

Artificial Intelligence Application, Global Value Chain Reconstruction and Enterprise Knowledge Power Relationship: Grounded Theory Research Based on Intelligent Manufacturing Enterprises

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Abstract. In the process of application of artificial intelligence affecting the formation of enterprise knowledge power, there are many factors that can influence it. However, there is no mature theoretical framework for the specific important influencing factors. The TongKun Group in Zhejiang province is a "future intelligence factory" that uses artificial intelligence and other advanced technologies to realize the global value chain reconstruction and enterprise knowledge power. Based on the grounded theory. The research data are collected from Tongkun company. According to the research process of grounded theory, original interview data are tested for open coding, spindle coding, selective coding and theoretical saturation. Using coding, categories are summarized into five main categories: enterprise artificial intelligence technology foundation, enterprise artificial intelligence technology usage, enterprise artificial intelligence technology results (output), global value chain reconstruction, and enterprise knowledge power. Finally, according to the "storyline", it is established that a relationship model about "artificial intelligence application, global value chain reconstruction and knowledge power" in enterprise.

1 Introduction

Based on the grounded theory, this study collects research data from Tongkun company, and deal the data by grounded method of open coding, spindles coding and selects coding. Finally, according to the "storyline", it will be established that a relationship model about "artificial intelligence application, global value chain reconstruction and knowledge power" in enterprise.

2 Literature review

2.1 The impact of AI technology on global value chains

Kristiansen Bernard (2012) analyzed the impact of AI on the global value chain, found that AI can improve the profit level and efficiency of global value chains [1]. Husain et al. (2016) studied the position and influence of AI in the global value chain, found that artificial intelligence technology as a new factor of production can improve the efficiency of factor allocation and resource utilization [2]. Acemoglu et al. (2018) studied the application of artificial intelligence technology has enhanced the division of labour in the global value chain to a certain extent [3]. Aghion et al. (2017) found that artificial intelligence technology is irreplaceable in the global value chain (GVC) [4]. GVC means enterprise resource allocation and the and industrial structure

optimization among different countries. Artificial intelligence application (AI) is an important driving force for the new round of technological revolution and industrial transformation.

2.2 The role of enterprise knowledge power in the global value chain

Johnson (2018) believed that knowledge power are the key elements to enhance enterprise competitiveness [5]. According to Oberfield et al. (2021), knowledge power refers to the ability to acquire, integrate and use knowledge, which can be realized by means of talent gathering, cultural output and system design [6]. Schmitz. (2012) believed that the development of AI technology can restructure the global value chain through technological innovation, talent training and institutional reform [7]. Knowledge power (KP) refers to the intellectual rights, commercial interpretation rights, and commercial leadership by enterprises.

2.3 Literature review on the relationship between AI-GVC-KP

Antràs et al. (2020) believed that AI technology has improved the division of labour in global value chain, improved the R & D investment and innovation ability of enterprises [8]. Lee et al. (2018) found that the development of artificial intelligence technology has

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spawned a large number of new industries, new business forms and new models, thus further diversified and complicating the global value chain structure [9]. Albrecht et al. (2020) believed that the application of AI technology in R & D design can make the design process more automatic, intelligent and efficient [10].

2.4 Literature review conclusion

The rapid development of artificial intelligence technology has had a profound impact on the restructuring of the global value chain. This paper believes that the existing research has the following problems: the influence mechanism of artificial intelligence technology on the global value chain reconstruction is still unclear; the relationship of AI, GVC and KP in enterprise needs further research.

3 Research methods

3.1 Survey design based on Grounded Theory

Glaser & Strauss (1967) jointly proposed the grounded theory research method which is a research method that deeply explores and summarizes the causes of a phenomenon by systemizing and standardizing the analysis of the collected empirical data [11]. Grounded theory is an abstract approach that views theory from empirical data rather than prior reasoning or guessing.

The general research process of Grounded theoretical research method is specifically divided into problem interviewing, data collection, three-level coding (open coding, spindle coding, selective coding), drawing conclusions, model building and other steps.

3.2 Preparation of the interview

This paper uses a semi-structured access method to obtain valuable first-hand information. Semi-structured interview is a kind of in-depth direct communication with the interviewees. It is a very important way of open exploration. The theme of semi-structured interview is "artificial intelligence application, global value chain reconstruction and knowledge power" in enterprise.

4 Samples and interviewees

4.1 Samples

The TongKun Group in Zhejiang province is a "future intelligence factory" that uses artificial intelligence, cloud computing, big data and other advanced technologies to realize the global value chain reconstruction and enterprise knowledge power.

4.2 Interviewees

Due to the content of the research, the research participants must have a higher position in Tongkun

enterprise. Because this is an in-depth interview, so the research participants must work in the enterprise for at least one year. Two interview methods were adopted: Face-to-face interview, Telephone (video) interview. The interview materials were collected from December 2022 to April 2023. Twenty valid interviewees were collected. The content is shown in Table 1.

Table 1. Basic information statistics of basic interview samples.

	Variable	Frequency
	General manager	3
	Head of business department	8
	Head of R& D Department	5
	Marketing director	4
	30 -40 years old	7
	41 -50 years old	9
	51-60 years old	4
	College education and below	6
	Bachelor degree and above	14

5 Analysis of grounded research

5.1 Public code

It is the first layer of the three-layer structure. With an "open" mind and a neutral concept of "believe it", researchers put their "viewpoints" and "opinions" as much as possible, and record the collected data according to their own situation.

We collected 20 interview samples with open code. Open coding refers to breaking the original description of the interview, marking and conceptualizing each sentence. This process uses as much as possible from the original sentences in the interview data to record. Then comparative analysis combines the internal structure and similar properties to extract an initial category. The content is shown in Table 2, Table 3, Table 4.

Table 2. Open Encoding Results (AI part).

Category	Initial concept
AI foundation in enterprise	A09 intelligent equipment A10 AI research team building A15 AI employee size in enterprise .
Usage of AI in enterprise	A02 intelligent customer service A05 Intelligent production process A08 Intelligent technology research and development
AI output in enterprise	A06 Intelligent products A09 Intelligent service A18 AI patent

Table 3. Open Encoding Results (GVC part).

Category	Initial concept
Leading GVC	A12 Sales network abroad (distribution network) A17 Brand characteristics (speciality stores) A16 Expert interpretation right
Active embedding GVC	A13 Upgrade the export products A01 Diversification of varieties A19 Export product quality
Passive embedding GVC	A14 Consumer preferences A13 Demand information and change A20 Requires diversification

Table 4. Open Encoding Results (KP part)

Category	Initial concept
Right of reward, punishment	A05 Industry Rankings A04 Corporate champion A20 Monopolistic patent
Expert interpretation	A19 Trend of industry technology A12 Industry technology change A11 market change
Intellectual property and guidance demonstration	A09 customer appeal A07 Technology brand demonstration A03 Customer identification

5.2 Spindle coding

Based on the open coding, this article summarizes content, and obtains 5 main categories (in Table 5).

Table 5. Spindle Encoding Results

Main category	Initial Category
AI foundation	Capital investment, intelligent equipment and network, and AI technicians
AI Usage	Intelligent research and development process, intelligent production process, intelligent sales process
AI Results	Intelligent products, intelligent services, intellectual property rights and AI patents
GVC Reconstruction	Enterprise passive embedding, enterprise active embedding, enterprise leading creation
Enterprise KP	Right of reward, punishment, expert interpretation, control, intellectual property and guidance demonstration

5.3 Selective coding

Describing the overall behaviour phenomenon according to the "story line", this part extracted a more systematic core category, and constructed a new theoretical system of essence.

The research results show that the foundation of enterprise AI technology, the usage of enterprise AI technology, and the output of enterprise AI technology are the important factors affecting the global knowledge power in GVC. The content is shown in Table 6.

Table 6. Selective Encoding Results.

Relationship structure	The connotation of the relationship structure
AI -KP Relation	The division in the global value chain directly affects the knowledge power in international market
AI-GVC-KP Relation	The technological innovation ability of an enterprise affects the way and position of the global value, determines the division of labor in the global value chain, and then affects their rights on knowledge power.
AI-GVC Relation	The level of channel control ability affects the division of enterprises in the global value chain, and then affects their voice in product price formulation.
GVC-KP Relation	The strength of the network capability reflects its influence on other participants in the value chain, thus having an influence on knowledge power, and then affecting their rights on product pricing.
AI Application	Technological innovation ability is shown through product differentiation. Enterprises acquire the control ability in the AI product differentiation and AI advantage. This AI ability is affected by in-external dynamic technology.
GVC Restructuring	Through the control of upstream suppliers or the terminal market, the control of enterprises in the international market is obtained. The international market power is formed. This control ability is affected by the in-external dynamic environment.
Enterprise KP	By identifying and constructing valuable network cooperative relations, eliminating redundant relationships, enterprises can enhance their international knowledge power and advantages, and then form international market forces. The result will be affected by the in-external dynamic knowledge power.

5.4 Theoretical saturation check

Tongkun Group has promoted the rapid development of China's chemical industry and the vigorous development of the chemical industry. Tongkun International Trading Co., Ltd. is gradually "going out", forming a global value chain through the transnational international industrial chain and supply chain, which

has injected a strong impetus into the high-quality development of the company.

By Tongkun group interview data of AI application, GVC reconstruction and knowledge power, which shows that the relationship structure model has reached the theory saturation, and can no longer be sampling.

6 AI-GVC-KP model formation based on grounded theory

According to the research process of grounded theory, original interview data were tested for open coding, spindle coding, selective coding and theoretical saturation.

Using coding, categories are summarized into five main categories: enterprise artificial intelligence technology foundation, enterprise artificial intelligence technology usage, enterprise artificial intelligence technology results (output), global value chain reconstruction, and enterprise knowledge power.

The "story line" is used to describe a complete behavioral process, and finally concludes a more systematic concept about "the main influence elements of knowledge power in the application of AI technology in the reconstruction of global value chain" (in Fig. 1).

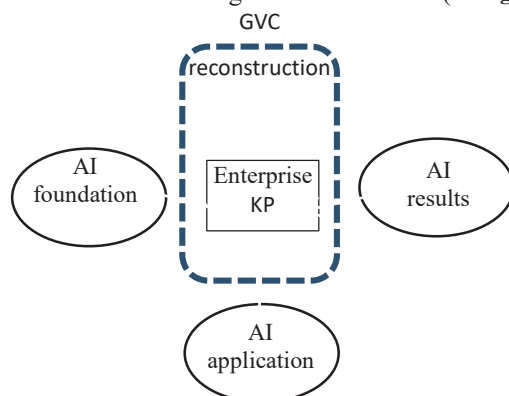


Fig. 1. Conceptual relation model "AI application-GVC reconstruction-enterprises KP" (Picture credit: Original)

7 Conclusion

In this paper, the "story line" method is used to summarize the core issue of "the main determinant of knowledge power in the reconstruction of global value chain".

Through comparative analysis and existing research results, this paper establishes conceptual relation model "AI application-GVC reconstruction-enterprises KP". However, the current research based on the grounded theory only summarizes the structural links between elements. The interaction and mechanism between elements are still unclear. So, in the following study, we will conduct an in-depth analysis to this conceptual model.

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