



International Journal of Technology Management

ISSN online: 1741-5276 - ISSN print: 0267-5730

<https://www.inderscience.com/ijtm>

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DOI: [10.1504/IJTM.2023.10052642](https://doi.org/10.1504/IJTM.2023.10052642)

Article History:

Received:	07 April 2021
Last revised:	05 July 2021
Accepted:	17 September 2021
Published online:	20 December 2022

Innovation and application of enterprise's supply chain management mode under the background of Industry 4.0

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Abstract: Under the background of Industry 4.0, aiming at the problems of low management performance and poor profitability of traditional enterprise's supply chain management mode, this paper discusses the innovation and application of enterprise's supply chain management mode under the background of Industry 4.0. Firstly, the evolution and development characteristics of Industry 4.0 background are analysed, and the operation structure and management content of enterprise's supply chain are determined. Secondly, the data of supply chain management is collected to determine the problems of supply chain management mode. Thirdly, the idea of establishing electronic supply chain management is put forward, introducing advanced management technology and establishing long-term supplier partnership. Finally, this management model is applied to the actual management work, and it is found that the comprehensive indicator of enterprise management performance is improved by about 0.25; this management model has good application effect.

Keywords: Industry 4.0; enterprise's supply chain; supply chain management; management mode innovation; management mode application.

Reference to this paper should be made as follows: Chen, H. and Su, W. (2023) 'Innovation and application of enterprise's supply chain management mode under the background of Industry 4.0', *Int. J. Technology Management*, Vol. 91, Nos. 1/2, pp.19–38.

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1 Introduction

At present, China is in the important period of the fourth industrial revolution. Under the background of Industry 4.0, the intellectualisation of enterprise's supply chain management is facing severe challenges. Supply chain management refers to the management of the whole supply chain process from suppliers to sellers and then to final customers. It is the management of a series of processes such as internal product production planning, goods procurement, customer orders, inventory storage, logistics distribution and customer service. Its purpose is to ensure the effective management of logistics, capital flow and information flow inside and outside the enterprise, so as to ensure accurately and timely deliver the products to customers with qualified quality and reasonable price (Wang et al., 2020). In recent years, supply chain management has become the focus of many enterprises (Liu, 2020). Supply chain management can help enterprises establish strategic cooperative relationship with upstream and downstream industries, connect multiple enterprises in the industrial chain with win-win interests, optimise the whole work process, strengthen the cooperation among the main bodies, so as to give full play to the advantages of each enterprise in the supply chain. Supply chain management is different from the traditional management; its purpose is to maximise the value of the enterprise at the lowest cost, by fully mobilising enterprise resources to meet customer demand. At present, supply chain management has been widely used in all walks of life, especially in industry, manufacturing, retail and other industries. From procurement, production to transportation, all links cooperate with each other to improve enterprise efficiency.

However, with the continuous development of social economy, the traditional enterprise supply chain management model has been unable to meet the requirements of enterprise development, resulting in a variety of problems in the process of enterprise supply chain management. Such as weak consciousness of supply chain management, supply chain efficiency is low and the stagnation of logistics time is too long, the low level of supply chain integration technology, the traditional supply chain management to ignore partnership growing, third-party outsourcing level as a whole is low, the external environment of supply chain, eventually lead to the enterprise supply chain management performance is low, the problem of poor earnings. Therefore, it is necessary to innovate the enterprise supply chain management mode. Innovating the enterprise supply chain management model can not only improve the overall supply chain operation level of the enterprise itself, enhance the competitiveness of the enterprise, increase the operating profit of the enterprise, but also promote the continuous improvement of the enterprise supply chain management model, so as to improve its viability and competitiveness in the international market. Therefore, it is of great strategic significance to innovate enterprise supply chain management mode for enterprise management.

In order to solve this problem, this paper discusses the innovation and application of enterprise supply chain management mode under the background of Industry 4.0, in order to adapt to the background of Industry 4.0 and improve the efficiency of enterprise supply chain management. The overall technical route of this method is as follows:

- 1 This paper analyses the evolution and development characteristics of Industry 4.0 background, and determines the operation structure and management content of enterprise supply chain.
- 2 Collect the management data of enterprise supply chain; determine the problems of supply chain management mode.
- 3 This paper puts forward the idea of establishing electronic supply chain management, introducing advanced management technology, establishing long-term supplier partnership and other innovative management modes.
- 4 This management mode is applied to the actual management work to verify the application effect of the mode.
- 5 Summarise the full text and draw a conclusion.

2 Analysis of enterprise supply chain management mode under the background of Industry 4.0

1 Industry 4.0 background

Industry 4.0 is the fourth industrial revolution, which is different from the previous three industrial revolutions. In the fourth industrial revolution, information communication and cyberspace virtual technology are applied to industrial production, which transforms the production and management mode of enterprises into information management mode, and realises the intelligent automatic production of enterprises (Liu and Degiovanni, 2019). Industry 4.0 makes use of internet of things and other information technologies to closely link the resources, information, things and people of manufacturing enterprises, and improves the intelligent level of manufacturing industry.

2 Enterprise's supply chain structure model

Enterprise's supply chain can be divided into internal supply chain and external supply chain. Internal supply chain includes procurement, production, warehousing, sales and other parts, which is the production and circulation process of internal products (Elkazini et al., 2021). The external supply chain refers to the supply and demand network composed of external enterprises, including raw material suppliers, manufacturers, storage and transportation providers, retailers and final consumers, participating in the production and circulation of enterprise products. The supply chain structure model is shown in Figure 1.

Figure 1 Supply chain structure model

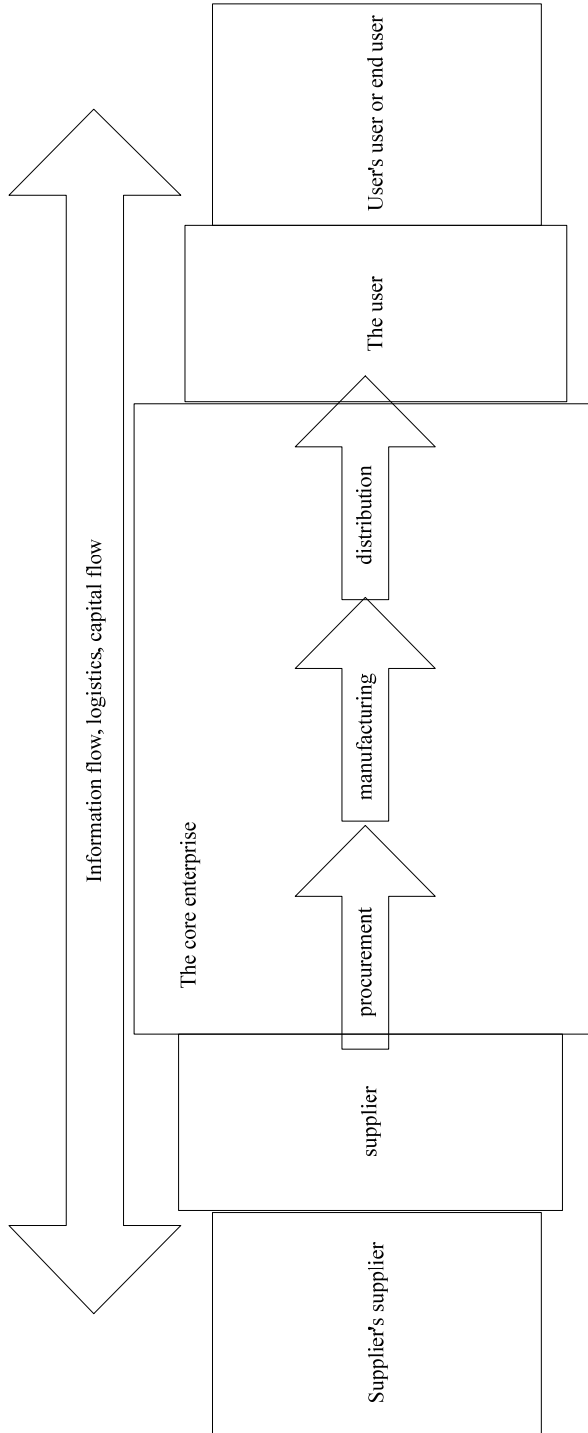
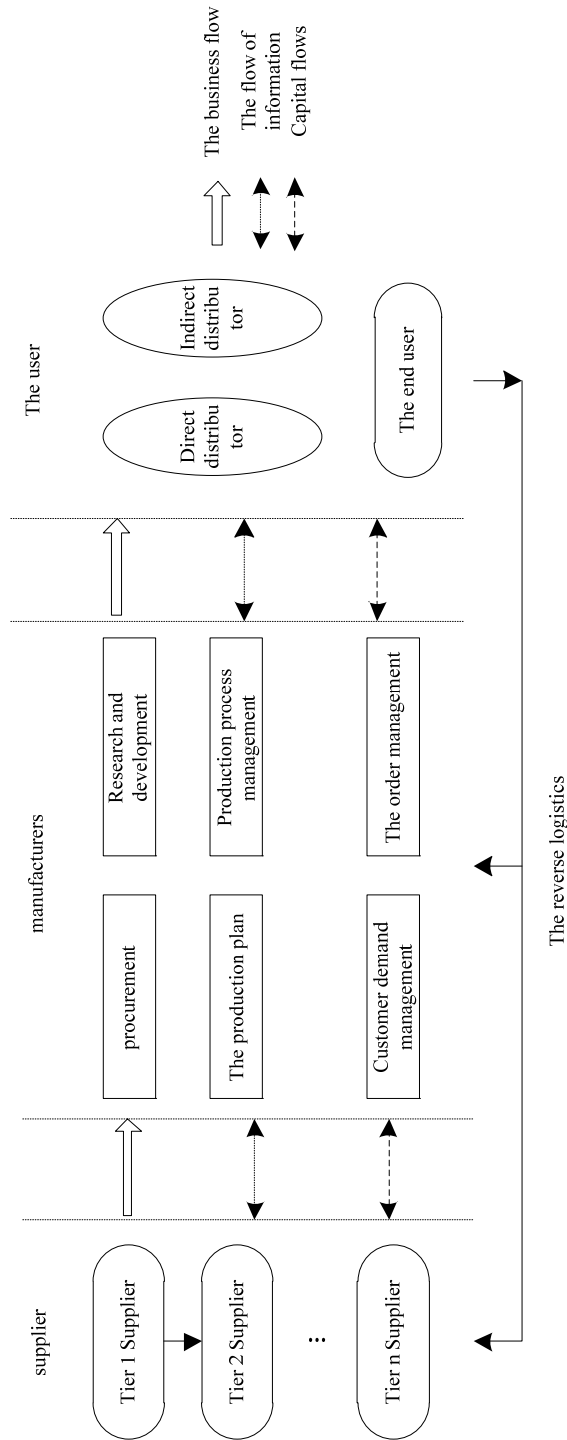


Figure 2 Schematic diagram of enterprise's supply chain management mechanism



It can be seen from the structural model that the supply chain takes a leading enterprise as the core, takes its connection with the upstream and downstream enterprises as the link, and realises the flow of information, logistics and capital flow through the cooperation among various supply nodes of the enterprise, so as to achieve the goal of supply chain value-added (Sassi et al., 2021).

3 Supply chain management mode

According to the main content of supply chain management, the management content of supply chain can be divided into two parts: functional domain and auxiliary domain (Tortorella et al., 2019; Shah et al., 2019). The functional domain mainly includes raw material procurement, production process, product technology, inventory, storage and other management work; and auxiliary domain mainly includes production manufacturing, outer packaging design, financial integration, human resources, product marketing, customer service and other management work (Lee, 2020). Through the analysis of each link, the enterprise's supply chain management mechanism is obtained, as shown in Figure 2.

2.1 Current situation of enterprise's supply chain management

Based on the supply chain management of some typical manufacturing enterprises in China, the information of enterprise procurement, production, sales, logistics and other links is collected respectively. According to the statistics and comparison of relevant data, the production and sales situation of manufacturing enterprises from 2011 to 2020 is shown in Table 1.

Table 1 Production and sales data of manufacturing enterprises from 2011 to 2020

<i>Year</i>	<i>Annual output of products (10,000 units)</i>	<i>Annual sales volume of products (10,000 units)</i>	<i>Import amount (US \$100 million)</i>	<i>Export amount (US \$100 million)</i>	<i>Output growth rate (%)</i>	<i>Sales growth rate (%)</i>
2011	1,379.1	1,362.16	741.38	689.37	47.54	45.48
2012	1,826.47	1,804.19	782.22	744.47	32.44	32.45
2013	1,841.89	1,850.51	825.23	784.18	0.84	2.45
2014	1,927.18	1,930.64	986.05	843.12	4.63	4.33
2015	2,211.68	2,198.41	773.26	800.46	14.76	13.87
2016	2,372.29	2,349.19	766.54	797.46	7.3	6.9
2017	2,450.33	2,459.76	882.71	834.11	3.3	4.7
2018	2,811.88	2,802.82	852.44	882.66	14.46	13.65
2019	2,901.54	2,887.89	863.54	894.73	3.19	3.04
2020	2,708.90	2,808.10	843.65	876.94	-4.2	-2.8

From Table 1, we can generally understand the development trend of the supply chain of some typical manufacturing enterprises in China. Combined with the statistical data of each module in the supply chain, we can get the relevant results of the current development of enterprise's supply chain management, and find out the problems existing in the stage management mode.

2.2 Enterprise supply chain management problems

2.2.1 Weak management awareness

With the emergence of network economy, the traditional and single way of competition is gradually disappearing, and the diversification consciousness of enterprises gradually replaces the single management consciousness. However, the supply chain management consciousness of most enterprises in China is still relatively weak. Even if they have the idea of supply chain management in the process of enterprise management, their supply chain management is still a weak link, and it is difficult to reach a consensus inside and outside the enterprise, which leads to the difficult formation of value chain between supply chains (Areta and Awwad, 2019). The ultimate goal of the supply chain is to achieve collaborative development and provide high-quality services for customers through the resource sharing among the nodes in the supply chain. However, in China, many enterprises still use the traditional way of operation, the links in the supply chain are not closely linked, and they neither communicate with each other, nor coordinate with each other, rarely cooperate with each other, which leads to a serious waste of resources.

2.2.2 Low level of integration technology

The supply chain management level of Chinese enterprises is relatively low, and the main reason is that the popularity of computers and the construction level of communication network are still very low. In supply chain management, enterprises need to operate computers to establish contact with suppliers, distributors and retailers. Information flow, logistics and capital flow need to be transmitted through computers and communications. However, due to the lack of understanding of supply chain management in China, an imperfect communication network has been established (Chen et al., 2020). But in the era of 'internet plus', the supply chain demands highly information technology, and the best coordination between systems is achieved. At the same time, the integration process of the supply chain also requires the effective combination of technology and resources. Only in this way can information flow in the supply chain. Therefore, it should make full use of modern information technology, accelerate the construction of internal and external systems and information technology integration, strengthen the rapid response and flexible management of supply chain information, and create favourable conditions for supply chain management.

2.2.3 Lack of policy enforcement

From the actual management of the supply chain, it is impossible to effectively integrate the information of each module of the supply chain, which may lead to a large number of isolated data in the supply chain, greatly increase the cost of information transmission and sharing within the supply chain, and also bring difficulties and challenges to the information management of the supply chain. In the context of big data, combined with the results of enterprise's internal information survey, in the five basic processes, the effective information exchange rate of the investigated enterprises is only about 65%. That is to say, about 35% of the processes are forced to be modernised and informationised (Fatorachian and Kazemi, 2020). In the enterprise's supply chain, this

directly leads to at least one fifth of the obstacles of process and business information exchange.

2.2.4 Low efficiency of supply chain connection

The connection efficiency of supply chain and the stagnation of logistics have become the biggest obstacles to the operation of supply chain. If we manage the supply chain according to the world standard, the level of supply chain management in China is still very low. The reason is that the link of China's supply chain is not smooth, resulting in the backlog of finished products and slow inventory turnover, which directly affects the operation of the capital chain. At the same time, it is also the poor market demand forecast control of Chinese enterprises, which leads to the finished product design, does not meet the actual market demand.

2.2.5 Lack of external environment to stimulate and promote

The combination of network economy and supply chain management has changed the traditional supply chain management mode. When the network performance is good enough, the information can be shared quickly, and the information can be transferred faster in the chain. In addition, supply chain management can make better use of network carrier to mine customer demand, so as to provide information support for enterprise strategy formulation (Valilai and Sodachi, 2020). With the rapid development of Industry 4.0, the inherent management concepts of enterprises are constantly changing, which makes the supply chain management change with the change of market demand. Driven by the background of Industry 4.0, the innovation of supply chain management mode has become an inevitable trend of long-term development of enterprises.

3 Innovation strategy of supply chain management mode in the background of Industry 4.0

By analysing the influence of Industry 4.0 background on enterprise supply chain management mode, we can see that the relevant research results of Industry 4.0 are introduced into automatic production line, robot and intelligent production process to realise the transformation of factory production from manual management to automation (Chen et al., 2019). Directly changing the manual operation mode of the staff to the automatic operation mode of the system can complete the production and processing of products, greatly reducing the cost of the enterprise. In terms of users, Industry 4.0 indirectly improves the speed of enterprises responding to market changes through big data analysis of consumers, and enables users to realise the whole process of research and development, production and delivery from product design to users' real use of products, realising users' personalised customisation and whole process visualisation, so as to improve users' experience (Smith et al., 2020).

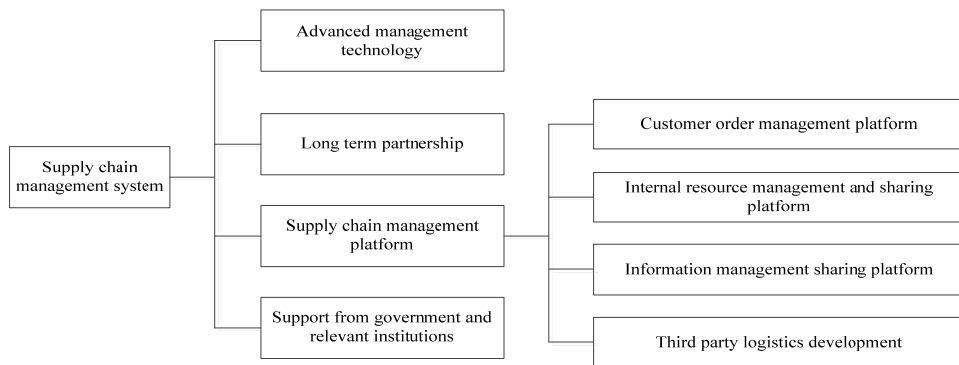
Combining the above analysis, this paper in order to solve the present problems in most of China's enterprise supply chain management model, under the background of Industrial 4.0, put forward a series of management mode of innovation strategy, including reference to advanced management technology, establish long-term supplier partnership, improve the enterprise supply chain management platform, for the government and

related institutions such as innovation management mode, And put it into practice. In order to adapt to the background of Industry 4.0, improve the efficiency of enterprise supply chain management, so this method has the characteristics of strong application and applicability. The enterprise supply chain management system is shown in Figure 3.

The enterprise supply chain management process is as follows:

- 1 Delivery: including order management, warehousing/execution, customisation/delay, delivery facilities, transportation, e-commerce delivery, customer/customer partnership management, after-sales technical support, customer data management.
- 2 Return: including receiving and warehousing, transportation, repair and renovation, communication, management of customer expectations.
- 3 Execution: including strategy and leadership, competitiveness benchmarking, product/service innovation, product/service data management, process presence and control, measurement, technology, business management, quality, safety, industry standards.

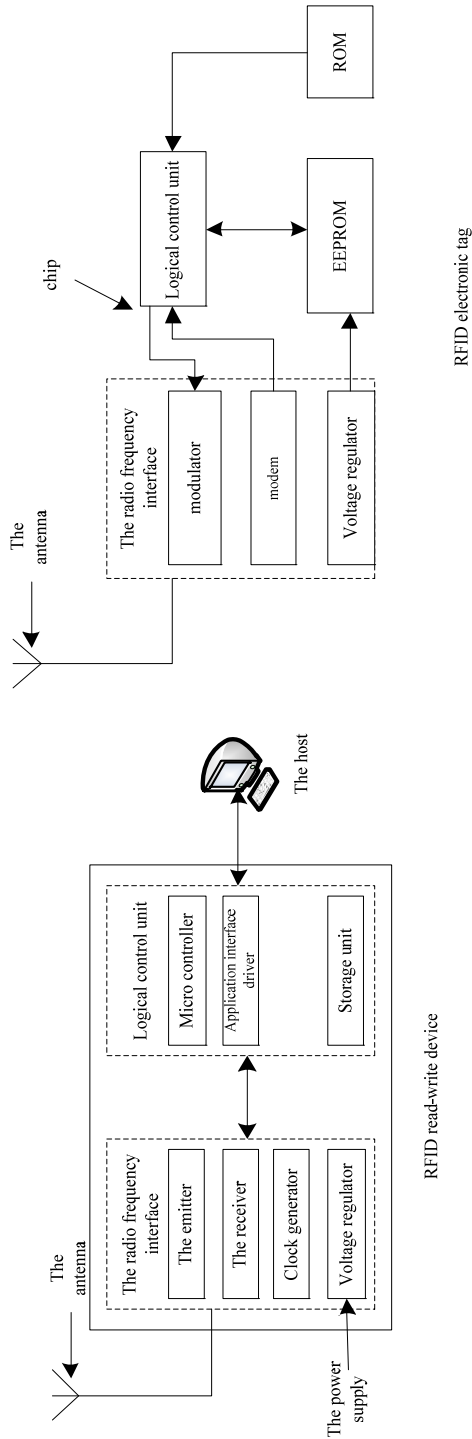
Figure 3 Enterprise supply chain management system



3.1 *Introducing advanced management technology*

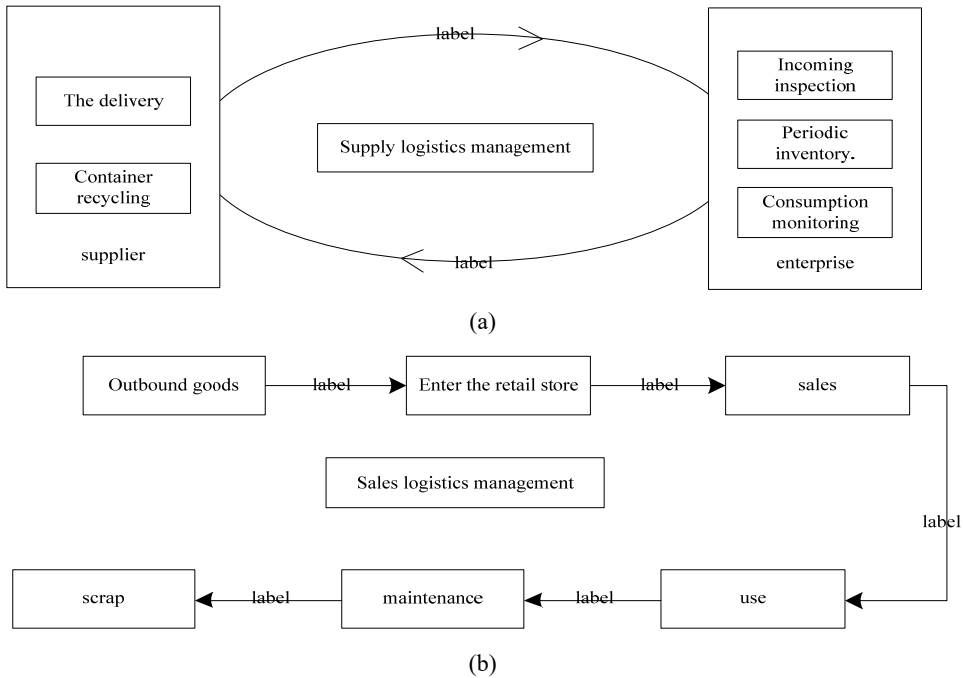
This paper introduces distributed database information integration, RFID tags and other technologies to realise the enterprise's supply chain management mode. Supply chain data is stored in distributed database, including order forecasting, inventory status, out of stock status, production planning, transportation arrangement, materials during transportation, etc. (Jiang, 2019). In order to facilitate managers to obtain information quickly and accurately, electronic data exchange and other technical means are applied to realise the clustering and integration of supply chain data, so as to achieve the purpose of multi supply chain information sharing. RFID technology system is mainly composed of reader, tag and information service system. The internal structure of RFID reader and tag is shown in Figure 4.

Figure 4 Internal structure of RFID reader and tag



In the process of supply logistics management, according to the different characteristics of business processes, different application modes are adopted in the supply and sales links, and RFID tags are used to track the whole vehicle logistics process until the goods are transported to the designated location (Muhammed and Rahman, 2019). The application mode of RFID technology in supply logistics and sales logistics is shown in Figure 5.

Figure 5 Application mode of RFID technology in supply logistics and sales logistics, (a) application mode of RFID supply logistics, (b) RFID sales logistics application model



No matter the information collected in the process of parts application or in the whole vehicle logistics link through tags, it is not only a data or a group of data, but also as an information resource to support the decision-making of supply chain management of manufacturing enterprises and assist enterprises to optimise supply chain management (Milambo and Phiri, 2019).

3.2 *Build long-term relationships*

Enterprises should strive to form strategic partnership with upstream and downstream enterprises in the supply chain and strengthen the management of partners. First, strengthen the mutual trust between the supplier and the demander, which is the cornerstone of enterprise cooperation and an important prerequisite for enterprises to develop towards win-win cooperation; enterprises should strengthen the evaluation and management of supplier cooperation, strictly control the mechanism of introducing cooperative suppliers; for cooperative suppliers, sign strategic cooperation agreements, establish win-win cooperation platform, reduce procurement costs, realise profit sharing

with suppliers, enhance mutual trust and reduce enterprise cooperation risks (Chittipaka et al., 2019). The third party notarisation organisation is introduced to effectively supervise the contract signed by both parties, ensure the transparency and fairness of the contract, standardise the economic behaviour between enterprises, and make the strategic decision of both parties more reasonable. To better maintain and consolidate the strategic partnership, through supplier relationship management, to achieve coordination and cooperation between enterprises. To establish a close strategic partnership, the corporate cultures of both sides must be compatible with each other, not conflict with each other, and develop together. Strengthening cultural integration is an important part of promoting partnership. For example, in the process of cooperation with suppliers, enterprises should fully consider the financial system of suppliers and pay suppliers in time, which can not only make the cooperation between the two sides more harmonious, but also promote the development of suppliers, so that suppliers have more funds for product development, to meet the needs of enterprise product upgrading. In the process of cooperation between enterprises and multinational suppliers, when there are great differences in cross regional and corporate culture, it should adjust the way of communication and workflow according to the needs of the other party. When cooperating with foreign suppliers, it should reasonably arrange the working hours of purchasing related personnel, so that the two sides can communicate more smoothly and improve the efficiency of cooperation.

3.3 Improve the supply chain management platform

The visualisation of enterprise's supply chain is to visualise the interactive matching relationship among logistics, information flow and capital flow in the supply chain. Through the information system, supply chain partners visualise the information of each node in the business process, material flow and capital flow generated by material flow, so as to facilitate the cooperation between partners. Intelligent decision-making refers to the use of all kinds of information in the supply chain management system, the use of big data processing technology for demand forecasting, through inventory management, production scheduling, supplier management and other means to provide early warning or decision-making basis for enterprises, so that front-line personnel or managers make decisions according to the analysis of data. Every link in the supply chain is regarded as a part of the supply chain, so as to improve the overall efficiency of the supply chain and achieve win-win or even multi win.

3.3.1 Creation of customer order management platform

In the customer order management platform, the order execution process is integrated through the information system, and the steps to improve the customer order management are: deleting the non value added, setting up the order execution team and so on (Saragih et al., 2020). Ordering process system is to find out the entry point of integrating the relevant steps in the process, and simplify the process by reducing paperwork and reporting. Setting up order fulfilment group can organise the activities with high separation degree in traditional organisation orderly. Connecting the ordering function can solve problems, eliminate bottlenecks and shorten the ordering cycle. Teamwork within the department can reduce the time for more valueless activities, solve customer service problems quickly, and reduce the time before ordering.

3.3.2 Construction of internal resource management and sharing platform

The results show that the enterprise can take the following two measures in the process of fund management: first, the enterprise's internal fund management data system is improved according to the relevant measures of Industry 4.0, that is, each department timely and accurately transmit their own budget information to the enterprise internal data system, the financial department prepare a unified budget according to the budget indicators of each department, and finally, the budget details are transmitted to each department through the big data system, and the use of various funds within the enterprise is clear through fund data sharing; second, a unified fund management system is established, which stipulates that the use of funds such as procurement, production, research and development and management should be true and reliable, and different budgets should be formulated for different departments, which should be approved according to unified regulations, so as to avoid the blindness of the use of funds by all departments and reduce the waste of funds.

3.3.3 Construction of information management and sharing platform

Enterprises should build a systematic and big data modern management system, establish a supply chain information management platform, and help enterprises obtain the required information, ensure the communication with consumers, and ensure the smooth flow of information communication. In addition, in order to improve the efficiency of internal supply management, enterprises should not only rely on big data processing technology, but also actively introduce intelligent technology to replace labour, so as to save the labour cost of enterprises. For example, Jingdong's logistics sorting has realised fully automatic intelligent processing, which can not only improve the efficiency and accuracy of sorting, but also greatly reduce the labour cost of enterprises, and promote the sustainable development of enterprise logistics supply chain. Enterprises on the Internet can retrieve important information and data from other places. At the same time, they are also facing new challenges and risks brought by the Internet, which enables customers, suppliers, mobile customers and internal employees to access, and uses relevant security technologies to protect enterprise confidential information from hackers and spies. The data stored in the information sharing platform are encrypted (Islam et al., 2020). The original wheel is composed of every byte in the plaintext matrix: each wheel on the middle $Nr-1$ wheel has four operations, namely S-box operation, row displacement operation, column obfuscation operation and wheel keying operation. Because the multiplication in column hybrid operation and column hybrid inverse operation only involves a few fixed numbers, it can be used as a table. Finally, the encrypted enterprise's supply chain information is stored in the information sharing platform.

3.3.4 Development of third-party logistics

Outsourcing warehousing, transportation and other links to third-party logistics enterprises can reduce business risks and enhance the core competitiveness of enterprises. In the process of third-party logistics management, it is necessary to divide the distribution centre and sales network. First of all, a three or four-line sales market, whose sales area contains a sales gathering place is assumed, whose coordinate is (a_i, b) . There are k sales outlets in the sales area at the same time, and T_m is defined as the i^{th}

consumption cluster, which is purchased in the m^{th} new direct retail outlet of household appliances. According to the gravity model, the purchasing power of home appliance retail outlets is inversely proportional to the power of λ of the distance gravity coefficient A_m and proportional to the mass gravitation coefficient E_j . Therefore, t can be obtained. The expression of T_m is as follows

$$T_m = \frac{\frac{A_m}{d_i^\lambda(x_m, y_m)}}{\sum_{m=1}^p \frac{A_m}{d_i^\lambda(x_m, y_m)} + \sum_{j=1}^k \frac{E_j}{d_i^\lambda}} \quad (1)$$

In the above formula, d_i^λ is the gravitational model of the i^{th} consumption point, (x_m, y_m) represents the position coordinates of the gravitational point.

Then, after the new retail outlets are added, if the market share obtained by the enterprise is T , it can be calculated by the following formula:

$$T = \sum_{i=1}^n W_i \frac{\sum_{m=1}^p \frac{A_m}{d_i^\lambda(x_m, y_m)} + \sum_{j=1}^k \frac{E_j}{d_i^\lambda}}{\sum_{m=1}^p \frac{A_m}{d_i^\lambda(x_m, y_m)} + \sum_{j=1}^c \frac{E_j}{d_{ij}^\lambda}} \quad (2)$$

where W_i is the proportion of the purchasing power of the i^{th} consumption point in the whole consumption area. Similarly, the market share F obtained by other retail outlets can be expressed as:

$$F = \sum_{i=1}^n W_i \frac{\sum_{j=c+1}^k \frac{E_j}{d_{ij}^\lambda}}{\sum_{m=1}^p \frac{A_m}{d_i^\lambda(x_m, y_m)} + \sum_{j=1}^c \frac{E_j}{d_{ij}^\lambda}} \quad (3)$$

Because the total purchasing power of consumers in a region is fixed, the best enterprise network setting will increase the market share of enterprises, which will inevitably lead to the decline of the market share of retailers in other regions. Therefore, the optimal network layout mode is to minimise the market share F of retailers in other places. According to the following ways, the network setting model of chain stores is established.

$$\begin{cases} \min F = \sum_{i=1}^n \frac{G_i}{\sum_{m=1}^p d_{ij}^\lambda(x_m, y_m) + H_i} \\ \text{St: } \sum_{m=1}^p B_m = B(x_m, y_m) \in (X, Y) \end{cases} \quad (4)$$

where (X, Y) is the location range of retail outlets of new home appliance, B_m represents the investment budget of the m^{th} new retail outlet. Similarly, it can get the specific location of the logistics distribution centre in the enterprise's supply chain.

3.4 Enlist the support of government and relevant institutions

The government, scientific research institutions, colleges and trade associations should pay enough attention to the implementation of supply chain management, and increase research efforts, so as to lay a theoretical foundation for the promotion and application of enterprise's supply chain management mode. It should strengthen the coordination among various departments, maintain the consistency of policies, regulations and standards, and strengthen the construction of laws and regulations and Internet security research, so that e-commerce can really play a role. To speed up the promotion and standardisation of bar code and EDI, the national standardisation management department is responsible for coordinating and unifying the standardisation work.

4 Test and analysis of application effect

Aiming at the application effect of the innovative enterprise's supply chain management mode in the actual enterprise operation under the background of Industry 4.0, this paper designs the application effect test and analysis experiment, and compares it with the traditional enterprise's supply chain management mode in many aspects, so as to highlight the application advantages of the innovative management mode.

4.1 Overview of enterprises and their supply chain

The test takes a manufacturing enterprise as the research sample, takes the post service market of hydraulic support with the largest use of fully mechanised mining equipment in the clothing industry as the breakthrough point, and takes the leading enterprise in the industry as the partner. Since its establishment, through accurate market positioning and focusing on its main business, the company has established a nationwide service network, customised and developed five service products for customers, providing comprehensive services such as maintenance and remanufacturing services, spare parts supply services, comprehensive guarantee services and second-hand clothing rental services. The enterprise studied in this paper has unique garment repair technology and leading three-level inventory management system, which is the pioneer of market service innovation in garment industry. The target business of this project is divided into four business units, which are sales of clothing accessories, maintenance and remanufacturing services, on-site operation services and equipment's general contracting services in life cycle. The learning enterprise structure is a typical pyramid structure, in which the managers are responsible for each business module according to the business module; the enterprise implements centralised procurement and unified sales; the purchasing department purchases the materials required by multiple logistics centres all over the country; the sales department and sales assistant department process the orders of customers all over the country in a unified way; the technical, financial, information management, administrative, logistics and other support departments are responsible for business operation, management and support of multiple logistics centres. The supply chain operation mode of the enterprise is studied, as shown in Figure 6.

Figure 6 Diagram of enterprise’s supply chain operation mode

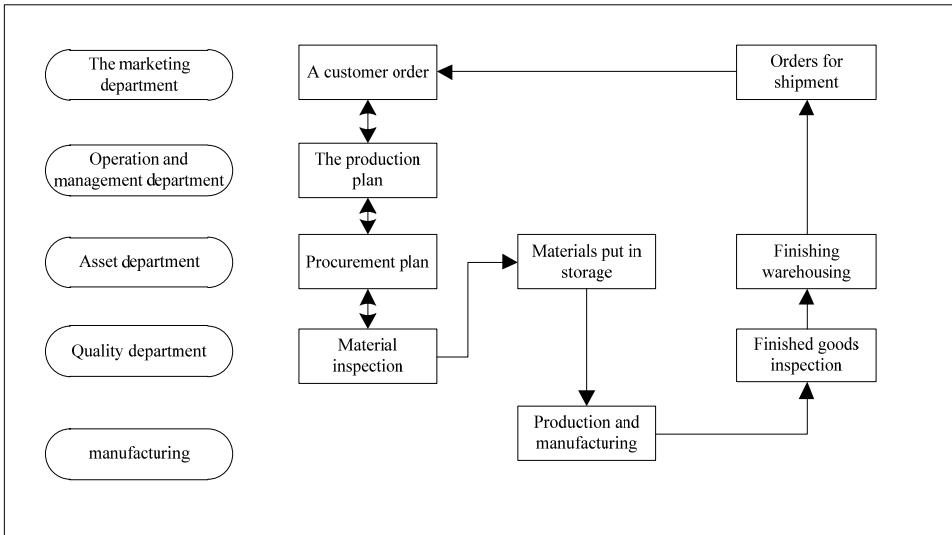


Table 2 Collaboration indicator system of business standard

<i>Second level indicators</i>	<i>Third level indicators</i>	<i>Weight/%</i>	<i>Score ratio/%</i>
Business standard collaboration indicators	-	15	73
Relevance of business standards	System functional coupling	15	65
	Relevance to existing business capabilities	10	55
Business collaboration	Collaboration of management activities	15	65
	Business activity collaboration	15	70
	Financial and capital coordination	10	80
Business flexibility	Continuous optimisation mechanism	10	60
	Coordination of internal and external standards	15	75
Business execution	Are business standards known	10	60
	Executive control	10	55

4.2 *Setting of management effect test indicator*

In the test, this application effect test was selected to conduct specific analysis from the two aspects of enterprise supply chain management performance and enterprise income. In the process of management performance test, Set management technology level, partners, intimacy, governments and relevant institutions support, order reaction ability, customer satisfaction, business coordination index, node network effect index indicators such as test quantitative test indicators, including order response ability index reflects the enterprises adopt supply chain management platform to deal with customer orders, the speed and accuracy. Customer satisfaction index reflects the satisfaction of enterprise

customers to the product quality and service level provided by each node of the supply chain, especially the core enterprise. Considering the operational standard synergy indicators, the business standard synergy indicator system is shown in Table 2.

In the same way, we can get the calculation results of other indicators reflecting the performance of innovation management mode, and the final calculated indicator value range is [0, 1]. The larger the indicator value is, the better the management performance is. In addition, in the process of statistics and calculation of enterprise profits, we should consider the return on total assets, operating costs and other aspects. Through obtaining the financial statements and indicators before and after the application of innovative enterprise's supply chain management mode, we can draw the analysis conclusion of enterprise profits.

4.3 Analysis of test results

4.3.1 Supply chain management performance comparison

The comparison results of enterprise management performance before and after the application of innovative enterprise's supply chain management mode are shown in Table 3.

Table 3 Comparison results of enterprise's supply chain management performance

<i>Evaluation index</i>	<i>2019 (application of traditional management mode)</i>	<i>2020 (application of innovative management mode)</i>
Manage technical level indicators	0.64	0.96
Indicators of cooperation intimacy	0.53	0.92
Indicators of support from government and related organisations	0.43	0.91
Order response capability indicator	0.66	0.89
Customer satisfaction indicator	0.83	0.96
Business standard collaboration indicators	0.78	0.91
Node network effect indicator	0.74	0.85
Comprehensive indicators of management performance	0.66	0.91

Can intuitive see from the data in Table 3, the application of innovation management mode, enterprise supply chain management and technical level, the cooperation of intimacy, the government and related institutions support order reaction ability, customer satisfaction, business standards coordination, node network effect index increased, from the aspects of integrated performance indicator, the model of innovation management, management performance improved by about 0.25.

4.3.2 Comparison of corporate profits

According to the statistics of financial information of research target enterprises from 2019 to 2020, the comparative results of enterprise profits are obtained, as shown in Table 4.

Table 4 Financial information of enterprises in 2019–2020

<i>Financial indicator</i>	<i>2019</i>	<i>2020</i>	<i>Contemporaneous change</i>
Days sales outstanding	217	191	–26%
Days of inventory turnover	124	112	–12%
Days of accounts payable turnover	178	176	–1
Net business cycle	163	126	–36
Turnover rate of total assets (Times)	0.79	0.75	–3.5%
Turnover rate of current assets (Times)	0.85	0.83	–2.3%
Return on total assets	19.4%	20.2%	0.9%
Asset liability ratio	48.5%	47.4%	–1.2%
Sales growth rate	33.2%	60.8%	27.7%
Gross profit rate	36.9%	38.1%	1.2%

It can be seen from Table 4 that after the application of the innovative enterprise's supply chain, the product sales growth rate and gross profit rate of the enterprise have been improved to varying degrees, and the asset load has been reduced. It can be seen that the profit of the target enterprise in 2020 is better than that in 2019, that is, the innovative enterprise's supply chain management mode has good application effect.

5 Conclusions

Under the background of Industry 4.0, the healthy development of enterprise's supply chain can be achieved by formulating a more innovative and more in line with the development of the times. However, different enterprises have different development models and ideas, and there are also differences in supply chain management and business models. Therefore, it is necessary to study the innovation and application of enterprise's supply chain management model under the background of Industry 4.0. Firstly, the evolution and development characteristics of the background of Industry 4.0 are analysed, and the operation structure and management content of enterprise's supply chain is determined. Based on the data collected from the supply chain management of the enterprises, the problems existing in the supply chain management mode are determined, such as the weak consciousness of supply chain management, the low level of integration technology, the insufficient execution in the management process, the low efficiency of supply chain connection, the stimulation and promotion of the external environment of the supply chain, etc. In addition, the application effect of this model is verified by an example. In the follow-up practical application of innovative management mode, we need to adjust it according to the characteristics of the enterprise, in order to further improve the level of supply chain management.

Acknowledgements

This work was supported by Anhui Provincial Education Department Foundation under Grant No. SK2020A0833 (Research on the path of applying blockchain technology to the development of cross-border e-commerce logistics) and supported by Anhui Provincial Education Department Foundation under Grant No. 2019kfk262.

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