A Research on the Developing Route and Model Structuring for Logistical Public Information Platform of "Smart Zhuzhou" in Circumstance of Big Data

Xin Liu

Hunan Railway Professional Technology College,Zhuzhou, Hunan, China

Corresponding author is Xin Liu

Abstract

As the important support for significant development of logistical industry in smart city, successfully establishing a logistical public information platform is very important, especially in today when smart entities are popping up. Meanwhile, when facing numerous growing big data, the users of logistical information service also urgently require timely and effective collection, processing, analysis and integration of big data, thus to establish public information platform for smart logistics and improve smart level. For the sake of preceding, this paper, under circumstance of big data, firstly analyzed big data resources from various aspects, and based on current situation, completed the route analysis for logistics software platforms in smart Zhuzhou such as functional requirements, construction objects, system modules, platform design, safety and security. Then, establish the models of functional structure, system structure and network structure of logistical public information platform which enhances the competitiveness of Zhuzhou.

Keywords: LOGISTICAL PUBLIC INFORMATION PLATFORM, ROUTE ANALYSIS, FUNCTIONAL STRUCTURE MODEL, SYSTEMSTRUCTURE MODEL, NETWORK STRUCTURE MODEL

1. Introduction

The sustainable development of urban logistics must be supported by urban logistics public information platform. However, a lot of cities at present just launch their researches on platform planning, design and development. More resources are needed for the research. For instance, the research conducted by (Liu Hon yin, M. *et al*, 2005) identified the logistics public information platform and analyzed its structure. (K.L.Choy, 2006) presented Integrated Logistics Information Management System (ILIMS) by studying the defects of the business mode of logistics service providers. (Lancioni, E. *et al*, 2007) proposed that information technology can greatly reduce urban logistics cost and improve efficiency, as well

directly influence the management effect of urban logistics, enabling fundamental improvement for urban logistics service quality. (Huo Lian, K. *et al*, 2008) conducted systematic simulation for logistics information platform. (MatS. Abrahamso, 2010) proposed that logistics information platform is necessary and important for improving strategic capacity.

From preceding researches and applications, we can find that though system structure and function modules of the platform had been analyzed, related simulation for platform system had been done, and the common consciousness of the necessity and significance had been achieved, few researches had mentioned the design of logistics information platform in smart city, and the construction of logistics

public information platform in smart city integrated with various entities such as enterprises, industries, government, etc. Therefore, those researches were microcosmic, rigescent, and lack of uniform standard for smart platform.

Therefore, the construction of logistical public information platform for smart city under circumstance of big data will be a complex software project, and an inevitable problem in the development of smart city nowadays. Platform construction is a must to enhance the economic exchange between cities and provinces, facilitate the regional allying, reduce logistical cost, and improve enterprises' profit. However, as certain disadvantages and drawbacks existed in the structuring of logistical information platform at present, it's a must to analyze the structuring route of platform from completely new perspective of big data, and bring brand new platform structure model, thus to drive the overall layout and adjustment for logistics in smart city, and provide theoretical basis for government realizing scientific and sustainable development strategy. This is a measure with practical and strategic sense for every city.

2. Sructuring route for logistical public information platform of "Smart zhuzhou" under circumstance of big data

When establishing a smart logistical public information platform with high efficiency, it's a must to focus on industrial and economic development of smart city, especially the strategy with smart city thought for logistical planning. By deeply learning the current status of economy and logistics of smart Zhuzhou, this paper analyzed the structuring route for platform from prospective of big data analysis.

2.1. The steps for establishing logistical public information platform in smart zhuzhou

To establish logistical public information platform in smart Zhuzhou, it's a must to plan the big data of urban logistics based on information competitiveness, from the government policies, layout of urban space, infrastructure development and industries, as well to pay attention to the relationship between logistics and transportation, market and network. Therefore, when investigating the information service demands of enterprises and institutes in smart Zhuzhou, this paper has analyzed and sorted the integration and coupling of information resources. It's found that all those demands are targeting on realizing effective using of existing platform resources of each industry or department, and improving the informatization level of enterprises for competition. Thus, the platform should embody the concept that free spread of information, seamlessly integration among platforms, and enterprises prior.

After identified the demands and goals of logistical information in smart Zhuzhou, various factors such as information platform construction involved with logistical enterprises and organizations, operation related policies, local economy, big data resource, etc., should be integrated for establishing a logistical information platform which is in accordance with requirements of local economy development and the competitiveness requirements of smart city. For enabling a sensitive and highly effective logistical information platform in smart city, a logical route steps should be followed when construction, as shown as Figure 1.
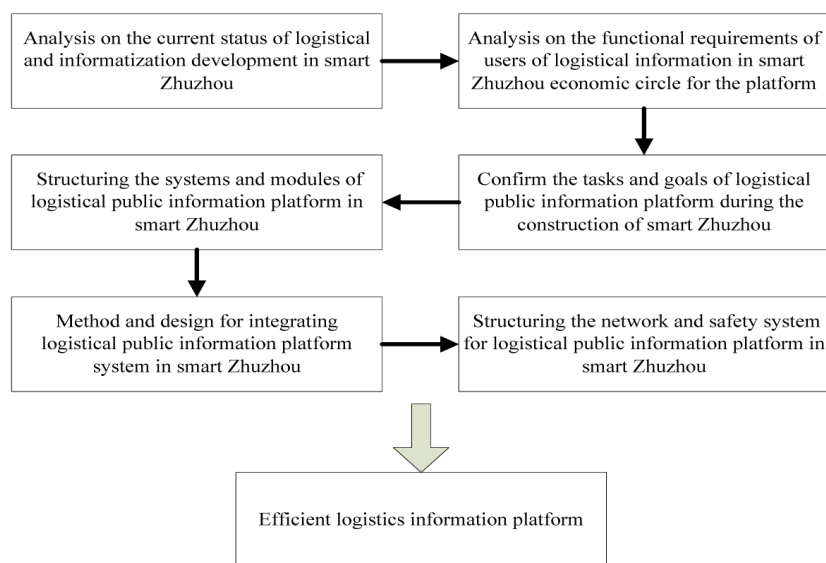

Figure 1. Route steps for structuring logistical public information platform in smart Zhuzhou

2.2. Analysis on the route of structuring logistical public information platform in smart Zhuzhou

Analysis on the current status of logistical and informatization development in smart Zhuzhou

a. Firstly, analyze the current status of economy and logistics development in smart Zhuzhou. During this step, the trend, structure and features of local economy development in smart Zhuzhou should be learned in detail with big data, such as policy environment, economic environment, geographic environment and social environment. Besides, the logistical business volume and economy capacity of Zhuzhou should be put into statistics and analyzed, thus to confirm the relationship between the two, and lay a foundation for medium and long-term planning of the platform.

b. Secondly, analyze the current informatization level of logistics in smart Zhuzhou. During this step, the current status and trend of development of informatization should be analyzed with big data, thus to assure there are basis and preconditions for implementing informatization relatd to logistics. During this process, data should be collected and monitored in real time to keep following the government policies and projects related to informatization, and prevent the platform being impacted by their changes. There are mainly two aspects:1) analyze the policy guidance of government, and the project progress and planning of government for informatization;2) analyze the informatization level of logistics of primary enterprises in smart Zhuzhou. The focus is the investigation on logistical enterprises. By analyzing how they adopt information technologies in their logistics business, this paper has identified the preliminary basic functional modules for logistical public information platform.

c. Thirdly, the spatial layout of logistics in smart Zhuzhou need to be supported by big data analysis. Pay attentions to what may involved in smart city, such as logistical planning in urban area, basic logistical facilities planning in the city, integrative logistical planning for the enterprises in the city, etc. The basic thoughts and strategies of logistics hinge planning in smart Zhuzhou should be comprehensively considered with big data analysis, thus to bring integrative competitive advantages.

Analysis on the functional requirements of users of logistical information in smart Zhuzhou economic circle for the platform.

a. Firstly, analyze the requirements of the government of Zhuzhou for the platform. The municipal government is the maker of policies and rules, as well the executor of macro-control. It has significant role in the development of logistics. To integrate the logistical public information platform with the electronic government affairs management system can enable following logistical functions: centralized processing of dynamic data of regional logistics for different industries, integrating big data resources in the city for decision-making, processing of real-time basic data of logistics in the city, managing the business status and credit scores of enterprises regarding to logistics, etc.

b. Secondly, analyze the requirements of enterprises for the public information platform. By exchanging between supplier and demander, online transaction and industrial trend covered by the logistical public information platform, and focusing on the requirements of enterprises, the interaction and information sharing among enterprises will be realized. Main functions of the logistical information platform for the enterprises include: logistical operation and transaction management, selecting supplier and service, trends and policies for logistics, knowledge provided by logistical forum, etc.

c. Lastly, analyze the requirements of 3rd part logistical enterprises for the logistical public information platform. At present, the 3rd part logistical enterprises in Zhuzhou are being strengthened. Of cause, they are the main participators of the logistical public information platform. As viewing from the perspective of demanding and supply of information service, the 3rd part logistical enterprises are improving in various aspects. For instance, they need platform to provide confirmed resource information of the market, accurate resource information for operation, complete resource information of infrastructure, correct resource information of logistical consultant service, etc.

Confirm the tasks and goals of logistical public information platform during the construction of smart Zhuzhou

a. Firstly, confirm the goals of logistical public information platform during the construction of smart Zhuzhou. The logistical public information platform of smart Zhuzhou should utilize the advantages of big data technology nowadays, and focus on the logistics construction, as well as economy integration, in Zhuzhou and its surrounding areas; serves as a comprehensive, accurate and effective business platform for different enterprises and industries in Zhuzhou area, enables interaction, communication and mutual trust through the logistical public information platform, and provides cost efficient quality service; further facilitates the information exchange between enterprises and government regarding to logistical business

for avoiding improper operation, reducing negative externality cost and improving competitiveness of positive externality, thus to improve the capacity of economy for sustainable and dynamic development.

b. Secondly, confirm the tasks of logistical public information platform during the construction of smart Zhuzhou. For their own demands, the construction participators of smart Zhuzhou platform should complete following major tasks with information technologies based on logistical public information platform: transaction, working and supply chain integration platform of smart Zhuzhou regarding to logistical information. Their detailed functions include spatial layout and planning of logistics in smart Zhuzhou, serving as information platform for government releases and publicity; basic planning for major logistical platform facilities which focus on urban area and cover counties and other areas, as well effectively introducing and promoting the unification and centralization of development environment; undertaking the routine activities of e-government affairs of logistics in smart Zhuzhou, and releasing important logistical policies, thus to bring more professional, systematical and purposeful decision-making and governance for logistical industry and business, as well timely spreading of government voice; supporting the cultivation of logistical industry in Zhuzhou area, enabling it to serve other industries, strengthen newest operating procedure of logistics, integrate logistical resources, study logistical knowledge and improve logistical efficiency.

Structuring the systems and modules of logistical public information platform in smart Zhuzhou

a. Firstly, confirm the scale and position of logistical public information platform. As viewing from social angle, logistical public information platform should be in accordance with the systematicness and hierarchy of logistics. For instance, logistical public information platform in national level, regional level and urban circle level are indicating the coherence and hierarchy of classification system. As there are great geographic and economic differences among different areas, for avoiding risks caused by such difference of geographical environment and spatial economy, public information platform in provincial level and municipal level are recommended at present.

b. Secondly, confirm the systematic structure of logistical public information platform modules. The logistical public information platform of smart Zhuzhou requires original data accumulation contributed by enterprises of different level and background, thus to support big data and large-scaled development.

Therefore, the platform must provide various functional modules to each participator, such as high-level big data collection module, advanced big data processing module, safe big data storage module, complete big data distribution module, etc. By doing so, integrative processing status of the system could be achieved, as well as the smart query and revision of public information in foreground and background.

Method and design for integrating logistical public information platform system in smart Zhuzhou

a. Firstly, confirm optional developing method. Logistical public information platform in smart Zhuzhou is an information system project, and moreover, a livelihood project. Its development should adopt matured method, rather than adventurous method. Furthermore, the system should be analyzed specifically with integration of new trends in software development at present. Here is the simple description of method to be adopted:

Object-oriented development and design is a kind of program design paradigm based on modeling object to study, understand and describe objective world. It includes not only layout tools for basic data, and man-machine interaction interface, but also the consideration of optimization of big data arrangement and intelligence.

A method was developed based on structural analysis on open and interactive links such as big data investigation, planning, layout structure, code compiling and validity testing, targeting at each lifecycle stage of a software.

Rapid prototyping is a completely new technical method based on discrete and stacking principle, which utilizes systematic engineering to establish a prototype at the earliest, then enables simple trial, as well enhanced communication and analysis for users and developers at the very beginning of prototype development with assistant software. The massive data acquired from trial will be assessed repeatedly to renew the prototype. The foundation of final product will be formed during the trial of prototypes.

b. Secondly, analyze the overall logical system of logistical public information platform. The logistical public information platform in smart Zhuzhou should enable all participators to acquire their required information and functions from the system. Therefore, the information of the platform either originated from the input of users, or information extraction from existing systems of all the participators. The platform serves like a junction for isolated information systems. Related logistical industry platform and other electronic online operation platform could be connected to logistical public information platform via external in-

terfaces, while related electronic government system could be connected via internal interfaces. With the seamlessly connection among information platforms, the resources will be available immediately for online government office and enterprise information operation, thus to bring conveniences.

c. At last, design the system of modern logistical public information platform in smart Zhuzhou. The logistical public information platform in smart Zhuzhou should be deployed in a set of servers, among which, the information processing system is composed by DMZ multiprotocol transceiving server, e-commerce website server, and email server. The DNS server, CA, electronic data exchange server and other components should be deployed behind the firewall. The management system is composed by subsidiary system servers in information management layer, business layer, and infrastructure equipment layer. The background data base is composed by servers for various businesses, such as storage, transportation, distribution and processing.

The logistical public information platform in smart Zhuzhou is composed by five important parts: application system for intelligent information, processing system for big data, intelligent system for central coupling, storage system, backup and analysis, and security system. Processing libraries formed by application of sub-platforms include processing library for public data management, processing library for transaction and business information, and analysis library for big data system.

The logistical public information platform in smart Zhuzhou should adopt high performance firewall system for all the applications and edge nods of the network, thus to prevent invasion, virus, attack and other security risks for the input data of logistical public information platform.

The application frame layer based on basic services is a systematic structure with multiple layers, including interacting task handling in user interface layer which responds to related status of users and system; business logical layer which is responsible for handling the system business logic laws; data layer which provides instant data required by system and data separation; as an entirety, the system provides routine operation management, tracing and monitor; safety protection layer which provides user identification, digital signature and data encode service, and support the safe transmission via network channels.

Structuring the network and safety system for logistical public information platform in smart Zhuzhou

a. Establish a perfect management system. The access into logistical public information platform in smart Zhuzhou must be controlled by permissions. Data processing and approval system should be carried out; the big data recorded, configuration and processing environment for information security should be verified; an active surveillance system with big data should be created to discover problems in time, and flexibly handle the reports of staffs.

b. Establish approval system for users access. The logistical public information platform in smart Zhuzhou must strictly obey the user verification system. There must be identification when users accessing the system. The users should be managed based on their classification. The usage and operating steps of users in the system should be recorded for future inquiry and analysis.

c. Protection against hacker and virus. The logistical public information platform in smart Zhuzhou must establish a network group security processing program with multi-function and high performance, which should be composed by modules such as invasion detection and analysis, big data treatment, firewall rules optimization, etc., thus to promote multi-angle and multidirectional protection for system hosts and database of different level in the network, and realize centralized treatment and unified deployment.

d. Establish perfect big data protection mechanism. The logistical public information platform in smart Zhuzhou must have automatic and synchronous system recovery and backup system with big data, and disaster data backup center. When the central equipment of main platform is invalid, the backup system and big data library should go enter working status to continuously provide service, thus to minimize the damage caused by disasters.

3. Model structuring for logistical public information platform in smart Zhuzhou under circumstance of big data

From perspective of society, the logistical public information platform in smart Zhuzhou should create a coherent and reasonably arranged big data system in municipal level, and integrate manufacturing, logistical and trading enterprises, as well as ports, customs, and banks with the systematic macro-control of government, thus to completely smooth the information, capital and business flow.

As for the logistical public information platform in smart Zhuzhou, the basic structure model includes three detailed aspects: 1) functional structure model; 2) system structure model; 3) network structure model. These three structure models form the logistical public information platform in smart Zhuzhou, as shown as Figure 2
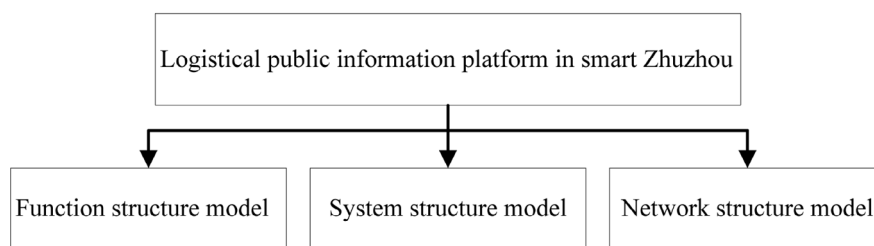
Figure 2. Structure Models of Logistical Public Information Platform in Smart Zhuzhou

3.1. The function structure model of logistical public information platform in smart Zhuzhou

A stable and effective logistical information platform will be the main body which includes participators, information technologies, informative entity function, logistical functions and sub-platforms. Its participators are the user, as well demander of information platform. The demand determines the contents and functions of platform module, while the information technologies are the basic condition for platform operation. Information and logistical function will influence the benefit and efficiency of overall operation of the platform, and each sub-system has its own task.

The logistical public information platform in smart Zhuzhou processes and integrates comprehensive logistical information, including collection, processing, storage, distribution, etc. Each link in the operation involves crossing check and background support, featuring large information, great processing intensity, and deep integration level; meanwhile, as the participators come from different areas and levels, they demand different logistical information. Therefore, all the participators are required to support with information and big data resources to enable the functions of the platform.

By accurate collection and intelligent processing of big data, the logistical public information platform in smart Zhuzhou offers specific support for business operation for all participators in Zhuzhou region, such as logistical service provider, logistical service demander, supervision department of government, banks, insurance industry, provider and demander of logistics hardware and equipment; by transferring various logistical information via the platform in time, to enable timely respond and interaction of participators to the logistical information, assure the fluency of logistical operation, as well the correction, promptness and frequency of communication in smart Zhuzhou, as shown as Figure 3.

a. Participator. A major participator of logistical public information platform in smart Zhuzhou is the administrative department of municipal government. The resource provider of the platform is the govern-

ment. It's the constructor and operator, as well as the information user. The government authority must confirm the elements of logistics, provide necessary policies and basic business data guidance for logistical operation, and be responsible for detailed arrangement for how logistical information processed by the logistical public information platform in smart Zhuzhou. The government of Zhuzhou should protect the logistical public information platform for healthy growth with its administration and policies, create a complex social credit system and a market with fair competition, improve the major operating model of logistical information platform, and realize the macro-control for the logistical market.

b. Logistical function. The logistical public information platform in Zhuzhou is a market information platform integrated with various functions and effectively operated. It leads the operation of other information platform in the city. It can also serve as an uniform, high effective and safe platform for acquiring and exchanging logistical information, providing the participators with integrative solution covering storage, transportation, delivery, loading and unloading.

c. Information technology and informatization function. The logistical public information platform in smart Zhuzhou is a complex system which extracts information from existing systems, users input, even various isolated information system platforms. It closely associated with the inspection platform of China E-port, electronic customs declaration platform, EDI administrative office system, and government agencies (including business administration, tax, commerce, and statistics department), as well as information system of industrial platform (ERP/SCM), electronic logistical platform (such as transportation), and network financial platform (such as banks and insurance company).

d. Sub-platform system. The logistical public information platform in smart Zhuzhou is a huge system which needs various sub-systems for highway transportation, railway transportation, container transportation, customs declaration, logistical delivery system, E-commerce, etc., to effectively and
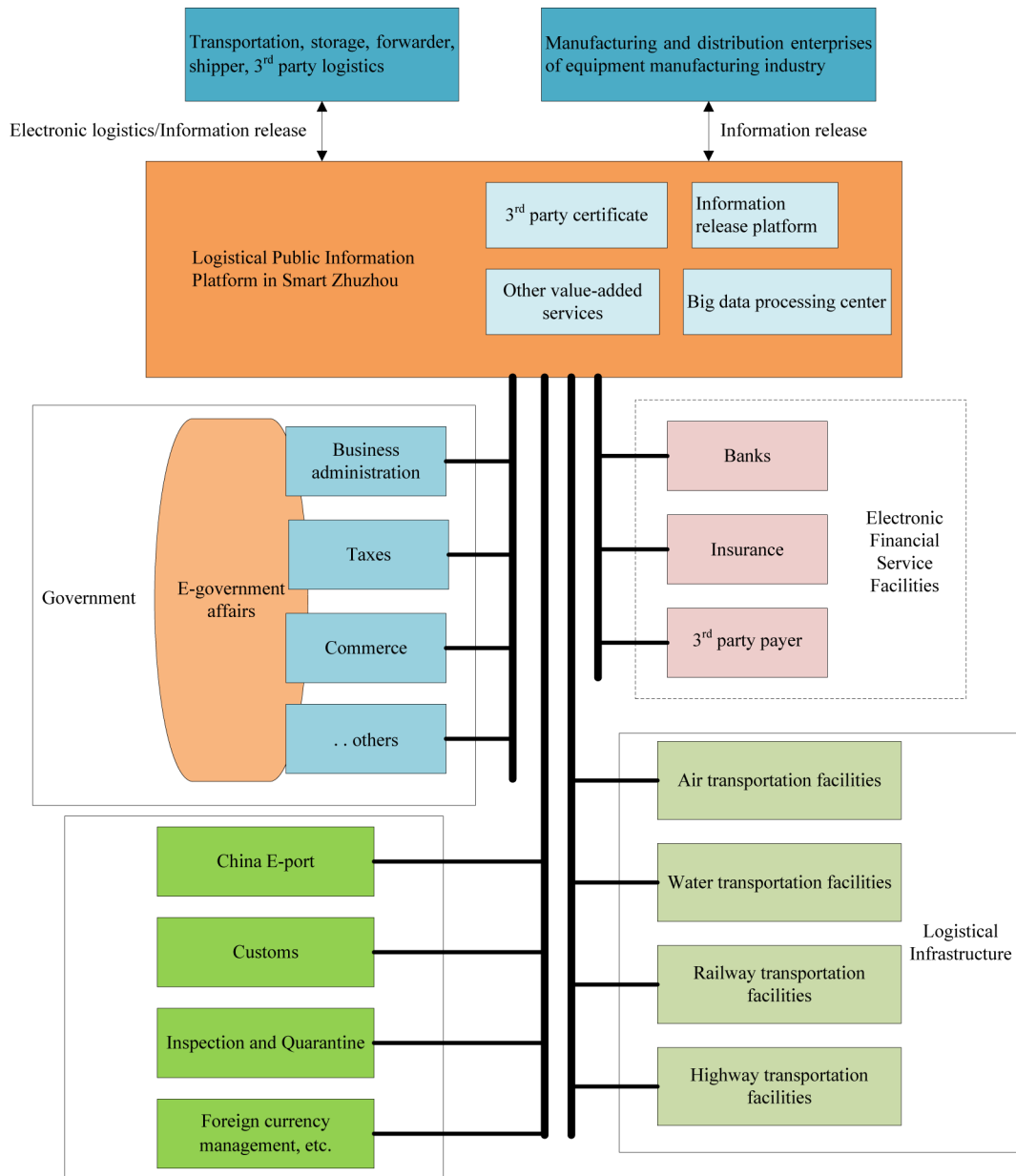
Figure 3. Function model structure diagram of logistical public information platform in smart Zhuzhou

comprehensively serve the participators of the platform. Therefore, it's a must to positively extend the platform, integrate other systems via safe interfaces, and realize integrative effect.

3.2. System structure model for logistical public information platform in smart Zhuzhou

The logistical public information platform in smart Zhuzhou should be associated with the operating devices of related industries, equipment manufactures and government agencies, making it a center to spread domestic logistical information resources, as well the aggregating and processing center for logistical information resources in smart Zhuzhou.

As shown as the figure, the system model of logistical public information platform in smart Zhuzhou is composed by external data connection platform, servers of logistical public information platform, internal data platform, and firewall. The electronic clearance platform, industrial platform, electronic logistical platform and electronic financial platform together forms the external data integration, which supports the operation of logistical public information platform in smart Zhuzhou. The internal data platform is mainly composed of five systems of web portal management, electronic government affairs management, big data information management, enterprises affairs management, and big data maintenance and management. They cover all the details of data, industries, government affairs and management involved in logistical public information platform, and form the system structure.
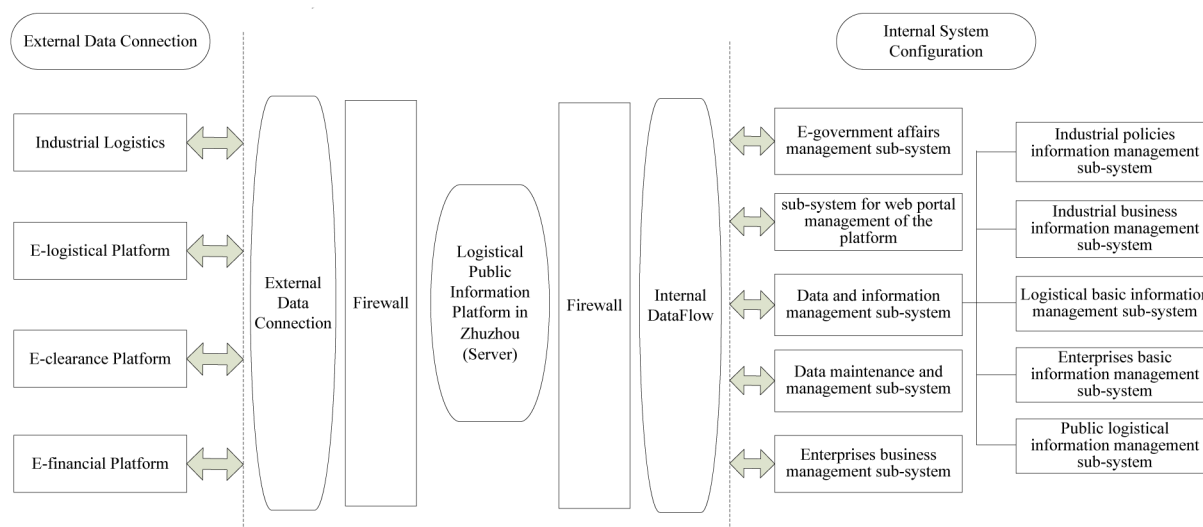
Logistics

Figure 4. System model structure diagram of logistical public information platform in smart Zhuzhou

a. Sub-system function analysis. In internal data and information management sub-system, the industrial and logistical data will be processed carefully and establish sub-system management.

Industrial policy information management sub-system. Users can use this system to acquire related policies and planning about logistical industry. Users can collect, sort, query and interpret policies and regulations released by logistical authority via web portal, and analyze the newest policies.

Industrial business information management sub-system. The system will sort the logistical information about the entities involved in smart Zhuzhou. For instance, sort, analyze and make statistics for related information which is acquired from other channels, and offer logistical database of enterprises and departments in great volume as reference.

Logistical basic information management sub-system. This system will be used to spread logistical knowledge via network, study logistics, and on-line interact with logistical research institutes, thus to train logistical talents; through the on-line consultant and guidance provided by experts, the enterprise logistical resources could be assisted by the platform, and form a well connected and beneficial platform environment.

Enterprises information basic processing sub-system. This system could be used by enterprises to search the data and credit files and records from simple documents. Users registered in the platform will be managed based on their classification. Users of related classification could query and evoke required enterprises information to know the supply and demand of other enterprises, thus to offset the lack of information in certain industry and capture business opportunity by overcoming information asymmetry.

Logistical public information management sub-system. This system could be used to extract logistical public information and general public information, and form an information query center for logistical businesses for all the users to query external public environment information which may influence logistical business, such as weather, traffic, ports status, sea waves, airports status, etc.

b. Analysis on the relationship among sub-systems. Enterprises management sub-system is the database of other systems. Its information resources are the registration information of enterprises. Electronic government affairs management sub-system will acquire related information for the database for querying the logistical information of related enterprises when they are querying and asking for resources. While other systems are relatively independent, and undertake only their own service functions. For instance, system based on logistical e-commerce function serves, business platform for more advanced and faster transaction among enterprises, ASP hosted system for most small enterprises to realize independent online processing of logistical business, for lowering the cost, and avoiding the development and maintenance of in-house developed logistical information system. The structuring of logistical public information platform in smart Zhuzhou should focus on information releases, big data processing, openness and electronic logistical government affairs. After the stabilization and mature of the platform, it could be integrated with new sub-systems to realize platform extension to meet logistical and regional development in smart Zhuzhou, as well to achieve self-growth, self-copy and self-reproduction.

3.3. Network structure model of logistical public information platform in smart Zhuzhou

Logistical public information platform in smart Zhuzhou obeys the operating principles of each main function and sub-system in function model and system model when severing as specific role and matching operating mechanism. But this need to be analyzed from network dimension. Reasonable configuration and layout of platform network are good for the effective operation of each function module, as shown as Figure 5.
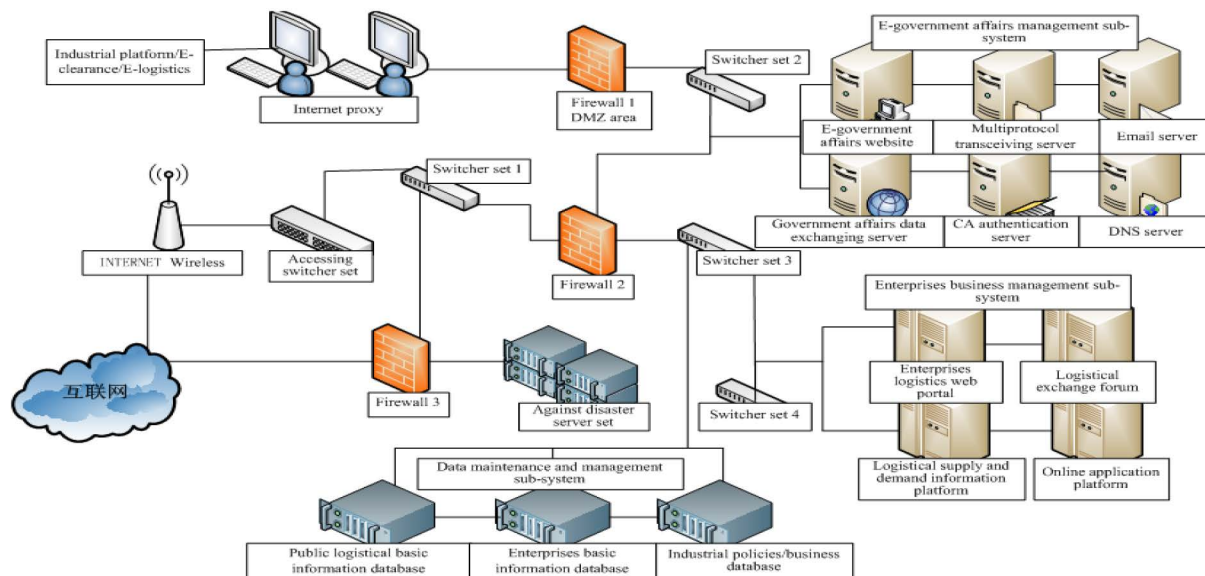
a. The composition of network of logistical public information platform in smart Zhuzhou

The information platform should be deployed in dual servers with warm backup for each other. The enterprise business management sub-system is composed by systems of information platform, enterprise logistics web portal, logistical forum, online application, etc., which should be deployed in website with DMZ firewall. The electronic government affairs management sub-system is composed of multi-protocol transceiving server, email server, DNS server,

Figure 5. System model structure diagram of logistical public information platform in smart Zhuzhou

authentication server, electronic government affairs data exchange server, etc. Data and information management sub-system is composed of public logistical basic database, enterprise basic information database and industrial policies and business database.

b. The network connection of logistical public information platform in smart Zhuzhou

The logistical public information platform in smart Zhuzhou could be accessed with newest computer technologies via various ways, such as web portal, dedicated access, 4G wireless, etc. So, the enterprises can access the platform either via platform web portal, or proxy server of internet. Related government agencies and networked equipment manufacturers can access the platform via internal database platform or dedicated access to exchange data and visit information. Under irresistible situation, 4G wireless and satellite transmission could also be used for accessing the logistical public information platform for exchanging and visiting data, thus to realize real-time, stable and seamless connection.

c. Extension of network of logistical public information platform in smart Zhuzhou

During the development of logistical public information platform in smart Zhuzhou, the extension has already been considered for catching the developing momentum of logistics and information technologies. In software aspect, the development of the platform should be distributed structured and layered, adhering to the developing concept of extensible. The extensible requirement of the platform should be meet by adding new functional modules. By removing function modules which are out of date to meet the module deployment requirement in different periods. In hardware aspect, select hardware which are modular, consider the demands of future development, and maximize the extensible property. In network construction, network topological structure is multilayer switched for future extension of main network by just adding switching nods.

Conclusions

By considering the features of logistics in smart Zhuzhou, and based on the elements study for logistical platform and information system, this paper summarized the structuring thoughts for logistical public information platform in smart Zhuzhou, and reason-

ably analyzed big data resources from various aspects, thus to complete the route analysis for software platform construction, and extract the structure model for logistical public information platform which suits smart Zhuzhou. This paper offered suggestions and references of certain value to the government for constructing the software platform of intelligent logistical public information.

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