Research on Intelligent Logistics Development Model Based on Internet of Things and Cloud Computing in Big Data Age

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Abstract

This paper analyzes the research and development status-quo of intelligent logistics. By reviewing the advantages of Internet of things and cloud computing in the development of intelligent logistics in big data age, it proposes an intelligent logistics industry development models from service management, application and infrastructure.

Keywords: Internet of things, cloud computing and intelligent logistics.

1. RESEARCH BACKGROUND AND RESEARCH STATUS-QUO

1.1 Research background

In recent years, the rapid development of the logistics industry has become one of the fastest growing industries in China's economy, as well as an important growth point of China. However, due to a variety of subjective and objective factors, China's logistics industry costs more than double that of the developed countries, leading to the serious obstacles in the development of the logistics industry (Zhao, 2016). With the continuous development of information technology, big data widely used in all walks of life, it has made important achievements. In the field of logistics, with extensive use of Internet of things and cloud computing and other high-tech methods, intelligent logistics formed on big data can effectively improve the resource utilization of logistics industry, reducing logistics costs and thus playing a significant role in China's logistics industry. At present, China has carried out a lot of researches on intelligent logistics, with the establishment of a number of the enterprises of intelligent logistics (Bian and Kang, 2014). However, China's intelligent logistics development starts late with more focus on the theoretical side. While practice of how to use Internet of things and cloud computing and other aspects are inadequate, resulting in many problems of the development of China's intelligent logistics. Therefore, in the perspective of bid data, an in-depth study on the intelligent logistics development model of Internet of things and cloud computing is of great significance.

1.2 Research Status-Quo

In 2008, IBM put forward the idea of intelligent earth, stating that intelligent technology should be widely used in people's lives and various industries, to promote the world progress in the direction of intelligent development. In 2009, President Barak Obama of the United States concluded the intelligent earth into the American national development strategies. At the same year, Premier Wen Jiabao also put forward the idea of perception of China, from the perspective of Internet of things, analyzed the important position of intelligent technology in China's development, making Internet of things into one of the important strategic industries in China's development (Zhang, 2013). Nowadays, the western developed countries have huge investment in Internet of things. The logistics industry, as one of the industries who first used Internet of things, has rich experience in the application of Internet of things. Therefore, in 2009, the concept of intelligent logistics was formally put forward. After that, it has attracted wide attention from experts and scholars in the field. It also began to study the intelligent logistics (Gu, 2017). However, the research is in its infancy, the intelligent logistics lacks a unified concept, its Architecture and framework is not mature enough, and there is a broad research and development space for it.

2. DEVELOPMENT OF INTELLIGENT LOGISTICS AGAINST BACKGROUND OF BIG DATA
2.1 Limited development of intelligent logistics enterprises

Developed countries have formed a large number of large-scale intelligent logistics enterprises. Many of China’s logistics enterprises have started the research and application of intelligent logistics, but on a smaller volume with uneven distribution, making the influence and development prospects of intelligent logistics enterprises limited (Li, 2017). Coupled with many imperfect intelligent logistics enterprise management system, the management level is low, causing serious problems in resource allocation of the logistics enterprises; a large number of distribution vehicles are idle for a long period; some distribution vehicles are loaded for all the time, making it difficult for logistics enterprises to carry out the development of intelligent logistics in an effective manner. At the same time, the small enterprise scale cause a lack of leading enterprises in the market, without the formation of industrial clusters or a unified market. In the development of the vast majority of intelligent logistics enterprises, there will be lack of talents, funds and technologies and other aspects of the defects. Even with the support of funds and the establishment of a sound infrastructure, it is difficult to use intelligent logistics to contribute to the economic benefits of the enterprises.

2.2 Imperfect development of intelligent logistics information standards

Logistics information standardization is an important basis for the development of logistics information. Only with unified and perfect logistics information standards, it can ensure that every step in the intelligent logistics process can be coordinated and work. This also requires a unified standard of the encoding of intelligent logistics, the file format, Electronic Data Interchange (EDI), Global Positioning System (GPS) and other code direction to eliminate communication barriers between the links and between the enterprises. Nowadays, the developed countries have established a set of logistics information standards, so that logistics customers, enterprises, suppliers and other aspects of the logistics to enable the clients, enterprises and suppliers of the logistics to communicate and cooperate through a unified logistics information, by bringing in a more favorable environment for the development of intelligent logistics. However, due to the late development of intelligent logistics in China, it has not yet formed a complete set of intelligent logistics information standards, resulting in that many logistics information platform and different enterprises are using different standards and norms. It is difficult to cooperate and share information between enterprises, making it difficult for China's intelligent logistics enterprises to form a network. The logistics process in all aspects of the supply chain is not smooth, affecting the development of intelligent logistics.
2.3 Imperfect information platform

Nowadays, there are certain shortcomings in the level of information construction of logistics enterprises in China. Many enterprises have not established a sound information platform, leaving it difficult to position and track the goods in the process of logistics (Lu, 2017). The construction of the information management system concerning the warehouse, transportation and other aspects is low, making it difficult to carry out integrated management of logistics information. At the same time, in terms of the infrastructure, such as in the application of bar code, GPS, radio frequency and electronic data exchange technology in intelligent logistics, there is huge gap between China and the developed countries. Logistics information platform can provide users with logistics information and related services (Jiang and Zhang, 2016). In the process of intelligent logistics construction, the construction level of logistics information platform and the competitiveness of intelligent logistics enterprises are closely linked. The lack of information technology makes the traditional logistics information platform fail to provide enough services, only fulfilling in releasing the information. The lack of supervision over the information results in poor accuracy. At the same time, due to the close relations between logistics industry and the traditional transportation industry, the poor construction level of the logistics information platform leads to inaccurate logistics information, creating huge obstacles in the development of intelligent logistics enterprises.

2.4 Lack of professional talents

China's logistics industry's rapid development poses a greater demand for talent. China has trained a few logistics professionals, making it difficult to meet the needs of the development of logistics enterprises, resulting in the lack of talent which has become an important factor restricting the development of the logistics industry. At present, China's logistics industry talents are concentrated in the frontline positions. The vast majority only know logistics technology. The lack of logistics management, computer applications, communications technology and other aspects results in the lack of high quality versatile talents for the logistics enterprises. The professional institutions and colleges and universities have already opened logistics courses, but most of the personnel trained only know the theoretical knowledge with poor practical ability, which does not meet the actual needs of enterprises.

3. SUPERIORITY OF INTERNET OF THINGS AND CLOUD COMPUTING TECHNOLOGY IN INTELLIGENT LOGISTICS

3.1 Superiority of Internet of things in intelligent logistics

Internet of things is a web means using sensing equipment, such as radio frequency identification, etc., to connect the actual goods and the internet, realizing the intelligent management of goods. Through the integration of a variety of high-tech means, Internet of things is known as the world's third wave of information industry development, playing an important role in promoting the development of a number of industries. In the intelligent logistics industry, through the tracking, identification and positioning of the goods, it can achieve the intuitive control and management of the flow direction, location and other information of each cargo, so as to effectively enhance the level of intelligent logistics work. In the application of Internet of things in the intelligent logistics there are characteristics as follows.

3.1.1 Comprehensiveness of perception

Through Radio Frequency Identification (RFID), radio frequency identification, sensors, GPS and other technology and equipment applications, it can collect the goods information at long distance anytime and anywhere (Zhang, 2015). It enables the users and enterprises to acquire direct information of the temperature, location, pressure, transportation speed and time, transportation distance and other related information of the goods. Such comprehensive information can enable the users to understand the goods information more, providing users with better service, so as to continuously enhance the competitiveness and performance of intelligent logistics enterprises.

3.1.2 Reliability of transmission

Internet of Things is a means of converting real information of the actual goods into virtual information and transmitting it over the Internet. Through the information network of things, it can upload the information of the goods in the process of transportation to the Internet. Therefore, the users, enterprises, suppliers and other
aspects can use the Internet to obtain more reliable goods information. Thus the enterprises and business the logistics process can form an integrated service, reforming the traditional independent work mode of the logistics enterprises and enhancing the level of customer service.

3.1.3 Intelligent processing

On the one hand, the use of radio frequency identification, RFID, sensors, GPS and other equipment, it can better collect the information of the logistics goods for analysis and processing (Yang and Dang, 2014). In the process of decision-making for the managers of the logistic enterprises, these cans serve as an important reference to achieve the intelligent enterprise management. On the other hand, through the related equipment of the logistics enterprises, combined with the Internet platform, it can handle the relevant information of the goods to achieve the intelligent selection of the appropriate distribution channels and distribution methods, with a more reasonable utilization of the logistics business manpower, distribution vehicles and other related resources. Thus it promotes the utilization rate of the resources of the logistics enterprises, reducing logistics costs and effectively enhancing the economic benefits of the logistics enterprises.

3.1.4 Common features of Internet of things and intelligent logistics

The common features of Internet of things and intelligent logistics (as shown in table 1) are mainly manifested in perceptual layer, network layer and application layer. First of all, in the perception layer, the Internet of things can extract the relevant information of real items through the perception layer which is comprehensive. Intelligent logistics, at the same time, also need a comprehensive collection of information on the goods and processing during the inspection of goods, to make the Internet of things and intelligent logistics comprehensive in the perception layer. Second, at the network level, the Internet of Things will display the information of the items to the network, forming a special network system. In the intelligent logistics industry, it will also include the information into the Internet platform in the form of data, both of which have the reliability of information transmission. Finally, at the application level, the Internet of things can make this information applied to work based on the analysis of real information. And intelligent logistics can improve the performance and management of the logistics enterprises through the rational analysis and deployment of goods and funds. Therefore, the two share the common feature of being intelligent.

<table>
<thead>
<tr>
<th>Internet of things architecture</th>
<th>Perception layer</th>
<th>network layer</th>
<th>application layer</th>
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<td>Logistics system composition</td>
<td>Logistics information collection</td>
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<td>Common features</td>
<td>Total perception</td>
<td>Reliable transmission</td>
<td>Can only handle</td>
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3.2 Application prospect of cloud computing technology in intelligent logistics

Cloud computing can achieve the same functions of the super computer, by processing the huge data in the shortest time with cloud computing technology which is done by dividing the huge systematic programs into a great number of small programs which are then analyzed and processed in a huge amount of servers whose results will be delivered to the users later via the internet. In the logistics industry, due to the huge data information produced from the logistics work, the ordinary computing and processing methods will have a greater difficulty in the process of processing data information. Cloud computing can play the unique role of supercomputer in dealing with the logistics data and information. With the use of cloud computing, it can effectively integrate a variety of data and information resources of logistics industry to help the logistics enterprises to deal with logistics information and data significantly, providing more convenient and efficient development channels for the logistic enterprises. In the actual application process, it can build a cloud computing platform by way of a nationwide service of integrating the scattered information data into one, even including the hybrid cloud of the combinations of the logistics industry and different industries. Therefore, China's logistics industry can achieve a high degree of unification, providing a broader development prospects for the logistics industry.

Cloud computing technology has been widely used in the intelligent logistics industry, effectively improving the security of the logistics data and information. Because cloud computing information data processing capacity is comparable to that of the supercomputer, it can avoid the data loss to the maximum in the process of processing information(Wang and Zhang, 2013). At the same time, the cloud computing is more powerful against the
invasion of viruses and hackers, with its security greatly improved. Logistics enterprises only need to load the corresponding procedures in the computer for data calculation and processing in the server, allowing the enterprises to spend the least cost as the premise for the greatest use of the computing resources. The huge capacity of data storage can meet the basic requirements of information storage of the logistics enterprise.

4. DEVELOPMENT MODELS OF INTELLIGENT LOGISTICS FROM PERSPECTIVE OF INTERNET OF THINGS AND CLOUD COMPUTING

From the perspective Internet of things and cloud computing, the development modes of intelligent logistics are mainly service management layer, application layer, infrastructure layer.

4.1 Development model of service management

With Internet and cloud computing, the development model mainly adopts Service Oriented Ambiguity (SOA) development structure in intelligent logistics industry. SOA is a system form based on the service, classifying different service functions and later connecting the Internet, logistics closely. It can effectively implement the SOA development structure. SOA mainly has the following functions.

First of all, SOA can re-integrate the data produced from the services of the enterprise, users and suppliers in the logistics process, so as to use such services.

Second, it can provide the appropriate information and reference information for the intelligent logistics enterprises, so that intelligent logistics enterprises can develop appropriate business processes in accordance with the industry's service characteristics. So the intelligent logistics enterprises can deliver better services to the users.

4.2 Development model of infrastructure

The content of the infrastructure layer mainly includes two aspects; one is the construction of hardware facilities, such as computers, information storage equipment, etc. The other is the construction of software facilities, such as cloud services, servers and so on. According to the different combinations of hardware and software, it mainly produced the following models.

First of all, the public cloud model. Public cloud model provides cloud services model for the logistics enterprises through the third party suppliers. This model does not require the logistics companies to build and maintain their own cloud servers; it is the most popular method for the logistics companies.

Second, the private cloud model. Private cloud model is that the logistics enterprises build their own cloud server to use self-sufficient cloud computing. Although this approach will cost heavily, it is much safer due to the internal network; it is the most popular method for the large logistics companies.

Third, the hybrid cloud model. The hybrid cloud model is a combination of the public cloud model and the private cloud model, which can effectively reduce the costs of cloud computing and improve the resource utilization rate of the logistics enterprises.

4.3 Development model of application

Application layer mainly contains three kinds of platforms, first is the development platform, based on SOA architecture, providing the development platform for the logistics enterprise. Second is the service application platform, including information management and detection, capital management and system maintenance modules. The third is the sharing platform, which can information communication between the enterprises, suppliers, users through the sharing platform.

5. CONCLUSIONS
Internet of things and cloud computing can effectively improve the resource utilization rate of logistics enterprises, reduce logistics costs and enhance the service level of logistics enterprises, which is of great significance in promoting the development of intelligent logistics.

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