

System Reform and Reconstruction of Rural Logistics under the Concept of Smart Circulation

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Abstract: For modern life, logistics is of great significance, is an indispensable component, and has a vital practical significance for the development and stability of different countries in the world. Affected by digitization, smart logistics is becoming the direction of transformation and development of logistics industry. Modern information technologies such as Internet of things, artificial intelligence and big data have been deeply integrated with rural supply chain circulation, and gradually changed the main structure, circulation channels, circulation links and access to circulation information of rural supply chain circulation., Due to the further development of high and new technologies, such as the Internet and information technology, the modern logistics industry has derived a new form: intelligent logistics. The vast rural areas actively broaden the upward channels of agricultural products and sell local agricultural products to all parts of the country, which has played a positive role in promoting the development of rural economy and become an important basis for the implementation of the Rural Revitalization Strategy. Combined with the development of rural logistics industry chain, this paper will further describe the impact of smart logistics.

Keywords: Smart circulation; Rural logistics; Agricultural products

1. Introduction

Focusing on industrial commonalities and bottleneck technologies in key fields, as well as cutting-edge cross domain technologies, it is required to build an innovative development system of emerging industries and realize their high-quality development, which is a new direction for the development of strategic emerging industries. Under the background of rapid economic development and supply side structural reform at this stage, the development speed of China's logistics industry is also increasing. With a series of modern technological upgrading, it has begun to move closer to the intelligent development direction, which is also the development direction of China's and the world's logistics industry. At present, with the development of artificial intelligence, Internet of things and other technologies, the intelligent transformation of e-commerce, logistics industry, transportation, sorting, distribution and other links has been comprehensively accelerated; In the environment of increasing employment costs, the automation and unmanned sorting and conveying operation has become the development trend of the logistics industry, which not only helps enterprises reduce costs and increase efficiency, but also promotes the acceleration of the development of "smart logistics" in China. However, when it comes to agricultural logistics, most of the content is carried out around the production link. The application of advanced production technology and machinery makes the development of traditional agriculture more intelligent. Under the planned economy system, relying on the mandatory plan of the government, the infrastructure is backward, the degree of marketization is low, there is no professional logistics service, and the information is blocked, which makes the rural development very passive and has a gap with the urban logistics.

As an important part of agricultural development, the circulation of agricultural products

conforms to the needs of agricultural industry development, and has a very broad development prospect in realizing innovative and intelligent circulation. Up to now, the rural logistics model still has the characteristics of diversity with strong contrast in time and space, so the rural logistics model in China is comprehensive. It will be very difficult to summarize and describe accurately. At present, the ascending proportion of agricultural products in most areas of China is still low, the upstream agricultural products are scattered, and there are many circulation links in the middle reaches, resulting in high product loss, especially the asymmetric information of production and marketing, which makes the downstream sales channels relatively simple, and the high quality can't be superior in price. The circulation of agricultural products in a broad sense refers to the process of organically combining and optimizing the management of agricultural products to meet the needs of consumers and realize the value-added of agricultural products in the physical flow of agricultural products from the supply place to the receiving place.

Based on the new stage of development, China should actively play the basic and leading role of logistics, smooth all links of production, distribution, circulation and consumption, promote high-quality economic development with high-quality logistics development, and promote coordinated economic development in rural areas with rural logistics development, and rural logistics can not achieve high-quality development without the support of rural logistics system in modern counties. With the proposal and continuous realization of smart agriculture, the development of smart agricultural products circulation has also attracted more and more people of insight to participate in it. Whether it is the agricultural wholesale market that adapts to the development of the times, armed with smart clothes, or the fresh e-commerce that is flourishing in the circulation field and has an unpredictable future, all of them are actively exploring the development of smart agriculture. Smart logistics is the inexorable development trend of the future logistics industry. This paper will make a detailed study on the agricultural modern logistics industry as the leading industry supporting the development of national economy, and put forward practical system changes and paths by combining wisdom ideas to optimize rural logistics.

2. Basic status of rural logistics and smart circulation

2.1. The composition of logistics

In a broad sense, "thing" refers to all material entities with economic significance, including both tangible and intangible things, including materials in the production process, commodities in the circulation process and wastes in the consumption process. However, in practice, the meaning of things is always determined and understood according to the specific logistics scope, which is the concept of "things" in a narrow sense. The relevant research on Logistics originated earlier. After years of research and analysis, it has formed a stable system and system. In the relevant theoretical system, there are special definitions and categories of logistics.

The first component of logistics is transportation, which is the key link and core business of logistics. It can directly affect the efficiency of logistics. It is necessary to consider the service quality and economic cost of transportation. It is usually measured and evaluated by indicators and standards such as freight, time limit, transportation frequency, timeliness of transportation, scope of application of transportation, timeliness of information communication and so on. The second is storage. There are a wide range of logistics contacts. Crops, fresh and cold storage, documents and large products have different characteristics. Some will rot because they are too hot, some are not easy to preserve because they are too cold, and large space is needed for preservation. Logistics is used for classification treatment to avoid losses caused by each environment. The increase in the

number of containers is shown in Figure 1.

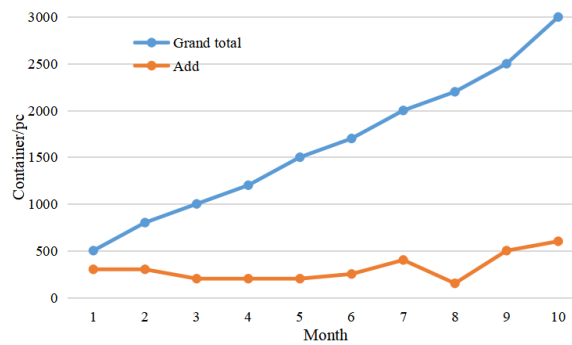


Figure 1 Growth chart of container proficiency

The third packaging, one is industrial packaging, the other is commodity packaging, both of which are for the convenience of transportation and can provide standardized services according to customer requirements. The content of the packaging situation is also very extensive. The fourth is handling, loading and unloading. This is widely used in different fields. It is a dependent logistics activity that can perfectly integrate logistics transportation, storage, packaging, and processing to ensure the integration of the logistics system. Ability to reduce logistics expenditures. The fifth type is distribution processing. This part realizes the process from the production of goods to the final consumer market, for the sales and efficiency of certain products, direct processing, and diversified portability for customers. Some very positive effects have created huge economic value for the enterprise and also provided protection for customers. The sixth is distribution. This is the core of transportation. According to the production of products and so on, the network system is used to optimize the route, and then arrive at the designated location to realize the distribution of goods. The management structure of the logistics system is shown in Figure2.

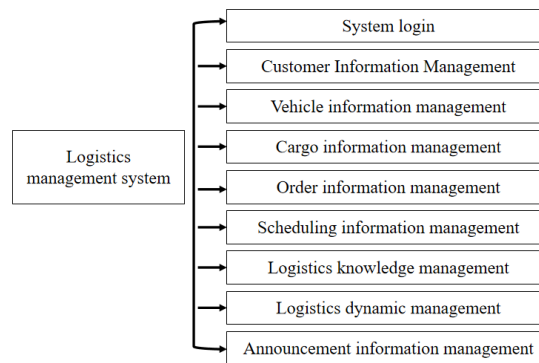


Figure 2 Logistics system management structure

The whole logistics system relies on data management to process the transportation, storage and operation route of goods, improve order efficiency, save time and cost, reasonably allocate and optimize space resources, and maximize benefits.

2.2. The status quo of rural logistics

Rural logistics is a concept relative to Urban Logistics, which refers to providing transportation, handling, loading and unloading, packaging, processing, warehousing and all related activities for the production, life and other economic activities of rural residents. Generally speaking, there are still

some problems in the scale of agricultural production in China, such as scattered farmers, small scale of production, poor strength, weak market awareness, etc., which lead to many circulation links of agricultural products, high cost, long channels, imperfect information network and low efficiency. However, the agricultural product consumption market has developed into a big market, and there are many problems in the connection between production and marketing, which requires a more suitable circulation mode of agricultural products. In the traditional planned economy, the operation of rural commercial logistics mode, our rural logistics mode mainly has the following aspects:

First, the development level of rural logistics is greatly affected by the development level of rural economy. At present, China's rural development momentum is good, and the rural tax reform has benefited farmers greatly. However, compared with cities, the rural economy is still backward, the farmers' income is low, and the rural market lags behind the development of the urban market, which will inevitably lead to the low level of rural logistics supply and demand and the slow development of the logistics industry.

Second, in the traditional agricultural planned economy system, agricultural product producers are only engaged in the production of raw materials, and the ordering and trading of agricultural products are handled under the unified marketing under the control of the state. Although they do not have to bear the risk of market operation, they are inconsistent with the logistics level of the city, which makes our agricultural product producers very passive.

Third, agricultural products are perishable and seasonal, which requires important operating time of products. Unlike industrial products, it is easy to deteriorate and rot, which puts forward higher requirements for the production time, transportation, packaging and seasonal processing of agricultural products, which increases the production cost of this link, and agricultural producers are not clear about the cost perception in the sales process. For example, because I need to rush this batch of products in the season, I need to order a large number of packing boxes to meet my agricultural products, and at the same time, I need cars to help me transport them. The expenses incurred in this process are not proportional to the products that can actually be sold, which is not conducive to the income of migrant workers, and will also cause a large number of people to be idle, bringing pressure to rural economic development.

Fourthly, the organizations engaged in the supply of agricultural means of production and the sale of agricultural products are strictly divided into regions, systems and grades. Farmers can only distribute their own agricultural products according to the requirements, which will lead to the lengthening of the whole supply chain process, which will also lead to the break of certain industries, especially some fresh agricultural products, if they can't be sold at the corresponding time, they will be easily lost and cause losses. The barriers between institutions are difficult to communicate with each other, the logistics facilities are repeatedly built, and the utilization efficiency of social resources is low.

Fifth, the resource education level of farmers will be lower than that of cities, so the technology production is small-scale, the management level is not uniform, the management level is low, and the technical conditions are low. They only want to do their part, rather than let the economic level of the whole rural production flow. Moreover, it is out of touch with the city, not to mention the use of advanced technology facilities, which will increase the cost of the whole operation, thus increasing the value of agricultural products and increasing the difficulty. The traditional logistics mode for farmers is shown in Figure 3.

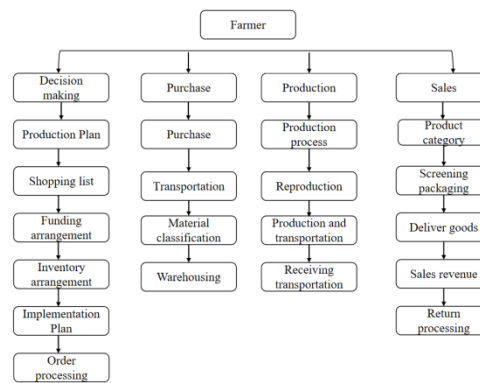


Figure 3 Traditional logistics model

Facing the current operating situation in rural areas, we need to realize the refined management of the entire logistics process by applying the Internet of Things technology and Internet technology to logistics and transportation, and form an automated, intelligent, and networked logistics transportation system and management model. . Use scientific technology to develop traditional agriculture into smart agriculture, and use smart concepts to drive the entire agricultural development. Let products in different spaces be effectively traded in a dynamic form through logistics, breaking the spatial attributes of products. The intelligent circulation of agricultural products is constantly being realized, which also gives more new "plays" to the intelligent circulation of farm products.

2.3. Problems of wisdom concept in traditional logistics distribution

In the context of today's rapid international development, the Internet of things has become an important platform to promote the rapid economic development of all countries in the world. Digital economy has brought new opportunities for the upgrading of logistics industry. Smart logistics is the product of the deep integration of digital economy and logistics industry. It has achieved a qualitative leap in production and service mode, management mode and information transmission means, and has also laid a foundation for the reform of logistics industry. Interconnection is the premise of smart logistics, data is the foundation of smart logistics, intelligence is the goal of smart logistics, and integration is the core of smart logistics The total transaction amount and growth rate of smart logistics from 2015 to 2020 are shown in Figure 4.

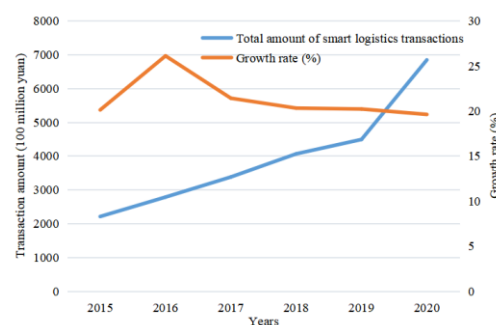


Figure 4 The total transaction amount and growth rate of Smart Logistics from 2015 to 2020

Advanced Internet of Things technology, cloud platform technology, big data technology, artificial intelligence, blockchain and other related technologies are the fundamental technical guarantee for smart logistics. The development of smart agricultural products circulation has also attracted more and more people of insight to participate in it, whether it is the agricultural batch

market that conforms to the development of the times and is marching toward the smart ranks of armed forces, or the flourishing and unpredictable fresh electricity in the circulation field. Businesses are actively exploring the realization of the development of smart agriculture. Reasonable application to accelerate the sales of agricultural products to obtain more considerable benefits is conducive to the development of this modern professional service system. In the early stage of the wisdom concept and the integration of rural logistics, there are also many problems that occur. The details are as follows:

First, at this stage, there is no complete certainty about the specific address information in the rural areas. There is no corresponding name for the roads. At the same time, all the houses in the rural areas do not have specific information such as definite house numbers, which leads to the lack of a way to construct a complete smart logistics. Rural information, so that the accuracy of distribution cannot be ensured, and it directly affects the tracking process of the distribution link. Without a special and unified collection system or platform for agricultural product transaction information, farmers cannot fully understand the market demand for agricultural products in a timely manner, resulting in information imbalance between the supply and demand sides. On the other hand, the construction of road traffic in rural areas is not very advanced. Compared with cities, the convenience is poor, and the common facilities are not very complete. Therefore, there is a big difference in the use time of smart logistics between cities and rural areas. Able to compare. Farmers are extremely susceptible to the current short-term prices, blindly producing and planting, resulting in unsalable sales, soaring prices and other consequences.

Second, smart logistics is a logistics model based on advanced technology, so it has certain requirements for logistics infrastructure, and professional talents are needed to uniformly manage smart logistics, which requires professional smart logistics stakeholders to go to the countryside and popularize smart logistics in rural areas. China's rural population is mostly left behind children and the elderly, with low educational level and low penetration rate of E-education. There is a lack of technical talents related to e-commerce in rural areas, and the intelligent concept can not plan the logistics only by farmers, nor can it carry out long-term systematic management of controlled products. If we want to gradually meet the real-time monitoring and management of goods circulation by smart logistics with the improvement of information technology, continuously and effectively innovate smart logistics based on technical means, strengthen the supervision of logistics and ensure the safety and rapidity of smart logistics circulation, these real-time supervision should be controlled by professional personnel, In other words, supervisors must have relevant training, reserve relevant knowledge and master advanced technology. This directly affects the speed of logistics.

Third, there is a lack of sound intelligent logistics system. As a new industry, intelligent logistics of agricultural products is greatly influenced by the management and supervision of the national government. A large number of farmers sell their agricultural products to the designated places according to the leadership of the government, which makes it difficult for smart logistics to start directly, and it is necessary to coordinate and cooperate with the relevant regulatory authorities in various fields such as the Internet, agriculture, transportation, information technology, etc., so that all departments can coordinate their work without the phenomenon of extreme contradictions. The chaotic system can easily lead to shirking responsibilities among departments, leading to the problems that the quality of agricultural products can't be guaranteed, express shipments are easily lost, and consumers can't grasp the logistics information in time. High logistics cost and low efficiency seriously affect the development of intelligent logistics of agricultural products. Moreover,

our current agricultural products do not have strict transportation requirements. In vast China, the temperature difference is very large everywhere, which will lead to the damage of our agricultural products, which is not conducive to the development of intelligent logistics system.

3. The path of wisdom concept reform

3.1. Road planning

The most important thing in the development of rural logistics is road planning. Without the correct logistics path and road construction, how can our agricultural products go out and how can urban development flow into the countryside? Only when roads are established and perfected, our logistics system will be more complete. In the process of increasing development of the times, different transportation schemes are formulated for different agricultural products, and there are different requirements for transportation temperature and cargo packaging. According to the distance of the destination and whether the transportation is convenient or not, in line with the principles of low cost, high efficiency and high quality, choose the appropriate means of transportation and arrange the best and most suitable transportation route. Reuse the logistics information system to update and record the current stage of the logistics of agricultural products and monitor it in real time. This will allow our products to be delivered to customers in the fastest and safest way. The distribution route map is shown in Figure 5.

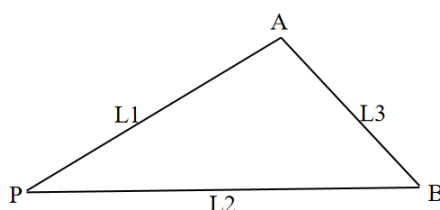


Figure 5 Distribution route map

Smart logistics also conducts related research and practice based on the basic principles of the conservation law. Assuming that a car delivers goods to customers A and B at the same time, the corresponding total length of the journey is:

$$L = L_1 + L_2 + L_3 \quad (1)$$

The distance difference between the two distribution schemes, that is, the total length of the saved distance can be:

$$\Delta_1 = [2(L_1 + L_2)] - (L_1 + L_2 + L_3) = L_1 + L_2 - L_3 \quad (2)$$

3.2. Training professional talents

The lack of professional logistics knowledge and talents affects the transportation of intelligent logistics. The cultivation of agricultural logistics talents plays a vital role in the construction of agricultural informatization. The government should take the main responsibility to strengthen the cooperation between scientific research institutes and agricultural technology institutions. It is necessary to cultivate a group of comprehensive talents with modern information technology to provide accurate and effective information guidance for the supply, production and marketing of agricultural products. Encourage high-tech talents to go to the countryside, go to the grass-roots level to accumulate experience and devote themselves to rural economic construction. Only the formation of professional personnel for distribution or guidance to rural areas can truly form a strong central logistics and transportation system. At the same time, local farmers are encouraged to participate in

smart logistics, conduct relevant basic knowledge and technical guidance training, and carry out unified and effective management of agricultural product logistics. China must also introduce relevant policies, give preferential policies to relevant talents, and encourage more professionals to participate in knowledge logistics. Introduce and train logistics talents, and carry out learning and training of logistics knowledge.

3.3. Establish a smart logistics information sharing platform for agricultural products to optimize resource allocation

Through the establishment of a third-party platform, the scattered and scattered information is integrated and analyzed by using cloud computing, big data and other technical means to form a real-time database. Farmers, consumers and logistics companies can obtain timely and effective information through the platform to avoid information blocking. The basic process of agricultural products intelligent logistics information sharing platform is shown in Figure 6.

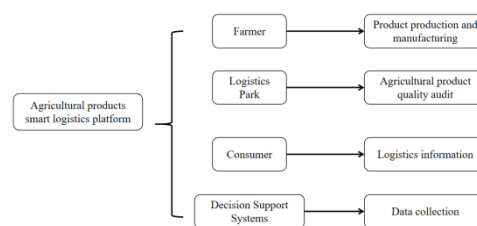


Figure 6 The process of agricultural product smart logistics information sharing platform

Secondly, the use of Internet of things and other information technologies to perceive, process and deeply mine the circulation information of crop supply chain, so as to realize the digitization of the circulation link of crop supply chain. At the same time, the information is quickly fed back to farmers, middlemen, enterprises and consumers, so as to realize the intellectualization of circulation subject decision-making. The construction of logistics channels is the last step away from the success of agricultural informatization construction. According to the original traditional logistics channels, we will improve and innovate for the purpose of strengthening the communication between consumers and producers and improving the symmetry of information. According to this point, we conduct data modeling to optimize road distribution.

It is set that there are k vehicles to distribute goods to customers. The load of each vehicle is $b_k (k = 1, 2, \dots, K)$ and the customer's demand is $d_{ij} (i = 1, 2, \dots, L)$. L represents the number of demand points. The path length between demand points i and j is represented by C_{ij} . Set r_k as the total number of goods to be transported by the k -th vehicle to the demand point, and use set $R_k (n_{ki} \leq i \leq n_k)$ to represent the k -th vehicle demand point. r_{ki} mainly refers to the k -th vehicle reaching the i -th demand point, and r_{k0} mainly refers to the distribution point of the k -th vehicle. Next, the mathematical analysis model is established according to the above parameters. The objective function is as follows:

$$Z = \sum_{k=1}^K \left[\sum_{i=1}^{n_k} C_{r_{k(i-1)} r_{ki}} + C_{r_{knk} r_{k0}} \right] \quad (3)$$

The optimization problem with constraints is summed up:

$$\sum_{k=1}^K n_k = L \quad (4)$$

$$\sum_{i=1}^{n_k} d_{r_{ki}} \leq b, k = 1, 2, \dots, k \quad (5)$$

$$0 \leq n_k \leq L, k = 1, 2, \dots, K \quad (6)$$

$$R_{k_1} \cap R_{k_2} = \Phi, \forall k_1 \neq k_2 \quad (7)$$

From the above expression, it can be known that (4) mainly refers to that all demand points need to send vehicles for distribution; Inequality (5) mainly refers to that the demand of each route cannot be higher than the total cargo capacity of vehicles; Inequality (6) mainly refers to that the sum of demand points for each vehicle needs to be less than or equal to the total number of demand points; Formula (7) mainly refers to the reasonable distribution of each demand point.

3.4. Improve the level of science and technology

China's logistics environment has abundant production capacity, and there is no shortage of supply. The development of intelligent logistics of agricultural products is closely related to the progress of logistics technology. In the long run, whether urban or rural, smart logistics sharing will empower the intelligent upgrading of the traditional logistics industry in the future, and the dimension of operation mode. On the basis of realizing the automation, intelligence, informatization and visualization of intelligent logistics, continuously improve the logistics efficiency and effectively reduce the human and material cost, so as to realize the intelligent integrated service from information collection, product supply, transportation to final distribution. Whether before, during or after the production of products, science and technology are used to ensure the safety of products and improve the reputation. From the perspective of supply chain, all participants in the chain are considered to provide supply chain services, stimulate the driving force of system innovation and development, and strive to achieve win-win results for all parties. The core structure of smart logistics is shown in Figure 7.

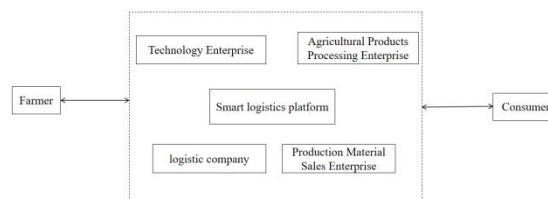


Figure 7 Core structure of smart logistics

3.5. Actively use the government and various economic cooperation organizations

Cultivating rural logistics economic cooperation organizations and encouraging farmers to participate in circulation organizations are not only conducive to increasing farmers' income, but also drive the structural adjustment of agriculture and promote the optimization of the circulation mode of agricultural products. The government supports the innovation of rural circulation system through laws, regulations and policies to reduce the cost of rural logistics operation; In terms of investment loans and tax policies, support the investment of rural logistics enterprises in the circulation and processing of agricultural products and the construction of rural logistics system, and actively cultivate local urban and rural leading logistics enterprises; Reform the administrative system of rural logistics market and coordinate the interests of local governments, departments, regions and

enterprises, so as to improve the operation efficiency and efficiency of rural logistics and reduce the cost of rural logistics. Encourage farmers to develop rural logistics economy in their own way, and support farmers' professional cooperative organizations and other production and management methods. Provide government support for the development of rural logistics economic cooperation organizations in rural economic zones.

4. Conclusions

In the context of rapid economic development, there are more and more logistics information. Whether for the logistics industry or logistics companies, the design and application of logistics software system are very important. In order to fundamentally reduce the transaction cost of agricultural products and improve the overall efficiency of agriculture, we must use modern advanced technologies such as Internet, big data and Internet of things to build a modern intelligent logistics system and complete the whole process integrated management of supply chain. The application of wisdom concept in agriculture is not only the inevitable result of agricultural development, but also the inevitable trend of development, which makes agriculture show unprecedented strength and potential. It not only changes the sales mode of agricultural products, but also promotes the development of the whole agricultural e-commerce and changes the production and life style of agricultural producers. In the rural distribution work, we should adopt innovative policies, expand technical personnel, constantly popularize smart logistics, and better promote the efficient operation of smart logistics in the rural distribution process. At present, the development of intelligent logistics of agricultural products in China is in a stable and rapid development stage. The change of production mode and industrial structure of agricultural products logistics promotes its rapid transformation. The national policies and the R & D and application of intelligent technology ensure its continuous innovation and development. This paper takes rural logistics as the center, studies the wisdom concept, and now studies its problems, and then gives reasonable solutions. Data modeling is one of the methods to optimize the path, because time is limited, and tracking research is also asked in the later stage.

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