Studies on the Model of Logistics Management System of Multidimensional Collaboration for E-Commerce Enterprises under the Perspective of Internet of Things

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Abstract

Under the background of Internet of Things, the new development patterns of e-commerce enterprises have been generated, the formation of logistics management system model of multidimensional collaboration has the significant meaning for the development of e-commerce enterprises. Therefore, the thesis states the framework of the types of logistics management system of multidimensional collaboration in the environment of Internet of Things, and provides frame foundation for the construction of management model, and thus proposes the methods of building the logistics management system of multidimensional collaboration for e-commerce enterprises on the basis of Internet of Things, and discusses from the aspects of the integration of the technology of logistic network, the establishment of algorithm flow, and the formation of multidimensional management platform, and aims at forming the logistics management system model of multidimensional collaboration for e-commerce enterprises, and promoting the development of e-commerce enterprises.

Keywords: Internet of Things, E-commerce Enterprises, Logistics Management System of Multidimensional Collaboration.

1. BACKGROUND OF STUDIES

1.1 Overview of studies

Under the background of Internet of Things, various kinds of development patterns of the management system of e-commerce enterprises have been formed. During the development process, with combination of the technology of Internet of Things, the framework of the types of logistics management system of multidimensional collaboration has been formed (Qiu, 2016). Through understanding and mastering coordination technology, the e-commerce enterprises are able to accurately use multidimensional technology in Internet of Things, and then form systematic logistic management system. During operational process, the e-commerce enterprises mainly rely on technical support among all dimensions, which also assists enterprises to establish accurate management system. At present, the literature studies on such aspect mainly center on the technology of Internet of Things and the multidimensional management system; through the analysis on these literatures, this thesis provides new idea and methods for other researchers to study on building the logistics management system of multidimensional collaboration for e-commerce enterprises under the background of Internet of Things, and also improves the building efficiency (Cheng and Wang, 2016).

1.2 Purpose of studies

The thesis starts with the frame types of logistics management system of multidimensional collaboration in the environment of Internet of Things, and clarifies the methods for e-commerce enterprises to build multidimensional logistics management system model, through grasping the practical conditions of e-commerce enterprises and understanding the technology of Internet of Things, the thesis combines with corresponding algorithm formulas during the process of building model, in order to provide construction idea and direction for the formation of model, and also integrates with the technology of Internet of Thing to deepen the coordination of model, and provide corresponding support for the development of e-commerce enterprises.
2. TYPE FRAMEWORK OF LOGISTICS MANAGEMENT SYSTEM OF MULTIDIMENSIONAL COLLABORATION IN THE ENVIRONMENT OF INTERNET OF THINGS

During the management process of production and operation, the e-commerce enterprises are faced with many issues about collaboration, but in the development process, it needs to combine with the technology of Internet of Things, and form the four-layer structure of management system of Internet of Things (Zhu and Jin, 2016). In regard to the multi-dimensional coordination management that e-commerce enterprises are faced with, the thesis defines the classifications of multi-dimensional collaboration from four dimensions, and analyzes the phenomenon that e-commerce enterprises show on the collaboration classifications of four dimensions, and then build parametric equations of logistics system. During the development process of logistics management system of multidimensional collaboration, the development characteristics have also been formed correspondingly (Li, 2016). One of the characteristics is multiple dimensions; the first characteristic of modern logistics collaboration is the multiple dimensions. Based on the analysis on perception layer, there is technical collaboration, including key technology breakthrough and establishment of standardization system; based on the analysis on network layer, there is information collaboration, including the realization of information collaboration through sensor network, wireless and wire net; based on the analysis on application layer, there is service collaboration, including competition and cooperation between upstream and downstream supply chain enterprises, in order to provide clients the value-added services with characteristics of intelligent perception and quick response and the personalized services, and improve quality of service through the quick feedback of service quality evaluation; according to the analysis on management layer, there is management collaboration, mainly refers to the regulation and control and guidance on internal management of e-commerce enterprises and government departments, which is mainly reflected in realization of the optimized combination and configuration through the collaboration of all subsystems or elements in enterprise system, and then generates the system that owns new life and far surpasses the original organization system on the aspects of structure and function (Gao and Liu, 2012). Another characteristic is intercommunity, in the e-commerce enterprises, the dimensions are coexisting, during the operation process, the multi-dimensional cooperative work can be achieved through the technology of Internet of Things, and the collaboration state of these dimensions can be interactive, will not intervene with each other or obstruct others’ operation during operation process, but can promote the development mutually. And the third characteristic is common cooperation. The characteristic of multidimensional collaboration of e-commerce enterprises is decided by the features of enterprises, the competition and cooperation of upstream and downstream supply chains of enterprises, the alliance cooperation of enterprises in the same industry, and the internal and external management and cooperation of enterprises form the cooperative characteristic of multidimensional collaboration of modern e-commerce enterprises. The fourth characteristic is logistics information sharing (Zhou, 2012). With the formation of Internet of Things, the e-commerce enterprises also form the informationized development flow during its development process, which reduces the occurrence of unsmooth operation of administrative departments formed by information isolated island and lack of office automation. And the formation of the information sharing characteristic greatly alleviates the problem and improves the work efficiency of e-commerce enterprises.

2.1 Collaboration of management technology

During its development process, Internet of Things includes a wide range of technology, such as, perceptive technology, network communications technology, identification technology, system framework technology, and safety and confidentiality technology, and forms the huge and complicated technology system of Internet of Things (Kong, 2013). The integration of various standards and technology become one of characteristics of technology of Internet of Things, covers the fields of perception, communications and application, which makes Internet of Things must own the characteristic of technical collaboration, the technology of Internet of Things related to e-commerce mainly includes sensor technology, wireless sensor network technology, positioning technology, electronic product code technology and electronic data interchange technology, it will be helpful for e-commerce enterprises to carry out intelligent management and information-based decision making through the application of these kinds of technology (Wu, 2014). The technical collaboration is the most fundamental collaboration demand in the multidimensional collaboration of modern logistics, it is available to provide the sharing and communication environment of real-time interaction for each mode of the platform by virtue of the collaboration of management technology, its main purpose is to realize the synchronous operation and information collaboration among all nodes of the platform, and meanwhile, to increase the port-to-port transparency, and improve the rapidity and effectiveness of decision-making process (Shang, 2014). The technical collaboration is the foundation and key factor for the system platform to realize collaboration, and provides powerful support for strategic collaboration and business process collaboration. The technical collaboration can be divided into three layers (Figure 1 is the classification of technical collaboration layers).
Figure 1. Classification of Technical Collaboration Layers

The first layer is the protocol layer, including communication protocol, business collaboration and business partner protocol, system integration standard protocol and information security protocol, its purpose is to build standardized communication protocol and realize the unified standard and unified interface (Wang, 2014). And the second one is data standard layer, including the information exchange standard, code data exchange standard and the data exchange standard of identity identification, the purpose is to realize the standardized data type, and form the unified access data format. The final one is application layer, which mainly includes the platform building of modern logistics collaboration information system.

2.2 Collaboration of management information

With the development of e-commerce enterprises, there is quite a large amount of information related to logistics, and higher requirements on the accuracy and timeliness of information (Wang, 2011), which mainly include purchasing information, supplying information, order information, financial information of orders, transportation cost information, record information of dispatching vehicles, cargo information, vehicle condition information, inventory information, cargo demand information, information of vehicle-mounted cargo, vehicle location information and information of customs clearance, etc. The network is just like the blood vessels of human body, and the information is just like the blood flowing in vessels, the whole logistics system can be operated efficiently only when the blood flows healthfully. The non-collaborative information is mainly caused by the aging of logistics system, incompatible subsystems, and disunity of data format and isolated island of information (Wang, 2016). The collaborative system of modern logistics is designed to solve the issues of collaborative operation among multiple subsystems properly. The information collaboration includes not only the information sharing between enterprises and upstream and downstream manufacturers, competitors and cooperative partners, and also the information exchange and efficient transmission among all intelligent management departments inside the enterprises, as well as the data collection, transmission, release, sharing and integration among the logistics system, office automation system, financial management system, electronic commerce system, customs clearance system and other information systems; the unity of transport protocols and the standardization of data format eliminate the isolated island of information, and realize the high efficiency and accuracy of information (Jia, 2015). The information collaboration decides the stability and efficiency of the whole logistics information system. The application of the technology of Internet of Things in modern logistics field effectively solve the problems of information collaboration and the information flow and sharing issues in logistics from the perspective of the entire supply chain (Guo and Zhao, 2015). It can be said that the information collaboration is the most crucial collaboration demand in Internet of Things of modern logistics. Through Figure 2 management information collaboration diagram, its operational process can be understood.
2.3 Collaboration of logistics service

The service concept of modern logistics has been transformed to continuously make innovation in logistics service mode and improve service level with the starting point of meeting the ever-increasing logistics demand of producers and consumers (Yu, 2013). The service demand is diversified, the Internet of Things in the modern logistics can sufficiently meet the service demand that the traditional logistics fail to meet. It is also able to meet fundamental service through perceptual recognition, responds rapidly and offers high-quality logistics service, and also promotes the generation of value-added services, as well as the realization of personalized service through intelligent logistics. The integration of the recognition technology of the Internet of Things with specific logistics operation will be able to achieve logistics informatization, automation and facilitation, and ensure the effective implementation of the fundamental logistics service. Through the application of tracking technology, the modern e-commerce enterprises are able to provide more efficient and high-quality logistics service for clients through quick response to the information on logistics link. Through the application of the information exchange technology of Internet of Things, the e-commerce enterprises can provide enterprise-level information value-added service for clients. The intelligent decision support system of modern logistics refers to the information system of utilizing computer, network and communication and other modern information technology to collect, classify, screen out, store, analyze, evaluate, feed back publish, manage, control relevant information of logistics operation, logistics process and logistics management in the region and make decisions. The service is the relatively macroscopic constituent part of collaboration on the collaborative service platform of modern logistics; such platform covers the information exchange and coordination among external systems related to the logistics information system and the process of logistics business, including customs, supervision departments, banks, small and medium-sized enterprises, cooperative partners and the public. The information platform carries out the public logistics information communication with the public through customer service system and the information communication with the banks through electronic delivery system, in order to transmit financial information timely; the supervision departments supervise e-commerce enterprises through e-government affairs supervision system and send the policy and supervision information to the information system.

2.4 Collaboration on management layer

Same as traditional logistics, the modern logistics also has the problems of traditional management concept and outdated management tools, the reasons are that most of e-commerce enterprises in our country enter in logistics market from transportation and storage and other functional services, only supply simple combination of basic services, but fail to provide integrated management integrated managements; although informatization tools are also used in management tool, they are not linked to be network and lack of comprehensive monitoring for cargo, and it is impossible to share information resources with clients, which causes enterprises seldom contact with clients, cannot meet the comprehensive demand of clients. The management collaboration mainly refers to the collaborative operation among all departments and all subsystems inside modern e-commerce enterprises, while the theories and thought of traditional management are built on the basis of a high degree of division, emphasize on the significance of division of labor, but do not pay sufficient attention to the entirety, only attach importance to the optimal allocation of internal resources. The management collaboration highlights the thought of collaboration and coordination between elements and the integration with external resources, the more important
is the internal unobstructed information flow and standardization of enterprises. The collaboration of management layer refers to the coordination pattern of cooperative work among all functional management departments and personnel in enterprises. In the collaboration network of management functions, the core layer is composed of the financial management, operation analysis and performance management, the purpose of collaboration is to improve enterprise competitiveness, reduce cost and reach to the best performance. The intermediate layer includes business management, human resource management, customer relation management and integrated management, the collaboration of the intermediate layer management is not only the foundation of the core layer, but also the important guarantee for the collaboration of outer layer management, the management functions of the intermediate layer cover most of management staffs and departments of enterprises, its collaboration difficulty and importance are relatively greater than the ones of the core layer. The collaboration of support layer includes information management and technical management, this layer plays the role of infrastructure and adhesive in the collaboration network of the entire management layer, it is impossible to achieve the collaboration of the intermediate layer and the core layer without the cooperative work of the support layer on the aspects of software and hardware (Figure 3 shows the management of collaborative layer process).

![Figure 3. Management of Collaborative Layer Process](image)

### 3. METHODS OF BUILDING LOGISTICS MANAGEMENT SYSTEM MODEL OF MULTIDIMENSIONAL COLLABORATION FOR E-COMMERCE ENTERPRISES

#### 3.1 Process for building the model algorithm combing the Internet of Things

During the process of building the logistics management system of multidimensional collaboration, it shall understand Internet of Things correctly, master the specific technology of Internet of Things and specific contents of coordination framework, and then combine with the practical operation and production conditions of e-commerce enterprises to build management model. During the process of forming the management model, it shall combine with corresponding algorithms, in order to offer algorithm support to the operation of model.

Build parametric formula of system

Set the coordinating efficiency of system to be \( y \)

\( x \) is the function of the time \( t \)

\( \beta \) is the slope of system changing from initial state to equilibrium state

\[
 y = \begin{cases} 
 y_0(x = 0) \\
 \beta x (0 < x < x_0) \\
 y_i (x_i < x) 
\end{cases} 
\]  (1)
\[ s(w) = \begin{cases} 
  s_0(w = 0) & \\
  \beta w(0 < w < w_0) & \\
  s_1(w_1 < w) & 
\end{cases} \]  \tag{2}

And then form order parameter equation:

\[
\frac{\partial s}{\partial t} = \begin{cases} 
  \beta w(t) + s_0 & \\
  \ln[\delta(t) + 1] + s_{02}, 0 < w < w_0 & \\
  h\phi^2(t) + \sum_{n, \phi > 0} \frac{s_n}{\chi(t)}, y > 0 & 
\end{cases} \]  \tag{3}

During the process of building model, it shall combine with algorithms, choose suitable algorithms for e-commerce enterprises, improve the accuracy rate of algorithms and thus promote the normal operation of e-commerce enterprises.

3.2 Build sensory perceptual system and establish model of service layer

During the process of building management model, it shall build sensory perceptual system. At first, through logistics management system frame of multidimensional collaboration, people can understand the specific connotation and operation mode of perception technology, and during the process of building model, the perception technology is the most important constituent part, through the application of perception technology, it is available for electronic commercial enterprise to collect logistics information timely and form highly efficient e-commerce operation system during the operation process. And meanwhile, the model of service layer of e-commerce enterprises needs to be built, during the operation process of e-commerce enterprises; the service is the foundation of its operation. On such basis, it needs to combine with the technology of Internet of Things and the collaborative technology of service information, form e-commerce service platform, promote to meet the service demand of users, and improve the development of e-commerce enterprises.

3.3 Form multidimensional management platform and improve operation efficiency

During the process of building e-commerce management system model, it shall build multidimensional management platform by means of the technology of Internet of Things. Through understanding the frame types of logistics management system of multidimensional collaboration, people will realize the importance of the development of e-commerce enterprises, and then apply carious kinds of technology, form multidimensional management platform, promote logistics information to be processed by system at the same time, and improve operation efficiency of e-commerce enterprises. And during the operation process, it shall form the highly efficient operation mode, combine with information technology, plan the information operation process and then increase its operation efficiency.

4. CONCLUSION

With the development of social economy, the e-commerce enterprises also enter in the period of rapid development, during the operation process, the concept of multi-dimensional coordinated development is formed through the combination of the technology of Internet of Things; with the guidance of such kind of concept, it will be helpful to build the logistics management system model of multidimensional collaboration for e-commerce enterprises, increase the management efficiency of e-commerce enterprises, and promote the development level of enterprises through combining with algorithm model.

REFERENCE


Li H. (2016). Cash flow management of small and medium sized enterprises under the financial model of online supply chain, Special Economic Zone, (07), 84-88.


