

# *Study on the Impact Factors of Digital Intelligence Empowerment on Organizational Quality Change in Smart Manufacturing Enterprises*

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**Abstract:** Smart manufacturing enterprises comply with the transformation and upgrading of digital intelligence, the new generation of information technology represented by big data, artificial intelligence technology and the combination of total factor quality management to achieve high-quality development purposes. Organizational quality management is transformed in the digital intelligence empowerment of smart manufacturing enterprises, and the upgrade and transformation of the digital intelligence of organizational quality management is realized by promoting organizational quality change with digital intelligence development. The organizational quality change based on the perspective of digital intelligence empowerment mainly refers to the quality elements in the enterprise such as technology innovation, value chain, productivity, supply chain, customer service, manufacturing methods, decision making and management, etc. through digital intelligence technology and digital intelligence concept to upgrade and innovate the organizational quality. In this paper, we will explore which factors of organizational quality change in smart manufacturing enterprises will be affected by digital intelligence empowerment.

## 1. Introduction

Digital intelligence technology is an important thrust for the high-quality development of intelligent manufacturing enterprises, building industrial Internet platform as the core of the value system to adjust the enterprise supply chain, resource allocation, management model, etc. to complete the organizational quality change. Digital intelligence technology is currently applied in the development and utilization of information resources, information security and maintenance, organizational resilience governance, financial management and other aspects. Ma<sup>[1]</sup> believed that "5G+blockchain" can be used to share, operate and store information resources and establish an information sharing platform, and integrate new media technologies such as artificial intelligence and 4D images to operate information websites and expand the scope of information sharing to achieve information dissemination and reception. Gao<sup>[2]</sup> established information security system with intelligent firewall, virtual technology isolation, encryption technology and anti-virus technology as the core by "5G + Cloud Computing" to reduce the risk of information security leakage of enterprises.

Digital intelligence technology has a positive impact on organizational risk prevention and control enterprise employees participate in risk management organization departmental synergy, digital intelligence technology is an important driving force of organizational resilience<sup>[3]</sup>. Zhou<sup>[4]</sup> proposed to build a virtual private network + hybrid cloud as the main body of the cloud network platform combined technology, finance, data to build a firm financial data processing capabilities, according to the big data collection mining financial potential and then through the financial robot to combine financial data and financial potential into scenario applications. Li<sup>[5]</sup> summarized the development mode of manufacturing industry in the context of "cloud + end" industrial integration and "intelligent collaboration + active service", and believes that manufacturing enterprises are empowered by digital intelligence to complete the change from internal organization system to service mode. Smart manufacturing enterprises through digital intelligence technology empowerment to complete quality change represents the transformation of enterprises from digital to digital intelligence, Lin<sup>[6]</sup> from the perspective of digital intelligence environment research enterprise quality development strategy change found that the dynamic nature of the environment and the richness of corporate governance level have inhibiting and promoting effects, respectively, in the role of the environment to improve the level of governance to promote quality change. Smart manufacturing enterprise organization quality change is about the comprehensive change of enterprise quality elements, is through the redundant process of various quality elements interaction and constraints. Huo<sup>[7]</sup> from quality efficiency competition, quality and safety, brand impact, consumer preferences as quality change drivers intelligent manufacturing quality change to provide paths and ideas. The quality change of smart manufacturing enterprises is the key to promote the quality change of manufacturing industry. Qu<sup>[8]</sup> transformed the supply chain management system of manufacturing enterprises based on the approach of stakeholder value network to enhance the intelligent management system and business process reengineering of manufacturing enterprises. Chen<sup>[9]</sup> enhanced the security issues of multi-party collaborative information processing of smart manufacturing enterprises on heterogeneous Internet of Things based on digital twin technology and block chain smart manufacturing framework The positive impact of digital intelligence on enterprise productivity is enhanced by the clustering of technological innovation and productive services, which Yang<sup>[10]</sup> argued that smart manufacturing enterprises enhance enterprise productivity through human capital. The purpose of digital intelligence empowerment in smart manufacturing enterprises is to achieve organizational economic benefits and social wealth with new technological processes, user needs, and innovative quality check methods as the main purpose. Organizational quality change is the result of multi-dimensional diversity together. Digital intelligence empowerment makes smart manufacturing enterprises provide more convenient and effective tools and methods on the road to quality change, while the principles and standards of quality management have changed along with the development of technology and systems<sup>[11]</sup>. Saihi<sup>[12]</sup> also discussed the use of Industry 4.0 technology to apply digitalization to quality management. In this paper, we will discuss what impact the digital intelligence empowerment of smart manufacturing companies will have on organizational quality change.

## **2. The Impact of Digital Intelligence Empowerment on Smart Manufacturing Enterprises**

### **2.1. Internal Organizational Influence**

#### **2.1.1. Organizational Change**

Organizational change ways and methods have changed under the impact of digital intelligence, and traditional value creation and path dependence are no longer applied. The organization realizes new value creation in production and operation through digital intelligence technology, improves the adaptability of intelligent manufacturing enterprises to information systems, and carries out digital

intelligence-enabled organizational change in terms of corporate users, production and operation management, and external cooperation to adjust the conflict between advanced technology and concepts and the original organizational structure and model brought about when enterprises are digitalized<sup>[13]</sup>. Organizational value, management model, personal value, etc. in the process of enterprise digital intelligence empowerment to get a new understanding of the digital platform to optimize the enterprise's goal management to promote management from control to empowerment of the transformation of organizational managers and employees from the original employment to symbiosis<sup>[14]</sup>. The practice and theory of digital intelligence in manufacturing enterprises are still in the preliminary stage<sup>[15]</sup>, and the activities of enterprise management are gradually becoming more complex along with the development of digital intelligence, and the transformation of digital intelligence affects the dynamic balance of human, machine and organization. The theoretical framework of "human-machine-organization" symbiotic system to build an intelligent organization provides ideas for organizational change and digital transformation in the intelligent era.

The digital intelligence environment brings more possibilities for innovation and the more creative and adaptive the organization is, the better it is for the organization to achieve change. Barlette<sup>[16]</sup> discussed the impact of big data analytics on agile organizational change in the context of Industry 4.0, and find that big data analytics enhances enterprise risk management capabilities and risk response capabilities, and improves the organization's ability to identify potential opportunities and threats organizational agility increases. The Smart manufacturing enterprises digital intelligence empowerment to overcome enterprise innovation dilemma, help organizations to change in five aspects of structure, talent, culture, process, leadership style to promote the enterprise to high-quality development.

### **2.1.2. Quality Management**

Through the combination of digital intelligence technology and total quality management, it promotes the further transformation of quality management of intelligent manufacturing enterprises to digitalization, informatization and intelligence. The quality management system of the organization is integrated, networked and information in the digital intelligence empowerment and the real-time dynamic monitoring with data collection, processing and control is carried out in the whole life cycle quality management to ensure the whole life cycle quality management. Zhang<sup>[17]</sup> believed that comprehensive digital intelligence quality management from the operation, measurement, management, monitoring and decision making levels, the advancement of digital intelligence technology has a great impact on quality data collection, product life cycle quality profile management, quality management tools, off-site visualization quality collaborative monitoring, quality prediction and decision making management. Liu<sup>[18]</sup> applied block chain technology to product life cycle management to process heterogeneous data from multiple sources at different stages of the product life cycle and share the processed data into the block chain network to improve product life cycle quality management and the relationship between stakeholders. Anma<sup>[19]</sup> proposed an integrated model of quality management based on digitalization regarding the combination of risk management and quality management, and digital intelligence and digital intelligence technologies to promote the optimization of enterprise quality management models.

At present, smart manufacturing enterprises apply digital intelligence technology in business operation, R&D design, production management and manufacturing execution, mainly in the intelligence of manufacturing process and production management as the main entry point to collaborate with the supply chain to promote innovative changes in production methods, business models and business forms. To establish smart manufacturing factory with data and algorithm-driven accurate industrial quality inspection, efficient planning and iterative process with digital space technology, intelligent machines to collaborate with manual agile operations, quality traceability with

all aspects of quality data, etc., to create a whole process of manufacturing and energy management of intelligent optimization, digital design and flexible production to meet the development of complex system products, individual demand-driven flexible customized production to promote business Smart manufacturing industry with precise innovation, flexible reconfigurable production and manufacturing process digitization.

## **2.2. Organizational External Influence - Business Competitiveness**

With digital intelligence casting high-end industrial advantages, the competitiveness of China's intelligent manufacturing in the market is relatively disadvantageous compared with developed countries such as the United States, Japan and Germany. Yu <sup>[20]</sup> proposed that the competitiveness of smart manufacturing enterprises can be improved from the meson level such as innovation factor promotion, digital information technology support, and policy support and micro aspects such as scale economy and product heterogeneity. Smart manufacturing new generation of information technology and advanced manufacturing technology integration it is the core of improving efficiency, cost, quality, digital intelligence to accelerate the smart manufacturing enterprises to achieve the goal, but also determine the development of the core competitiveness of smart manufacturing enterprises. Wang <sup>[21]</sup> OPC-UA technology, information queuing technology, data compression technology designed the information intelligent manufacturing Internet platform to solve the intelligent manufacturing enterprise "information island", "digital redundancy" and other problems to ensure the enterprise business docking information It ensures the continuity of business-to-business information and enhances the core competitiveness of enterprises. Sun <sup>[22]</sup> Through studying the impact of smart manufacturing infrastructure on enterprise competitiveness, it is found that value network collaboration promotes business efficiency, automated equipment and management promotes enterprise quality improvement, information promotes product innovation and thus smart manufacturing digital intelligence empowerment positively affects enterprise competitiveness. To build a new generation of smart manufacturing enterprises with digital intelligence technology and digital intelligence knowledge to enhance product quality, shorten life cycle and improve business rate to promote the growth of smart manufacturing enterprise competitiveness.

## **3. Organizational Quality Change Drivers**

### **3.1. User Requirements**

User needs gradually tend to be fragmented and personalized with the development of the new round of technological revolution, and smart manufacturing companies carry out quality changes to adapt and meet user needs to shape their unique competitive advantages. The extraction and analysis of consumer demand is the key information input for the unfolding of quality function, and the optimization, configuration and technical characteristics of products are significantly related to consumer demand, Zhuo <sup>[23]</sup> based on online product review mining and fuzzy SETS consumer demand behavior mining response to consumer demand. Sean <sup>[24]</sup> developed a management decision support system based on user demand based on PROMETHEE II method; Wang <sup>[25]</sup> proposed a collaborative management framework for user demand by constructing a user demand database through demand assessment and prediction processing. The intelligent quality management platform is built with demand-driven, and the collected user demand information is sensed, intelligently analyzed and processed with Internet of Things, big data, artificial intelligence, virtual and reality technologies as the core to finally realize the product service intelligence. With intelligent service platform to meet the diversified and diversified needs of users of intelligent manufacturing enterprises, enhance the information retrieval, analysis and utilization capabilities of enterprises in professional,

precise and intelligent services so as to make the product functions of enterprises precise and innovative. Intelligent manufacturing enterprises based on intelligent platform to user demand-driven product and service quality upgrades to enhance the level of enterprise quality management.

### 3.2. Organizational Competitiveness

Mastering core competencies is the key to the long-term development of a company, and consolidating core competencies starts with the reorganization of organizations and processes and quality changes. Valdez<sup>[26]</sup> found that the competitiveness of a manufacturing company grows when the company increases its investment in quality and innovation by studying the causal relationship between process quality and product innovation. To achieve high quality development under the competitive ability to take advantage in the market intelligent manufacturing enterprises need to optimize the technical innovation ability, quality management ability, product import and export quality. Wang<sup>[27]</sup> found that the digital economy improved the technological innovation capability and resource allocation of manufacturing enterprises through empirical analysis such as two-way fixed effect model to improve the quality of product import and export of manufacturing enterprises thus manufacturing enterprise competitiveness. The introduction of management innovation closely combines quality and organizational competitiveness to achieve total quality management and change in quality planning and product release, process quality control, quality inspection combined with new generation information technology to create top competitiveness of intelligent manufacturing enterprises. The level of quality management determines the competitiveness of manufacturing enterprises, and organizational competitiveness drives the organization to actively achieve quality change, and the two promote each other to work together.

### 3.3. Quality Benefits

The most direct means to achieve economic benefits for intelligent manufacturing enterprises is to improve quality efficiency; in the market economy of manufacturing enterprises, product quality is the key to determining the quality of efficiency is also one of the decisive parameters of product excellence, the ultimate goal of quality change to produce high-quality products to meet customer needs. Therefore, if enterprises want to improve quality efficiency, they must improve product quality through quality change. The rise of a new generation of information technology has changed user needs, and enterprises adjust their development direction with market orientation and user needs. When the quality efficiency of smart manufacturing enterprises is in the doldrums, enterprises will reverse the process by changing production processes, updating production equipment, and improving supply chain quality management, etc. Enterprise performance and organizational quality will be improved under data-driven supply chain quality management<sup>[28]</sup>. Product quality unevenness and difficulty in prediction are the focus of quality control in smart manufacturing enterprises. Digital twin-driven quality control is used to build a digital twin model for quality control of critical parts in manufacturing enterprises, and intelligent decision making and optimization through simulation to solve product quality problems. Jain<sup>[29]</sup> achieved a low-cost quality prediction scheme for manufacturing enterprises through a dynamic monitoring strategy centered on product quality, which optimized organizational quality management Reduce product quality maintenance costs. Smart manufacturing enterprise digital intelligence empowerment measures the degree of digital intelligence transformation with quality benefit as an indicator, and uses internal and external information and data to evaluate the change of quality benefit under organizational quality transformation from three dimensions: process control, quality decision management, and quality prediction and evaluation. The level of quality efficiency determines whether the organization will carry out quality transformation, and the organization will carry out quality transformation by

optimizing the management mode and improving the production process when the quality efficiency does not reach the enterprise target standard.

#### 4. Conclusion

The complexity and uncertainty of the development of the digital economy affect the stability of the quality management of intelligent manufacturing enterprises, and the transformation of digital intelligence and industrial changes make intelligent manufacturing enterprises realize digital intelligence empowerment at the same time urgent organizational quality changes to ensure that enterprises adapt to the integration of digital intelligence technology. Digital intelligence has changed the way and method of enterprise organization change, the integration of artificial intelligence and other digital intelligence technology makes the intelligent manufacturing enterprises in the organizational structure, management mode, operation platform, organization staff and other dimensions combined with new technology to achieve "human-machine-organization" as the core management. The quality management ability and competitiveness of the enterprise are also improved after the digital intelligence empowerment. Smart manufacturing enterprises have a positive impact on organizational change, quality management, and organizational competitiveness after digital intelligence empowerment.

The three factors of user demand, organizational competitiveness, and quality efficiency influence organizational quality change from different dimensions respectively. User demand determines the direction of product design and development, organizational competitiveness affects product production quality, and quality efficiency affects organizational quality management, all three factors promote organizational quality to high requirements, high standards, and high productivity to promote organizational quality change. User demand, organizational competitiveness, and quality benefits are changed by the impact of digital intelligence environment, so manufacturing enterprises in the digital intelligence empowerment of organizational change, digital intelligence quality management, organizational competitiveness to increase the positive impact on quality benefits, digital intelligence change user demand trend organization to high-quality intelligent direction of change. Through digital intelligence empowerment, intelligent manufacturing enterprises influence organizational change and quality management and thus promote organizational quality change; the impact of corporate competitiveness to promote quality benefits drive organizational quality change; the effect of user demand drive enterprise digital intelligence transformation to encourage change quality.

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