ATLANTIS PRESS
Advances in Social Science, Education and Humanities Research, volume 264
5th International Conference on Education, Management, Arts, Economics and Social Science (ICEMAESS 2018)

The Construction Plan of the Fourth Party Logistics Platform of Chongqing Cross-Border E-Commerce

Jiangxia Yu[1, a], Xiaojun Lu[2, *, b], Zhen Liu[3, c]

[1]Department of Economic Management, Chongqing Chemical Industry Vocational College, 100 Jialing Fourth Village, Jiangbei District, Chongqing, China

[2,*]Harbin university of commerce, Harbin, China

[3]College of Computer Science, Chongqing University, 174 Sha-Zhengjie, Sha-Pingba District, Chongqing, China

[a]6735892@qq.com, [b]lxjharbin@126.com, [c] kim_lau@126.com

Keywords: Cross-border E-commerce, Supply chain, 4PL platform

Abstract: The cross-border E-commerce in Chongqing has achieved remarkable progress in recent years. However, with the development of the cross-border E-commerce, the logistics becomes an important factor that restrains its rapid development. Therefore, this paper proposes to build a fourth party logistics (hereinafter referred to as "4PL") platform so as to promote the sustainable and health development of Chongqing cross-border E-commerce. Firstly, the paper makes a brief introduction to the 4PL and the 4PL platform and also analyzes the positive effects of the 4PL platform on the development of the cross-border E-commerce by referring to the status quo of Chongqing cross-border E-commerce. Then, the paper puts forward a safe, open, expansible and highly available construction plan about the 4PL platform by making a comprehensive explanation about the platform framework design. Finally, the paper holds that once being implemented, this construction plan will put the companies with mutual needs into a network so as to reduce the logistics cost effectively, increase the efficiency of the logistics operation, promote the transformation and upgrading of Chongqing logistics industry, provide guarantee for the fusion and development of the cross-border E-commerce, and finally promote the development of the social economy.

1. Introduction

After years of development, the cross-border E-commerce has obtained great progress, and Chongqing has become the only trial city with the four modes of cross-border E-commerce service in China. However, the logistics is inhibiting the rapid development of the cross-border E-commerce. In the aspect of the cross-border E-commerce logistics, there are many problems, such as high cost, long delivery time, no whole course tracking, clearance barriers, parcel damage or even loss, and no return and exchange etc.. Therefore, it seriously needs to further study and develop the 4PL platform so as to integrate the logistics resources, perfect the logistics services and promote the sustainable and health development of the cross-border E-commerce.

2. Definition of 4PL Platform

There is no unified definition of the 4PL now, and the representative ones are as follow:

Douglas Babe(1996)[1] firstly put forward the definition of 4PL, that is, a supply chain integrator that can allocate and manage itself, has the resource, capability and technology for complementary service providers, and can provide comprehensive supply chain solutions. He believes that the 4PL is a suppositional logistics which depends on all the dependable value-added service providers in this industry to integrate the social resources and provide perfect comprehensive solutions on the basis of the customer supply chain.

Donald J. Bowersox(1999)[2] held that the 4PL refers to the supply chain operation mode in which the integrator provides point-to-point services to the customers through controlling and managing the teaming partners in the supply chain.

Y. Y. Xi (2002) [3] stated that the 4PL supplier is a integrator of the supply chain. It integrates and manages the different resources, capabilities and technologies within a company or those possessed by the service suppliers with complementarity so as to provide a complete set of supply chain solutions.

X. Zhang (2002) [4] held that the 4PL is a supplier who intensively manages its own resources, capabilities and technologies and provides comprehensive supply chain solutions with complementary services. It is provided by the “fourth party” that is independent from the links of the current logistic system and has no direct interest relations with the original logistic system. It can integrate its own resources, capabilities and technologies with the resources, capabilities and technologies of the providers of supplementary services.

3. Platform/System Design

In order to give play to its role as the logistic integrator, the 4PL has to take use of effective logistic operation platform so as to connect and integrate the information of the 3PL.

Y. B. Huang et al.(2012)[5] put forward the systematic framework for the 4PL information platform on the basis of the network service. G. L. Mao(2008)[6], made a process design for the 4PL platform from the government level, and on this basis, made a system design for the 4PL platform from the company system level, the government management system level and the credit system level. In order to improve the overall coordination efficiency of the supply chain, T. Pan et al.(2010)[7], based on the previous studies, put forward a multi-agent information system including its theoretical basis, basic framework and operation model. F. Yang et al.(2011)[8], made a penetrating analysis of the function and framework of the 4PL information platform and put forward the basic framework of the information platform. S. L. Ge et al.(2012)[9], designed the 4PL information platform by adopting the multi-agent method and the AUML modeling method.

4. Effects of the Platform

In the recent years, with the rapid progress of the trading globalization and the fast development of modern information technology, the cross-border E-commerce maintains its strong growth momentum for its advantages of breaking through the time and space restraints of the traditional trading, effectively saving the human resources and reducing the intermediate links. In 2014, the trading volume of Chongqing cross-border E-commerce has broken through 60,000,000 RMB. But the logistics is restraining the rapid development of the cross-border E-commerce. Lacking of the cross-border business logistics platform for exhibiting and exchanging the information that influences the collection and analysis of data and causes the high operation cost and low operation efficiency of the cross-border E-commerce. The effects of the studies and construction of the cross-border E-commerce 4PL platform are as follow:

(1) To achieve the structural upgrading and transformation of the logistic industry in Chongqing. By creating the 4PL platform operation model that coordinates the information technology, the profession consultation and the 3PL, the combination of the traditional logistic operation and the professional consultation service will be achieved, and the upgrading and renewal of the operation model and industrial structure of the logistic industry will be accomplished.

(2) To assist the companies to find new profit points and form the core competitive power. Through the platform, the logistic information within Chongqing can be collected and can be shared with the users of the platform.

(3) To improve the capability for international logistic channels. The construction of the 4PL platform contributes to the integration of more resources and the more effective allocation of the

logistic resources, which helps to achieve the value increase of the logistic value chain of the cross-border E-commerce, promote the construction of the international trading channels and build the international logistic channels.

5. Application Framework

The application framework of the 4PL platform adopts the hierarchical design. The division and cooperation between each level will integrate the information flow, the business flow, the logistics and the capital flow in the cross-border E-commerce supply chain and will optimally allocate the logistic resources. The application architecture is shown in Figure 1.

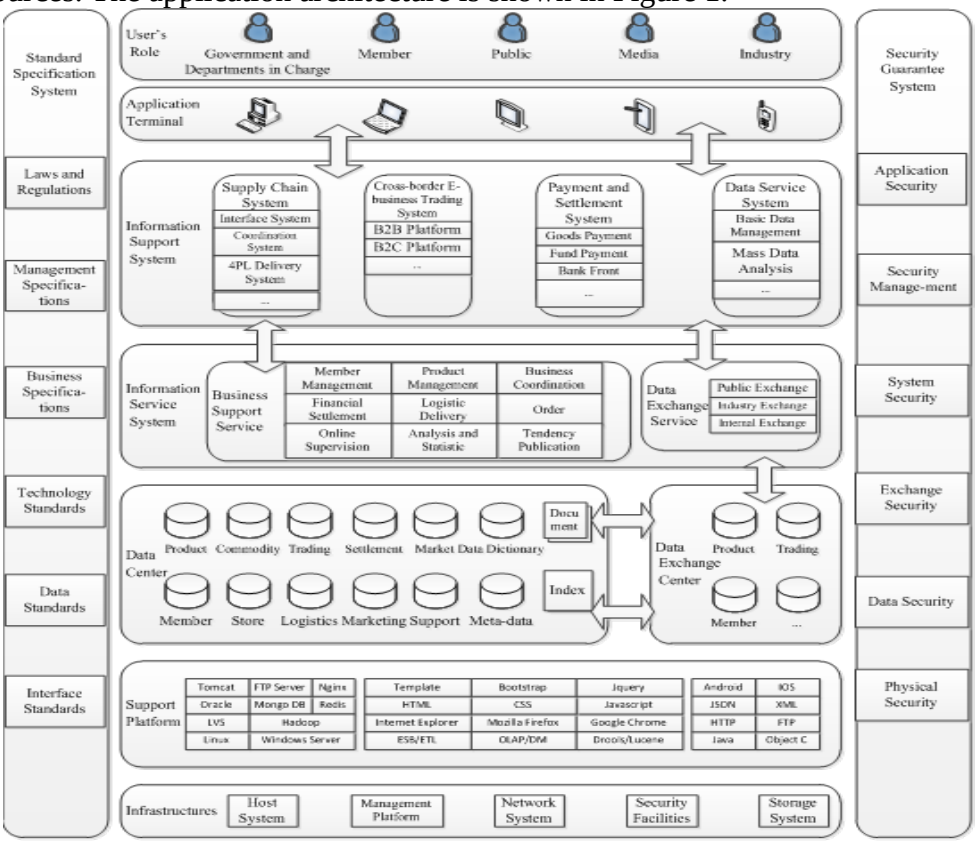

Figure 1. Application Architecture

(1) The infrastructure level, the lowest level of the 4PL platform, is mainly used for supporting the normal operation of all the information systems.

(2) During the integration of the cross-border E-commerce logistic resources, several application systems for satisfying the own business are needed, and these systems has to be connected with several heterogeneous systems so as to achieve the mutual connection between the systems. Therefore, strong support platform is needed to guarantee the development of these systems. The integration of the systems is achieved by providing the mainstream information middleware, integration middleware, analysis middleware, communication agreements and application standards.

(3) Data platform is the data center to support the data collection, data cleansing, data storage and data exchange in the whole information system.

(4) The 4PL platform mainly contains the business service and the data exchange service, all of which gather on the service platform level. The business service will provide all the core business functions that are shared by the cross-border logistics. The data exchange service will provide data exchange services for the purchasers, suppliers, logistic companies and financial settlement companies that are involved in the cross-border E-commerce.

(5) The trading, the delivery and the settlement, the common links in the cross-border E-commerce, form a close circle which improve the user experience through data services, such as the data about

the trading and the data about the logistics etc.. Therefore, the corresponding application system is needed as a support to provide all the business functions to the users and to guarantee the normal operation of the 4PL platform. The systems mainly are:

Supply chain information system: to integrate the information flow, the business flow, the logistics and the capital flow in the cross-border E-commerce supply chain and to achieve the mutual connection and the data share of each chain and each segment in the supply chain. It mainly includes the supply chain interface subsystem, the collaboration subsystem and the 4PL delivery subsystem. The supply chain interface subsystem will accomplish the mutual connection of each information system. The collaboration subsystem will achieve the collaborative management of the process, the data and the business principles. The 4PL delivery subsystem will achieve the reasonable allocation of the logistic delivery information and calculate the optimal delivery plans to reduce the delivery cost to the maximum extent.

Cross-border E-commerce trading system: to solve the common problems in the cross-border shopping, such as high logistic cost, long delivery time, damage and loss of parcels etc.. It mainly includes the member management system, the product management system and the order system, all of which can satisfy the needs of several kinds of E-business, such as the B2B and the B2C.

Payment settlement system: the online payment and settlement function is accomplished by connecting with the banks and the third party payment platform. At the same time, it will provide financial services by taking use of the core companies on the supply chain. It mainly includes the payment settlement subsystem, the capital payment subsystem and the bank front subsystem etc..

(6) The security guarantee system refers to satisfy the national security standards and other requirements such as the privacy protection, the network anti-virus defense, the vulnerability scanning and the intrusion detection etc..

(7) The management system refers to the systematic management of the solutions to the 4PL platform and the management of the organizational institutions, the talent teams, the information standards and regulations and the management systems during the design and construction.

6. Data Framework

With the development of Chongqing cross-border E-commerce, the 4PL platform will produce a lot of business data about trading, settlement and delivery and some standard data for supporting the business. Therefore, the data framework needs to be planned reasonably and scientifically in order to guarantee the normal operation of the platform, to accomplish the comprehensive utilization of all the kinds of business data on the platform, to maximize the value of the data and to support the operational analysis and the scientific and intelligent decision making of the platform. The data framework is shown in Figure 2.

The specific information about the data framework includes:

(1) All the data involved by the platform are stored and managed in the storage system in order to reduce the complexity of the data management and to improve the convenience of the data management.

(2) The data are divided into the business data, the basic data and the settlement data which are stored hierarchically in the special databases to improve the security of the data.

(3) The reading and writing separation technology is adopted in the utilization of the data. In order to achieve the real time synchronization of the inquiry database and the business database, to reduce the inquiry pressure of the databases and to improve the performance of the databases, an independent inquiry database is established.

(4) The standby system adopts the warm standby, the cold standby and the tape standby to make timely standby of the trading data, the settlement data, the delivery data and the logistic data etc., which can guarantee the security of the data.

(5) The platform provides standard data collection service and data exchange service, can improve the utilization efficiency of the data and reduce the coupling degree of the system, and

also can help the platform to collect the needed data from the business system and to realize the flexible exchange of data between the data center and the business system.

(6) The whole-process data security supervision system is established to supervise the security and performance of the data on the platform in view of the performance and the throughput capacity of the database and the security of the data standby etc.

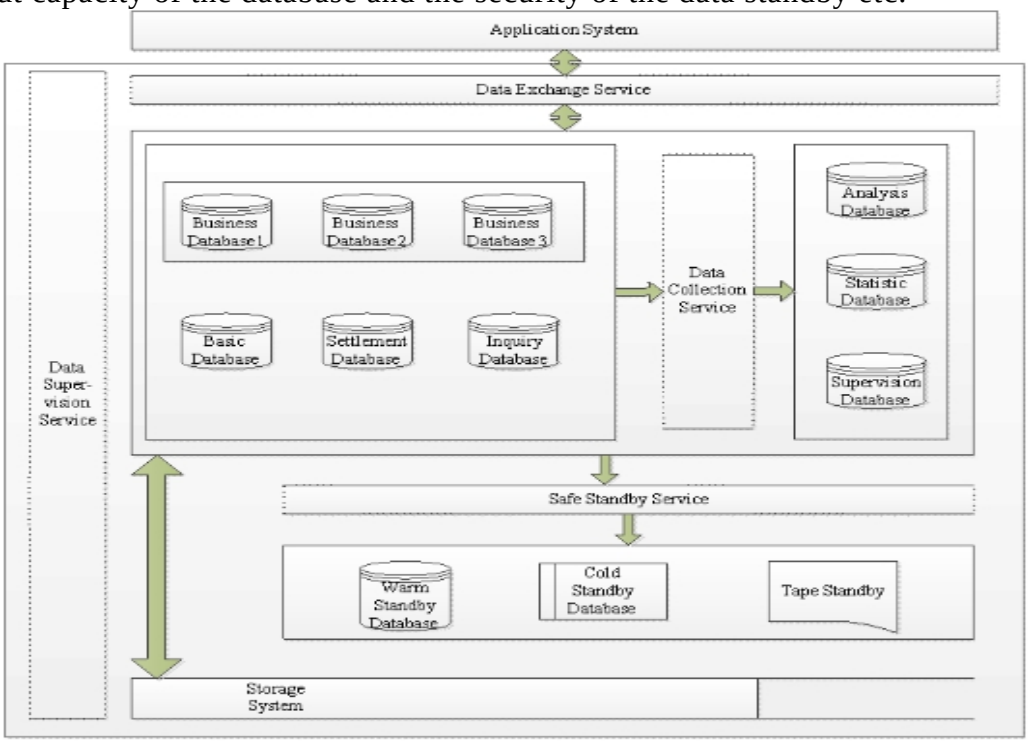

Figure 2. Data Architecture

7. Technological Framework

7.1 Key Technologies

7.1.1 The supply chain data exchange technology

A data exchange platform that takes the message bus as the core and the enterprise service bus as the method is established to satisfy the share of the heterogeneous data from the different application systems. The core of the data exchange consists of the access interface to data resources, the technological components for message and the technological components for service.

1) The access interface to data resources

The data collection and exchange provides the mutual connection service for the application systems involved in the cross-border E-commerce and makes reading and writing operations to the heterogeneous data resources.

2) The technological components for message

There are obvious time differences between the data production and the data consumption among the involved information systems during the cross-border E-commerce trading process. In view of the minimum dependence between the systems, the message bus and the message delivery mechanism with high efficiency and reliability shall be adopted to achieve the data communication that is independent of the platform, which is helpful to the integration of the distributional system and the mutual connection of unceasing business.

3) The technological components for service

The platform shall adopt the enterprise service bus technology to make the application-level resource integration. Through the enterprise service bus, the supplier of the cross-border E-commerce

can register the products to the purchase information list in the form of service. The order call can be routed to the supplier and the delivery company when the purchaser orders in the application software. When the delivery company delivers the goods, the service requirement will call the related services in the enterprise management system of the supplier and the inventory management system of the purchaser successively. Thus, the goods information is exchanged, and the statistical information in the whole business process will be sent to the government supervision system through the information report service provided by the bus. Finally, the complete integration of the whole-process supply chain is realized Place tables as close as possible to the text they refer to and aligned center. A table is labeled *Table* and given a number.

7.1.2 The supply chain information platform technology based on the SOA framework

Each heterogeneous system is built into the collection of the existing components on the basis of the SOA framework. The incompatible heterogeneous units can make new service-level agreements through the simple and flexible neutral interface without rebuilding the original system. At the same time, the internal details of the services and the data sent between the service components can be hidden from the external.

7.2 Network Framework

During the operation of the 4PL platform, the data center has to bear several kinds of business functions. The data center, regarding the exchange structure with high reliability and high speed as the center, shall connect the production area, the external connection area, the operation and maintenance area and the DMZ area in accordance to the requirements including unity, publicity, expansibility and manageability through the modularized and hierarchical construction method. It shall also make targeted design according to the different business requirements and security requirements of different functions. The network framework of the 4PL platform is shown in Figure 3.

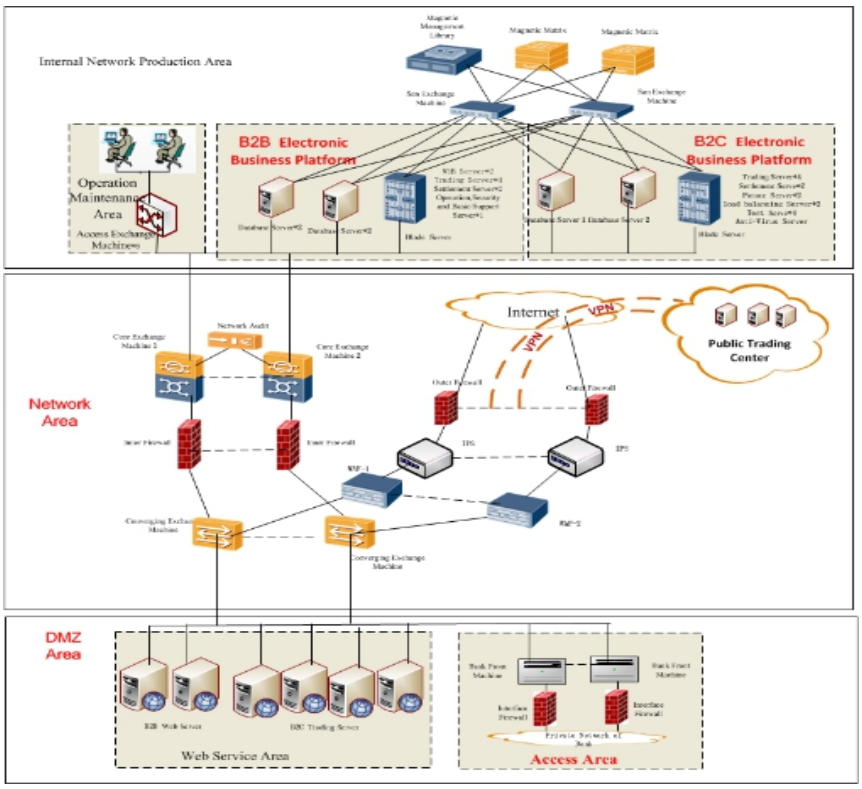

Figure 3. Network Topology

8. Security Framework

Due to the multi-user and the high frequency of the cross-border E-commerce and the involvement of fund flow, the security of the platform is very important. The 4PL platform achieves unceasing management and improvement of the platform in the main four security goals, i.e. the security system construction, the obedience and implementation of laws, the controlling of the security risks and the effective security management, through the basic framework security, the information security and the security management and combining the three supporting systems including the technology, the management and the operation and maintenance. The security framework is shown in Figure 4.

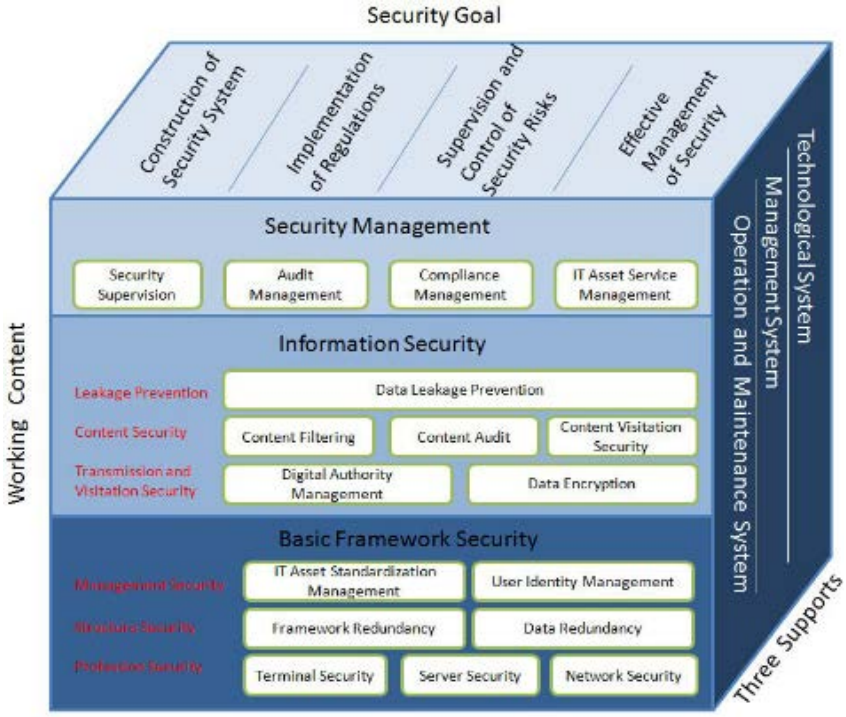

Figure 4. Security Architecture

The first level: the basic framework security level. As the information and data supporter of the 4PL platform, this level contains a large number of and a great variety of infrastructures and basic framework groups. It is built from the basic to the high-grade so as to reach the goal of “manageability”.

The second level: the information security level. As the important core content of the security goal of the 4PL platform, the information security level pays much attention to the visitation and transmission of the information and the security control and audit of the data content and data visitation.

The third level: the security management level. The security of the IT system of the 4PL platform is optimized and improved unceasingly. After the management goals (specific indexes and regulations) are made, the supervision, the audit and the detection are adopted and are accompanied with the process management of IT service to rectify and reform the security. To establish the support system for the platformized security supervision, audit management, compliance management and IT asset service management is the main content of the security management.

9. Conclusion

By analyzing the development bottlenecks of the cross-border E-commerce and the status quo of the 4PL platform and making a comprehensive discussion on the application framework, the technological framework, the data framework and the security framework, this paper

designs a safe, open, expansible and highly available 4PL platform which regards the intelligent data analysis as the core. This platform formulates the logistic data standards and opens up the standard agreement interface, which provides the resource share platform to the supply side and the demand side in the circulation part of the cross-border E-commerce. The resource integration advantage is taken use of to formulate highly effective and convenient logistic solutions which can reduce the logistic cost for the suppliers, improve the resource utilization efficiency for the logistic companies and the delivery efficiency for the consignment service, and provide convenient and whole-process logistic supervision. We hope this platform construction plan can provide an effective solution to the rapid development of Chongqing cross-border E-commerce, can connect the enterprises of mutual needs into a network to guarantee the mixed development of the different parties of the cross-border E-commerce and finally can promote the development of the society and the economy.

Acknowledgements

The authors would like to thank Chongqing Medicine Exchange for the help with the collection of the data used in this paper, and professor Li-Yi of Chongqing University of Posts and Telecommunications for his valuable advice. Also, this research is funded by Chongqing Science Technology Commission and The Decision Consultation and Management Innovation Project.

References

[1] C. D. Babe, James K Mueller, “New For the millennium: 4PL”, Logistics Today, vol. 40, no. 2, (1999), pp.78.

[2] D. J. Bowersox, “Supply Chain Logistic Management (English Version)”, Mechanical Industry Press, (1999). pp. 224-256.

[3] Y. Y. Xi, “The Application and Development of the Fourth Party Logistics in China”, Journal of Wuhan University of Science and Engineering, (2002), pp. 198-200. In Chinese

[4] X. Zhang and P. Tian, “The Outsource of Logistic Planning-the Fourth Party Logistics”, Shanghai Economic Forum, (2001), pp. 28-29. In Chinese

[5] Y. B. Huang and Q. F. Wang, “Study on 4PL Information Platform Based on Web Services”, Journal of Convergence Information Technology, vol. 6, no.5, (2011), pp. 160-168.

[6] G. L. Mao, “The Creative Design on the Integration of Process and System of the 4PL Platform”, Management World, (2008), pp. 8-14. In Chinese

[7] T. Pan, L. Zheng, G. Yan, “Research of Information Framework for Fourth Party Logistics”, Journal of Convergence Information Technology, vol. 5, no.7, (2010), pp. 90-99.

[8] F. Yang, S. J. Zhang, Y. H. Cao and X. T. Li, “The Function and Framework Analysis of the 4PL Platform”, Information Science, vol. 5, no.5, (2011), pp.782-787. In Chinese

[9] S. L. Ge and D. Q. Nie, “The Study of the Structural Models of the 4PL Platform Based on the Multi-agent Theory”, Application Researches of Computers, vol. 29, no.2, (2012), pp.575-578. In Chinese