

Research on Blockchain Driving the Transformation and Upgrading of the Manufacturing Industry

Jingshan Chen, Hao Dai

Business School of Hubei University, Wuhan 430062, China.

Abstract: As an important breakthrough for the independent innovation of China's core technologies, the deep integration of blockchain with the manufacturing industry will play an important role in promoting the transformation and upgrading of China's manufacturing industry. Transformation and upgrading of traditional manufacturing industry faces a series of problems, centralized data management, closed production organization activities, weak enterprise independent innovation ability, insufficient supply of blockchain manufacturing talents. Enterprises can make use of the integration of the blockchain technology and the manufacturing industry to drive the transformation and upgrading through decentralization, breaking the data islands, enhancing the independent innovation ability, and improving the collaborative innovation ability of industrial clusters.

Keywords: Blockchain; Manufacturing Industry; Transformation and Upgrading

1. Introduction

Driven by the fourth Industrial Revolution, the manufacturing industry is increasingly becoming digital, intelligent and interconnected, followed by the emergence of new manufacturing models such as digital manufacturing, intelligent manufacturing and network manufacturing, which have had a profound impact on the development direction of the manufacturing industry. The promotion of the achievements of the new generation of information technology in the manufacturing industry has made an unprecedented improvement in production efficiency and a revolutionary change in the production mode, breaking the development bottleneck of stagnant manufacturing productivity, more and more dispersed demand and sluggish innovation in the past decade.

Blockchain technology as a key support technology of information underlying, which also plays an important breakthrough for the independent innovation of China's new generation of information core technology, giving full play to its characteristic role of decentralization, openness, autonomy, information immutability and anonymity. When blockchain and manufacturing are deeply integrated, it gradually forms a distributed intelligent production network, helping the transformation and upgrading of the manufacturing industry in terms of industrial asset digitalization, industrial Internet data security, and multi-party collaborative production.

2. The value of blockchain in the manufacturing industry

With the deepening of digital economy, and the popularization and application of a number of communication technologies such as sensors, Internet of Things and big data have continuously improved the level of manufacturing informatization, making it possible for blockchain technology to be applied to all links of production and manufacturing. All relevant information about all links of the product life cycle, such as product design, procurement, production, quality control, packaging, transportation, after-sales service and recycling, can be added to the chain, which has laid a foundation for the transformation and upgrading of the manufacturing industry.

2.1 Promoting the transformation of manufacturing informatization

First, digital property rights system makes assets intelligent. Whether the tangible assets or intangible assets of an enterprise, the

ownership of digital assets can be confirmed through establishing a clear property right system through the blockchain mechanism. Second, irreversible data information can guarantee data security. The blockchain integrates cryptography and computer technologies such as digital signature, automatic verification, and distributed storage. At the same time, all nodes in the system jointly maintain the same data and information record, so that the data and information in the manufacturing enterprise system cannot be tampered with, so as to ensure the security of enterprise data and information. Third, automated smart contracts can save costs. Once the conditions set by the code are met, the smart contracts on the blockchain can be automatically executed without human intervention, saving a lot of time and labor costs, and improving the efficiency of the enterprise. Fourth, traceability of the information can improve efficiency. Manufacturing enterprises store information on raw materials, parts and products on the blockchain, which can trace the whole production process based on such an immutable and permanent electronic record, greatly improving the transparency of the whole process information and helping all parties to carry out efficient collaboration where does not require mutual trust.

2.2 Promoting intelligent production and management in the manufacturing industry

First, blockchain can improve the level of quality monitoring by preventing arbitrary modification of BOM lists, process information, and machine tool processing procedures. As long as the link data is linked, the quality can be traced to ensure the authenticity of quality data. Second, blockchain technology can realize the information sharing of mutual trust with equipment manufacturers, guarantee the service boundary identification of manufacturers, fully grasp the use of equipment, prevent private external use, understand the real-time production situation, ensure the accuracy of report data, and provide accurate and high-quality data sources for data analysis. Third, blockchain technology can realize real-time quality inspection and certification of the whole process of materials, prevent the theft, running, running and leakage of industrial materials, and track the material flow information in real time. Smart contract implements real-time payment and compensation, and realizes the whole process of materials after the traceability. Fourth, blockchain technology helps enterprises to establish a production accountability system, making personnel management responsibility segmentation, and can connect to multiple sets of control systems, effectively avoid industrial manufacturing security problems caused by malicious tampering of control programs.

3. The dilemma of manufacturing industry transformation and upgrading

3.1 Centralized data management

First, data security is difficult to guarantee. In the traditional manufacturing mode, the enterprise data such as the quality of raw materials, outsourcing parts, equipment operation, production and maintenance records, product inspection records stored in a single, isolated system, once judge the product quality problems and responsibility, enterprise internal departments, service providers and external suppliers are difficult to ensure record consistency and authenticity. Second, problem traceability is difficult. In general, anyone with control of a database can tamper with the data record, and no data record alone can prove their innocence, which increases the difficulty of problem analysis and quality improvement, and adds additional costs.

3.2 Closed production and organization activities

First, organizational management and product value appreciation are constrained. The production organization activities of traditional manufacturing enterprises are relatively closed, and they are not closely connected with relevant departments and enterprises, and the information sharing channels are not smooth, resulting in the limited total amount of internal resources, which seriously restricts the organization and management of enterprise production and the value-added of products. Second, it is unable to take advantage. Traditional manufacturing enterprises blindly pursue the production management mode covering the whole production and operation process of design, production and marketing, making the enterprise cannot focus on a core link, play its advantages, unable to make full use of, all kinds of high quality of external resources for the value-added to the products, also cannot make use of external resources will extend the scope of the boundary to as far as possible.

3.3 The independent innovation ability of enterprises is relatively weak

First, in the transformation and upgrading of the manufacturing industry, blockchain technology can boost the research and

development, production management and sales of enterprises, but blockchain technology is only an auxiliary factor to promote the transformation and upgrading of manufacturing enterprises. The key lies in the independent innovation ability of enterprises and the mining of innovative core technologies and processes. Second, the lack of innovation capacity and R&D investment form a vicious circle. The weak core manufacturing technology leads to the lack of deep integration of manufacturing industry and blockchain technology, which further affects the development of intelligent manufacturing in China. The added value of Chinese manufacturing industry and the profit margin of enterprises are not ideal due to the weak core technology, which in turn leads to the lack of process optimization funds and technology research and development investment of Chinese manufacturing enterprises, thus forming a vicious circle.

3.4 Insufficient supply of blockchain technical talents in the manufacturing industry

First, blockchain technology covers multidisciplinary knowledge. Blockchain technology, as an architectural innovation technology, has a great demand for compound talents. It requires practitioners to master various professional knowledge related to computer technology, cryptography, smart contract, P2P network, mathematics, economics and so on, as well as network programming, compilation, distributed storage and computing. Second, the blockchain talent training system corresponding to the manufacturing industry has not yet been formed. At present, Chinese universities, research institutes and manufacturing enterprises have not yet popularized the scientific research and teaching work of the integration of blockchain and manufacturing industry, and have not yet formed a systematic professional learning system for manufacturing blockchain, leading to the lack of high-end talents of blockchain technology in the manufacturing industry.

4. Policy recommendations

4.1 Optimize the manufacturing and production process

First, Manufacturing enterprises can connect the communication network, control module and system, ERP system, sensors through blockchain technology, and upload to the unified books closed chain, form M2M network. Sharing the data collected on the industrial site with the enterprises and the relevant departments, can realize data decentralization, and ensure the authenticity and reliability of the data. Second, mining data and optimize the quality management system. Analyze and mine the trusted data in the blockchain, accurately and efficiently improve and optimize process, so that the product quality can be truly and effectively improved. Third, using smart contract to save costs and improve the level of intelligent manufacturing. Blockchain-based smart contracts are defined by the code and will be enforced. Once written, they cannot be tampered with, avoiding signature and seal, intermediate guarantee and default processing. In intelligent manufacturing, goods transmission, payment, financing and other businesses can be executed through smart contracts, reducing the dependence on human labor in the process of transaction and reducing human error. Smart contract can also promote the intelligence of devices, which is conducive to improving the real-time analysis, independent decision-making and accurate execution capabilities of devices, so as to further improve the level of intelligent manufacturing.

4.2 Break the data islands and improve manufacturing production decisions

First, the intelligent decision-making of manufacturing enterprises needs massive amount of information, involving enterprise internal data, industry data, market data and even government statistical data. Blockchain technology can clearly confirm the property right subject of the data, and if either party wants to obtain the data, it can exchange equal value with the data subject without going through any third-party platform. Under the premise of keeping sensitive data confidential, blockchain can realize the data sharing between relevant departments and enterprises, which can well solve the problem of *data island*. Second, all the nodes on the blockchain store the same information, which reduces the degree of information asymmetry of enterprises, and enables manufacturing enterprises to obtain intelligent decision information comprehensively, quickly and accurately.

4.3 Excavate the source of innovation power and enhance the innovation ability

First, on the basis of existing technologies, in order to realize the transformation and upgrading of blockchain-driven manufacturing industry, blockchain talent training must go first. Universities and research institutes should provide talent guarantee for

the deep integration of blockchain and manufacturing industry. Colleges and universities should include blockchain technology in the basic courses of schools to improve students' understanding of blockchain. Second, we should increase basic research, pay attention to the research and development of the underlying blockchain technology, accelerate the integration of blockchain and the new generation of information technology such as big data, cloud computing and artificial intelligence and manufacturing, and strive to master the voice in the global blockchain industry competition. In particular, focus on the research and development of asymmetric cryptography technology, consensus mechanism, programmable contract and other blockchain key technologies, accelerate the formation of safe and controllable blockchain product system, and form mature block chain solutions and services in vertical fields.

4.4 Focus on the industrial chain and improve the innovation ability of industrial clusters

First, blockchain can realize production digitalization through smart contract and distributed intelligent production network, thus improving the CNC rate of the equipment of industrial enterprises, and accurately control the production and development progress and costs of enterprises. Second, enterprises can make use of block chain smart contracts and data tamper-proof characteristics to help manufacturing enterprises solve problems such as supply chain and investment attraction. Third, on the premise of sensitive data confidential, manufacturing enterprises can share data with the upstream and downstream enterprises of the industrial chain, so as to enhance the synergy of the industrial chain, constantly optimize the industrial chain structure, and promote the high-quality development of the manufacturing industry.

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Author introduction: Jingshan Chen, master student of Business School of Hubei University; Hao Dai, lecturer of Business School of Hubei University, master tutor, doctor of management, postdoctoral fellow of economics, software engineer, research direction of industrial innovation and enterprise growth.