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Creating New Productivity: The Practice and Breakthrough of Liuzhou Intelligent Terminal and Robot Industry Innovation Ecosystem

Songxing He[1], Linhao Yang[2]*

1.Liuzhou Institute of Science and Technology Information, Liuzhou, Guangxi Zhuang Autonomous Region, 545000, China
2.Guilin university of technology, Guilin, Guangxi Zhuang Autonomous Region, 541000, China

Corresponding author: Linhao Yang, 3369168540@qq.com

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Abstract: Under the background of accelerating the global scientific and technological revolution and industrial transformation, the intelligent terminal and robot industry has become a key field to measure the level of national scientific and technological innovation and manufacturing industry, and also an important starting point for cultivating new productivity. As the core city of Guangxi ‘s industry, Liuzhou is actively promoting the transformation and upgrading of industrial structure from traditional heavy industry to intelligent and digital, and focusing on building a modern industrial system with intelligent terminals and robot industry as the breakthrough point. Based on the theory of innovation ecosystem, this paper analyzes the construction path and practical effect of Liuzhou intelligent terminal and robot industry innovation ecosystem from three dimensions of supply end, organization end and demand end, and analyzes its progress in industrial linkage, digital empowerment, technical support and institutional guarantee. It points out that there are still development problems and puts forward corresponding solutions to help Liuzhou build an intelligent terminal and robot industry cluster with regional characteristics, and provide practical reference for Chinese modernization and high-quality development of local economy.

Keywords: New Quality Productivity; Intelligent Terminal; Robot Industry; Innovation Ecosystem

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1.Introduction

Stimulated by the rapid growth of the global economy and the continuous innovation of science and technology, the robot industry and intelligent terminals have become the focus of competition among countries. They are included in the judgment index of a country’s scientific and technological innovation ability and manufacturing level, and become an important direction for the future technological development of the world[1]. In recent years, with the rapid progress of software and hardware technology, the product continues to be iteratively upgraded, the application scenarios and service models continue to expand, and the intelligent robot presents an increasingly strong market demand. China attaches great importance

to the development of the robot industry and lists it as a national strategic new industry. In the "14th Five-Year Plan for Robot Industry Development" it is clearly stated that China should become a new source of global robotics, a high-end manufacturing cluster and a new highland for integrated applications. At present, the overall development level of China's robot industry has been steadily improved, the application scenarios have been significantly expanded, the localization process of core components has been accelerating, the advantages of collaborative robots, logistics robots, special robots and other products have been continuously enhanced, and a large number of innovative enterprises have emerged. Accelerating the technological revolution of intelligent terminal and robot industry is not only an important part of modern manufacturing industry, but also has great potential in improving production efficiency, reducing labor intensity and saving costs. As the industrial core city of Guangxi Zhuang Autonomous Region, Liuzhou City has long relied on traditional heavy industries such as steel, machinery and automobile manufacturing to develop its economy. It is facing the challenge of relatively single industrial structure and insufficient driving force for innovation and transformation. Under the dual requirements of the country's transformation and upgrading of traditional manufacturing industries and the intelligence and digitization of global manufacturing industries, promoting the transformation of intelligent terminals and robot industries has become the only way for the innovative development of traditional industrial cities with industrial foundations. According to "The requirements of the 14th Five-Year Plan for Economic and Social Development of Liuzhou City "and the" Implementation Opinions of the Liuzhou Municipal Committee of the Communist Party of China on Implementing the Spirit of the Third Plenary Session of the 20th Central Committee of the Communist Party of China to Further Deepen the Reform and Promote the Practice of Chinese-style Modernization in Liuzhou". Liuzhou should actively cultivate the intelligent terminal and robot industry as the fourth pillar industry, develop the new productivity system and mechanism according to local conditions, and build a "3 + 3 + X" modern industrial system. Through the "Implementation Opinions on Promoting the Development of Intelligent Terminal and Robot Industry in Liuzhou City", it can be seen that the city has further clarified the development direction, path and measures of intelligent terminal and robot industry: intelligent terminal, focusing on the development of artificial intelligence network equipment, intelligent electrical equipment, drones and electric vertical take-off and landing aircraft, smart home, intelligent medical equipment, intelligent teaching equipment, etc. The robot industry focuses on the development of industrial robots, humanoid robots, service robots, logistics robots, inspection and maintenance robots, and robot integrated applications. In October 2024, the Liuzhou Municipal People's Government held the ' Liuzhou Intelligent Terminal and Robot Industry Development Cooperation Conference' and issued the 'Nine Measures of Liuzhou City to Support the Development of Intelligent Terminal and Robot Industry (the first batch) ' (hereinafter referred to as the 'Nine Measures'), which also clearly gave strong support to industrial development. However, there is still a gap between Liuzhou 's local industries and developed regions in terms of scale, innovation ability and industrial chain integrity. In order to enhance regional competitiveness, Liuzhou urgently needs to build an intelligent terminal and robot industry innovation ecosystem that adapts to the era of digital intelligence manufacturing.

2.The theoretical connotation of intelligent terminal and robot industry innovation ecosystem

The concept of innovation ecosystem came into being in the 1990 s [2]. The American Competitiveness Commission defined the innovation ecosystem as an organic unity composed of social and economic systems, basic research, financial institutions, institutions of higher learning, science and technology, and human resources in the report "Innovating America-Challenge and Change. " Through the transformation from the main body in the research innovation system to the dynamic interaction process between the research subjects and between the system and the environment, the evolution of the innovation analysis model is realized [3]. The essence is that each innovation subject within the innovation ecosystem exerts its own heterogeneity to carry out collaborative innovation with other subjects, realizes value creation, and forms an interdependent and symbiotic evolution of the innovation ecosystem [4] (Miller, Hankeke and Luo, 2002) [4]. The network collaboration between different organizations and subjects breaks the traditional industry barriers and realizes the deep integration and sharing of multi-party resources[5]. For the theoretical research of innovation ecosystem, most Chinese scholars refer to the foreign mainstream theories of open innovation proposed by Chesbrough et al[6].and ecosystem collaboration proposed by Adner et al[7]. Based on

this, based on the theory of business ecosystem, this paper defines the innovation ecosystem of intelligent terminal and robot industry as the system productivity of technological achievement transformation, industrial chain value-added and regional economic upgrading, which is composed of enterprises as the main body of innovation, based on the innovation environment, with technological innovation as the core driving force, through the coordination of supply side, organization side and demand side.

2.1 Supply side: technological innovation and change

The innovation ecosystem has three dimensions, namely, innovation subject, innovation resources and innovation environment[8]. The fundamental connotation of the upgrading of the intelligent terminal and robot industry is innovation-driven, which is manifested as technological progress and industrial change on the supply side.

As far as the main body of innovation is concerned, enterprises are the most important investors in innovation. In 2016, the Central Committee of the Communist Party of China and the State Council issued the " Outline of the National Innovation-Driven Development Strategy" and formally proposed the implementation of the innovation-driven development strategy. In theory, the enterprise is the most important role in innovation activities. Under the condition of socialist market economy, enterprises, as the main body of market economy, directly participate in market competition. In order to meet the ever-changing product demand of customers, enterprises need to increase the production input of technological innovation and product innovation, and avoid fading out of market competition through long-term innovation. Therefore, it is the center of innovation resource integration and the output center of innovation achievements. From a practical point of view, the innovation subject of enterprises is irreplaceable in absolute position. General Secretary Xi Jinping pointed out when attending the deliberation of the Jiangsu Delegation at the Third Session of the 14th National People's Congress: "To promote the integration of scientific and technological innovation and industrial innovation, we must build platforms, improve institutions and mechanisms, strengthen the principal role of enterprises in innovation, and ensure seamless integration between the innovation chain and the industrial chain. "To promote the deep integration of scientific and technological innovation and industrial innovation, the key is to strengthen the dominant position of enterprise scientific and technological innovation[9]. Strengthening the dominant position of enterprises's cientific and technological innovation is conducive to giving full play to the role of enterprises in the whole chain of innovation. General Secretary Xi Jinping proposed in the report of the 20th National Congress of the Party to "strengthen the main position of enterprise technology innovation and give full play to the leading and supporting role of technology-based backbone enterprises". Liuzhou can build an innovation community around the main chain enterprises, which is "led by the main chain enterprises and coordinated by specialized, specialized and new small and medium-sized enterprises." and give full play to the pioneering role of leading enterprises in science and technology. With the help of leading manufacturing enterprises such as Liugong and Wuling, Liuzhou can promote the independent innovation of the whole process and the whole industrial chain of enterprises, promote cross-border integration and innovation by means of technology penetration, and form a two-way synergy of "driven by the demand side and empowered by the supply side " (Jacobides et al., 2018).

As far as innovation resources are concerned, the intelligent terminal and robot industry help the transformation and upgrading of traditional enterprises, opening up a new track of strategic emerging industries and future industrial development. Several industrial revolutions in history are marked by the technological innovation of a single industry, which in turn forms a radiation-driven effect on upstream and downstream industries[10]. The intelligent terminal and robot industry injects youthful vitality into the allocation of production factors, further releasing the innovation vitality of traditional production factors such as labor and capital. The industry integrates modern science and technology, constructs the value co-creation mode of human resources and machine efficiency, effectively promotes the intelligent transformation of production, and helps enterprises to realize intelligent production. From the procurement of raw materials to the monitoring of production process to the quality control of finished products, every detail can be optimized by means of big data, artificial intelligence, Internet of things and other technologies. It not only helps workers to innovate their own knowledge structure, thinking mode and innovative methods, but also saves operating costs for enterprises. The remaining resources can be further invested in innovative research and development to create conditions for a new round of technological renewal.

As far as the innovation environment is concerned, technological progress and industrial transformation on the supply side are the trend of the times. In 2024, China's global innovation index ranked 11th, and the total amount of R & D investment in the whole society ranked second in the world. The number of high-tech enterprises has reached 463,000, and the number of global top 100 scientific and technological innovation clusters has reached 26, ranking first in the world[11]. The Party Central Committee attaches great importance to and supports the development of intelligent terminals and robot industries. In recent years, it has successively promulgated the top-level design documents such as the " Guiding Opinions on the Innovative Development of Humanoid Robots, " " Three-year Action Plan for Innovative Development of Metaspace Industry (2023-2025), " " 'Robot +' Application Action Implementation Plan " to lay the tone of high-quality and rapid development, and escort the development of the industry. All localities have actively responded to the call of the state, and large and small enterprises have joined scientific research institutes, universities and other scientific research institutions to continue to promote the deep integration of industry, university and research. The scientific and technological innovation market has shown a good trend. Technological innovation competition has driven industrial change, and industrial change has pushed back technological progress, making China's innovation environment full of vitality.

2.2 Organization end: the center of enterprise operation and collaboration

The organizational side is the control center of the entire innovation ecology. Its main function is to rely on the cooperation between the main elements of enterprises, governments, research institutions, etc., and the allocation of various resources to complete the mutual transformation of technology, products, and markets. In this process, it plays an important role in the cooperation of material flow, information flow, and energy flow.

First of all, the organization needs the material flow to achieve accurate allocation of resources and ensure efficient production. In traditional industries, most of the resource allocation is done manually, depending on the manager 's personal experience or intuitive judgment. This mode puts forward high requirements for the ability of managers, but due to the limitation of resource conditions, it is impossible to ensure that each decision of managers is correct, rational and timely. The scheduling of material resources often lags behind market changes, resulting in low production efficiency, inventory redundancy or shortage, which aggravates the waste of resources. However, in the modern innovation ecology, the resource allocation model at the organizational level has undergone fundamental changes. With the help of data intelligence and network collaboration to build a "digital twin" system, the organization end no longer relies solely on manual decision-making. Through means such as Internet of Things sensors, ERP systems, and cloud computing platforms, it can maximize the correct value of resources in an appropriate way, ensure the stable supply of raw materials and parts, and ensure the continuous operation of the production line. Optimize the inventory structure, reduce storage costs while ensuring sufficient inventory products to cope with market fluctuations, but also according to market forecasts to achieve capacity planning, reduce the probability of overcapacity and other issues.

Secondly, the organization side also needs to collect and process the information. At present, the organizational deconstruction of more and more digital transformation enterprises presents a flat design, which accelerates the information transmission and decision-making efficiency within the enterprise, and helps to improve the innovation synergy efficiency between alliance enterprises in the innovation network. These changes in communication and collaboration have benefited from the application of digital technology, which has strengthened data sharing and cross-border collaboration among technological innovation subjects, original innovation subjects and policy innovation subjects. In addition, with the help of information sharing and transmission of information flow, each innovation element can grasp the industry trend in time, understand the frontier dynamics of the industry, and clarify the next innovation direction according to the development prospect of the industry, so as to improve the competitiveness of the industry.

With the guarantee of material flow and information flow, energy flow is also needed to realize the green management of resources. General Secretary Xi Jinping pointed out to "accelerate the formation of new productive forces and enhance new development momentum. "With the help of energy flow, enterprises can reduce production energy consumption, optimize enterprise cost, promote digital, green and intelligent technological innovation, reshape enterprise production mode and development mode, actively respond to national policies, help enterprises seize development opportunities and enhance core

competitiveness. The application of automation equipment such as intelligent production system, intelligent control system and industrial robot reduces energy consumption while improving production efficiency and product quality. The construction of digital supply chain platform promotes the cooperation between upstream and downstream enterprises, improves the operation efficiency of industrial supply chain, and lays a solid foundation for the green and sustainable development of enterprises.

2.3 Demand side: the output and feedback hub of market demand and enterprise innovation

The demand side is the end point of the value realization of the innovation ecology[12]. The direction of technology research and development should be closer to the market demand, driving product optimization and accelerating commercialization. Science and technology are not the product of the times, but should take the initiative to implement, give full play to its supporting role in high-quality development, and apply scientific and technological achievements to production and life. The market is the main consumer of enterprise science and technology innovation, so enterprises must pay attention to market demand when carrying out innovation. At present, the customer ‘s consumption demand mainly presents: the demand for commodity functions is diversified, the pace of consumption is accelerating, and the demand for derivative value is increasing. For example, in recent years, the new energy automobile industry has developed rapidly, the contradiction between new energy and old technology has become increasingly fierce, and consumers ‘ requirements for the long-term endurance of new energy vehicle terminal and the safety of lithium battery accidents have been continuously improved, forcing enterprises to achieve R & D breakthroughs in high-energy density batteries, AI energy-saving control and other fields, guiding enterprises to develop green and safe technologies, and promoting the virtuous cycle of “ demand-driven supply, supply-created demand.”

3.Analysis of the development status of Liuzhou intelligent terminal and robot industry innovation ecosystem

After the introduction of “ Made in China 2025 “ and “14th Five-Year “ intelligent manufacturing planning, the research on intelligent industry has changed from theoretical discussion to actual regional and policy implementation, focusing on the ecological construction of intelligent industry in the Yangtze River Delta and Pearl River Delta, while relatively ignoring the industrial cities in the central and western regions. As an important industrial town in Guangxi, Liuzhou actively implements the spiritual requirements of the Party Central Committee, keeps up with the trend of the times, and vigorously develops the intelligent terminal and robot industry. In recent years, the ecological development of industrial innovation based on industrial linkage, digital empowerment, technical support and institutional guarantee has achieved remarkable results. This industry has become an important industry to support Liuzhou to achieve high-quality development, and has become one of the leading areas of China’s advanced manufacturing industry. It has laid a solid foundation for further promoting the development of Liuzhou and Guangxi ‘s new industries.

3.1 Industrial linkage level: the cluster effect is beginning to appear, and the integration of industrial chain promotes upgrading

The world is at the intersection of the new technological revolution and the industrial revolution. With the continuous integration of informatization and industrialization, the intelligent industry represented by robot technology is booming, which has become an important symbol of technological innovation in the modern era. Liuzhou intelligent terminal and robot industry has begun to take shape. Relying on the development mechanism of complementary advantages between industries and continuous upgrading of industrial chain, the industrial development shows a large-scale growth trend. In the first half of 2024, Liuzhou has nearly 50 intelligent terminal and robot enterprises, with an output value of 6.15 billion yuan from January to September, an increase of 52.6 % year-on-year[13]. The city’s industrial robot stock is 8,000 units, and 134 intelligent manufacturing benchmarking enterprises, ranking first in the region, with a solid industrial foundation. Relying on the modern industrial system, Liuzhou combines the advantages of the intelligent industry with the traditional manufacturing industry, and learns from each other’s strengths, so that the application of industrial robots blossoms. The traditional manufacturing industry represented by Shanghai General Motors Wuling Precision Manufacturing Factory and Dongfeng Liuqi Production Line applies robots to realize the upgrading of the manufacturing industry. Enterprises such as Youbixuan, Sike, Zhituo,

Sibichi and Qianjin have formed an aggregation effect on Liuzhou ‘s intelligent terminals and robot industry. Among them, Youbixuan Liuzhou Base has built a leading domestic production line of consumer robots, supplementing the gap in the regional high-end manufacturing industry chain[14]. It presents an innovative trend of coordinated development of “ intelligent empowerment-chain extension”, promotes the construction of industrial chain resilience, and the development model of “intelligent empowerment-chain extension “ also makes emerging industries and traditional industries Linkage, integration and symbiosis, providing a solid material foundation for the innovation ecosystem.

3.2 Digital empowerment level: wide application of wisdom and strong support of digital infrastructure

Digital economy empowerment is the core driving force for the development of Liuzhou intelligent terminal and robot industry. Digital infrastructure and intelligent scene application provide strong driving force for industrial development. At present, Liuzhou promotes “ quality “ with “ intelligence “, promotes new industrialization, builds a modern manufacturing city, and promotes the high-quality development of intelligent terminals and robot industries. In terms of digital infrastructure, we will actively carry out the construction of information infrastructure such as the city’s industrial and information Internet and 5G networks ; support and promote the digital transformation construction of intelligent terminal and robot industry ; promote the city to create smart application scenarios, covering smart government affairs, smart logistics, smart education and other fields ; a social intelligence ecosystem has been initially formed, which has set up a good test scenario and landing scenario for enterprises. Benefiting from the expansion of data exchanges between China and ASEAN countries under RCEP, the cross-border opening of cross-border e-commerce service model has led to the opening of cross-border optical cables, 5G pilots and other service areas in the city. Liuzhou adheres to the training of big data digital skills, vigorously cultivates local professional and technical talents, and makes up for the gap of high-end talents. The “ hard infrastructure + soft ecology “ linkage empowerment has an important impact on the output value growth of Liuzhou ‘s intelligent industry.

3.3 Technical support level: technological innovation is accelerated, and scientific research transformation is becoming more and more effective

Liuzhou intelligent terminal, robot industry technology support system is increasingly perfect, enterprises in the research and development of existing technology on the basis of the formation of industrialization, application of products. Local enterprises actively explore the practical path of promoting independent innovation ability through their own technology research and development. Some enterprises have launched a variety of competitive terminal products in the fields of consumer robots, industrial robots, intelligent controllers, service robots, and industrial automation equipment. The automatic cold rolling laser cutting system is used in Fangchenggang Base of Liugang Group, which realizes the application of complex scenes[15]. The government relies on the integration of science and education innovation and industrial innovation to build a public technology service platform to enhance the core technology of enterprises through digitization and intelligence. At the same time, with reference to the cooperation experience of China-ASEAN, we encourage local enterprises and universities to work together to tackle key problems and cultivate technical talents. The Liuzhou Intelligent Terminal and Robot Industry Development Cooperation Conference, held in October 2024, invited many experts and scholars from the Chinese Academy of Engineering, the China Machinery Industry Federation, Tongji University and other units to actively plan and accelerate the transformation and upgrading of traditional industries, emerging industries, and future industries. Cultivate, build the intelligent terminal and robot industry into the fourth pillar industry, and accelerate the construction of a modern industrial system supported by advanced manufacturing.

3.4 Institutional guarantee level: the improvement of policy system

The stable development of the industry is inseparable from the support of policies. The guarantee of capital and talent strong support system is the support of Liuzhou industrial innovation ecosystem. It depends on the talent training system and the high-end talent introduction plan to improve the quality of human resources and solve the shortage of high-end talents in Liuzhou. The party committee and government of the autonomous region have vigorously promoted Liuzhou to create a new situation of “ layout of new fields and development of new clusters. “ The municipal party committee and municipal government have issued a landmark project plan around “ development of new productivity, “ promoted Liuzhou ‘s industrial intelligent manufacturing, intelligent networked equipment and robot application, and formed a linkage with China-ASEAN

system coordination, regional intellectual property protection collaborative network construction and technology transaction negotiation mechanism. Liuzhou enjoys the results of regional intellectual property collaborative protection and reduces the difficulty of technology transaction. The guarantee of funds depends on the participation and support of the government ‘s guiding investment cooperation fund, financial institutions and other aspects. Through appropriate measures such as increasing the interest rate of financial institutions, Liuzhou ‘s industry will continue to stabilize.

To sum up, Liuzhou has realized the positive role of new productivity in the high-quality development of the region, and is vigorously developing the intelligent terminal and robot industry. With the help of digital empowerment, it can stimulate the industrial kinetic energy, strengthen the collaborative linkage between upstream and downstream enterprises, build a strong material foundation, promote the innovation and development power of science and technology, and improve the system guarantee system. However, Liuzhou should strive to take the lead in the development of the global intelligent terminal robot industry, deeply integrate into the domestic and foreign circulation, give full play to its advantages, strengthen scientific research cooperation and regional coordination, and promote high-quality development to take on the situation.

4.Deconstruction of the development of Liuzhou intelligent terminal and robot industry innovation ecosystem

Compared with the traditional industrial base, Liuzhou ‘s industrial transformation has its particularity: Liuzhou used to be a traditional old industrial city known for its industry. On the basis of doing a good job in industry, Liuzhou has also actively developed new industries such as intelligent terminals and robots in recent years, and has achieved certain results. In 2024, the total output value will achieve explosive growth: from January to October, it will exceed 6 billion output value, an increase of more than 50 % year-on-year[16]. However, there is no efficient allocation of innovation resources, insufficient deep participation of enterprises, inappropriate technical capabilities, ineffective convergence of policies and regulations, and insufficient industrial complementary effects. Problems still exist, which restrict the development of Liuzhou ‘s industrial innovation ecological vitality. This article will analyze from five aspects.

4.1 The allocation of innovative resources is unbalanced, and the synergy of science and technology industry is weak

Although Liuzhou has increased investment in intelligent terminals and robot industries, the uneven distribution of innovative resources has made it difficult for technology and industry to collaborate. There are many intelligent terminal and robot enterprises in Liuzhou, but the resources are concentrated in the hands of Liugong, Zhituo Technology and other enterprises[17]. The lack of innovation resources in small and medium-sized enterprises leads to the problems of high R & D investment and unreasonable structure of R & D personnel among enterprises. The fundamental reason lies in the unbalanced distribution of scientific and technological resources: under the condition of limited resources, high-end talents and funds are inclined to large projects, the channels for project integration of resources are insufficient, and the construction of basic R & D and public service platforms is lagging behind; there is no efficient transfer and transformation system of scientific and technological achievements. Although the elements such as “ government-industry-university-research-application “ have been deeply integrated in Liuzhou, from the perspective of vertical innovation chain, a closed-loop innovation chain has not yet been formed ; from the perspective of the horizontal industrial chain, the cooperation between enterprises mostly stays in trade exchanges, production and R & D exchanges are few, and enterprises can not achieve technology exchange and joint R & D in various links ; the repeated allocation and inefficient utilization of resources coexist, the patent output rate is low, the achievement conversion rate is not high, the industrial technology upgrading is slow, the industrial cooperation innovation ability is insufficient, and the ecological function is not in place.

4.2 Enterprises to participate in the gradient differentiation, collaborative network linkage loose

The participation of enterprises in Liuzhou intelligent terminal and robot industry is quite different, and there is an obvious “ core-edge “ division of labor pattern, which is not conducive to the formation of collaborative network. On the one hand, leading enterprises rely on technology and policy guidance to innovate, and can directly apply new technologies, new processes and new tools to automated production lines. For example, Liugong excavator factory can realize 9 minutes off-line an excavator[18]. However, most small and medium-sized enterprises still have a gap in the construction of innovation

ability, especially the narrow coverage and low level of technological innovation, and they do not have high-level innovation and R & D conditions. This is because the hardware facilities of small and medium-sized enterprises are relatively backward, the shortage of R & D equipment, the lack of high-level professional talents, the inability to support intelligent production and technology research and development, resulting in the fault of innovation chain, which in turn increases the development gap with leading enterprises. The resource sharing among large, medium and small enterprises is blocked, and intelligent technology is difficult to transmit to traditional industries. The weakening of synergy is not conducive to the agglomeration development of industrial clusters and the sustainable development of industrial ecology, and is not conducive to the improvement of Liuzhou ‘s overall industrial competitiveness.

4.3 The level of technical ability is very different, and the cooperation adaptation is difficult to connect

There is a large gap in technical capabilities between Liuzhou enterprises, and there are problems such as low adaptability in enterprise innovation cooperation, which makes it difficult to further extend the industrial chain. Some leading enterprises can realize the intelligentization of the whole process, but most enterprises are still in the initial stage. Due to the high degree of disparity in technical capabilities, there is a problem of standard adaptation: high-end standards cannot be connected to the existing systems of small and medium-sized enterprises, and there is a phenomenon of insufficient high-tech innovation and mismatched demand, resulting in sluggish development of the industrial chain and difficulty in upgrading the value chain. And Liuzhou enterprises do not master some core technologies such as artificial intelligence algorithms and high-end sensors, and there are certain technical shortcomings. In the “ Liuzhou New Generation of Artificial Intelligence and Real Economy Integration Development Plan (2020-2025), “ it is pointed out that Liuzhou is lagging behind the frontier technology in key technologies such as basic theory and core algorithms, and lacks advanced technology pre-research and strategic layout. Although Liuzhou has established an intelligent terminal and robot industry technology research institute, it lacks top artificial intelligence and robot researchers. The participation of colleges and universities in related fields is not high, and it has failed to form a leading innovation ecosystem. There is a certain deviation between local scientific research strength and industrial demand. The ability to tackle key core technologies such as basic algorithms and high-end sensors is weak, and it is urgent to achieve external supply through the introduction of high-end talents. In addition, Liuzhou still lacks a municipal computing center. The existing data room only operates on government data, and does not cover related aspects such as artificial intelligence and large models. It not only hinders the development of research and development work of local enterprises in Liuzhou, but also increases the cost of enterprise investment.

4.4 Absence of coordination of policies and regulations, institutional barriers barrier more

The lack of policy implementation and the difference of institutional norms cause institutional barriers, thus restricting the innovation vitality of enterprises. Since 2017, Liuzhou has set up government investment guidance fund, Liuzhou government innovation and venture capital guidance fund, “ONE-TWO-Five” project industry innovation guidance parent fund and other industrial development support policies to encourage industrial incubation and innovation development. However, due to the lack of legislative guarantee, the lack of convergence from top-level planning to grass-roots deployment, and the ambiguity of enterprise policies for different development stages, the effectiveness of policy implementation is not high. In the process of data circulation and intellectual property protection, the relevant rules are different. The horizontal and vertical management conflicts make the operating costs of enterprises higher and increase the operating risks faced by enterprises. It reduces its enthusiasm to join the industrial innovation ecosystem.

4.5 The complementary efficiency of the industry is not obvious, and the kinetic energy of collaborative innovation is lacking

The complementary potential of Liuzhou traditional industry and intelligent terminal robot industry is insufficient, and collaborative innovation lacks internal motivation. Although the two types of industries have integration space in structure, the synergy between the two is weak: traditional enterprises pay more attention to the investment and construction of hardware facilities, ignoring the improvement of soft capabilities such as data-driven, system integration and service innovation ; the development of emerging enterprises is fragmented, the overall scale is small, and the product line is relatively single, which is difficult to support full-chain collaboration and system integration. The connection between

upstream and downstream enterprises is low, and the cooperation between enterprises mostly stays at the level of basic material supply, lacking in-depth cooperation in the direction of technology co-research and market coordination.

5.The development path of Liuzhou intelligent terminal and robot industry innovation ecosystem

In view of the main problems existing in the innovation ecosystem of intelligent terminal and robot industry in Liuzhou, the following five solutions are proposed.

5.1 Continue to deepen the innovation ecology and build an open and shared innovation resource network

In-depth implementation of the market-oriented reform of science and technology reform demonstration enterprises to improve the quality, scientific and technological innovation ability to enhance the double mention " project, and constantly stimulate the vitality of enterprise innovation and entrepreneurship. Strengthen the construction of cross-industry integration technology platform for chain main enterprises, jointly establish technology research and development institutions and test centers with universities, research institutes and small and medium-sized enterprises, diagnose enterprise problems according to the difficulties faced by enterprises, form targeted research reports and put forward optimization suggestions, and promote the construction of talent teams in colleges and universities while solving enterprise problems. We vigorously promote the " intelligent cloud " industrial Internet platform and supply chain digital twin system to achieve efficient use of resources and reduce waste with shared R & D data, production progress and logistics status, and to gather innovation elements and release innovation vitality on a larger scale. Guangxi Zhituo Technology Co., Ltd. can monitor the production of suppliers in real time after using Huawei Cloud IoT platform, and issue early warning. The accuracy of early warning is 92 %[19]. Relying on the advantages of platform sharing, it greatly reduces the local computing cost of enterprises, which is conducive to rational allocation of resources, increase the efficiency of capital use, and promote industrial upgrading and development.

5.2 Deepen the collaborative innovation of large, medium and small enterprises, and strengthen the leading role of chain enterprises

For the problem of capacity differentiation between leading enterprises and small and medium-sized enterprises, while cultivating and developing chain enterprises such as Liugong and Zhituo Technology, we can encourage them to open their own technical interfaces and technical standards for special fields, drive the remaining small and medium-sized enterprises to focus on core components to carry out technical research and development work, and create a gradient industry development ecology. Solving the problem of differentiation does not mean that it is necessary to hinder the development of the main chain enterprises, but like the " first rich drive after rich " in economic development, the main chain enterprises develop themselves while driving the development of other enterprises. For example, the intelligent equipment of Qianjin in Liunan District has designed a welding automation production line for Saike Technology, and the implementation of personalized manufacturing of non-standard equipment is the synergistic effect of large enterprises after opening up resources. Liuzhou can also set up a special fund to support the pilot construction of " artificial intelligence + manufacturing " for small and medium-sized enterprises, promote the continuous optimization of industrial structure and reduce the dependence on traditional manufacturing industry.

5.3 Strengthen core technology research and industry-university-research collaboration, and break through technical bottlenecks

Digitization and intelligence should be the main direction of the future development of Liuzhou industry. We will accelerate the construction of Guangxi Industrial Design City and Big Data Industrial Park, build intelligent factories and digital workshops, and actively create a national intelligent manufacturing pilot area. Accelerate the construction of national standardization demonstration pilot, promote leading enterprises to participate in the development of important technical standards in the field of new energy vehicles and construction machinery. Accelerate the construction of the autonomous region of scientific and technological achievements transfer and transformation demonstration area, from scientific and technological achievements to the integration of industrialization road. Support enterprises to unite well-known universities and scientific research institutes at home and abroad to carry out research and development of key common technologies,

equipment and standards in the industry, accelerate the transformation of scientific and technological achievements, and provide funds and policies for basic research and technical pre-research on artificial intelligence algorithms, high-end sensors and other aspects to help enterprises solve the bottleneck of technology adaptation. Speed up the construction of municipal computing power center, meet the needs of large model training and industrial simulation, build Guangxi artificial intelligence application scenarios and industrial cluster innovation base, increase the synergy of industry, university and research, and shorten the cycle of technology industrialization.

5.4 Optimize the policy and regulation system, improve the financial security and cross-domain coordination mechanism

Encourage enterprises to actively participate in the autonomous region ‘s science and technology “overshoot “action, “double hundred double new” and “thousand enterprise technological transformation “ and other preferential policies, through the cross-border data flow rules under the RCEP framework to connect with the local regional intellectual property protection mechanism, with the help of “nine measures” to accelerate the transformation of technological achievements. In the “Nine Measures, “it is mentioned that “support up to 10 million yuan for eligible public service platforms according to the proportion of construction costs. “This initiative provides assistance for the construction of technical research platforms in the short-board fields such as high-end chips, operating systems, and artificial intelligence algorithms. Liuzhou, as the second batch of pilot cities for the digital transformation of small and medium-sized enterprises in China, can focus on the policy system formed by the construction of Liuzhou digital government group, incorporate industrial funds, talent introduction and gathering, and scene opening into the policy package, improve the new highland of talent agglomeration oriented by innovation ability, and solve the problem of lack of high-end talents in Liuzhou. Try the four-in-one collaborative effectiveness evaluation system of enterprises, universities, scientific research institutions and functional management departments, and evaluate the operation effect of the innovation ecosystem by quantifying indicators such as patent conversion rate, number of industry-university-research innovation centers, number of enterprise cultivation and industrial added value.

5.5 Try a new sandbox model pilot program to promote cross-border integration and release new productivity

Drawing on the experience of sandbox supervision in the financial field, this paper attempts to explore the “policy sandbox” in the field of intelligent terminals and robotics industry, and discusses allowing enterprises to carry out breakthrough new technology trials and trial trials within a limited range. The research puts forward the industrial ecological development concept of “innovation has fault tolerance, R & D has support, and due diligence and controllable errors are not investigated. “Promote the integration of traditional industries such as steel and automobiles with intelligent terminals, create a “ smart factory + digital twin “ demonstration project, release synergistic kinetic energy, and drive the transformation and upgrading of traditional advantageous industries. Explore the customized production service platform of industrial robots, and guide the transformation of traditional manufacturing from products to “products + services. “ Guangxi has proposed to build 100 artificial intelligence application scenarios. Among these contracted projects, there are 43 local projects in Liuzhou, with a total investment of 33.77 billion [20]. At the same time, it has also brought new formats to Liuzhou ‘s old industries, including intelligent logistics and intelligent detection, which is of great significance to the transformation and upgrading of the entire traditional industry.

6.Conclusion

In the tide of global scientific and technological revolution and industrial transformation, Liuzhou anchored the intelligent terminal and robot industry as the door to open up new productivity, seize the commanding heights of industrial development, build an innovative development platform for the artificial intelligence industry in the whole industrial chain, accelerate the layout of an industrial innovation ecosystem with regional characteristics, and support a number of representative leading enterprises while improving policy measures, so as to realize the transformation and upgrading from traditional manufacturing to intelligent manufacturing. In the face of the problems that hinder the operation power of the construction industry ecosystem, such as the dispersion of innovation resources, the lack of core technology innovation ability, and the

insufficient coordination and coordination of the government, the government is trying to make breakthroughs in many aspects: building an open and shared innovation resource network, integrating the advantages of enterprise collaboration, tackling key technical problems, improving the institutional guarantee system of legislative guarantee + dynamic evaluation, and releasing institutional dividends. In the future, Liuzhou should be closely integrated into the China-ASEAN Innovation Community, accelerate the pace of cooperation with ASEAN countries in mutual recognition of technical standards, open sharing of scenes, and joint training of talents, so as to build Liuzhou into an important base for the development of two major industrial clusters of intelligent terminals and robots. At the same time, we should give full play to the innovative role of technology co-research, ecological co-construction and achievement sharing, reshape the strength of Liuzhou ‘s traditional industrial city, provide Liuzhou’s wisdom for the reconstruction of global industrial chain and regional coordinated development in the era of digital economy development, and open a new chapter of intelligent future.

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Conflict of Interests

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