Construction of Two-Teir Logistics Platform
- A Study Based on Linyi Logistics

Xueliang Zhang[*]

Beijing Jiaotong University No.3 Shangyuancun, Haidian District, Beijing, China
*Corresponding author. Email: zxlbjtu@163.com

ABSTRACT
In the context of big data, the Internet economy has promoted the separation of physical logistics space and virtual space, forming a two-tier platform system of top-level virtual network platform and physical platform dominated by informatization. This article takes the development of Linyi logistics as an example, with the help of new technologies such as artificial intelligence, 5G, and blockchain to form a top-level virtual network platform and a logistics entity platform with "smart cloud" and "data cloud" as the two wings, which are all information-oriented. The two-tier platform system promotes the transformation and upgrading of the logistics industry and the deep integration of the related industries. And it improves Linyi's economic development efficiency to achieve industrial connotative upgrading.

Keywords: Two-teir platform, Logistics platform, Platform construction.

1. INTRODUCTION

In recent years, the importance of the logistics industry in the national economy has increased. The State Council and organs of the state council have successively issued relevant documents to support the rapid development of the logistics industry. At this stage, most of the traditional logistics companies in China present some problems such as single operation mode, unbalanced business development and lack of innovation. All problems suggest that the industry need to transform and upgrade to a modern level. The transformation and upgrading of the logistics industry is carried out in the context of the national industrial transformation and upgrading. In terms of the upgrading path, according to the dual characteristics of the logistics industry as both a derivative demand and a supply chain service so as to lead the transformation and upgrading of the industry, the logistics industry must aim at its own service innovation and supply chain capability improvement. Also, it must develop through the integration of logistics and related industries.

Linyi is a central city in the southeast of Shandong, a modern industrial and trade city with waterfront characteristics, and a commercial logistics center. From 2011 to 2018, Linyi's logistics production value showed an "N"-shaped trend of rising, then falling and then rising. In recent years, Linyi logistics's contribution to

Linyi's total production value has declined. Since Linyi logistics industry is characterized by speed and scale expansion, the logistics industry here is still a "labor-intensive" industry, with less application of high-tech technology and insufficient planning. Thus, the logistics industry in Linyi urgently needs to be transformed and upgraded. However, in the existing research, in view of the transformation and upgrading of the logistics industry, the proposal of cloud logistics platform and smart logistics platform has enhanced the transferability of logistics information and logistics resources. Relying on the cloud logistics platform, it can also connect logistics enterprises, realizing the sharing of logistics information and resources and establishing a more complete modern logistics industry chain. In this way, all the upstream and downstream industries may coordinate with each other better and achieve the win-win goal in the end. No existing research has further elaborated the relationship between the physical logistics platform and the virtual logistics platform and the overall construction.

This article first proposes a two-tier platform system of top-level virtual network platform and physical logistics platform led by informatization, relying on the "smart cloud" and "data cloud" to connect the three axes of virtual network platform, logistics enterprise, and physical platform. Three platforms extend and upgrade each module on basis of the axis platform, and finally

become a logistics platform hub. Taking Linyi Logistics as an example, combined with the characteristics of local logistics, the use of platform-based logistics hub strategy construction provides a technological path for Linyi Logistics.

2. LITERATURE REVIEW OF PLATFORM CONSTRUCTION THEORY

Lehnerd and Meyer believe that the platform can be understood as a large collection of specific product components. This collection can enable different terminal products to enjoy the same physical connection of components, and at the same time can generate a large number of derivative products in the process. Zhang Xiaoning proposed that the products and services that connect different user groups in the bilateral market are called "platforms." The platforms connect two different user groups to form a complete network and establish a network that helps promote both parties. Different from the traditional organizational form, the platform market is usually a two-sided market because the provider of the platform must negotiate the relationship between the user and the supplier. Xu Jin and Zhang Xiangjian on the basic concepts and types of platforms. The concept of platform is applied to different situations such as product platform, supply chain platform, industry platform and multilateral market platform.

The construction of the platform must form a two-sided network. The platform strategy is aimed at connecting enterprise products and services with two or more specific user groups. It provides an interactive mechanism for specific user groups to meet the needs of user groups and builds an Internet-based ecosystem, highlighting the market strategy of network effects. It is generally believed that the network effects of platform companies are all related to scale. The more users the platform has, the more valuable it is. For the logistics platform, a large number of upstream and downstream logistics companies can provide a large number of user needs and platform driving forces for the platform market. The large scale of user aggregation has a decisive influence on the endogenous driving force of the platform. In addition to the scale of the platform, there is another important factor that affects the value of the platform and the generation of network effects:

platform structure. Chen Siqin proposed an industrial technology innovation system model based on an innovation platform. The platform structure consists of a core layer, a development application layer and an innovation platform. Wang Yulu, Huang Ping and Shan Mengmeng elaborated on the two-tier operation system of the technology innovation platform, using the two-tier platform system of the common technology innovation platform governance layer and the common technology innovation platform operation layer to study the impact of distributed innovation. Enterprises should build and improve the construction of multi-level platforms. The focus of platform-based enterprise construction is the expansion of bilateral markets and network effects. The behavior of platform enterprises should focus on establishing bilateral network connections and promoting the convenience of transactions.

To sum up, the theory of platform construction needs to be studied from the perspective of platform-based enterprises and platform upstream and downstream enterprises. The construction of the platform should be guided by the needs of the target group. To provide revolutionary products or services meet the needs of the user group and provide an interactive mechanism for the user group, solving information asymmetry and the problem of information barriers. The structure of the platform must conform to the characteristics of the industry and the market relationships and capabilities of different companies in the industry. The structure of the two-tier platform system can better connect upstream and downstream companies in the supply chain, and give full play to each axis platform within both the two-tier platform system and each modular functions.

3. LOGISTICS TWO-TIER PLATFORM

With the development of big data and Internet e-commerce technology, the Internet economy has promoted the separation of physical space and virtual space, as shown in Fig. 1, changed the offline traditional commodity circulation and consumption patterns, and formed a small number of virtual network platforms and platforms replaced by informatization. With the two-tier platform system of the physical platform, the platform logistics enterprise connects the separated virtual network platform and the physical logistics platform in the ecosystem platform.
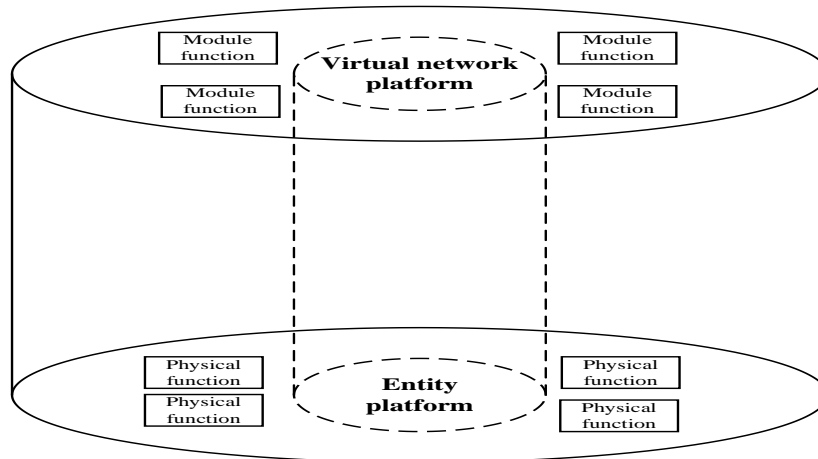
Figure 1 Logistics two-tier platform.

3.1. Virtual Network Platform

The top-level virtual network platform mainly refers to the information technology platform based on emerging technologies such as big data, cloud computing, Internet of Things, artificial intelligence, 5G, and blockchain. Such platform generates the collection and transmission of logistics big data such as business flow, information flow, and capital flow. It has four functional sections: user information, information release, service platform and information reception. The virtual network platform is a new logistics information management model based on "data cloud" and "wisdom cloud". The cloud logistics platform is the core component of the cloud logistics system. It is an intermediary platform that connects supply and demand to realize the data exchange and unified management of the data among the logistics enterprises. Under the cloud service comprehensive resources, there is also a software layer that can uniformly manage all information resources and provide services for both logistics parties, including resource description, service composition, service management, QoS monitoring, service matching and service scheduling functions to enhance the entire industry chain Interaction ability.

3.2. Virtual Network Platform

The physical platform, as shown in Fig. 3, guarantees the data exchange and unified management between service providers and service receivers. The platform is able to make sure that all kinds of material information is consistent, realizing quick response and service of information in the platform. What is more, the use of RFID radio frequency technology, bar code technology, GPS/GIS technology, mobile communication and other technologies enrich the logistics operation management methods. Such

management ways could provide customers with warehousing, transportation, processing, agency, and distribution services.
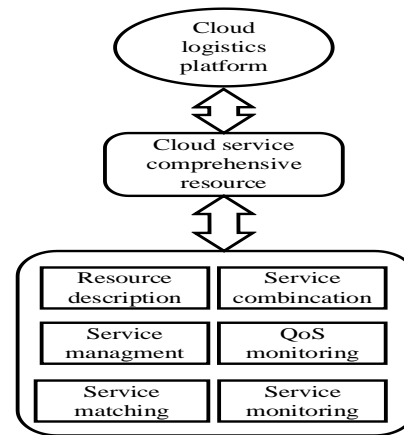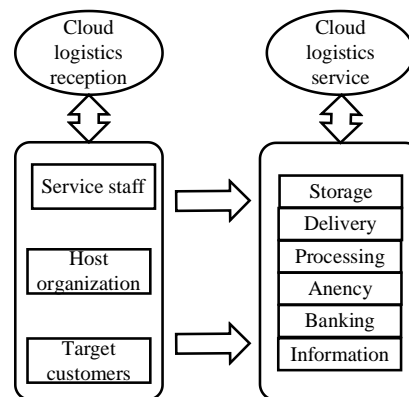

Figure 2 Virtual network platform

Figure 3 Physical platform

Logistics platform center

Figure 4 diagram: Two-tier logistics platform at Linyi, showing Data Cloud and Wisdom cloud on either side, with three stacked cylindrical layers: Virtual network platform (User profile, Information publish, Service platform, Information reception), Logistics enterprise (Financing institution, Upstream firm, Goverment, Downstream firm), and Physical platform (Storage, Park, Delivery, Tenant).
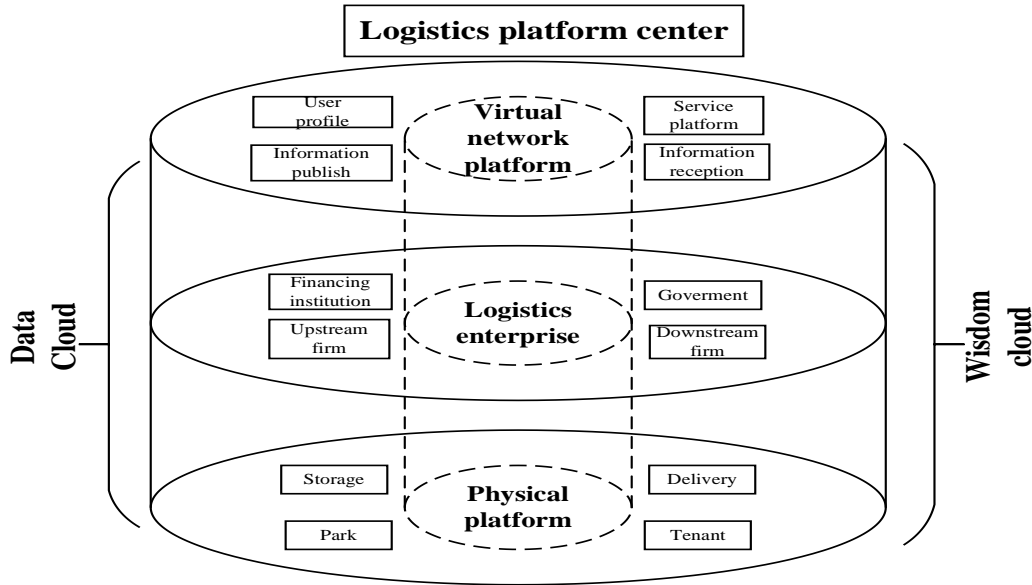
Figure 4 Two-tier logistics platform at Linyi

4. TWO-TIER LOGISTICS PLATFORM AT LINYI

The construction of the Linyi logistics platform hub, as shown in Fig. 4, mainly relies on the two clouds: "data cloud" and "wisdom cloud". Two cloud wings connect the three axis platforms of virtual network

4.1. Construction of Virtual Network Platform

Linyi, as one of the service-oriented national logistics hubs and the "One Belt and One Road" comprehensive pilot zone, develops a regional international logistics integrated center platform. On this basis, it connects local logistics service platforms and overseas logistics service platforms to achieve inter-platform interconnection. With the support of relevant government departments and the majority of enterprises, Linyi promotes the information sharing and integration of different logistics platforms. Accordingly, good logistics information basic environment is created, supported by the standard logistics technologies.

As shown in Fig. 5, the core business layer of the virtual network platform includes smart supply chain logistics management, smart logistics basic business

platform, logistics enterprise and physical platform. Based on each axis platform, each module will be upgraded. Finally, all parts work together to form a logistics platform hub. Platform logistics enterprises connect the separated top-level virtual network platform and physical logistics platform in the ecosystem platform.

management, and information global control business. Through the big data technology, purchase logistics, production logistics, sales logistics and customer data may be collected and analyzed to realize the integrated management of supply chain logistics. The auxiliary business layer includes credit management, data management, performance evaluation, smart packaging, smart processing, smart loading and unloading and handling services. The virtual network platform monitors and manages the logistics process in real time from the supply side of logistics transportation. From the perspective of information collection, the resource provider uses information such as warehousing, manpower, vehicles, drivers and other information as basic stock information into the big data system and dynamically adjusts it. In terms of flow of goods, it uses relevant technology to accurately track the manpower and material resources in the logistics process.
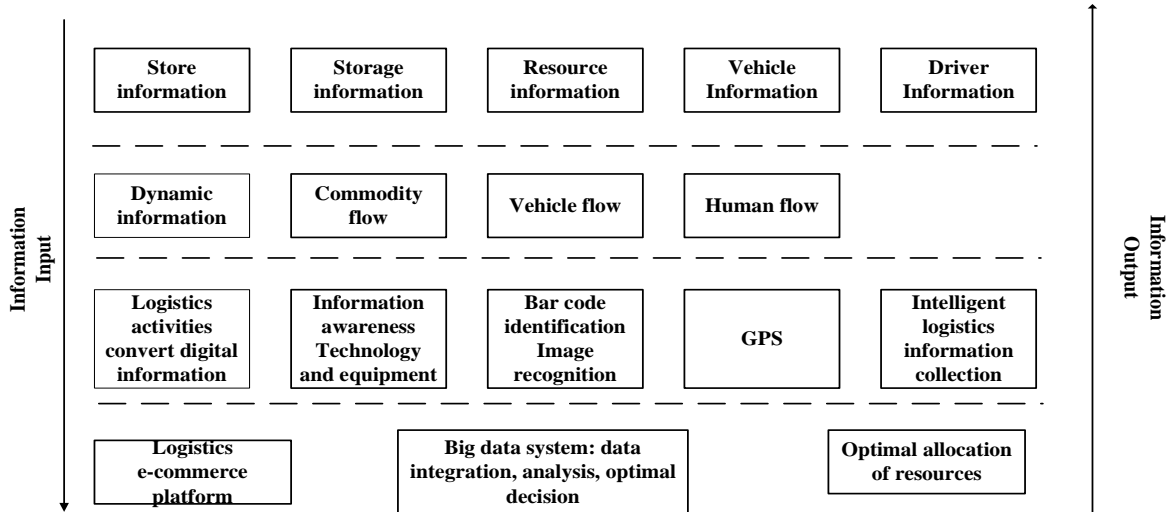
Figure 5 Input and output for information on virtual network platform

4.2. Construction of Logistics Enterprise

The supply side of the traditional logistics model is composed of multiple logistics companies. The logistics industry chain is integrated, so that the supply side can truly realize resource sharing, information sharing, and data sharing in order to maximize and optimize the use of stock resources. The advantages of supply-side integration can be summarized as the following points. Firstly, to allocate supply resources with the goal of maximizing resource utilization, overcoming inter-enterprise restrictions. The second point is to help upstream and downstream enterprises in the supply chain intelligently predict replenishment based on the cloud sale forecasting. Thirdly, cloud computing can analyze products based on its sales destination. It also allocates the best storage location based on the reasonably furcating. Finally, big data can analyze the situation for different regions and different times, realizing the intelligent layout of human and material resources.

4.3. Construction of Physical Platform

Linyi builds a transportation hub that highlights its advantages and is conducive to its own development based on its own location conditions, resource characteristics and the current status of surrounding logistics infrastructure construction. Linyi also makes the information system and the physical system together under the government control, industry association guidance, and marketing information. Through the integration of the demand side, Linyi makes it possible to maximize human resources. Under such platform, raw material suppliers provide raw material order quantity, order time, ordering company and other data; manufacturers provide product demand data; e-commerce enterprise retailers provide consumption data.

The smart logistics model integrates the upstream and downstream of the entire supply chain and links the physical platform with the cloud system, as shown in Figure 6.
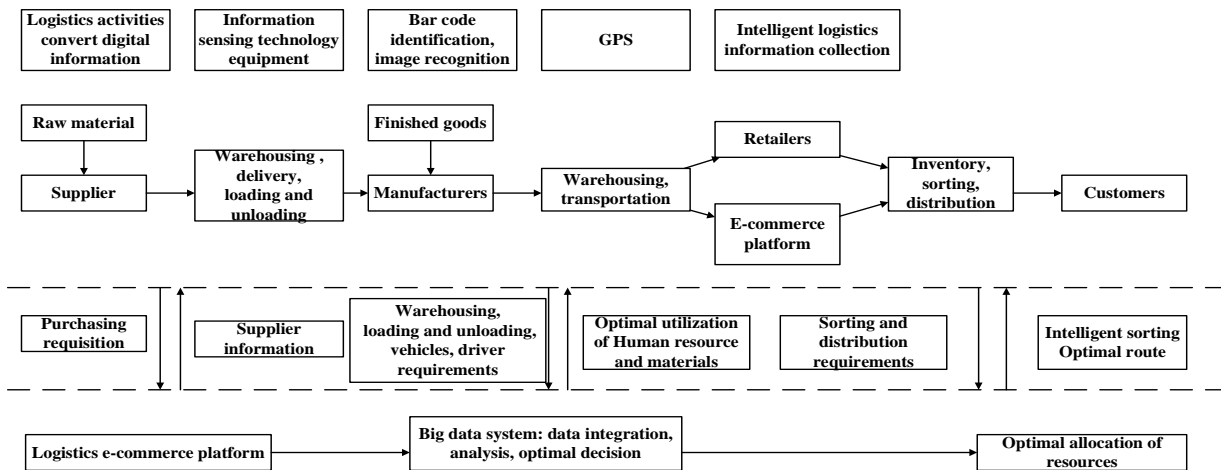

Figure 6 Smart logistic model

First, input the relevant information of raw material procurement in the big data system. Through smart analyzing and smart decision-making function, the best supplier and the best storage will be automatically matched. Secondly, on the way of delivering, big data system may choose the best transformation and storage service for the suppliers, manufacturers, and retailers. On top of that, in the sorting and distribution process, according to the embedded radio frequency identification technology information in the goods and the big data platform link, the best distribution routs may be created, making the entire distribution process is efficient and timely.

5. CONCLUSION

Based on the relevant theories of platform construction, this paper takes Linyi Logistics as an example, and constructs a two-tier logistics platform system of top-level virtual network platform and physical logistics platform, which will help to expand the relevant theories of platform construction. In the context of the Internet, new technologies such as artificial intelligence, 5G, IoT, big data, and blockchain are used to promote the best application scenarios within the logistics platform. The construction of a two-tier logistics platform should conform to the characteristics of the logistics industry itself and the needs of upstream and downstream logistics enterprises. The expansion of the theoretical basis and the enhancement of the practical significance of the industry will make the logistics double-layer platform system more profound. Based on a theoretical review of relevant literature on platform construction strategies, this paper constructs a logistics platform system from the perspective of a two-tier platform system, and takes Linyi Logistics as an example to construct a two-tier logistics platform system with "smart cloud" and "data cloud" as its two wings. The main conclusions drawn in this article are:

First of all, with the proliferation and popularization of big data and Internet e-commerce technologies, the Internet economy has promoted the separation of physical space and virtual space, changed the offline traditional commodity circulation and consumption patterns. Virtual network platform is information technology platform based on emerging technologies, with different functional sections to provide users with online services. The separated physical platform is not independent of the platform ecosystem. The virtual network platform is connected, and the physical platform provides users with physical services.

Secondly, in view of the unity of logistics, information flow, capital flow, and negotiation in modern logistics, Linyi form a two-tier logistics platform system with one body and two wings. The two-tier logistics platform system can promote the transformation and upgrading of the traditional logistics

industry to modern logistics, enhance the digital and intelligent level of the logistics industry, reduce logistics costs and information circulation costs, improve the level of trade facilitation, and drive regional manufacturing and commerce industries to develop.

However, there are still many in-depth research areas. For example, this article only constructs theoretical models and lacks empirical models to test. This article uses Linyi Logistics as an example to explore. Linyi logistics models may not be applicable to other regions. These shortcomings remain to be continued to study.

6. ACKNOWLEDGMENT

REFERENCES

[1] Di H & Liu F, Cloud Logistics Development Model and Upgrade Path Based on Big Data Background, Journal of Commercial Economics. 29(2019)67-70.

[2] Meyer M H & Lehnerd A P, The Power of Product Platforms: Building Value and Cost Leadership, Research-Technology Management.40 (1997)526-529.

[3] Zhang X, Review and Prospect of Platform Strategy Research, Economic management.3 (2014)190-199.

[4] Xu J & Zhang X, Survey on platform Economics, China Industrial Economy.5 (2006)40-47.

[5] Wang Y, Huang P & Shan M, Influencing Mechanism of Two-layer Operation System of Generic Technology Innovation Platform on Distributed Innovation - From the Perspective of Innovation Network, R&D Management.28(2016)97-106.

[6] Li J, A Research on Intelligent Logistics Mode Reconstruction Based on Big Data Cloud Computing, China Business and Market. 2(2019)20-29.

[7] Wang M, Research and Judgement on the Development Path of China's Logistics Industry Transformation, Journal of Beijing Jiaotong University.18 (2019)9-15.

[8] Rochet J & Tirole J, Platform Competition in Two-side Markets, Journal of the European Economic Association.4 (2011)990-1029.

[9] Boudreau K J & Hagiu A, Platform Rules: Multi-sided Platforms as Regulators, Harvard Business School Working Papers.7 (2018)110-11.