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Research Article

Path and Mechanism of Industrial Internet Industry Promoting the Transformation and Upgrading of Small and Medium-sized Enterprises with Artificial Intelligence

Yi He

School of Civil Engineering and Architecture, Guangxi Vocational Normal University, Nanning, Guangxi, China

Correspondence should be addressed to Yi He; 888@zcmu.edu.cn

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With the development of intelligent sensing and communication, industrial Internet of Things (IoT) networks have been widely applied in many application scenarios. As a typical application of industrial Internet of Things (IoT) networks, industrial Internet industry has attracted much attention from researchers. Specifically, in the transformation and upgrading of small enterprises in the Internet industry, their paths and mechanisms are very important. The correct path and mechanism of transformation and upgrading can promote national economic growth, strengthen market competition, enhance market vitality, and optimize economic structure. Small and medium-sized enterprises have always been the backbone of my country's economic development, especially in terms of promoting employment, promoting technological innovation, increasing national taxes, and improving people's livelihood. In this paper, when discussing the relationship between knowledge sharing and business performance of SMEs, the organization name is introduced as an intermediate variable. By combining theoretical research and empirical research, a theoretical model is established, research hypotheses are proposed, and the previous research questionnaire is used, by exploiting the intelligent sensing and communication. As a reference, a research questionnaire suitable for the reality and needs of this research was designed. On this basis, this article first has a deep understanding of the research status of comprehensive budget management at home and abroad and analyzes the innovations and shortcomings of this article in the analysis process, understands the mobile Internet, integrates budget management, and integrates information for budget management. It prove the feasibility of helping small and medium-sized enterprises to transform in the mobile Internet environment and analyzes the feasibility of implementation to help small and medium-sized enterprises; it also shows that the industrial Internet industry is helpful to the transformation of traditional industries and is conducive to the transformation and upgrading of enterprises, thereby solving the problem of high cost of building an information platform, reducing the workload of IT personnel and extending the budget Management time provides new ideas for promoting the transformation and upgrading of the Internet for small and medium-sized enterprises, which can increase the efficiency of the small and medium-sized enterprises by more than 40% and greatly increase their profits, through the intelligent sensing and communication. The research of this paper provides important guidance for the application of industrial IoT networks, especially for the intelligent sensing and communication.

1. Introduction

With the development of wireless communication and edge computing, industrial Internet of Things (IoT) networks have been widely applied in many application scenarios. As a typical application of industrial Internet of Things (IoT) networks, Industrial Internet industry has attracted much attention from researchers. Specifically, with the implementation of the "Broadband China" strategy and the rapid development of mobile smart terminals, the Internet has penetrated into all areas of the economy and society and has greatly affected people's living standards, production methods, industrial standards and service levels, and business model. "Internet +" is the improvement, update, surpassing, and gathering of Internet applications. The essence is to use Internet technology to overthrow traditional

business models and new service models in the industry. At present, traditional industrial models and business models have not integrated and penetrated the Internet. Traditional enterprises are faced with high procurement costs, difficulty in clearing inventory, insufficient user stickiness, and lack of understanding of user positioning and user needs, which have seriously affected the development of small and medium-sized enterprises.

Based on the industrial Internet industry and artificial intelligence, in the current economic growth, SMEs are still the backbone of the economy. The scale and number of SMEs are very large. Therefore, only by promoting our own sustainable development can we maintain social and economic stability and realize the well-being of the people and the country. The current dilemma is that transformation is a necessary step for the sustainable development of SMEs. If this step is not taken, the company will inevitably go bankrupt, but it is also very difficult to take this step steadily. Faced with this problem, we use Internet thinking. Conversion and renewal are the starting point for companies seeking growth. From the perspective of management concepts, after entering the Internet, many previous management models have become obsolete. In the era of rapid Internet development, the organization of the company has become difficult, and the company is implementing new innovative models, new operations, and sales. Models and new openings and construction are facing huge challenges. In the Internet age, exploring new management and operating models to replace increasingly exposed bureaucratic management methods and improving inefficient production and operating models is positive for promoting the innovation of related theories.

Starting from the industrial IoT-based upgrade path and mechanism, Ji Liuhe believes that the deep integration of Internet technology and traditional industries has become the future development trend. The application and development of the industrial Internet have created new business models and are becoming the main force in the redesign and modernization of traditional buildings. We determine the connotation of industrial Internet and business models, select the innovation process of business models, theoretically analyze network results and industrial Internet platform models, explore the deep integration mechanism of the Internet, build traditional companies, and establish the Internet, and establish the Internet, technological innovation, and business models. However, Internet technology needs strong algorithm support and also needs continuous improvement and optimization before it can be put into use [1]. Zhu Xiaojing believes that the Internet is a product of the deep integration of a new generation of information and manufacturing technology. The Industrial Internet is an effective choice for the transformation and modernization of manufacturing companies. Manufacturing clusters have a huge advantage in the development of the Industrial Internet. In promoting the development of the Industrial Internet, cluster companies still face difficulties in knowledge, talent, capital, and information security. The government should increase support to encourage the widespread use of the industrial Internet in the cluster. Large companies in the cluster should actively develop the ecological environment and study the application scenarios of the industrial Internet. Small and medium-sized companies should strive to improve the level of digitalization and actively integrate into the industry's Internet platform. However, the transformation of the Industrial Internet requires a lot of funds and time, and results cannot be seen in a short period of time [2]. Wang Yichen believes that the Industrial Internet plays an important role in the digitization, networking, and intelligentization of industries. The development of the Industrial Internet is of great significance for promoting the transformation and modernization of industries, expanding new spaces for the digital economy, and promoting the construction of buildings and power grids. In terms of promoting the transformation and modernization of industries in China's Industrial Internet, there is a gap between platform development and landing applications. There is a gap between the reality of business and platform requirements, there are problems between standard cases and replication and upgrades, and the integration of information technology and operation technology is not enough. There are four unresolved issues in the future, and we must start from these four aspects: perfect Industrial Internet policy system, maintaining the ecology of the industrial Internet platform, accelerating business model innovation and scenario implementation, strengthening the construction of complex talent teams, the development of industrial Internet and the acceleration of industrial transformation and modernization, but the transformation time requires a process, and the speed will be relatively slow [3].

Starting from the industrial IoT-based upgrade path and mechanism, small and medium-sized enterprises are an important contributor to the national economy. However, the ever-changing economic situation has brought many opportunities to small and medium-sized enterprises, but also brought many challenges. A large number of small and medium-sized enterprises have been eliminated by the market in the process of rapid economic development. This article takes small and medium-sized enterprises as the research object, from the perspective of social networks to study the role of social networks in acquiring the three major elements of the transformation and upgrading of small and medium-sized enterprises. Therefore, the research goal of this article is to use social network theory to analyze the role of social network in promoting the transformation and upgrading of SMEs. Specifically, it is through analyzing the influencing factors of the transformation and upgrading of SMEs, summarizing the essence of transformation and upgrading, analyzing and summarizing the mechanism of the social network's acquisition of the transformation and upgrading elements of SMEs, and constructing theoretical models to use empirical methods to effectively illustrate the SMEs' development which is inseparable from social networks, and social networks will actively promote the transformation and upgrading of SMEs [4, 5].

In the industrial IoT networks, relevant scholars have explained the transformation of enterprises, but they have not studied the specific path and mechanism of

transformation. In this regard, the article uses the Internet to explain the transformation of enterprises and the mechanism therein. Finally, it shows that SMEs in the social network must continuously strengthen their own absorptive capacity and actively exert the importance of social network functions, so as to provide theoretical guidance and suggestions for the successful transformation and upgrading of Chinese SMEs by intelligent sensing and communication. The research of this paper provides important guidance for the application of industrial IoT networks, especially for the intelligent sensing and communication.

2. Industrial IoT-Based Path and Mechanism of Transformation and Upgrading of SMEs

2.1. Industrial IoT-Based Transformation Background and Content Layout. From the perspective of the industrial IoT-based path and mechanism of small business upgrading, intelligence, precision, efficiency, and economy are the inevitable trends of future industrial manufacturing. How China's industrial small and medium-sized enterprises change from rough to refined development is a systematic and complex problem. In the context of "Internet+" and Industry 4.0, the world is becoming increasingly flat and everything is becoming more interconnected. "Connectivity" is the core content of the "Internet+" concept [6, 7]. This article explores the influence mechanism and process of the "Internet+" trend on industrial transformation and upgrading at the management level and the actual business process level of the enterprise, and analyzes how the industry uses Internet thinking to achieve strategic, organization, production, and market transformation and upgrading, and put forward policy recommendations on how to realize the transformation and upgrading of my country's industry under the background of "Internet +." The industrial Internet platform is shown in Figure 1.

Figure 1: Industrial internet platform (the picture comes from https://image.baidu.com/).

In the industrial Internet industry, how to make use of the technological upgrading and "Internet +" thinking brought by the new round of industrial revolution to make the connections between enterprises and resources, enterprises and consumers, and enterprises and enterprises more valuable, which is important for promoting the transformation and upgrading of industrial small and medium-sized enterprises. Significantly [8, 9], the specific research content of this paper is as follows:

(1) Distinguish and define confusing concepts such as "transformation," "upgrade," "enterprise transformation," and "industrial upgrading," and explain and differentiate the concept of transformation and upgrading of industrial SMEs under the background of "Internet +."

(2) Based on the analysis of the development process and status quo of my country's industry, the motivations for the transformation and upgrading of industrial SMEs are analyzed from both internal and external aspects.

(3) Put forward the goal of the transformation and upgrading of my country's industrial small and medium-sized enterprises-the concept of smart enterprise and build a network of actors based on the perspective of the value chain, and analyze the mechanism of the transformation and upgrading of industrial small and medium-sized enterprises.

(4) Based on the influence mechanism of the "Internet+" trend on industrial SMEs, study the transformation and upgrading path of industrial SMEs under the background of "Internet+" from four perspectives: production mode, business philosophy, organizational system, strategy, and management.

2.2. Research Methods

(1) Document retrieval method. This article selects foreign industries and domestic related industries as samples, sorts out the theory of enterprise transformation and upgrading, and combines the systematically sorted literature for fusion analysis, and summarizes this. Drawing on the existing research results of others, this research is not only inherited from the predecessors, but also innovative.

(2) Actor Network Theory (ANT, Actor Network Theory). The establishment of an action network diagram between industrial small and medium-sized enterprises and their stakeholders based on the network of actors has strong logic and rationality and is used to define, analyze, and clarify the integration mechanism of "Internet +" and industrial small and medium-sized enterprises [10, 11]. This paper constructs a network of actors in the transformation and upgrading process of industrial SMEs, emphasizing the equivalence between smart products and human subjects in the "Internet +" era and studies the transformation and upgrading of industrial SMEs through the analysis of forced access points and translation analysis of actors.

(3) Value chain theory. The influence of the "Internet +" trend on industrial small and medium-sized enterprises is not only reflected in the value chain of the enterprise itself, but also in the supply of the entire value chain of the business ecosystem, which is composed of resources, enterprises, consumers, and other elements [12, 13]. This article analyzes the important activities in the value chain of industrial small and medium-sized enterprises and their

stakeholders and lays a theoretical foundation for analyzing the mechanism, path and strategy of their transformation and upgrading.

(4) Case study method. The article takes the industrial rise of the industrial power as a reference case, provides case support and reference for the analysis of the paper, and uses Haier Group as a specific case to analyze the transformation and upgrading path of my country's industrial small and medium-sized enterprises to prove the transformation of industrial small and medium-sized enterprises proposed in the article the mechanism and path of the upgrade are typical and maneuverable.

3. Relevance Experiment of Industrial Internet Technology

3.1. Partially Observable Markov Decision Process. In the industrial Internet industry, the essence of MDP is a collection of a series of execution actions to achieve a certain purpose, that is, to maximize the long-term benefits. Therefore, the solution of the MDP problem is also called a strategy [14, 15]. Different strategies are selected for the same problem with different requirements. The specific process is shown in Figure 2.

In the industrial Internet industry, if R_t is used to represent the direct income at time t, then the maximum long-term income expectation from time 0 to k can be expressed as follows:

$$\max E\left[\gamma^n \sum_{t=0}^{k-1} R_t\right] = 0. \tag{1}$$

In the industrial Internet industry, in order to obtain the optimal strategy, so that the long-term return function is expected to reach the maximum value, it is necessary to establish a mapping from state to action, and this mapping relationship is the value function [16, 17]. Then, by calculating the value function, the optimal action to be taken in each state can be determined.

For infinite-order MDP, the validity of the strategy can be verified by defining the value function V [18, 19]. When the system is in state s and the strategy is adopted, the expected system benefits that can be obtained are as follows:

$$V^{\pi}(S) = E\left[\gamma_i^n R\left(s^t, \pi\left(s^t\right)\right)\right], \tag{2}$$

where s represents the system state at time t, Furthermore, formula (2) can be rewritten into a recursive form:

$$V^{\pi}(s) = R(s, \pi(s)) + \gamma \sum_{s \in S} T^{\pi(s)}\left(s, s^t\right). \tag{3}$$

The decision-making action k is made according to the system state at time k and k_1, and the total revenue of the system after all actions are executed can be expressed as follows:

$$V_k^{\pi} = \sum_{ij}^{\pi}\left[r_{ij}^{\pi} + \gamma \times V_{k-1}^{\pi}(s)\right]. \tag{4}$$

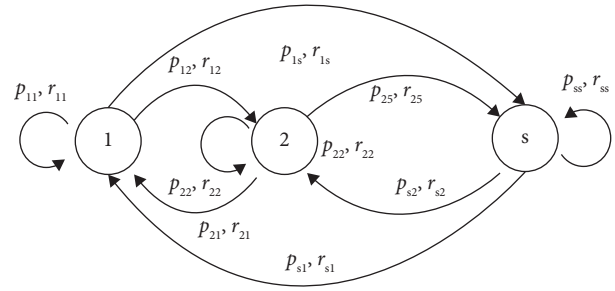

Figure 2: Markov decision process (the picture comes from https://image.baidu.com/).

From the above description of the value function of infinite and finite order MDP, it can be seen that its essence is the only common solution of a series of linear equations, so the value function can also be called an evaluation function (Evaluation Function) [20, 21]. In summary, the essence of solving the MDP problem is to find the optimal action strategy set that maximizes the long-term total profit. Compared with MDP, POMDP can determine the system information in practical problems in time, and the past enterprise income information can be determined in time by determining the status, which is also the advantage of the POMDP method.

3.2. Pomdp Basic Model. In MDP, the choice of strategy is carried out when the state information is completely observable. However, the system status information of many practical problems is sometimes not known, or the accurate status of the system cannot be directly obtained [22, 23]. In such problems, it is necessary to make decisions based on the incompletely known system state, which is the POMDP model. The POMDP dynamic model is shown in Figure 3.

The POMDP model is mainly based on the system state information to act, the system will observe it and update the state information at any time, through such a cycle to obtain the best benefit model. The goal of POMDP is the same as that of MDP, that is, to find an action strategy that maximizes long-term benefits [24, 25]. Similarly, the long-term expected return of the system can be expressed as follows:

$$R_{\exp} = E\left[\sum_{t=0}^{n} \gamma^t r_t\right]. \tag{5}$$

After introducing the belief state, the POMDP is transformed into a Markov chain based on the belief state for solution. According to the Bayesian equation, let b denote the probability distribution of the system in the states after the action occurs in the belief state s and the observation state o, namely:

$$\begin{aligned} b'\left(s'\right) &= \lambda O\left(o \mid s', a\right) \sum_{s \in S} R\left(t^n \mid t\right), \\ Pe(o \mid a, b) &= \sum_{s=i}\left[O\left(o \mid s', a\right)\right], \end{aligned} \tag{6}$$

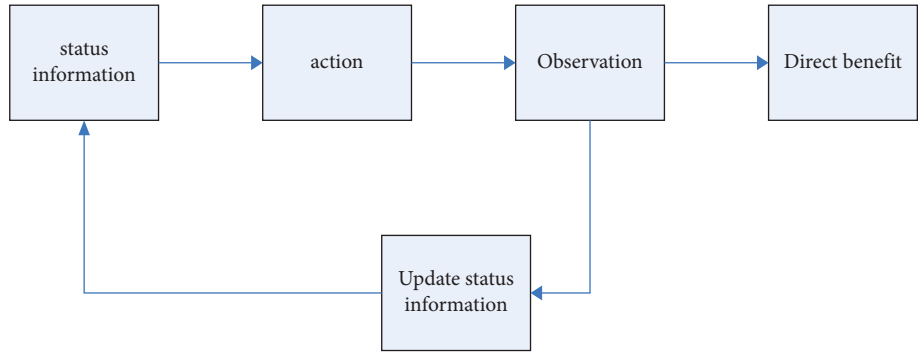

Figure 3: POMDP dynamic model.

where B represents the set of belief state information obtained from the observation state, A represents the set of actions, t represents the transfer function of the belief state, and r represents the revenue function based on the belief state [26, 27]. Among them, the transition function of the belief state can be expressed as follows:

$$t\left(a,b,a^{'}\right) = \Pr\left(a^{'} \mid a,b,o\right) \Pr\left(o \mid a,b\right), \tag{7}$$

and the income function r can be expressed as follows:

$$r(a,b) = \sum_{s=i} b(s)R(s,a). \tag{8}$$

3.3. Pomdp Strategy and Value Function. From the POMDP model, in short, the strategy of POMDP can be understood as a mapping relationship a, b from belief b to action a. According to Bellman's principle, assuming that the initial belief state is b, the expected value of the system's return by adopting the strategy can be expressed as follows:

$$V^{2}(b_0) = \sum_{t=0}^{n} \gamma_t r(a,b) = \sum_{t=0}^{n} \gamma E\left[R(s_t,a)\middle|b\right]. \tag{9}$$

Among them, v is the discount factor and $v < 1$. Similar to MDP, the goal of POMDP is to find the optimal action strategy that maximizes the expected total return [28, 29], namely:

$$\pi^{*} = \operatorname{argmax} V^{n}(b_i). \tag{10}$$

According to equations (10) and (11), the value function of belief b is the maximum system revenue expectation V that can be obtained when the action strategy is adopted, namely:

$$V^{*}(b) = \max\left[r(b,a) + \gamma \sum_{\alpha=0} O(o \mid a,b)\right]. \tag{11}$$

For the finite-stage POMDP, the optimal value function is a piecewise linear convex function, so V can be approximated by a group of finite vectors forming a convex shape [30].

4. Industrial Internet Industry-Based Transformation and Upgrading of Small and Medium-Sized Enterprises

4.1. Investigation and Analysis of Enterprise Transformation and Upgrading Based on Industrial Internet Industry. Based on the industrial Internet industry, in order to ensure that the samples of this study have a certain degree of representativeness, this study conducted a certain analysis and selection on the survey objects. In order to ensure the reliability and validity of the measurement data, the data collection of this study was conducted through questionnaire surveys (including electronic questionnaire surveys). For the questionnaire design, this article uses the Li Ke Characteristic Scale. This table can clearly and intuitively understand the information of various dependent variables, independent variables and intermediate variables, and control variables, and deliberately determine the relevant indicators through the characteristics of the relevant variables.

The research variables in this study are divided into four categories, namely dependent variables, independent variables, intermediate variables, and control variables. The dependent variable is the transformation and upgrading of the enterprise, which is measured from two aspects: product upgrade and function upgrade. The independent variables are the two dimensions of social networks, namely the structural dimension and the relational dimension, which are specifically subdivided into network scale, network density, network centrality and relationship quality, relationship connection strength, and relationship stability. The intermediate variable is the absorptive capacity of the enterprise, which is mainly measured from four aspects: cognitive value, resource acquisition, internalization of understanding, and development and utilization. The control variables are mainly firm size and firm age. See Table 1 for details.

The textile manufacturing industry, metal product industry, handicraft manufacturing industry, and cultural and sports education product industry account for a higher proportion. The reason is that the textile industry, metal product industry, small commodity manufacturing industry,

Table 1: Variable definition table of empirical research based on industrial internet industry.

Variable type	Variable name	Metrics	Symbol
Dependent variable	Enterprise transformation and upgrading	Product upgrade, function upgrade	Trans
Independent variable	Structural dimension	Network size	Size
Intermediate variables	Absorbing power	Cognitive value	Abso
Control variable	Enterprise size	Number of employees	Scale

etc. are relatively developed, and this type of enterprise is the majority. They all belong to small and medium manufacturing enterprises, which are in line with the research of this article, as shown in Table 2.

The IoT-based descriptive statistical analysis of the sample is mainly used to statistically describe some basic statistics of the collected measurement indicators of each variable, such as basic information such as mean, standard deviation, skewness, and kurtosis. Figure 4 describes the statistical information of social networks, control variables, and corporate transformation and upgrading.

Starting from the industrial IoT-based upgrade path and mechanism, as shown in Figure 4, it is generally believed that when the absolute value of the skewness of the sample data obtained in the study is less than 3 and the absolute value of kurtosis is less than 10, it indicates that the sample basically obeys the normal distribution. For the study variables, their mean, skewness, and median were 3.68, 2.64, and 3.88, respectively. The absolute values of the skewness and kurtosis of the data are within and meet the sample standard. Therefore, this study believes that the data in this sample survey basically obeys a normal distribution, which can be used for further data analysis.

The industrial IoT-based reliability and validity of the scale directly affect the results of subsequent data analysis. A good scale should have sufficiently high reliability and validity. The reliability of the questionnaire mainly refers to the reliability, consistency, and stability of the measurement results, that is, whether the test results reflect the stable and consistent true characteristics of the testee.

It can be seen from the coefficient test results in Table 3 that the industrial IoT networks-based reliability values of the variables in this study are all greater than the overall reliability values of the scale to meet the general research standards, so the survey data of this study can be accepted and the next step of data analysis can be carried out. The reliability value is the product of the reliability coefficient and the quantity of the product. In the pair of variable factors, their reliability coefficients are all between 0 and 1, and all are greater than 0.5, indicating that the coefficient can be used to explain the results of the experiment, and there is certain stability.

As shown in Figure 5, this study assumes that industrial IoT networks will promote the transformation and upgrading of SMEs under the intermediate role of corporate absorptive capacity, the better the development of social networks, the more conducive to the transformation and upgrading of SMEs. Since this study divides social networks into two dimensions: structural dimension and relationship dimension, the impact of these two dimensions on the transformation and upgrading of SMEs may be heterogeneous. Therefore, these two dimensions cannot be integrated into a single social network using a simple average method. Instead, we should analyze each dimension to find out its different effects on the transformation and upgrading of SMEs. The following will conduct regression analysis on each dimension of social network one by one. This research puts forward the hypothesis in chapter four: network scale, network density, and network centrality have a positive effect on the transformation and upgrading of enterprises. The absorptive capacity of SMEs is defined as the dependent variable, network size, network density, and network centrality are, respectively, defined as independent variables, and two control variables of firm size and firm age are inserted for regression analysis.

4.2. Industrial IoT Networks-Aided Impact of Industrial Structure Size on the Absorptive Capacity of Small and Medium-Sized Enterprise. After adjusting the three sub-regression models of industrial IoT network scale, network density, and network centrality under the condition of controlling the two control variables of firm size and firm age, the F value is significant, indicating that the model has a good fit. Among them, the regression coefficient between the scale of social network and the absorptive capacity of enterprises has a significant positive correlation, as shown in Table 4.

The previous section has shown the regression analysis of the industrial IoT-network to absorptive capacity and absorptive capacity to transformation and upgrading. The regression results show that social network will enhance the absorptive capacity of enterprises, and absorptive capacity will promote the transformation and upgrading of enterprises. Next, this research will further conduct regression analysis of social network, absorptive capacity and the transformation and upgrading of SMEs to verify the intermediary role of absorptive capacity in the transformation and upgrading of SMEs. The results of regression analysis on the mediating effect of absorptive capacity on the transformation and upgrading of SMEs in the dimension of social network structure are shown in Figure 6.

From the regression analysis results in Figure 6, it can be seen that in the given industrial IoT networks, the three subvariables of the social network structure dimension have reached a significant value under the action of the intermediate variable's absorptive capacity, which has a certain impact on the transformation and upgrading of SMEs. The absorptive capacity is in the social network structure. Dimensions play an intermediary role in the impact of transformation and upgrading.

From the development of industrial IoT networks, we can find that China's advantages in the international intelligent manufacturing industry are mainly reflected in the

Table 2: Industrial IoT networks-based economic proportion.

Industry	Plastic	Crafts	Textile	Metal	Stylistic education	Commodity	Fur leather	Food	Total
Number of companies	17	26	43	28	18	25	12	14	183
Sample specific gravity	9.3	14.2	23.5	15.3	9.8	13.7	6.6	7.6	100

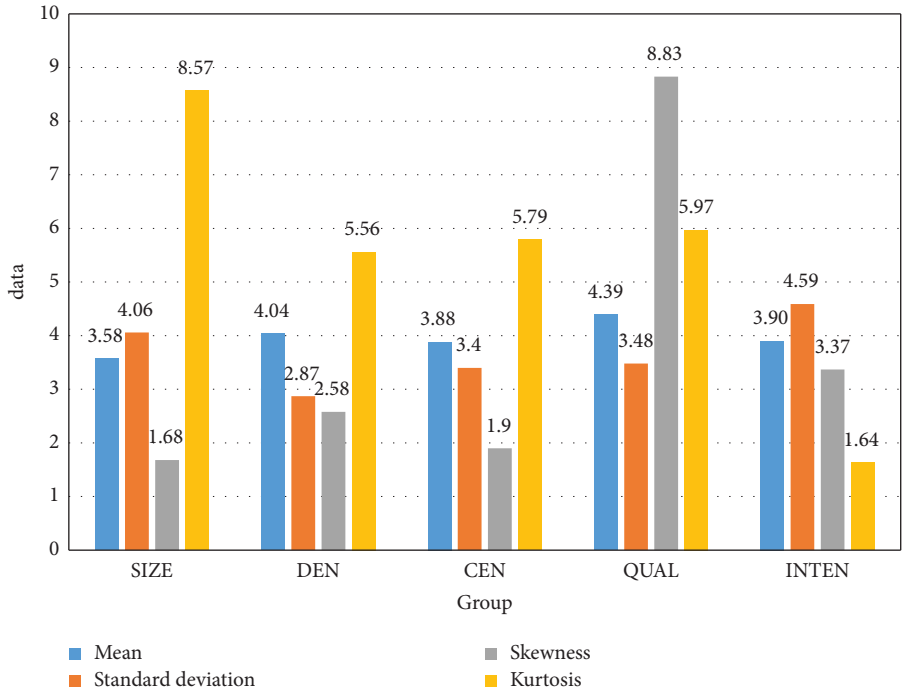

Figure 4: POMDP model-based descriptive statistical analysis of characteristic variables.

Table 3: POMDP model-based reliability measurement of survey scale.

Variable	Number of indicators	Coefficient	Processing method
Size	5	0.701	Accept
Den	4	0.547	Accept
Cen	4	0.589	Accept
Qual	4	0.552	Accept
Inten	4	0.644	Accept

huge market and complete supply chain. Based on the relevant content of the "Twelfth Five-Year Plan for the Development of Intelligent Manufacturing Equipment Industry," by 2015, based on relevant data forecasting and analysis, my country will receive nearly 1 trillion yuan from intelligent manufacturing equipment. Five years later, intelligent manufacturing will become my country's pillar industry and will enable Chinese manufacturing companies to have a certain competitive advantage in seeking overseas market development. Therefore, the formation of a complete set of intelligent system equipment will effectively drive 3 trillion yuan in revenue, of which the domestic market industry will account for more than 60% of the share, and the integration of intelligent equipment will be realized. It can be seen that in the next 10 years, an average annual growth rate of 25% will be achieved in this area. It can be seen that the huge potential of the smart manufacturing market can be seen. When the wave of smart manufacturing and "Internet +" strikes, Chinese smart manufacturing companies hope to rise rapidly in global competition. The growth of the Internet industry is shown in Figure 7.

Taking advantage of the "Internet+" wind, the technology required by the increasingly close connection between people, people and things, and things and things is undoubtedly more diversified. Enterprises must have relevant technical capabilities to open up existing and new markets. The popularization of mobile Internet enables smart hardware to access the network anytime and anywhere, which greatly expands and enriches the functions of smart hardware products. At the same time, China has formed a relatively complete ecosystem including maker-space, hardware foundry, cloud computing services, chip and parts production, overall solutions, channels, application development, and crowdfunding. Only by breaking the original organizational boundaries of enterprises, using the Internet as a basic and platform tool, and through collaborative innovation and collaborative manufacturing, can technology diversified upgrades be achieved. In addition to financial innovations, the legal provisions formulated by the state further clarify the scope of protection of intellectual property rights and improve the content of relevant provisions on infringements. These laws will better purify the

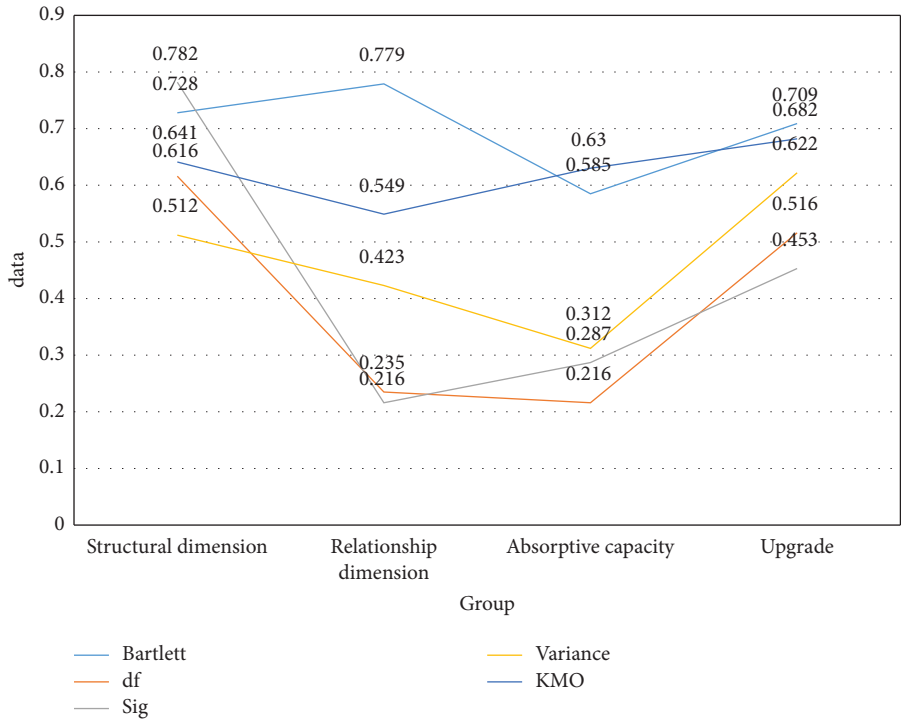

Figure 5: POMDP model-based result table of factor validity analysis.

Table 4: POMDP model-based regression coefficient of network size and absorptive capacity.

Model	R square	Adjusted R square	F	Sig
1	0.802	0.798	171.750	0
2	0.756	0.432	193.243	0
3	0.782	0.647	221.074	0

market, which can encourage more companies to invest more manpower and financial resources to increase business innovation and make corporate transformation successful. From 2010 to 2012, the average annual increase of smart devices in China was about 27. From 2015 to 2020, the number of smart devices increased every year, reaching 200 in 2020, with a total value of 30 billion yuan.

The industrial IoT networks-based organizational structure of industrial organizations has experienced significant modifications as a result of "Internet +." The conventional bureaucratic connection model increasingly disintegrates and is replaced with a network-like connection cycle model. Manufacturing companies will evolve to become "networking, modular, and informationized" in the future. However, the network organization system is differentiated and integrated in accordance with functional modules to form a functional network structure. Examples of these functional modules include the market organization system, the production organization system, the research and development organization system, and the organization system for decision-making. A key decision-making function for enterprise development, such as development goals, development plans, and development policies, is provided by the decision-making organization system. The R&D organizational framework offers R&D support for technical advancement, including standard technologies and significant technological advancements. The production organization system opens up the product, opening the way for technology deconstruction and integration as well as intelligent manufacturing. By establishing market platforms and dredging information routes, the market organization system offers cracking functions for the supply and demand paradox. Each organization system is interconnected, forming an open loop, as shown in Figure 8.

From the development of industrial IoT networks, we can find that the consumer needs will diversify as a result of the quicker integration of local, regional, domestic, and worldwide development brought about by the rapid expansion of the mobile Internet and e-commerce. Consumer demand is an organic blend of high-standard items that are production-oriented and high-quality services that can continuously broaden the business scope for manufacturing enterprises. In this sense, collaborative production will change the organizational design of manufacturing firms and become a development trend. Each enterprise's decision-making organization system, R&D organization system, production organization system, and market organization system can be linked to the corresponding organizational function systems of other enterprises and utilize Internet's borderless capabilities to realize resource sharing and information exchange. This is congruent with the meaning of the earlier-mentioned term "intelligent alliance." By relying on the Internet, every connection in the manufacturing business and every person in every link have become into information communicators. Modern communication software will considerably increase

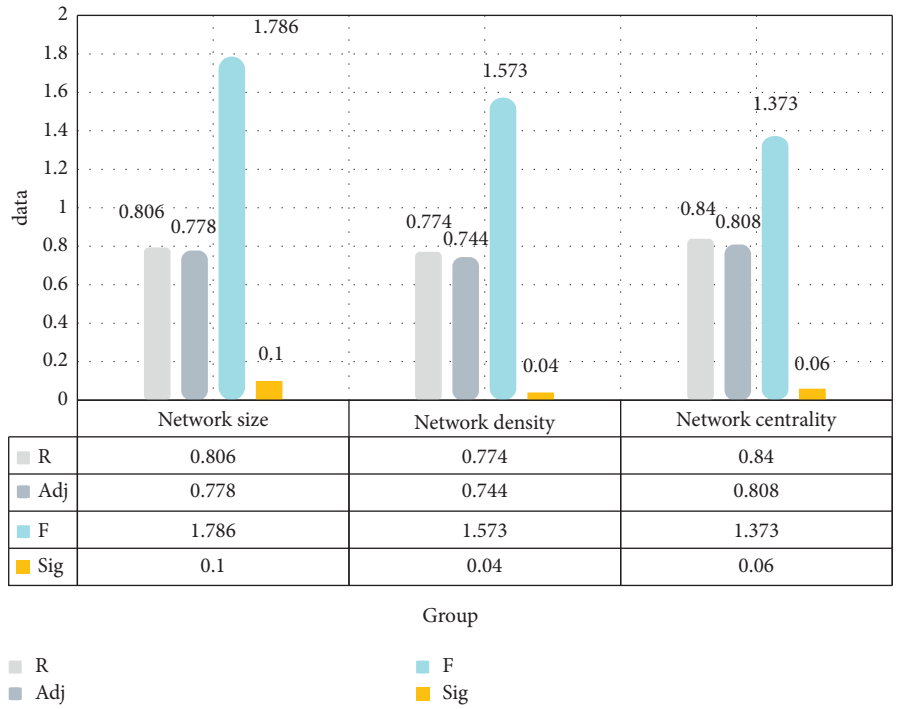

Figure 6: POMDP model and industrial IoT networks-based regression analysis results of enterprise transformation and upgrading.

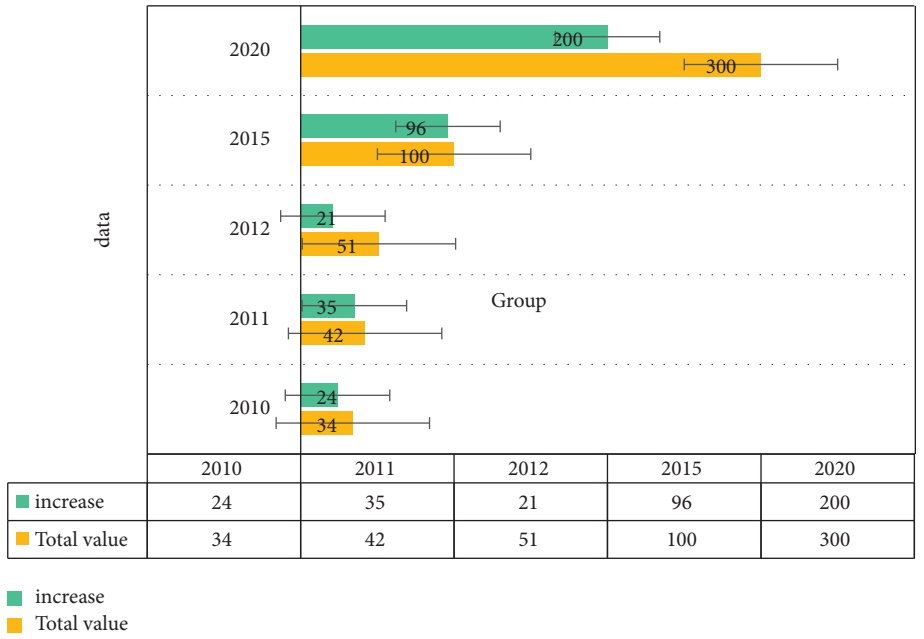

Figure 7: POMDP model-based 2010–2020 growth trend of output value of China's intelligent equipment manufacturing industry.

communication efficiency, which will lay the groundwork for increasing work efficiency. In the industrial sector, the design of a plan essentially aims to increase overall competitiveness. It will use a range of collaborative production techniques in order to increase its own competitiveness. This means that now or in the future, a company has an operating headquarters, but business production is outsourced to other companies. Such virtual enterprises will emerge as the times require. For example, Xiaomi has its own R&D institutions and R&D personnel. The production and warehousing of Xiaomi mobile phones involved are directly outsourced to other companies for operation. It can be said that such an integrated and innovative approach can provide more companies with the space for survival and development, and business management is gradually moving towards a flattened direction. For companies, consumers have become

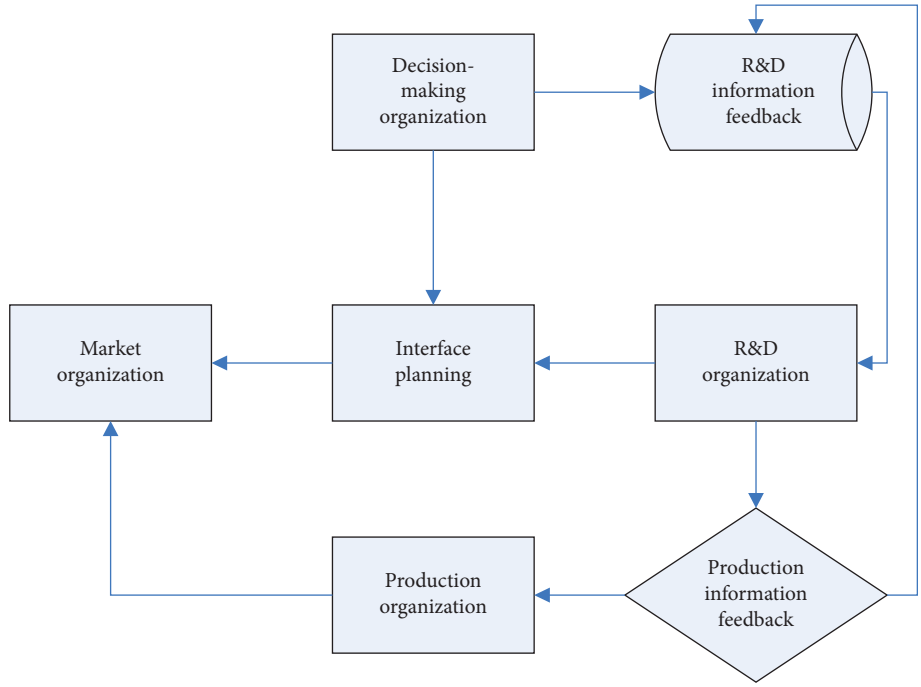

Figure 8: POMDP model-based analysis of the organizational structure upgrade model of manufacturing enterprises.

a key element of corporate strategic decision-making, and this has also become the core force of corporate development. According to the relevant information, the transformation of small and medium-sized enterprises under the Internet is mostly very successful. After the transformation, the enterprise also uses the Internet to improve the profit of the enterprise. Because in the new era, this is also in line with the way most people consume.

In the industrial IoT networks, the dual requirements of not only meeting the efficiency of mass production but also ensuring the accuracy of individual customization determine that the organizational structure of manufacturing enterprises needs to be changed accordingly, and it has the duality of flexibility and efficiency. One is the pyramid structure model. This model is mainly divided into two parts: the front end and the back end. The front end is composed of multiple teams, and the back end is formed by a unified organizational structure. Haier Group uses such a structural model to operate. According to the customer orders obtained by the front end, the production is made by relevant personnel at the back end. Through the acceptance and evaluation of orders by customers in the later stage and the profits enjoyed by relevant personnel, Haier Group guarantees the development advantages of each small team and at the same time, takes into account the high-level operation of the entire large platform, so that it can proceed smoothly.

5. Conclusions

With the development of wireless communication and edge computing, industrial Internet of Things (IoT) networks have been widely applied in many application scenarios. As a typical application of industrial Internet of Things (IoT) networks, Industrial Internet industry has attracted much attention from researchers. Specifically, with the advent of the fourth industrial revolution, the global industrial system is in a critical period of adjusting its industrial structure and reshaping its development advantages. This article then proposes the path of transformation and upgrading of my country's manufacturing enterprises driven by "Internet +," and obtains the different path choices of manufacturing enterprises in the transformation process, which will show the linear and nonlinear characteristics of the transformation of manufacturing enterprises at different stages. From the perspective of the value chain, "Internet+" can penetrate from information transmission to manufacturing, operation, sales, and other value chain links, promote the open integration of the value chain, use the value of the Internet platform, and clarify on the basis of the modular integration of the value chain by the intelligent sensing and communication. For its core competitiveness, we need to choose the right Internet tools to achieve transformation and upgrading. This article introduces the concept of smart enterprise to understand and discuss the transformation and upgrading mechanism and path of my country's manufacturing enterprises driven by the "Internet +," by the intelligent sensing and communication. Although some new viewpoints and conclusions have been obtained through research, and the research results are the construction of smart enterprises, the development of smart manufacturing and Enterprise transformation and upgrading provide reference and reference, but there are still some shortcomings. The weak point in this paper is that the decision-making process is explained in detail, and in the POMDP strategy, only the key points are selected for explanation, and the advantages and disadvantages of the strategy and the impact

on the enterprise are not explained. The unique nature of manufacturing will not change. Because of this, it will become even better with the advent of the Internet. I sincerely hope that this research can make some contributions to the development of my country's manufacturing enterprises and hope that my country's manufacturing enterprises can stride forward to the goal of "a world-class manufacturing enterprise." The research of this paper provides important guidance for the application of industrial IoT networks, especially for the intelligent sensing and communication.

Data Availability

The datasets generated during and/or analyzed during the current study are not publicly available due to sensitivity and data use agreement.

Conflicts of Interest

The authors declare no conflicts of interest.

Authors' Contributions

All authors have seen the manuscript and approved to submit to your journal.

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