigated the relationship between digital capabilities, knowledge management and enterprise innovation performance, and the results showed that digital capabilities have a significant direct positive impact on innovation performance, and knowledge management plays a mediating role in it. Therefore, this paper argues that digital empowerment can promote collaborative innovation of enterprises, and knowledge collaboration plays an intermediary role in it.

3. Research Conclusions

By combing through the relevant literature on digital empowerment, knowledge collaboration and collaborative innovation and analysing the current problems, the following conclusions are drawn:

First, through literature review, it is found that digital empowerment has a positive impact on technological innovation, green innovation, innovation ability and innovation performance. Collaborative innovation is an important way for enterprises to connect with the outside world to promote their own development, and enterprises are conducive to promoting collaborative innovation through the use of digital technology. Therefore, this paper argues that digital empowerment has a positive impact on the collaborative innovation of enterprises.

Secondly, most scholars believe that digital empowerment and knowledge collaboration will promote enterprise innovation. The literature mediated by knowledge synergy is scattered, and the dimensions of knowledge synergy are divided into many dimensions. Depending on the content of the study, different measurement and classification criteria apply. From the perspective of digital empowerment, this paper studies the impact of digital empowerment on collaborative innovation, and divides knowledge collaboration into three dimensions: knowledge acquisition, knowledge transfer and knowledge creation by analyzing the effect of digital empowerment on collaborative innovation. Through literature reading, it is found that the three have a positive impact on collaborative innovation and play an intermediary role between digital empowerment and collaborative innovation.

4. Research Outlook

In the context of the digital economy era, the role of digital empowerment and knowledge collaboration is more important. In order to better help enterprises use digital empowerment to implement collaborative innovation and improve collaborative innovation performance, this paper puts forward the following outlook for the problems existing in the current research:

In terms of research content, the research on digital empowerment and innovation is relatively rich, but the research on digital empowerment and collaborative innovation is not yet systematic, and the existing research is mainly based on case analysis and theoretical analysis. In view of this situation, this paper will use the empirical analysis method, find the middle and senior managers of the enterprise to fill in the questionnaire by means of questionnaires, and use SPSS and AMOS software to test the reliability and validity, correlation analysis and regression analysis, so as to obtain the reliability results.

In the research object, Strategic emerging industries are currently industries strongly supported by the state, and the impact mechanism of digital empowerment on collaborative innovation will be studied from strategic emerging industries, in order to better promote the development of strategic emerging

industries.

In the organisational context, the impact mechanism of digital empowerment on collaborative innovation is a complex process, and environmental dynamics, enterprise types, organizational flexibility, and institutional changes all have an impact on innovation. The collaborative innovation willingness of the personnel in the enterprise will also greatly affect the effect of collaborative innovation of the enterprise, and the collaborative willingness has a positive impact on the innovation effect. Therefore, the willingness to collaborate on innovation will be added to the future research to study the moderating effect of the willingness to collaborate.

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