

# Research on the Collaborative Innovation Mechanism of Liuzhou Automobile Manufacturing Supply Chain Enterprises from the Perspective of Block Chain

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**ABSTRACT.** Block chain is a disruptive information technology with great potential for development. It has typical characteristics such as decentralization, distributed equivalence, chained data block, forgery and tamper-proof, transparency and credibility. Block chain can fundamentally solve the cheating phenomenon in the process of information and value exchange and transfer to collaborative innovation, thus reducing innovation cost and improving innovation efficiency. Taking liuzhou automobile manufacturing industry as an example, this paper explores the strategy of collaborative innovation mechanism of liuzhou automobile manufacturing supply chain enterprises from the perspective of block chain.

## 1. Introduction

The rapid emergence of blockchain has attracted global attention. China's 13th five-year plan lists blockchain, quantum communication, artificial intelligence and other technologies as major tasks and key projects during the 13th five-year plan period. The innovation of liuzhou automobile manufacturing supply chain enterprises involves many subjects. The r&d and innovation of product technology requires the participation and cooperation of the upstream and downstream of the supply chain. Due to the differences in the goals of the innovation subjects and the lack of trust, the cooperative subjects, information, interests, trust and other opportunistic risks exist on the collaborative innovation process of the automotive supply chain enterprises. The features of block chain, such as decentralization, transparency and tamper-proof, can more effectively solve the problems of collaborative innovation and improve the level and efficiency of collaborative innovation. Based on this background, this paper analyzes the strategy of collaborative innovation mechanism of liuzhou automobile manufacturing supply chain enterprises from the perspective of block chain.

## 2. Theoretical Basis

Blockchain was proposed by a scholar named Satoshi Nakamoto in 2018. The blockchain described in the literature is a kind of decentralization Shared general ledger that is not temporal and cannot be forged by combining data blocks of specific data structures in a chain of a chronological order, and is guaranteed by cryptography [1]. In the white paper on China's blockchain technology and application development (2016) released by the ministry of industry and information technology of China, blockchain is defined as a new application mode of computer technology such as distributed data storage, point-to-point transmission, consensus mechanism, encryption algorithm, etc. It is a decentralized and trusting infrastructure and distributed computing paradigm [2]. The main features of blockchain are open consensus, decentralization, transparency of anonymous transactions and tamper-proof.

An earlier definition of collaborative innovation abroad was given by Peter, a researcher at the Massachusetts institute of technology in the United States. He believed that collaborative innovation is a collective vision formed by a network group composed of self-motivated people, who communicate ideas, information and work conditions through the network to achieve common goals through cooperation. Xiong Y, an early domestic scholar on collaborative innovation, believes that collaborative innovation is a collaborative innovation activity in which universities, enterprises and research institutes invest their own superior resources and research capabilities to jointly carry out technological innovation with the cooperation of the government, research service intermediaries and other relevant subjects [3]. Since then, about the definition of cooperative innovation, the domestic scholars from different angles, different explanation is given, and the high recognition of which is system such as the definition of cooperative innovation, namely, collaborative innovation is the enterprise, government, knowledge production organization (university, research institute), intermediary agencies and users in order to implement the major scientific and technological innovation and to carry out the value-added knowledge as the core, large span integrated innovation organization pattern [4].

### **3. Current Situation Of Collaborative Innovation in Liuzhou Automotive Manufacturing Supply Chain Enterprises**

Liuzhou automobile industry is the pillar industry of liuzhou. It is one of the seven demonstration bases of automobile industry in China. In 2018, the annual output of liuzhou automobile exceeded 2.15 million, and the automobile industry continued to lead the whole city. Under the large automobile enterprise strong pull, also obtained the rapid development of auto parts enterprises, more than about 500 liuzhou existing automobile and parts manufacturing enterprises, constitutes "the Guantang, "pioneer park, Yang and industrial district, Luowei industrial concentration district" automobile industry cluster, and formed many 432 auto parts enterprises, the total assets of nearly 57.8 billion yuan, staff more than 50000 people, products include engine, gearbox, axle, rims, shock absorber, refrigeration compressor, and air conditioning system, automobile body covering parts, stamping weldments, both inside and outside decoration, and other important components, has been formed a relatively complete industrial chain, among them, Automobile transmission, automobile axle and other parts for liuzhou local matching rate of up to 70%, forming a relatively complete industrial chain and industrial agglomeration effect.

At the same time, the development of liuzhou automobile supply chain enterprises is obviously lagging behind, and the "short leg problem" of automobile supply chain enterprises has become an important factor affecting the development of liuzhou automobile industry, among which the main problems can be summarized as six points: first, the obvious situation of "scattered, small, heavy and low." "Dispersion" means that the advantages of the vehicle have not been fully reflected, the professional agglomeration effect is not prominent, the parts enterprises are in the state of dispersion, the lack of a complete supply chain system. "Small" means small scale of production (except engine), small supporting range and small export volume. "Heavy" means repeated set up, repeated construction and repeated production. "Low" means that compared with other major cities in the automotive industry in terms of investment in complete vehicles and main engines, the investment in spare parts is less and the level of industrial development is lower. Second, lack of technical support. Liuzhou automobile manufacturing supply chain enterprises have been relying on their own rolling development, lack of continuous technical support. Third, the development of the vehicle and parts is very inconsistent. Liuzhou vehicle manufacturing industry in terms of market share has achieved the national top several proud achievements, but the development of the automotive manufacturing supply chain in the middle and the lower level. Fourth, the lack of financial security for sustainable development. On the one hand, liquidity is tight, enterprise production organization difficulties. On the other hand, the financing channels of smes are not smooth, the funds available for investment or operation are very limited, and it is difficult to make

large-scale investment and further expand the business scope. Fifth, automotive manufacturing supply chain enterprises rely too much on local host enterprises, dedicated parts more universal parts less.

#### **4. Analysis of Collaborative Innovation in Liuzhou Automobile Manufacturing Supply Chain Enterprises**

Since the 1980s, many domestics and foreign automobile manufacturing suppliers have started to carry out collaborative innovation with vehicle manufacturers, and have been more involved in the innovation activities of vehicle manufacturers, including technical improvement, new product development and product update. Compared with the vigorous development of collaborative independent innovation of automobile supply chain at home and abroad, the collaborative innovation of liuzhou automobile supply chain is still in the initial stage. Not only are fewer enterprises involved in collaborative innovation, the degree of collaboration is low, but some problems inevitably exist. In liuzhou automobile supply chain, the problems of collaborative innovation between vehicle manufacturing enterprises and parts enterprises are more prominent.

Due to the lack of good collaborative innovation platform and opportunities, liuzhou vehicle manufacturers and parts suppliers still maintain the traditional relationship of buying and selling. There are several main reasons for the collaborative innovation among supply chain enterprises[5]. First, liuzhou automobile supply chain enterprises lack of mutual communication and trust. Liuzhou automobile manufacturers and suppliers of communication between generally limited to the purchasing department and the supplier's sales department, information communication is limited to order the goods, the manufacturer's engineers are reluctant to share with the supplier's engineer technical information and afraid of opportunistic behavior, lack of trust each other, they are reluctant to take the initiative to communicate information about product development, design. Secondly, the nodal enterprises in the automotive supply chain have insufficient awareness of risk sharing and benefit sharing. In the automotive supply chain, enterprises at each node lack the awareness of risk sharing and benefit sharing, and focus more on short-term interests and ignore long-term interests. Risk sharing and benefit sharing are the basis of collaborative independent innovation among supply chain enterprises. Whether risk sharing and benefit sharing can be achieved will directly affect the quality of cooperation between enterprises and the length of cooperation period. Due to the lack of long-term vision and other reasons, liuzhou enterprises basically failed to achieve risk sharing and benefit sharing with the collaborative independent innovation relationship of supply chain, blindly pursuing short-term interests. Third, participation in collaborative independent innovation is insufficient. Due to vehicle manufacturers and parts suppliers on both sides to stay on the common parts of collaborative development, and for the development of key components, manufacturers often reluctant to let suppliers to participate in, the suppliers participate in collaborative innovation degree is not enough, which seriously affected the establishment and development of automotive supply chain collaborative innovation relations. Fourth, the time lag of independent innovation between suppliers and manufacturers and the low degree of information sharing. Suppliers often participate in manufacturers' new products, process development and other technological innovation activities, and there are often problems such as late participation and low transparency of sensitive information between each other.

#### **5. Strategy Construction of Collaborative Innovation Mechanism Of Liuzhou Automobile Manufacturing Supply Chain Enterprises Under Block Chain Technology**

(1) Block chain is used to strengthen the driving force mechanism of collaborative innovation

Due to the platform of collaborative innovation of supply chain based on the block chain information content is transparent, and each node can receive block chain platform related enterprises and other enterprises and institutions of the supply chain collaborative innovation information[6], it will break the barrier of the cooperative innovation between enterprises, push the

car manufacturing supply chain enterprises independent innovation ability and the innovation ability, accelerate the collaboration between supply chain enterprises through cooperation, cooperation, innovation, and other forms to absorb the advanced scientific and technological achievements and technology resources into manufacturing supply chain collaborative innovation activities, Furthermore, through the open dissemination of collaborative innovation information on the block chain, it provides the willingness and motivation for collaborative innovation of supply chain enterprises.

(2) Block chain is used to enhance the trust mechanism of collaborative innovation

The trust problem caused by the uncertainty risk such as behavioral risk and contract risk is one of the insurmountable barriers to the collaborative innovation development of liuzhou automobile manufacturing supply chain enterprises. Only by resolving the problem of trust in the two sides can we promote the sincere cooperation. Since data onto the block chain platform cannot be tampered with at will, this provides an effective way to solve the trust problem with collaborative innovation[7]. Relying on block chain technology, enterprises in the supply chain can quickly establish trust relationships, and due to the non-tamperability of data, the degree of information asymmetry is greatly reduced, and the communication cost between enterprises will be reduced. In addition, based on a block chain platform, the consensus of the mechanism, enterprise in the supply chain can develop a collaborative process used in collaborative innovation, and has set up the trust relationship, this process can effectively guide the enterprise cooperative innovation, and form a dynamic enterprise in the supply chain collaborative innovation alliance, produce attract high-quality enterprises, eliminate the bad effect[8].

(3) Using block chain to strengthen collaborative innovation resource supplies mechanism

According to the relevant research data, the independent innovation and collaborative innovation of liuzhou automobile manufacturing supply chain enterprises are restricted by capital and talents. Limited by various reasons, the traditional financial supply and its allocation efficiency are low, unable to meet the needs of supply chain enterprise innovation and development. Relevant departments should step up to block chain technology applied in liuzhou automobile manufacturing supply chain big promotion, based on block chain of automobile supply chain financial ecosystem, establish dynamic credit evaluation system, set up more upstream and downstream of micro, small and medium enterprises and financial companies such as Banks, investment firms connected to achieve more social main body participation, and between each main body through the block chain technology to establish trust relationship of cooperation, so as to promote the cooperative innovation between enterprises of supply chain for a long time, promote the sustainable development of the auto industry of liuzhou. In addition, in the collaborative innovation process of automotive manufacturing supply chain enterprises, block chain technology can be introduced to build a block chain technology platform for enterprises, universities, research institutes and innovative talents for the development of enterprises. In addition to technical talents to carry out r&d and production innovation, automobile manufacturing collaborative innovation member enterprises also need human resources like entrepreneurs to realize management and service innovation.

(4) Block chain is used to strengthen the guarantee mechanism of collaborative innovation

A good supply chain operating environment can not do without a good mechanism to ensure[9]. Similarly, the guarantee mechanism of liuzhou automobile manufacturing supply chain is not perfect, which also becomes another obstacle to the collaborative innovation of enterprises in the supply chain. The emergence of block chain technology brings a brand new solution to this problem. The participants of the supply chain collaborative innovation platform should rely on the block chain to find, track and deal with all kinds of dishonesty in collaborative innovation, so as to restrain the participants' bad behavior. If individual companies have dishonest ACTS, can not fulfill responsibility by the electronic contract, the enterprise will have a bad credit history to present on the block chain, other enterprises on the supply chain can choose not to cooperate or severe punishment policy, credit deficiency about the severe punishment will weaken the breach the

reputation of the enterprise, reduce the opportunity of cooperation, and may even because of the existence of bad credit records was forced to withdraw from the supply chain, so as to guarantee the supply chain collaborative innovation. In addition, once the opportunistic behavior of supply chain enterprises is identified by the block chain, it will also lead to the crisis of cooperation and trust with the supply chain. If the opportunistic behavior of supply chain enterprises is not found, the default risk that may occur to the customer side will be traced back to the key problems through the block chain technology. Therefore, in view of the possibility of the existence of opportunistic behavior on manufacturing supply chain and its bad consequence, supply chain cooperation will inevitably attaches great importance to the trust factor, and form a kind of supply chain collaborative innovation based on the technology of block chain safeguard mechanism, used to reduce risk in the process of supply chain collaboration innovation and bad behavior in the process of collaborative innovation between supply chain enterprises.

## 6. Conclusion

Taking liuzhou automobile manufacturing industry as an example, this paper analyzes the current situation and problems of collaborative innovation development of supply chain enterprises in liuzhou automobile manufacturing industry. It is found that the main problems of collaborative innovation in liuzhou automobile manufacturing industry include: low success rate of collaborative innovation projects, lack of collaborative innovation in new product development, insufficient technical exchange among supply chain enterprises, etc. The reasons are as follows: lack of communication and trust in enterprises, insufficient awareness of risk sharing and benefit sharing among nodal enterprises, and insufficient participation in collaborative independent innovation. In view of the above problems, combined with the collaborative innovation mechanism under the block chain technology, it provides support and guarantee for collaborative innovation from the aspects of power, resources, trust and incentive, so as to better promote the level and efficiency of collaborative innovation of supply chain enterprises in liuzhou automobile manufacturing industry.

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