Research on the Ecological Operation Mechanism of MSMEs in China--Based on the Perspective of Smart Ecological Economy

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Abstract: With the integrated development of artificial intelligence, RPA, IPA and other technologies, green technology is bound to reshape the elements of human production and living environment twice, and the relevant operation and management ecosystem of enterprises tends to develop in the direction of smart ecological economic model. In this paper, the operation ecosystem of MSMEs in China is regarded as the research object, and the ecological operation and management mechanism of MSMEs is discussed in detail from the perspective of smart ecological economic. At the same time, it is hoped that the enterprise smart ecological operation mechanism that introduces advanced technologies such as artificial intelligence and RPA super automation and integrates green innovation technology and global ecological business model will help expand the development space of enterprises, which is expected to break the boundaries of capital and time and space, and help all of MSMEs quickly realize the sticky expansion of self-brand and the value of customer group assets. In this paper, through the investigation and study of the development status of China's MSMEs combined with case analysis to further explore the development of intelligent ecological economy management elements and operation mechanism, explore the MSMEs to achieve intelligent ecological economy development mode mechanism. Finally, it is hoped that this study can provide some reference for the government's macro policy adjustment strategy and the improvement of management science level, and provide research reference for researchers in the same industry.

Keywords: MSMEs; Smart Ecological Economy; Operating Mechanism; AI; Green Creation; Global Operation

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1 Introduction

The hottest term of 2023 so far is "ChatGPT." ChatGPT opens a new chapter in the field of artificial intelligence and represents the first year of human intelligence. According to the latest report, Microsoft has started to develop a new biological intelligence chip, which opens a new development direction for the current chip nanoscale technology to break through the dilemma. Separately, the International Sustainable Development Standards Board ISSB has preliminarily completed the latest global standard for sustainability and climate-related reporting for worldwide use, which will be implemented on January 1, 2024. Carbon neutral index governance will be launched globally, and carbon emission data in standard range 1 and 2 will become mandatory. The global implementation of this standard puts forward new development requirements for relevant stakeholders in different countries. In addition, although the standard puts forward two different versions of requirements for high

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case and low case for small and medium-sized enterprises in developing countries, and allows different countries and subjects to choose independently, ISSB is considering the time limit for the transition to high case for the disclosure subjects who choose low case. All the above shows that it is important for MSMEs to establish an smart ecological economic management system, and put forward higher requirements for the implementation of green innovation and intelligent transformation.

By the beginning of this year, the number and quality of MSMEs in China had exceeded 52 million. China is strengthening policy support for "specialized, special and innovative" enterprises, in order to cultivate more and stronger innovative enterprises and cultivate a localized innovation soil in China. According to the economic operation data of small and medium Enterprises released by the China Association of Small and Medium Enterprises in April, the Small and Medium Enterprise Development Index (SMEDI) for the first quarter of 2023 was 89.3, up 1.3 points from the previous quarter, reversing the continuous downward trend since the second quarter of 2021. However, the Chinese economy still faces severe internal and external risks and challenges. First, the world economy is clearly lacking momentum and the fragility of the global financial system is on the rise. Second, the foundation for China's economic recovery is not yet solid, and China is still facing the triple pressure of further shrinking demand at home and abroad, intensified supply-side shocks and weakening national economic growth. Chinese enterprises, especially micro, small and medium-sized enterprises, still face many difficulties in production and operation, their development space is reduced, and the external business environment needs to be further improved.

If MSMEs have the advantages of strong innovation ability, good growth and rapid strategic transformation of enterprises, then play an important role in strengthening, stabilizing, supplementing chains, effectively activating market structure and stabilizing social and economic development. However, according to the investigation of the Ministry of Environmental Protection, there is a serious shortage of the management ecosystem of micro, small and medium-sized enterprises in China, which cannot meet the needs of low-carbon, green and sustainable development. Therefore, it is the most important choice for Chinese MSMEs to improve the smart ecological economic system.

In addition, in order to effectively alleviate the dual dilemma of rough business model and low resource efficiency faced by MSMEs, enterprises must strive to explore the intelligent ecological economic development path of green innovation, and further realize the twin growth of ecological benefits and economic benefits. At present, there are few relevant studies on this content, which cannot effectively provide guidance for the construction of the corresponding intelligent ecological economic model. This paper attempts to build an ecological operation mechanism model of Chinese micro, small and medium-sized enterprises based on the perspective of intelligent ecological economy, so as to provide a reference path for enterprises to achieve future breakthrough development and provide a reference for research in related fields.

2 Overview of Smart Eco-economic Management

Li Junxia, Wang Yuan, Wu Haixia (2022) proposed in they article that Professor Michael Porter believes that the rational design of environmental regulation can stimulate the innovation consciousness of enterprises, which can give the regulated enterprises a certain competitive advantage compared with the unregulated enterprises [1]. Due to the increasing contradiction between the world economic development and the ecosystem, the concept of ecological economy has been put forward, which is a new requirement for future economic development. As the main body of development, MSMEs must realize the efficient use of energy and resources and reduce environmental pollution. Based on the management concept of ecological economy, it not only pays attention to enterprise benefits, but also takes into account ecology, and makes it clear that quality and efficiency are jointly composed of economy and ecology. Wu Hua, Zhang Wensong (2019) believed that the benefits of economic activities belong to the system concept, including ecology, society, economy and other aspects [2]. At the present stage, no matter what type of small and medium-sized enterprises are facing a tight market environment, they need to be supported by new management to help them achieve the ecological economic management goals of low consumption, less investment, light pollution and excellent quality, and eliminate development disadvantages [2]. On the other hand, smart city construction pays more attention to the quality of

economic development, requiring new connotation of benefit management, taking into account both economic quality and ecological quality. The evaluation index system of urban economic development puts forward more stringent requirements for ecological quality, and the ecological performance and environmental standards of products are also included in the evaluation category of the system. Finally, we should attach importance to the quality of energy economic development, build the strategic framework of energy economic development of enterprises themselves, give full play to the deep role of scientific and technological innovation in the transformation of energy economic framework of enterprises, implement carbon neutrality, and realize the intelligent ecological economic development mode of enterprises. Therefore, only by taking the road of economic and ecological integration can we promote the sustainable development of micro, small and medium-sized enterprises and conform to the trend of social green development.

Recently, Wang Zhigang, minister of Science and technology, said at the 7th World Intelligence Conference that Chinese enterprises should firmly grasp the new opportunities of global AI development, respect the law of scientific and technological innovation and AI development, increase the layout of AI basic theory and cutting-edge technology research and development, create a number of AI regional highland and technology platform, deepen the integration of industry, university, research and application led by enterprises, Thus comprehensively promote the economic and social development of artificial intelligence. So what are the new opportunities for AI development? Compared with MSMEs, how to build the corresponding intelligent ecosystem, improve and strengthen their comprehensive competitiveness of development, realize overtaking in corners, and make enterprises complete the leapfrog development of scale efficiency? How to define an enterprise's intelligent ecosystem? How to explain the intelligent ecosystem model of MSMEs will become the starting point of research, and take this as an opportunity to explain the ecological operation mechanism of MSMEs.

Table 1 Smart Ecosystem Elements of Msmes

Elements of the System	**Factor Construct Framework**	**Application Scenarios**
Data acquisition and analysis	Through the Internet of Things, artificial intelligence and data mining technology, the nodes of each element of enterprise production and operation activities are built into an intelligent decision-making platform to provide multi-dimensional data-driven decision-making support.	Existing enterprise-level integrated application system platform.
Intelligent manufacturing and automation	With the help of artificial intelligence and super automation technology, the whole production process of enterprises can be intelligent optimization and transformation.	Robot production line
Marketing and sales support	Through intelligent market research and user analysis, it helps enterprises develop accurate marketing strategies, and provides online sales channels and personalized user experiences by using Internet and mobile technologies.	Economic cooperation model of live streaming platform
Supply chain management	Through the intelligent supply chain management system, the enterprise's procurement, warehousing, distribution and distribution, logistics and other links are optimized to reduce costs, optimize the response timeliness mechanism, improve delivery efficiency, and realize the coordination and traceability of the supply chain.	Jingdong commodity logistics industry chain model
Financial management and risk control	It provides intelligent financial management tools and risk control systems to help enterprises achieve rapid sorting and analysis of financial data, and real-time monitoring and early warning of the financial status of enterprises.	Financial dynamic management platform application mode
Green innovation and cooperation platform	Promote resource sharing, technology cooperation and innovation co-construction among enterprises, improve the innovation initiative and market leading competitiveness of enterprises.	Huawei Open ecosystem
Talent ecosystem	Provide a platform for talent discovery, training, education and exchange.	Cross-industry talent pool system
Security and privacy protection	Establish a sound security response mechanism and privacy protection system to ensure the security and compliance of enterprise data.	Information security and data security models
Financial support and investment and financing services	Provide an intelligent interaction ecosystem with financial institutions.	Taobao, Jingdong financial model
Social cooperation and innovation	We will create an open cooperation and exchange ecosystem, reject isolated island circles, and promote resource sharing and open innovation.	Social media systems

Elements of the System	Factor Construct Framework	Application Scenarios
Policy support and laws and regulations	Government departments play an important role in the development of enterprise intelligent ecosystem, providing policy support, guidance of laws and regulations and market supervision, and creating a good environment and conditions for the development of enterprise intelligent.	Government open portal platform

In this paper, the enterprise intelligent ecosystem refers to the ecosystem that provides comprehensive intelligent solutions for smes. The ecosystem tries to integrate artificial intelligence (For example, ChatGPT.), big data, cloud computing, Internet of Things, 6G, RPA, IPA or super automation and other emerging technologies, aiming to improve the comprehensive competitiveness of small and medium-sized enterprises, such as independent innovation initiative, zero carbon momentum, production efficiency, technical level and management level. The intelligent ecosystem elements of smes are shown in Table 1.

As shown in Table 1 above, it can be considered that the goal of the intelligent ecosystem of small, medium and micro enterprises is to help MSMEs to improve management level, production technology efficiency, faster and open access to information, reduce enterprise costs, and green innovation and integrated development through the support of technology and platform, so as to better adapt to market changes, improve competitiveness, and achieve sustainable and efficient development in the digital era. The construction of intelligent ecosystem of MSMEs needs the cooperation of multiple parties, including enterprises, scientific research institutions, technology suppliers, financial institutions, governments and so on. The development of artificial intelligence in the future benefits from the accumulation and development of high-quality data in the past, present and future. In addition, this paper will try to explore whether there are opportunities and paths for Msmes to expand their transnational operation and management business under the background of intelligent interconnection technology.

3 Research Background and Significance

3.1 Investigation on the Current Situation of China's MSMEs

This paper takes Beijing as an example to analyze the operation of micro, small and medium-sized enterprises. The statistical data of MSMEs is the statistical data obtained by regularly integrating the statistical information of the survey units in various industries of the national economy, which is based on the existing resources of the government's comprehensive statistics. The classification standard of enterprise scale shall be implemented in accordance with the Provisions of the Classification Measures for Large, Small and Micro Enterprises in Statistics (2017). According to the scope of application of the measures, enterprises in the following industries shall not be included in the statistics of enterprise scale: railway transportation industry, finance industry, real estate leasing operation, education and health. Table 2 below shows the operation statistics of micro, small and medium-sized enterprises in Beijing from January to March 2023.

Table 2 Business Statistics of Msmes in Beijing from January to March 2023

Item	Operating Income (100 Million Yuan)		Total Profit (100 Million Yuan)		Average Number of Employees (Ten Thousand)	
	1-3 months	Year-over-year growth (%)	1-3 months	Year-over-year growth (%)	1-3 months	Year-over-year growth (%)
Combined count	17553.2	-0.5	210.0	34.8	295.0	-4.0
Classification by size						
Medium size	11230.0	-1.3	183.3	22.2	170.2	-5.0
Small size	4724.6	0.3	26.5	-	117.3	-2.7
miniature	1598.6	3.0	0.2	-95.1	7.5	0.0
By Industry						
Industry	2021.1	1.2	113.1	-29.3	45.6	-0.4

Item	Operating Income (100 Million Yuan)		Total Profit (100 Million Yuan)		Average Number of Employees (Ten Thousand)	
	1-3 months	Year-over-year growth (%)	1-3 months	Year-over-year growth (%)	1-3 months	Year-over-year growth (%)
Among them: Manufacturing	1770.0	0.3	84.6	-36.2	42.9	-0.2
Construction industry	535.4	-15.7	-17.1	-	16.8	-6.8
Wholesale and retail	9190.1	0.4	77.3	-30.3	35.5	-5.2
Transportation, storage and postal services	598.4	-5.3	8.0	-33.2	8.4	-11.3
Accommodation and catering industry	157.8	16.4	-3.8	-	14.7	-7.0
Information transmission, software and information technology services	2331.8	1.6	-28.7	-	40.3	-4.3
Real estate industry	442.2	-9.9	18.9	-25.0	18.6	-6.6
Leasing and business services	1446.6	0.6	36.8	-	77.6	-3.4
Scientific research and technical services	502.6	-7.6	-1.9	-	22.9	-0.2
Water conservancy, environment and public facilities management	60.4	-2.8	-1.8	-	2.4	-3.3
Residential services, repairs and other services	42.8	8.1	2.5	-	4.4	-5.2
Health and social work	1.9	-0.9	-0.5	-	0.3	-5.2
Culture, sports and entertainment	222.3	-2.0	7.2	-61.8	7.6	-5.9
Note: The industry shall be implemented according to the industry Classification of National Economy (GB/T 4754-2017) standard.						

3.2 Technology Market Application Survey

As an important bridge connecting advanced digital technology and business application scenarios, the efficient and orderly operation of science and technology will be an important means for enterprises to continuously improve and consolidate their digital capabilities. The greening of science and technology will subtly affect the greening process of the whole enterprise. Today, with the increasing attention of the country, society and investors and the practice of the concept of green development, the development of green science and technology for enterprises is not only a necessary choice to assume social responsibilities, but also an inevitable move to meet the needs of investors for green investment.

In addition, with the development of the aging society, the overall employment age range of the society is tightening, and the change of social identity values, the available labor resources are increasingly scarce, and the labor cost is ushered in a period of high growth. In the face of this challenge, the development strategies of different enterprises turn to the direction of digital productivity. With the proportion of RPA, IPA or super automation and other related technologies in the future development of enterprises, the exploration and development of artificial intelligence will usher in a breakthrough and explosive development stage, and the exploration and development of artificial intelligence will enter the development stage of integrated innovation in the whole field of science and technology.

RPA stands for Robotic Process Automation. It is a technology that allows organizations to automate repetitive, rule-based tasks and processes by using software robots or "bots." These bots can mimic human interactions with digital systems, such as logging into applications, navigating interfaces, extracting data, and performing tasks.

According to the DTE matrix observation report, the development of China's RPA market is in the period of efficiency expansion, and the Chinese market has a large development space and market opportunities. Figures 1 and 2 below illustrate the development stage, market size and market segment structure of China's RPA market, respectively.

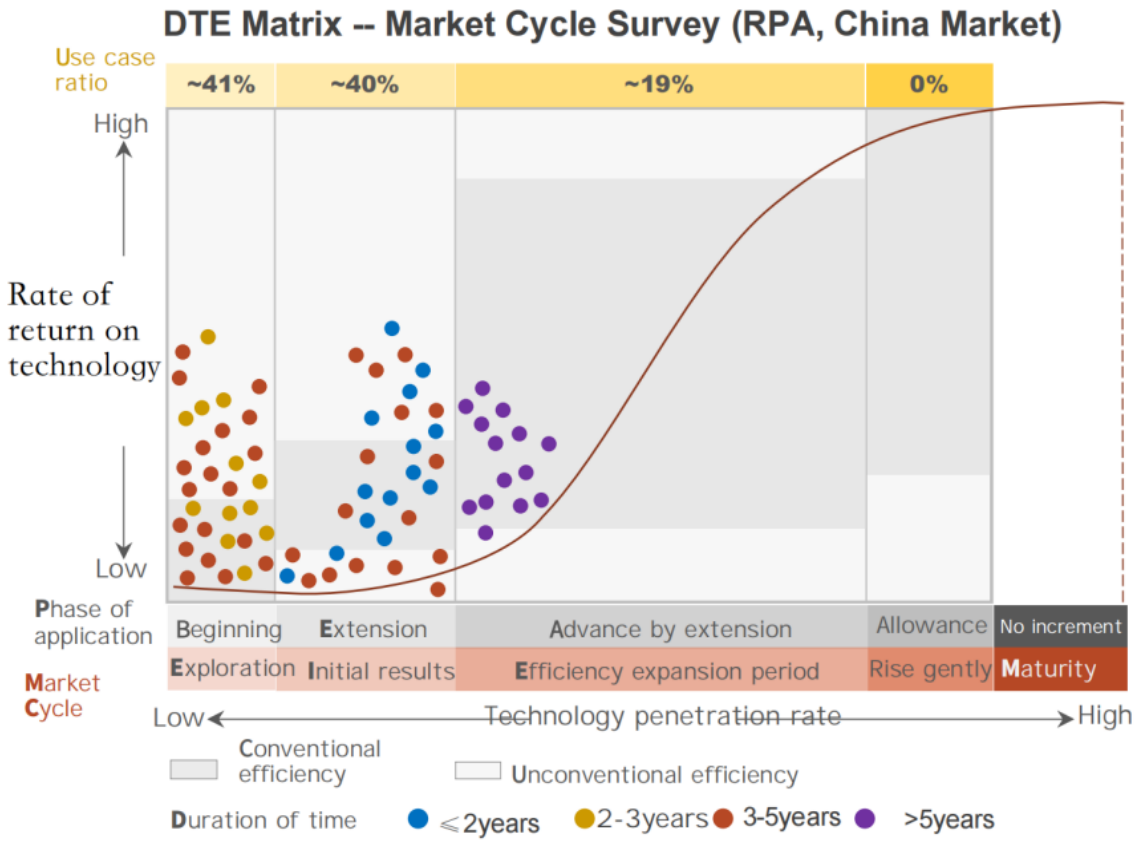

Figure 1 Current Situation of RPA Market in China

Note: 1. RPA China -Market Insight: China RPA Market Development Insight (2022).
2. Note: Each use case circle in the DTE matrix represents an enterprise user, which is evaluated and calculated according to the rate of return and penetration of RPA technology applied by each enterprise, and then its position in the matrix is determined.

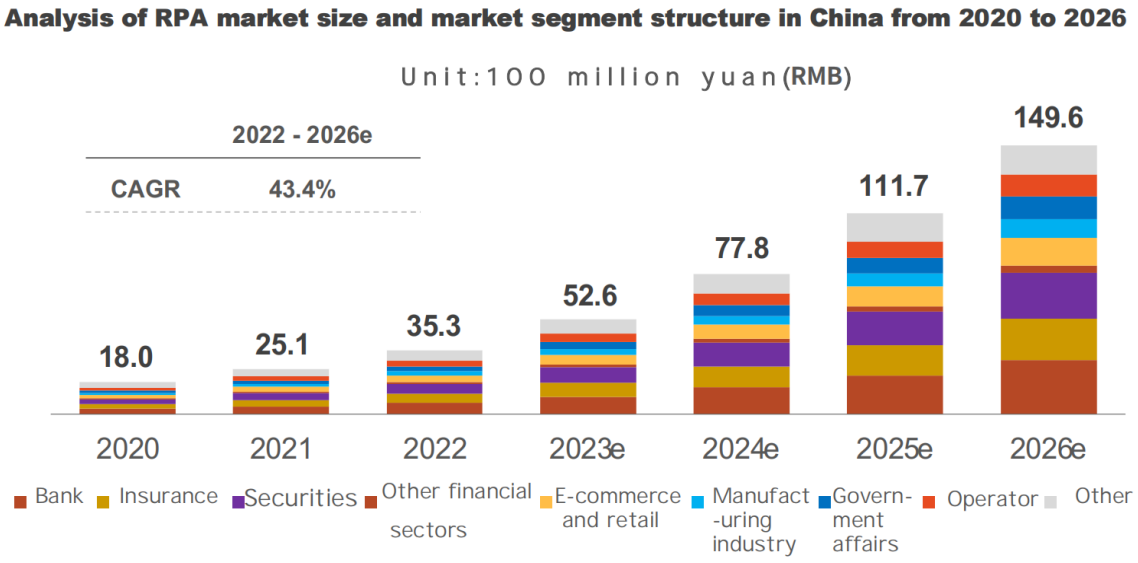

Figure 2 Analysis of RPA Market Size and Market Segment Structure in China from 2020 to 2026

Note: Note: RPA China -Market Insight: China RPA Market Development Insight (2022).

With the rapid development of ChatGPT, the evolution of large language model has entered the fast track, the market prospect of capital investment and technology application has become infinite, the progress of key

technologies has promoted the development and application of related software environment, and the new industry substitution effect has gradually emerged. In the field of artificial intelligence, transfer learning, logical reasoning ability and adaptive change are gradually becoming possible, bringing new leading factors to human production and life style. This technological transformation has provided unlimited possibilities for the development of micro, small and medium-sized enterprises, shortened the distance of the world's scientific and technological revolution, and provided a reference model for human development in outer space and the transplantation of civilization. SRE+AIOps is an advanced implementation of cloud integration of Research and Development (DevOps) in operation and maintenance. IT aims to improve technological flexibility and automate IT operation and monitoring processes through advanced digital technologies such as big data, data analysis and machine learning. Core application scenarios include application performance monitoring, IT infrastructure operation monitoring, IT event analysis, and network operation analysis and diagnosis, which can improve quality assurance, cost management, and efficiency for enterprises. Therefore, this paper believes that we should focus on the development and application trend of basic science and technology, dance with the trend, head on, seize the opportunity from multiple levels and perspectives to quickly achieve capital accumulation and technological breakthrough. Table 3 shows the investigation and prediction of the development trend of traditional IT infrastructure and cloud infrastructure in the future, and Figure 3 shows the evolution tree of large language model.

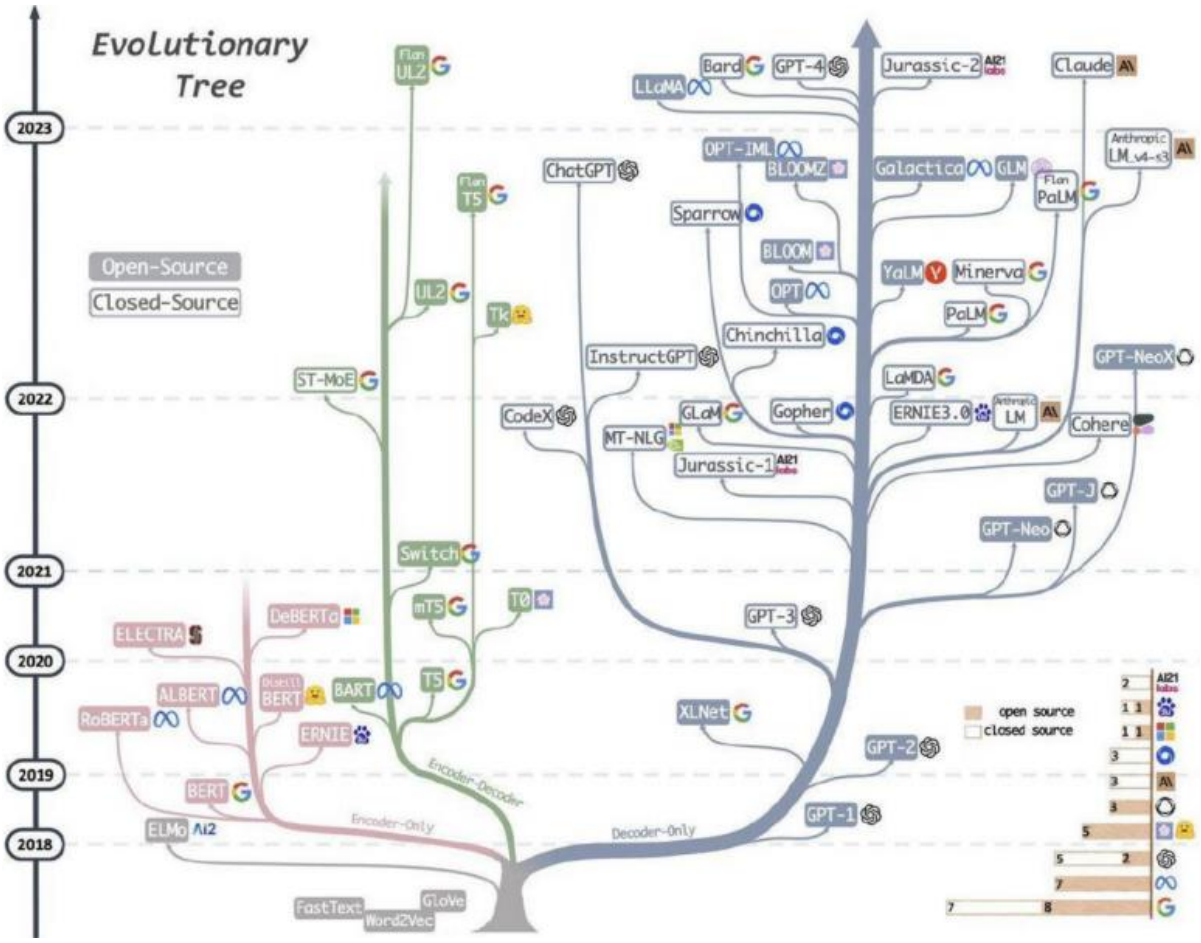

Figure 3 Evolution Tree of Large Language Model

Note: 1. citation: Harnessing the Power of LLMs in Practice: A Survey on ChatGPT and Beyond, JINGFENG YANG et al. 2. Description: gray - word vector and early training model, blue - decoder only model, pink - encoder only model, green - encoder-decoder model, vertical position of model timeline - represents release date, open source model - solid box, closed source model - hollow box.

Table 3 Survey and Forecast of Future Development Trend of Traditional IT Infrastructure and Cloud Infrastructure

Name of Project	2018	2021	The first quarter of 2023	Forecast for 2023	Forecast for the next three years
Containerization facility (public cloud)	12%	11%	20%	11%	47%
Containerized facilities (private cloud/on-premises deployment)	18%	22%	—	20%	—
Virtualization facilities (public cloud)	19%	16%	36%	15%	34%
Virtualization facilities (private clouds)	25%	30%	—	32%	—
Traditional server (local deployment)	26%	20%	44%	18%	19%

Source: Software-Defined Infrastructure Survey; Expert interviews; BCG Analysis

As mentioned above, we can see that the RPA market segment is gradually expanding, the market scale effect is gradually prominent, and the development has entered the stage of expansion and promotion. The characteristics of technology development show that with the gradual increase of technology penetration rate, the market scale is proportional to the increase, and the enhancement of product maturity and demand adaptation ability will provide more opportunities for rapid expansion and development in business areas. Therefore, corresponding enterprises are required to quickly follow up the demand for development opportunities, accelerate the construction of platform systems to improve operational efficiency, break data siloes, and enhance the empowerment of the whole business chain of investment and research, sales, risk control and operation through the testing and application of machine learning, big language model and other emerging technologies, so as to promote the transformation from "digital" to "digital intelligence".

3.3 Ecological Economic Management and Operation of MSMEs in China

3.3.1 External Environmental Constraints

According to Liu (2021) that International political law has raised the protection of the environment to an international responsibility [3]. In recent years, in order to protect ecological resources and environment, various countries have signed international environmental agreements. China has also actively participated in the signing of a series of environmental protection conventions, including the United Nations Framework Convention on Climate Change, Kyoto Protocol, Copenhagen Agreement, Convention on Biological Diversity, etc., to protect the earth's ecology and reduce greenhouse gas emissions [3]. According to Chen Meixi and Chen Qian (2021) believe that in the past, in order to quickly seize the market and improve economic benefits, the traditional production mode of small, medium and micro enterprises in our country was rough, failing to pay attention to the impact of ecological environment and not meeting the needs of existing ecological construction [4]. This mode is easy to violate the requirements of the Convention, especially for export-oriented enterprises, whose products are mostly sold abroad. In order to enter the world market, they need to comply with the requirements of ecological society and implement ecological economic management [4]. We will reform and upgrade the internal operating mechanism [4]. China has also promulgated the Catalogue of Encouraging Imported Technologies and Products and the Catalogue of Guiding Industrial Structure Adjustment to encourage the development of environmental protection and energy saving industries, but they have not been effectively implemented due to the insufficient conditions for attracting talents of small and medium-sized enterprises themselves, and the long benefit cycle of ecological management and high input cost [4].

3.3.2 Internal Environmental Constraints

(1) Lack of ecological concept

Han Cheju, Xu Xiaofei, Zhang Xiangqian (2021) believed that more than 80% of micro, small and medium-sized enterprises were private enterprises, and entrepreneurs realized entrepreneurship by seizing opportunities and using specific resources, so that the owners and managers of enterprises were combined into one, and the internal management was mostly family management, lacking insight into the economic situation and ecological economic concepts [5]. It causes obstacles to the ecological economic management of enterprises. Most small and medium-sized enterprises attach more importance to resources than to ecology [5]. Talent recruitment fails to link it with enterprise strategy and recruits more technical talents, resulting in unreasonable talent structure and difficulty in improving the overall enterprise efficiency [5]. The founder of the enterprise also serves as the general manager and chairman of the board. Under centralized management, posts are set

according to the situation of family and friends. This kind of people-based post setting reduces the enthusiasm of employees for work.

(2) Insufficient initiative in green innovation

Wang Rui and Yan Dawei (2019) believed that in the ecological economic management of micro, small and medium-sized enterprises, it is necessary to rely on ecological technology, cooperate with appropriate environmental assessment indicators, and integrate them into the production of enterprises to achieve ecological strategic goals [6]. However, existing enterprises are faced with weak scientific and technological innovation and insufficient independent innovation of green technology, with less investment and difficulty in purchasing advanced technologies for independent innovation [6]. In addition, Jiang Shanyu and Wang Feng (2021) believe that even if a few enterprises implement ecological economic management, they lack technical and time support, the management system is not sound, and the cost is high [7]. For example, an enterprise invests 4 million yuan in pollution control equipment, the state subsidizes 2 million yuan, and the enterprise bears 2 million yuan. Besides, the annual operating cost of the equipment varies, and all of them need to be included in the operating cost of the enterprise [7]. In this case, the product production of micro, small and medium-sized enterprises is mostly imitation, unable to achieve efficient and environmentally friendly sustainable development mode. In the face of the increasingly strengthened protection of intellectual property rights and patents, enterprises also need to continuously increase production costs, resulting in insufficient time and funds to improve the corresponding elements of green innovation development, resulting in a serious lack of efficiency of green innovation. In addition, due to the lack of abundant funds and small scale, micro, small and medium-sized enterprises cannot provide good treatment for scientific researchers, and it is difficult to attract outstanding talents. As a result, green technology innovation lacks personnel guidance, which is also one of the key factors of the low efficiency of enterprise green innovation.

(3) Low product competitiveness

Micro, small and medium-sized enterprises are mostly in the labor-intensive field, which is the processing and manufacturing process at the low end of the "smile curve". Zhao Chengguo and Jiang Wenxin (2021) believed that in terms of the lack of brand characteristics of domestic small and medium-sized enterprises, the market is flooded with homogeneous products, the industry competition is fierce, and they seize the market by compressing product prices and blindly expanding production scale, which causes damage to the ecological environment [8]. Enterprises mainly rely on the introduction of equipment and technology for leading products, and have insufficient ability to absorb and digest technology, especially in industries such as "overcapacity," "dependence on raw materials," "backward production capacity," and "traditional low profit."

(4) Low efficiency of data intelligence

MSMEs have limited space for growth from their birth, and their output products or services cannot timely respond to market changes. In addition, MSMEs have drawbacks such as untimely, inaccurate and narrow data range in data collection and application management. Data quality cannot timely feedback market demand, and data quality cannot accurately locate the strategic needs of enterprise operation and development. Enterprise costs and expenditures are seriously unbalanced with actual benefits. The above reasons lead to low efficiency and limited development of enterprise data intelligence. The overall operating conditions of enterprises are seriously poor due to the inability to effectively respond to market behaviors, and the energy level effect of enterprises is low, resulting in increased data energy consumption and pollution effect on the average productivity of the society. In serious cases, they are eliminated by the society.

4 Components of Smart Ecological Economic Management

4.1 Market Factors

Market factors belong to the external factors of enterprise ecological economy operation, which can be divided into supply chain factors and consumer factors. In the supply chain elements, the focus is on the distributors and suppliers that meet the requirements of enterprise characteristic elements, which is the key factor to promote the implementation of ecological management by enterprises. The supply chain is formed together with consumers and enterprises. Only when both of them have ecological characteristics, establish ecological concepts and build market information communication platform, can they actively implement the requirements of ecological environmental protection. Wang Qian (2018) believes that the business scope of small and medium-sized enterprises determines that economic activities are not limited to

internal, and the external environment will also provide direction for their mechanism operation, and the internal and external environments are interdependent and influence each other [9]. In terms of supply chain operation, the selection of suppliers should consider the product quality and the ecological concept to ensure that both sides reach a consensus, otherwise the seemingly harmonious cooperation will increase the supply cost [9]. In terms of downstream dealers, small and medium-sized enterprises should also pay attention to the corporate culture of dealers, ensure that the culture has ecological characteristics, understand consumers' demand for products, and choose responsible and responsible dealers [9]. Among the consumer elements, it aims to change the traditional concept of consumers, green consumption market, and stimulate enterprises to implement ecological production. In this process, people should be guided to respect ecology and advocate nature, change their consumption concept, and focus on sustainable consumption while pursuing comfort and convenience. Consumers' purchase demand points out the direction of enterprise product production, so that enterprises can take environmental protection as part of their business strategy, consciously implement ecological management, and restrict production behavior.

4.2 Five Elements of Enterprise Management

Wu Jianhui and Tang Lili (2020) believe that the internal elements of smes include organizational system and production system elements [10]. The organizational system needs to ensure that the intelligent structure, internal culture and management system have ecological coordination, the management level should establish ecological concepts, grasp the ecological laws of the market, the strategies of all departments are the same as ecological decisions, implement ecological concepts into the organizational structure, and transform ecological management rules and regulations into internal productivity [10]. In terms of production system, ecological management should be implemented in ecological management, product design and manufacturing process, which can not only ensure the environmental protection of products, but also avoid the secondary harm of environmental pollution, realize the two-way coordination between customer satisfaction and resource conservation, and control the ecology of products at the source.

According to the four-factor model of business model proposed by Gary Hamel in his book Leading Enterprise Change based on the perspective of business strategy analysis, the five-factor model of enterprise operation in this paper is proposed. As shown in Figure 4. In this model, the profit path is proposed to define the key significance of enterprise operation, and on this basis, the critical path method of operation of MSMEs is proposed, as shown in Figure 5.

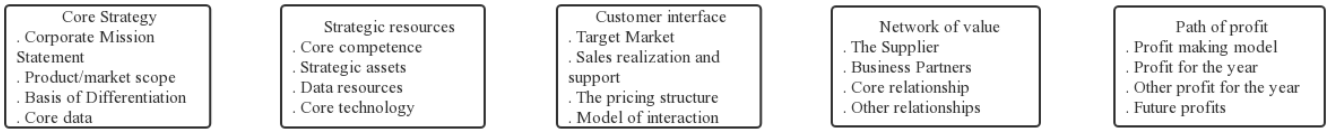

Figure 4 5-factor Model of Msmes Operation

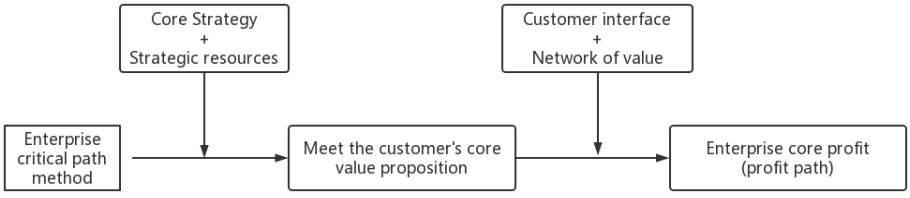

Figure 5 Critical Path Method for MSMEs

4.3 Innovative Development Factors of Energy Economy

Energy economic innovation is the main driving factor of enterprises' own development vitality. From the dual perspectives of internal energy efficiency innovation and consumption reduction and energy saving, the enterprise economic ecological management should be viewed, the basic role of energy economic innovation should be given

full play, the intelligent transformation of enterprise production and operation efficiency should be led by green innovation technology to realize the fine and adaptive mode, the enterprise intelligent ecological economic system should be self-realized, and the innovation and development of enterprise energy economy should be promoted.

4.4 Social Elements

The growth of MSMEs is social, and they need to accept the supervision of public opinion to promote the development of enterprises. In the long-term development of enterprises, the measurement of operating conditions is mainly based on economic income, and there is little attention to social effects, which makes the environment bear a high cost and requires social guidance. In terms of education, it is necessary to strengthen public understanding and education on the concept of environmental protection, enhance public awareness of environmental protection, establish ecological concepts, advocate the new trend of self-supervision and supervision of environmental behavior, and trigger social attention from multiple dimensions. Education not only includes professional environmental education, academic education, etc., but also can use T-shirt, network and public video number, TV advertising, artificial intelligence, circle culture guidance and other ways to create a social ecological management atmosphere, so that the business activities of MSMEs are widely supervised by the society, to examine the production process from the perspective of intelligent ecological economy, and regulate their own behavior.

5 Management and Operation Mechanism of Smart Ecological Economic

5.1 External Operation Mechanism

For ecological economic managers of MSMEs, external operation mechanism is the constraint and guarantee condition for achieving management goals. Under the current social development mode, enterprises should not only realize the pursuit of increasing wealth and realizing self-value, but also purify enterprise value, increase zero pollution wealth value, and assume the responsibility of social, economic and environmental protection development. However, in the actual development, due to subjective and objective factors, the ecological economic management costs of MSMEs are mostly borne by the society. In order to reduce social costs, the cost of using environmental resources is materialized as the source of internal income, so that enterprises can consciously compare the external ecology and internal economy, make clear that short-term revenue is undesirable, overcome the external ecological management costs, and improve the ecological benefits of economic profits. First, formulate policies and regulations. Xu and Zhang (2020) believed that environmental compensation, as a focal policy, refers to the social price given by the society based on the benefits and social carrying capacity of enterprises, and is an incentive system for small and medium-sized enterprises to implement ecological economic management, which consists of social compensation and enterprise compensation [11]. The implementation of this system requires clarifying the obligations and rights of participants, establishing ecological protection standards and punishment methods, standardizing the ecological management behavior of enterprises in strict accordance with the provisions, urging them to change the production mode, adjusting the financing structure, attracting the attention of environmental protection capital, and ensuring that enterprises can consciously fulfill their obligations, otherwise, the punishment will be increased. Secondly, the establishment of management standard system, the introduction of artificial intelligence product system to identify the ecosystem, through the safety certification mark and ecological implementation standards to implement professional and intelligent management, so that it runs through the whole production management process, accept the supervision of consumers and public opinion. In order to facilitate users to identify products, intelligent ecological mark can be established, requiring enterprises to produce green and pollution-free products in the whole life cycle, and implementing Internet of Things technology for tracking and traceability. Any product has two-dimensional code, scanning the code can understand its environmental monitoring label, determine the green index of the product in the whole life cycle, so as to provide users with better products and services. At the same time, ecological management should carry out ISO14000 management standards, which as an international market pass, put forward higher requirements for product quality, production in

accordance with the standard, can achieve the purpose of reducing pollution and saving resources. Finally, relying on advanced intelligent technologies such as big data, blockchain and artificial intelligence to realize intelligent supply chain management, and the new "adaptive" business operation model driven by terminal demand, the essence of intelligent supply chain is to realize intelligent driving model on the application basis of digital supply chain, namely "basic supply chain management + intelligence". Open source completes strategic planning, source searching, comparison and optimization procurement, intelligent design, intelligent manufacturing, intelligent logistics and intelligent service support. As shown in Figure 6, the "adaptive" supply chain business operation model constructed by intelligent supply network is constructed.

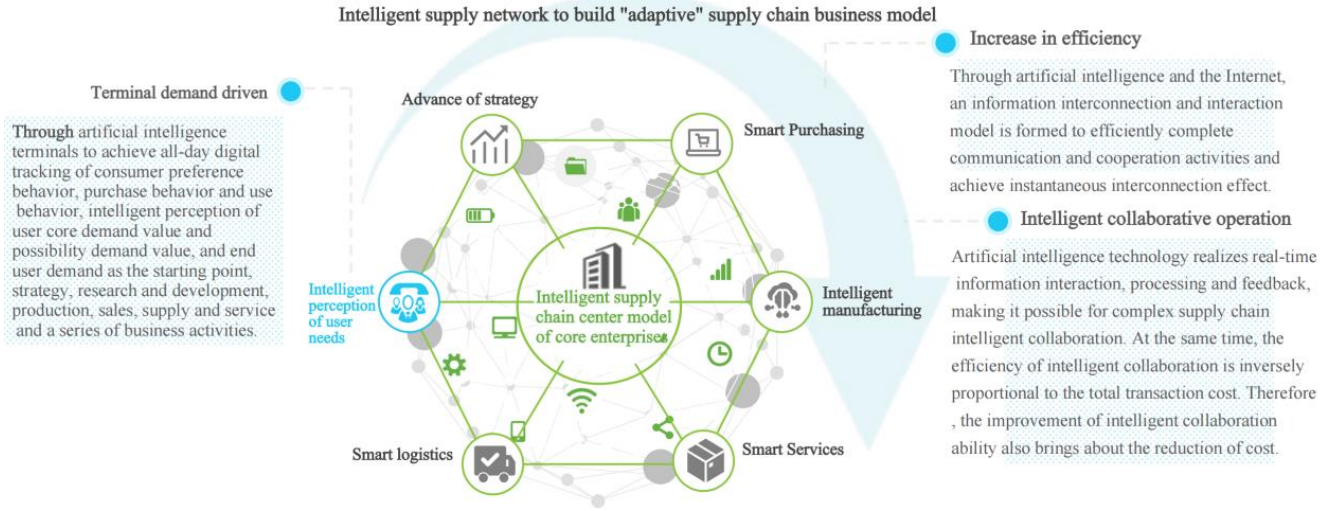

Figure 6 The Intelligent Supply Network Constructs the "Adaptive" Supply Chain Business Operation Model

Note: Prepared according to the report of iResearch Consulting Research Institute.

5.2 Internal Operation Mechanism

(1) Improve the management level and gather the core centripetal force

In the strategic planning of MSMEs, the management concept should be changed, focusing on the intelligent ecological economic system, and the ecological concept should be implemented at all levels. In this process, Wan (2019) believes that enterprises should pay attention to the needs of employees, accept their management opinions, arrange professionals to care about employees' work and life, clarify what problems they encounter, arrange their spouses to work and their children to go to school, and improve employees' sense of belonging, so that they can devote themselves to green production without worries [12]. Through guidance to enhance the ecological concept of employees, actively carry out talent introduction and training, increase human capital investment, employees with high potential will be provided with opportunities for further study, scientific talent retention strategy, and actively guide employees to do a good job in career planning. Employees who make outstanding contributions to the enterprise can be given management rights, provide direction guidance for their work, mobilize their enthusiasm for work, enhance environmental awareness, ensure that the internal work together, and create an intelligent ecological and economic enterprise.

(2) Realize green scientific and technological innovation -- green innovation and intelligence

Smart ecological economic management requires MSMEs to improve the comprehensive efficiency as the starting point, strive to do a good job in the innovation and development efficiency of ecological environmental protection, use the intelligent balance analysis ability of big data platform, and actively balance the interests of all relevant groups, including intelligent ecology of service mode and product process, intelligent ecology of service process and production process, intelligent ecology of service and product structure. Actively participate in the creation of intelligent ecological enterprise model based on RPA and AI technology. As the terminal of enterprises, products and services can affect customers' impression of enterprises. Enterprises are still responsible for the service

effect, accelerate the introduction of green innovation technology and investment in research and development, promote humanized services, and produce according to the requirements of intelligent, clean and circular economy. It is no longer the process of "design, production, use and waste". Consider the closed-loop process of "design, production, use, waste and design", realize the reuse of raw materials, reduce waste emissions, reduce energy consumption and resource waste, pursue high performance product structure, create maximum value with minimum resources, and use science and technology to change products, so as to produce products sought after by the market. In view of the current problems that MSMEs are limited by their own lack of funds, are prone to suffer bottlenecks in the development process, and are difficult to manage the ecological circular economy, and cannot achieve long-term development strategies, Ge Xiaohong and Xing Manjiang (2020) believe that enterprises should strive to increase the proportion of intelligent manufacturing in their development strategies, and introduce core intelligent manufacturing capabilities [13]. Vigorously introduce mechanization, automation, intelligence, information and digital means, comprehensively enhance the competitiveness and self-innovation and development ability of enterprises, further enhance the core strategic position of enterprises' supply chain strategic alliance, and strengthen the assimilation of enterprises' strategic goals [13]. In addition, it makes full use of agents based on mobile Internet, cloud platform, Internet of Things and big data to dynamically perceive and analyze user needs and market environment changes, provide intellectual support for enterprise supply chain strategic alliance, and realize intelligent coordination between strategic partners [13].

Enterprises should not only implement ecological management for core products and services, but also focus on the design and development of environmental indicators, ecological efficiency, cost quality, and product ecological performance in the process of product and service life cycle management. Enterprise developers and designers need to achieve the repeatability and high efficiency of energy efficiency on the balance of multiple composite factors such as resource reuse rate, ecological and economic indicators, and low-carbon operation benefits, use easily recyclable or degradable materials, reduce secondary waste generation and expand toxic and side effects, so that enterprise products and services in the intelligent ecosystem continue to expand their market value. In this process, Lv Jun, Yang Mengjie (2022) found that in order to improve the level of environmental protection and the rational use of various resources, they believed that it could be achieved by promoting the "industry-university-research" cooperation paradigm, that is, small and medium-sized enterprises actively cooperate with local universities to carry out "one enterprise, one technology" activities, so that research institutes and enterprises can jointly build R&D institutions [14]. Research and development of green technology, accelerate the digestion and absorption of new technology and achievement transformation [14]. Service-oriented enterprises need to provide users with human services, so as to achieve a win-win situation in the interests of society, enterprises and users.

(3) Cultivating green brand -- integration of solid and idiosyncratic

Medium, small and micro enterprises need to provide users with qualified quality products and build environmental protection and green brands. According to the survey of new consumption concept by Tencent research institute, with the change of consumer subjects, the new consumption era presents the characteristics of individfication, diversification and quality. More than 50% of consumers hold a positive attitude towards new brands, which provides soil for the birth and rapid development of new brands. The new view of consumption holds that enterprises should manage brand crowd with assets, build CDP customer management system, and pay attention to positive brand image and brand customer loyalty management. However, due to factors such as cost, technology and business philosophy, most small, medium and micro enterprises adopt extensive management, are in the low-end production chain, and lack of independent brand marketing. Therefore, they need to strengthen the construction of green ecological brand, so as to create the scale effect of private brand agglomeration, so as to achieve the needs of rapid development of enterprises. Therefore, MSMEs should establish trademark awareness, increase the number of independent brands, actively develop the existing product service system, use green innovation technology to continuously improve market competitiveness, strive for green brands, and constantly accumulate the management and maintenance of brand audience assets. In addition, enterprises should actively participate in the formulation of national, industrial and local standards, ensure that the standards are consistent

with the development of enterprises, actively learn international advanced management experience, pass the environmental quality management system certification and product certification, parking trademarks, create ecological brands, and gather brand effect. In addition, enterprises should actively utilize artificial intelligence technology to expand the output of existing business models. The development result of the integration of artificial intelligence and virtual "meta-universe +" technology provides relatively mature market environment and ecological conditions for micro, small and medium-sized enterprises to actively explore overseas markets, and helps enterprises to create a new operating mechanism model by integrating the corresponding solid and special characteristics. This paper has reasons to believe that the current innovation results of the integration of artificial intelligence and "meta-universe +" technology are more conducive to the brand creation and promotion of micro, small and medium-sized enterprises in the market, and conducive to the rapid formation of corresponding market influence of micro, small and medium-sized enterprises.

5.3 Public Participation Mechanism -- Creating an Environment-Friendly Smart Eco-economic System

Manjiang Xing, Dae-Won OH, Chi Gong (2022) think that in the future smart city will be an efficient, convenient and intelligent green ecological system that solves the problems of human information communication, green ecology and energy production and supply, and comprehensively serves the individual and the public [15]. The basic functions of the city will no longer be only safety, livability, health, traffic information, emotion and other aspects, but also reflect the importance of the degree of intelligence [15]. Pursue a more free and independent energy space and time [15]. Therefore, the ecological environment is related to human development and survival [15]. It is not only the responsibility of enterprises and governments to build intelligent ecosystem civilization and fulfill the responsibility of ecological balance, but also a universal public obligation [15]. Only through extensive public supervision behavior, can we constantly promote small, medium and micro enterprises to establish intelligent ecological economic system, implement ecological economic management responsibility, improve ecological environmental awareness, establish a good corporate social image, through the creation, improvement, application of new intelligent ecological technology, and finally achieve the unity of ecological, economic and social benefits [15].

(1) Enhancing public ecological awareness

As the only home, the earth provides people with broad space and rich materials, but it is also necessary to realize that the earth's environmental ecological resources and carrying capacity are limited. Under the deterioration of the ecological environment, green protection is a national sport, so it is necessary to encourage the public to participate in the construction of ecological civilization, improve the public's ecological awareness, and put it into action. We can also learn from the development experience of ecological enterprises in developed countries, carry out propaganda and education activities, and guide more people to participate, so that they can understand the significance of enterprises as ecological economic management models and fulfill ecological responsibilities. However, the unbalanced development of urban and rural areas in China, the lack of ecological awareness of the people in remote areas, we need to focus on the ecological education in remote areas, accelerate the construction of ecological civilization.

(2) Media supervision

Under the implementation of ecological economic management, MSMEs need not only government supervision and self-restraint, but also external society to supervise them, and give play to the supervision functions of media and social organizations, so that MSMEs can fulfill ecological responsibilities and build ecological civilization. Under the development of the new economy, the emergence of new social organizations and new media has a great influence, which can play the supervision and coordination role of media organizations, associations, trade unions and other organizations, promote enterprises to fulfill ecological responsibilities, actively publicize ecological environment education, and guide people's ecological awareness. The media can also use their own social influence to restrict the economic behavior of enterprises, inspire other enterprises by publicizing the model enterprises, or publicly criticize and report the environmental damage production events of enterprises, warn other enterprises, encourage the operation and management behavior of small and medium-sized enterprises, and take the initiative to assume the responsibility of ecological and environmental protection.

(3) Supervision by non-governmental environmental organizations

The protection of the ecological environment is the obligation of the whole society. According to the ecological practice of developed countries, the supervision of non-governmental institutions can also promote small and medium-sized enterprises to achieve green production, fulfill ecological responsibilities and protect the ecological environment. The participation of non-governmental institutions means that non-governmental and non-rational organizations actively participate in the intelligent ecological economic management of MSMEs in non-market and non-administrative ways such as social morality and public opinion. Such social organizations can adjust the complex relationship between non-monopolistic public goods and human ecological resources and environment, support the establishment of civil environmental protection organizations, and promote the development of environmental protection. Our country's ecological non-governmental organizations are still in the primary stage of development, mostly academic research organizations, limited by various conditions, failed to play their role, professional environmental protection organizations can be actively developed, relax the conditions for establishment, so that they can standardize and guide enterprise behavior in technology, industry management. Enterprises should also use environmental organizations to enrich their practical experience and environmental protection concepts, correctly implement environmental protection responsibilities, and realize the effective operation of ecological and economic management.

5.4 Global User Operation Mechanism

Enterprises should formulate global operation solutions, plan the top-level strategy of global operation of enterprises, improve the marketing strategy of key customer groups -- key groups, pay attention to the cultivation of consumption intention of consumer groups and the maintenance and management of brand sticky growth strategy, and strive to build their own advantages in brand consumption resource management and service. Make full use of existing technologies and methods to meet the global user operation strategy, realize the expansion needs of full-cycle coverage and airspace filling strategy, carry out corresponding cultivation, protection and development strategies for consumer group resources according to different products and services in different industries of the enterprise, do a good job in market segment positioning analysis, and establish corresponding group asset files. In addition, corresponding management costs are paid to maintain the resource relationship of the customer group, and the corresponding 5R crowd asset model and STAR global user value-added model are proposed to meet the requirements of global operation optimization strategy.

6 Case Analysis

(1) Aner: "361" operating principles + "double shopping guide" service model, online and offline member assets get through, and four models help refine operation.

Anniel is a Chinese children's clothing brand mainly engaged in high-end children's clothing. Since 2019, Anner has relied on the "361" operating principle + "double shopping guide" service mode, based on social trust, to efficiently operate user groups and promote user transaction transformation. In order to cope with the fragmented market situation of channels with limited operational resources, Annel has rationally allocated traffic and operational energy. "361" operation principle refers to the investment of 30% for ordinary members, 60% for silver card members and 10% for gold card members to operate, that is, the operation focus of Anel is to drive the large volume and higher value of converted user groups to a higher level of circulation, improve frequency and promote activity. In the "dual shopping guide" service mode, the store shopping guide is mainly responsible for serving the customers around the store, while the headquarters shopping guide undertakes the online traffic of non-stores, and simultaneously shapes the intimacy between user groups and brands.

Annel has designed targeted strategies for each type of user group while allocating its operational energy properly. For example, in terms of operation frequency, Annel will consider each consumer's first purchase time, second repurchase time interval, children's birthdays, etc., and then provide targeted discounts and personalized services. In terms of building emotional relationships, Annel will also push some content related to parenting growth to new Jinbao mothers through community and 1v1 private chat to gain the goodwill of parents.

(2) Tencent ecological touch point global user management -- fine management

The content layout of Tencent ecological resources is complete and rich, taking into account both public and private domains. The public domain touch points include Tencent video, Tencent games, QQ Music, Tencent advertising, Tencent brand discovery mini program, etc., while the private domain touch points include enterprise wechat, public account, moments of friends, mini program mall, wechat Pay, etc. It covers all traffic touch points from building consumer cognition, planting grass, and pulling grass transformation, and supports Tencent's global user operation solution on the basis of full-contact traffic assets (as shown in Figure 7).

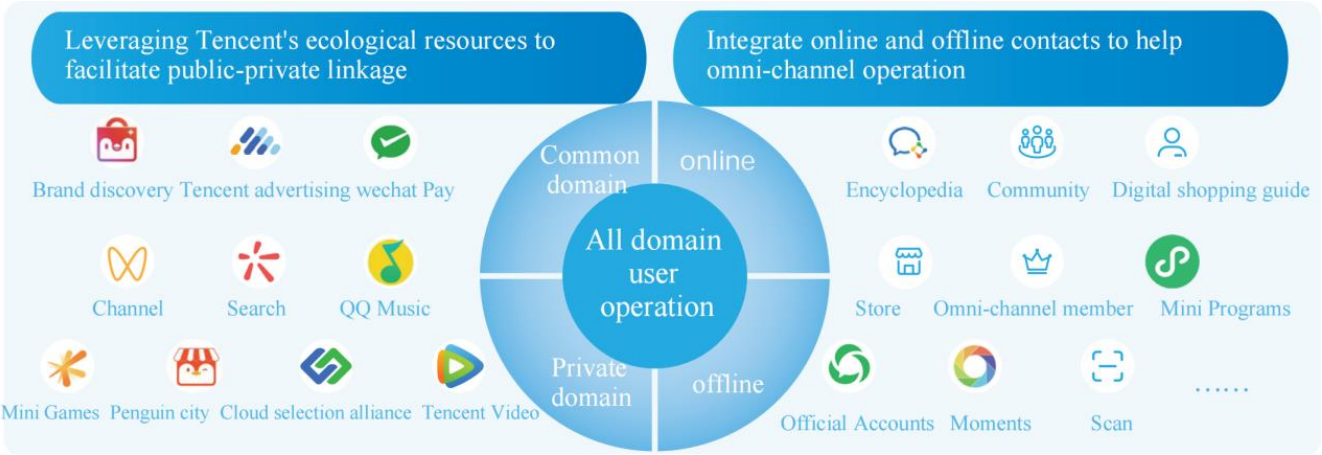

Figure 7 Tencent Ecological Touch Points

For example, the above two cases fully reflect the advantages of the enterprise in the current comprehensive use of advanced scientific and technological development achievements into the enterprise ecological management system mode. This advantage reflects the endogeneity and external expansion energy efficiency of the intelligent ecological economic system mode, which can effectively expand the depth and breadth of enterprise operation, not only reflected in the time line of the omni-domain dynamic operation. It can also increase the psychological intimacy of customer groups, establish a wide range of comprehensive three-dimensional intelligent ecological economic system with different levels, different contact perspectives and different product and service depths for enterprises and customers, so as to establish a wide range of social attention, establish a positive and healthy social image of enterprises, and provide a reference model for low-carbon and intelligent operation of enterprises. This paper holds that the intelligent ecological economic system model is not only the combination of ecological environmental protection model and intelligent scientific and technological products, but also a more detailed global ecological management model. This model can not only assist enterprises to improve the self-innovation, self-intensification and global conceptual growth three-dimensional management model, but also meet the dynamic efficiency required by social and economic development and progress. It will provide new development energy efficiency for the construction of social green and ecological civilization and the intelligent and harmonious development of human beings and society. Therefore, for Chinese MSMEs facing various business difficulties at present, efforts should be made to develop and realize the smart ecological economic model suitable for the development of the enterprise on the basis of this study, which will help the enterprise successfully break through the circle, shape the intelligent and harmonious ecological economic model of human, society and nature, and develop the enterprise scale gradually, so that the enterprise can successfully stand on the head of the future century. It has become an effective driving force for social development.

7 Conclusions and Deficiencies

This paper discusses in detail the operation and management mechanism of MSMEs from the perspective of intelligent ecological economic system. The intelligent ecological operation mechanism of enterprises that introduces advanced technologies such as artificial intelligence and RPA super automation and integrates

green innovation technology and global ecological business model is helpful to expand the development space of enterprises and is expected to break the boundaries of capital and time and space. It will help the rapid development of small and micro enterprises to realize the sticky expansion of self-brand and the value of customer group assets, and provide infinite possibilities for the future growth space of MSMEs.

To sum up, the extensive development mode of MSMEs can no longer meet the requirements of modern economic and social development, and the growth comprehensive operation model driven by intelligent ecological economy system, namely intensive development + global operation mode + green innovation circular economy mode, has become the mainstream trend of enterprise development in the future. Therefore, in order to achieve rapid breakthrough, MSMEs must change the existing operation and management mechanism and create a comprehensive, sustainable and multi-dimensional integrated development critical path to meet the needs of the society. In particular, it is proposed that due to the large number of MSMEs, changing their traditional operation and management mode is related to the success or failure of the national ecological and economic civilization construction strategy. Therefore, based on the actual situation, enterprises can realize the sustainable and virtuous cycle development of the big intelligent ecosystem from the aspects of external operation mechanism, internal operation mechanism, public participation mechanism and global user operation mechanism.

In the process of research, this paper integrates the concept of innovative development, based on macroeconomic research methods, forms the corresponding operation mechanism of green innovation with the help of artificial intelligence, RPA and other advanced technologies, and discusses the operation mechanism of relevant enterprises to global users with examples, and puts forward certain reference opinions on the existing problems and solutions of MSMEs. The research in this paper has the problems of insufficient data quantity, too much attention to the dynamic efficiency of science and technology on enterprise development mode, insufficient analysis of social factors, and incomplete demonstration of intelligent ecosystem model. Therefore, the research team will conduct special research on the above problems, and the later research will take the establishment of large intelligent ecosystem model as the starting point, so as to provide some reference for relevant researchers.

Conflicts of Interest

The authors declare they have no conflicts of interest to report regarding the present study.

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