Research on the Transformation and Upgrading Path of Traditional Industries Based on Intelligent Manufacturing

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Abstract: Faced with the intensified market competition in traditional industries and the rise of Internet informatization methods, intelligent manufacturing has become a response strategy and means for many traditional production enterprises to transform and upgrade. By expounding the connotation of intelligent manufacturing, this article focuses on analyzing the current status of the development of intelligent manufacturing in traditional production industries and the value advantages of intelligent manufacturing, so as to provide specific solutions for many traditional industries in transition.

1. Introduction

Intelligent manufacturing is embodied in “smart”. With the rise of Internet + APP technology, “smart” is more about getting closer to the end consumers through the latest information and communication technology, knowing the needs of customers through massive data collection and using big data to mine effective information from customers. Advanced manufacturing technology forms an organic fusion of industrialization and informatization in all aspects of manufacturing activities such as design, production, management, and service in the Internet + era.

Since the reform and opening up more than 40 years ago, China's manufacturing industry has developed rapidly, and the scale of its manufacturing industry has leapt to the forefront of the world. By 2010, the total output value of China's manufacturing industry accounted for 19.8% of the total output value of the world's manufacturing industry, 0.4% higher than that of the United States, and China became the world's largest manufacturing country. In 2015, China's manufacturing industry accounted for 22% of the world's total, ranking first in the world (see Figure 1). At present, on a global scale, China has grown into one of the few major manufacturing countries with complete categories and complete systems [1].

At present, as far as the development trend of the global manufacturing industry is concerned, it is actively making changes and gradually developing in the direction of intelligent manufacturing. At the same time, intelligent manufacturing has also received widespread attention in China. Therefore, the country has also proposed a new strategic goal for the manufacturing industry to perfectly integrate industrialization, informatization and intelligent manufacturing, so as to promote China's measures to achieve strong manufacturing. With the progress of the times, many manufacturing industries have taken intelligence as the core of enterprise development, which has promoted the widespread attention of intelligent manufacturing in the manufacturing industry of various countries. Therefore, the development of traditional manufacturing to intelligent manufacturing has become the reform of modern manufacturing industry [2]. China's economic development has entered the “new normal”, on one hand, industrialized countries have adopted the strategy of reshaping manufacturing advantages and implemented the strategy of manufacturing return; on another hand, and some developing countries have used their own advantages to achieve rapid catch-up in manufacturing [1]. Therefore, China's manufacturing industry is facing tremendous dual and two-way development pressures, and it is imperative to transform and upgrade the manufacturing industry.

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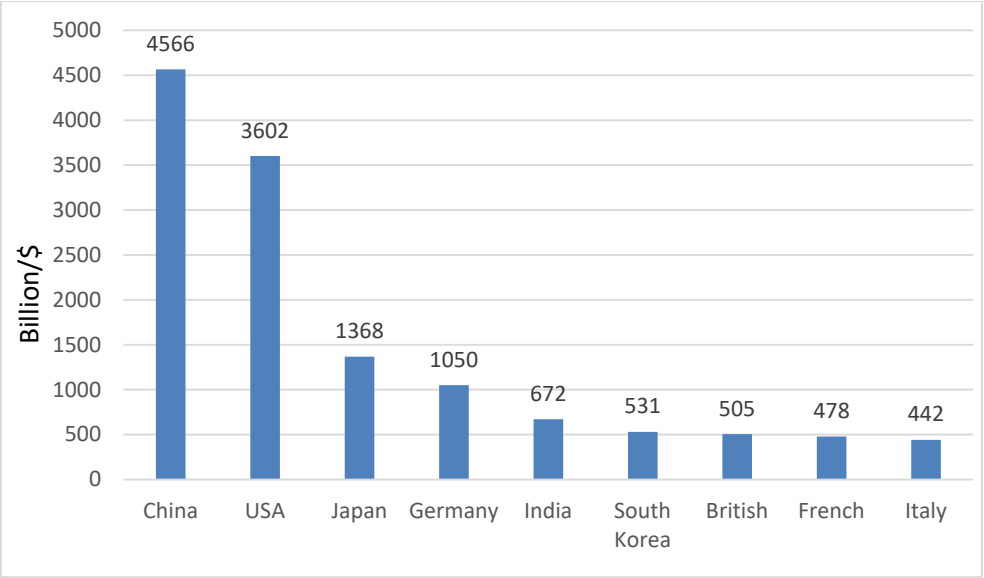

Fig.1 Industrial Output of Major Countries (2016)

2. The Connotation of Intelligent Manufacturing

Intelligent manufacturing is guided by the full life cycle of products, integrating modern information technologies such as the big data, Internet, and the Internet of Things, using data to mine customer demand information and run through all production links in the supply chain, including production, design, and product inventory. For key links such as customer needs, logistics and distribution, and customer relationship management, advanced automated machinery and manufacturing systems are used for flexible production, forming a multi-dimensional intelligent manufacturing system. Improve core competitiveness through intelligent manufacturing, innovate the old labor-intensive model, and turn the traditional manufacturing industry into a high-tech enterprise with high added value and production service [2]. The connotation of intelligent manufacturing is reflected in the following three aspects:

2.1 Organic Integration of Industrialization and Informationization

Intelligent manufacturing is embodied in “smart”. With the rise of Internet + APP technology, “smart” is more about getting closer to the end consumers through the latest information and communication technology, knowing the needs of customers through massive data collection and using big data to mine effective information from customers. Advanced manufacturing technology forms an organic fusion of industrialization and informatization in all aspects of manufacturing activities such as design, production, service and management in the Internet + era [3].

2.2 Smart Factory as the Carrier, Comprehensive and Deep Interconnection

Smart factory is an important carrier to realize smart manufacturing in traditional manufacturing industry. The smart manufacturing system is the core link of the smart factory. The realization of intelligent scheduling in the production process, effective implementation of production and on-demand production, and order-to-order production with zero inventory are the most critical manufacturing nodes and production management nodes in intelligent manufacturing [3]. Oriented by the intelligent production system characterized by data interconnection and interoperability, around the full life cycle of the product, through the creation of a visual and intelligent factory, the production process such as each production unit, process design, deployment and use of smart equipment, and knowledge workers Real-time management and optimization of systems such as the use, execution system, and automated logistics distribution.

2.3 Driven by the Information Data Flow from the Client to the Production End

Modern information technology means that customers can place orders directly online, and the

C+M model and O2O model have become a reality. Traditional manufacturing companies can realize the combination of similar items in personalized customization through intelligent analysis of large-scale orders generated on the Internet. The driving factor of intelligent manufacturing is mainly data. When products can be turned into data, each production process can be connected in series with a set of data, which can realize data exchange through the Internet to realize the entire manufacturing process through collaboration. In short, the intelligent manufacturing link is driven by the information source of the client and the production side, turning customer needs into a production unit of collaborative manufacturing, and realizing large-scale production customization, so as to realize the direct from production to service and from users [4].

3. The Status Quo of the Development of Intelligent Manufacturing in Traditional Production Industries

3.1 The Traditional Manufacturing Industry Has Low Added Value and Unreasonable Production and Sales Structure

China's traditional manufacturing industry is large but not strong. The development of the manufacturing industry is restricted by problems such as land resources and environmental constraints, low added value of products, incorrect production and sales, resulting in inventory backlogs, irrational industrial structure, weak competitiveness, and weak innovation capabilities [4].

3.2 Advanced Manufacturing Machinery Parts Rely on Imports and High Replacement Costs

The production upgrade of intelligent manufacturing requires the use of robots and the improvement of production efficiency. The core components of advanced robots mainly rely on imports [5]. Due to small orders and slow capital turnover, it is unrealistic for some small and medium enterprises to replace workers with robots on a large scale.

3.3 The Development of Intelligent Software Systems is Lagging Behind and the Degree of Independent Research and Development is Low

The “Internet +” Action” clearly proposes to improve the level of networked collaborative manufacturing, and accelerate the transformation of manufacturing services into a series of “Internet +” collaborative manufacturing. The traditional production line operation is far from meeting the requirements of large-scale personalized customization, especially the backward production software system cannot generate a series of automatic instructions to direct the robot operation [6]. Most of the operating systems of CNC machine tools, robots, and production processes in the industry rely on foreign software companies. The software technology of domestic intelligent manufacturing equipment manufacturers is very lagging behind, such as basic operating systems such as CAD, ERP, MES, sensors, and so on. Only some large enterprises can independently develop and produce operating systems based on the characteristics of their products, and integrate them into customers’ individual needs for flexibility [5].

3.4 The Difference in the Basis of Automated Production in Various Industries Makes It Difficult to Upgrade Intelligently

Due to the differences in production automation and digitalization in the original industry, there are big differences in the upgrade paths of smart manufacturing in various industries. What the major traditional manufacturing enterprises produce, the market will provide what products. However, with the development of the integration of the Internet + manufacturing industry, enterprises can control the latest market demand by analysing customer orders, and realize the monitoring of the full life cycle of the product [6]. However, some enterprises have low data integration and comprehensive utilization capabilities, and cannot use massive source data to extract effective customer demand information, and thus cannot be transformed into production data and accurate business decisions.

4. The Strategy and Realization Path of Intelligent Manufacturing in Traditional Industries

4.1 Focus on Customer Needs and Implement Personalized Customization

Through the mobile Internet + e-commerce channel model, actively explore customer needs, encourage customers to participate in the product development process, consumer experience, and enable manufacturing companies to gradually extend from the low end of the value chain to the high end of the value chain to achieve value co-creation throughout the product life cycle and improve services To improve the level of service. In terms of product sales management, through online and offline channels, WeChat official accounts, online shopping malls, Tmall Taobao, mobile e-commerce, cross-border e-commerce and other channels, to broaden the level of customer needs. At the same time, encourage manufacturing companies with a strong foundation in automated production and a certain degree of influence to take the lead in realizing large-scale personalized customization to form smart manufacturing pilot demonstration centers, thereby driving weak small, medium and micro enterprises to gradually upgrade to service providers-based manufacturing companies [7].

4.2 Build a Full Production Service Ecological Chain

With consumers as the core, reconstruct the intelligent manufacturing system of personalized product research and development, flexible production, and mass customization. Through the use of cloud computing, cloud storage, and the Internet of Things, integrate the process of customer participation in the design of product services and increase manufacturing services [7]. The investment and supply of elements will strengthen the deep integration of manufacturing and service industries, and expand upstream of the value chain such as R&D and design to increase the added value of products and realize the value added in the value chain. In addition, with the help of statistical analysis of big data, intelligent product platforms and channel platforms are built to realize the continuation of the ecological chain throughout the life cycle [5].

4.3 Apply Information Technology to Innovate Marketing Methods

Apply the latest information technology to establish a company's own big data system covering the level of customer needs and the internal production process and equipment utilization of the factory. It is necessary to organically integrate information technology with business processes and organizational structures to conduct internal governance of the company [8]. According to customer needs, develop new technologies and new processes, innovate marketing methods and sales channels, etc., and carry out service innovation.

4.4 Government-Enterprise Linkage to Encourage Service-Oriented Smart Manufacturing

For a long time, affected by the development of extensive industries, manufacturing enterprises have excessively pursued scale, determined demand by production, emphasized products and neglected services, and ignored the individual needs of customers [8]. The additional capabilities of products were relatively low. With the introduction of the “Made in China 2025” strategy, companies continue to use smart manufacturing transformation to solve the dilemma of overcapacity, serious product homogeneity, fierce price wars, and rising labour costs. In order to ensure the smooth implementation of the strategy, a government-enterprise linkage strategy should be adopted, that is, through the government's “hands” to build a productive service cluster base, provide appropriate policy inclination and preferential measures in fiscal and taxation and land policies, and improve the service-oriented manufacturing of public services [8]. The system encourages the integration and development of manufacturing companies and service companies to achieve large-scale benefits.

5. Summary

Through the above research and analysis, China's manufacturing industry is transforming towards intelligence, and at the same time, the country has formulated the relevant intelligent manufacturing

strategy, laying a good foundation for the development of intelligence. This article briefly describes the characteristics of intelligent manufacturing and its development process, and analyses the factors affecting the development of traditional manufacturing to intelligent manufacturing. At the same time, through the analysis, proposes the development of traditional manufacturing to intelligent manufacturing. Promoting the development of intelligent manufacturing has been widely recognized.

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