Research on the Evaluation Index of Digital Transformation Level of Manufacturing Enterprises

Le Zhang[1,2,*], Juhong Chen[1]

[1] *School of Economics and management,Xi'an University of Technology,Xi'an, China*
[2] *School of Economics and management,Weinan Normal University,Weinan,China*
corresponding author. Email: 547457271@qq.com

ABSTRACT

Digitalization is the way for manufacturing enterprises to achieve transformation and upgrading, and there is no unified standard for how to assess the level of digital development of manufacturing enterprises. Based on summarizing the existing research on the degree of digital transformation of manufacturing enterprises, this paper proposes to include three major dimensions of business model change, technical capability change and organizational way way change to comprehensively measure the degree of digital transformation of enterprises, this paper proposes countermeasures to promote the development of digital transformation of traditional manufacturing enterprises.

Keywords: manufacturing enterprises, digitalization, development level, evaluation index

1. INTRODUCTION

The manufacturing industry is the main body of the real economy and a key engine to promote long-term stable economic growth, which is extremely important for sustained economic prosperity and social stability. The sudden arrival of the COVID-19, while the traditional business has been greatly impacted and forced to press the "pause button", the comprehensive digital transformation of enterprises has pressed the "fast forward button". More and more manufacturing enterprises intuitively and deeply feel the significant advantages brought by digital transformation, and realize that digital transformation is the necessary road for enterprise development in the era of digital economy. For manufacturing enterprises, digital transformation is more urgent, and it has become an inevitable way to reduce costs, improve quality, reduce labor costs, accelerate product iteration and maintain their competitive advantage. Major industrial countries such as the United States, the United Kingdom, Germany, and Japan have launched a series of national strategies in the field of digital transformation, such as Germany's Industry 4.0, the United States Industrial Internet, the United Kingdom Industry 2050, and India's National Manufacturing Policy, in order to use digital transformation to enhance the competitiveness of traditional industries. McKinsey has researched more than 800 traditional enterprises globally, and the results show that although 70% of enterprises have started digitalization, most of them still stay in the pilot stage. According to the digital transformation index of Chinese enterprises released by Accenture, only 7% of Chinese enterprises have significant digital transformation effects.What are the factors that affect the digital transformation of enterprises and how to evaluate the development level of digital transformation of enterprises have become the urgent issues to be solved. In this context, this paper explores what are the factors influencing digital transformation of manufacturing enterprises in the Chinese context? How should digital transformation evaluation indicators be constructed? In order to provide some reference to the digital transformation of enterprises.

2. LITERATURE REVIEW

2.1 The meaning of digital transformation

Gartner [1]proposes that digitalization is a process of transitioning a company from its previous model to a digital business model, in which the company relies on digital technology to convert the corresponding business model to get continuous profits and win continuous value; the Development Research Center of the State Council reports that digital transformation refers to the use of a new generation of information technology to build a closed loop of data collection, transmission, storage, processing and feedback.[2] Meng Fansheng[3] proposed that digital transformation refers to the comprehensive optimization of equipment and workflow within

manufacturing enterprises, the establishment of a shared database in the whole life cycle of products, the formation of useful information through data processing, the use of relevant data and information to simulate the actual production process, the implementation of digital management of the production process, so that the production process can be optimized; Hu Chaping [4]and others proposed that digital transformation refers to the use of a new generation of information technology to build a closed loop of data collection, transmission, storage, processing and feedback, and to improve the overall operational efficiency of the industry by breaking the data barriers between different levels and different industries. The study of three local manufacturing enterprises by Hu Chaping[4] research, the digital transformation process of manufacturing enterprises is divided into 3 stages: focus on product manufacturing, focus on product basic service provision and focus on customer business competitiveness to enhance service provision. Bordelea et al[5] propose that digitalization is the process of innovating their products, services and business models as well as improving their competitiveness and process performance through the use of emerging technologies. Although different scholars have given different definitions of digital transformation from different perspectives, the core of their digital definitions lies the use of digital assets to change production technologies, organizational structures, and business models.

2.2 Measurement of the degree of digital transformation

In 2015, the German Mechanical and Engineering Association proposed an Industrie 4.0 Readiness Model for the mechanical engineering industry, which measures the level of digital transformation in national, regional, industry, and enterprise dimensions, and analyzes and judges the development level and maturity of digital transformation, which classifies companies into three types of newcomers, learners and leaders, and evaluates companies' Industry 4.0 readiness in six dimensions: strategy and organization, smart factories, smart operations, smart products, data-driven services, and employees; in 2016, Schumach er A, Erol S et al. evaluated companies' Industry 4.0 readiness in terms of products, customers, operations, technology, strategy, leadership Governance, culture, and people measured Industry 4.0 readiness and maturity in these dimensions; in 2017, De Carolis et al. measured the digital readiness maturity of enterprises in the dimensions of process, monitoring and control, technology, and organization. The assessment model of digital transformation was proposed by Accenture, Hua Qiangsen and other domestic and foreign research institutions from different perspectives to measure the maturity of transformation development; Pacchini et al. classified the readiness of enterprise Industry 4.0 implementation into six levels:

budding, initial, primary, intermediate, advanced and fully ready, based on the adoption and application of key digital technologies. Wang et al. developed a digital maturity model by filtering and refining key process domains and specific evaluation indicators. The model includes 5 key process domains, 19 primary indicators and 63 secondary indicators. It provides a method and tool for enterprises to assess the comprehensive level of digitalization.

3. CONSTRUCTION OF DIGITAL TRANSFORMATION ASSESSMENT INDEX SYSTEM FOR MANUFACTURING ENTERPRISES

Through the above review, it is found that the core of digital transformation of manufacturing enterprises is to use data as the key element to penetrate digital technology into the whole process of production and operation of enterprises, so as to bring about changes in manufacturing, organization and management of enterprises, which are summarized in this paper as changes in 3 aspects: business model, technical capability and organization, and also as the first-level indicators of digital transformation assessment.

3.1 Business Model Change

The change of business model is the starting and ending point for enterprises to carry out digital transformation, and is the direct manifestation of the value of transformation. The results of digital transformation can be measured in terms of the depth of digitalization ultimately used by each business line. The business lines include R&D, procurement, production, marketing, customer service, etc., which measure the value chain links, and also include internal management lines, such as strategy, human resources, finance, IT, etc.; the level and capability level of product and service digitization can be measured by assessing the business connection and integration across departments and business links of the enterprise, specifically through the integration of R&D design and production manufacturing, operation management and production control, the integration of The level and capability of product and service digitization can be measured through the integration of R&D design and manufacturing, operation management and production control, production, supply and sales integration, rapid response customer service, and product and service digitization.

3.2 Technology capability change

Firstly, the development of new generation information technology such as big data and cloud computing has prompted enterprises to reconfigure and change the infrastructure conditions such as network, communication equipment and original system, etc.

Digital infrastructure construction is the cornerstone for manufacturing enterprises to carry out digital transformation. Data center construction, industrial network construction and application, data management and application standardization, and computer and network security protection should be evaluated; secondly, digital technology application is the main driving force of enterprise transformation and upgrading, and the level of digital product development, manufacturing digital level, management digital level, and digital level and capability in market services should be evaluated. Once again, data capability is also a very important measurement indicator for the degree of digital transformation of enterprises. The degree to which an enterprise can apply data analysis for business decision making includes both data availability and data analysis capability. Finally, digital investment provides support to promote the digital transformation of enterprises. The higher the percentage of digital investment, the more attention enterprises pay to digital transformation, and the more obvious the effect of digital transformation.

3.3 Organizational changes

With the increasing personalization of consumer demand, enterprises are forced to use digital technology to change their organizational structure in order to enhance the speed of response to the market. The digital awareness of senior leaders and the planning for macroscopic strategies often determine whether the digitalization of enterprises is implemented smoothly. Under the digital organization dimension, evaluation is made in terms of digital system and culture, digital human resources, digital production and operation, etc. Secondly, it is necessary to judge whether the mechanism for enterprises to promote digital transformation is mature, such as digital governance model, change management personnel skills, and digital change within the organization through digitalization in management from the perspective of the enterprise; it is also necessary to strengthen direct communication between employees and information access to improve digital skills and management capabilities, which in turn will drive the demand for digital application talents in the enterprise. The main indicators chosen are the ability of cross-team collaboration and active innovation, the ability to use external and social resources, and the ability of continuous learning and digital capacity building of the team.

4. COUNTERMEASURE SUGGESTIONS FOR DIGITAL TRANSFORMATION OF ENTERPRISES

(1) Strengthen the cultivation of digital talents. Strengthen the training of digital skills for enterprise employees, and at the same time enhance the digital cognition of all employees, especially managers.

Enterprises should increase the introduction of talents to attract comprehensive digital talents who understand technology and manufacturing to the enterprises, and help manufacturing enterprises accelerate the digitalization process. For the grassroots employees, strengthen the digital application skills training, so that employees fully appreciate the convenience brought by digitalization to the work, and improve the "digital" literacy of all people.

(2) Enterprises should strengthen the application of digital technology in production management. Digital management of business is a key indicator of the ability of digital transformation of enterprises. In the process of applying digital technology, manufacturing enterprises should focus on improving the digital level of production. We should pay attention to the all-round application of digital technology in the production process, open the data chain and prevent the emergence of "data silos".

(3) Guarantee data and information security in digital transformation. The state should issue regulatory policy documents to require cloud service providers to effectively safeguard the system security of public databases and public cloud systems, and ensure the integrity, authenticity and real-time nature of data. For those who are led by a few enterprises to develop and turn the private cloud into an industry database, operating system and cloud service platform open to the society, corresponding regulatory measures should be formulated to maximize the protection of the legitimate rights and interests of enterprises and prevent the generation of data monopoly and data security issues.

5. CONCLUSIONS

Digital transformation is a complex evolutionary process, a complex project involving multiple levels and aspects. This paper evaluates the degree of digital transformation of enterprises by initially constructing three dimensions for assessing the degree of digital transformation: business model change, technology capability change and organizational way change, which can help enterprises understand the stage of their digital transformation, grasp their problems in the process of digital transformation, and further optimize and adjust their transformation strategies.

REFERENCES

[1] Gartner, Gartner hype cycle for emerging digital technologies.http://www.gartner.com/newsroom/id/3114217. Accessed 26 Apr 2015.

[2] Li Wei,Li Wenjun. Digital transformation of SMEs from the prevention and control of the new crown pneumoniaepidemic[J].EnterpriseEconomics,2020, 39(07):14-19.

[3] Meng Fansheng,Zhao Gang. Research on factors influencing the development of traditional manufacturing to smart manufacturing[J]. Science and technologyprogress and cur,2018,35(01):66-72.

[4] Hu Chaping, Wang Tao, Zhu Liya. Generative logic of servitization performance in manufacturing industry: based on the perspective of firm capability theory[J].Scientific Research Management, 2018(5):129-137.

[5] Galati F, Bigliardi B. Industry 4.0: Emerging themes and future research avenues using a text mining approach[J]. Computers in Industry, 2019, 109: 100-113.