

Research on Port Logistics Information Technology Risk

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Abstract

Firstly, this paper expounds the relevant theories of port logistics information technology risk. Secondly, it discusses the characteristics and causes of port logistics information technology risk. Thirdly, it puts forward the countermeasures of information technology risk prevention. Finally, taking N company as an example, this paper makes a case analysis in order to provide theoretical guidance for the healthy development of port logistics industry.

Keywords

Port Logistics; Logistics Information Technology; Risk.

1. Introduction

In the 21st century, the development of electronic information technology has brought unprecedented changes to various fields and industries, and the system of all walks of life has developed rapidly. In the field of logistics, logistics enterprises use information collection technology, information processing technology and other related technologies to improve the efficiency of port logistics operations, simplify the procedures of logistics information entry, and reduce production and operation costs. However, the technology from information technology has also buried information technology security problems and hidden dangers, and the risk of port logistics information technology has gradually emerged. Therefore, it is very necessary to study port logistics information technology.

2. Literature Review

In China, scholars' research on port logistics and information technology can be traced back to the 1990s. In 1994, in *On China's Information Industry*, Daidi Teng divided the information industry into information consulting service industry, information technology service industry, information technology development and operation, information circulation and communication industry, information infrastructure construction service industry and information distribution industry [1]. Xiaopei Yan believed that information industry refers to industrial groups engaged in information equipment manufacturing and information production, processing, transmission and service, including information technology equipment manufacturing and information intensive service industry [2]. Lina Zhou believed that port logistics had the functions of logistics, information flow and capital flow, sales and trade, production and service [3]. Lijun Zhang used the grey correlation analysis method to analyze the relationship between logistics industry cluster and regional economic development [4]. Jing Li combined principal component analysis and grey correlation degree to evaluate the comprehensive logistics competitiveness of 16 cities [5]. Ying Guo studied the optimization model of recycling logistics [6]. According to geographical location, scholars divided ports into coastal ports, estuary ports, ports along rivers, and ports near lakes. Scholars divided ports into

commercial ports, industrial ports, fishing ports and military ports according to their uses and nature [7].

In foreign countries, scholars believed that the development of American logistics industry could be divided into traditional stage, distribution stage, comprehensive stage and port supply chain stage. Nolan proposed the enterprise informatization development model. Elliot studied the operational efficiency of American logistics enterprises. Ehsan used DEA to evaluate the reverse logistics efficiency of third-party logistics enterprises. Pham studied the relationship between information logistics enterprises and supply chain partners. Patton believed that the hinterland is an important factor in the development of port logistics. Holye B Charlie studied the relationship between port logistics and regional economy. Tim Othyp. Ryan analyzed the relationship between port and urban economic development by using fuzzy evaluation method. Jun woo Jeon used SNA method to study the change trend of port competition. P. Bernal Valverde believed that operation efficiency and management cost were important factors to improve the competitiveness of port logistics.

3. Theoretical Basis of Port Logistics Information Technology Risk Research

3.1. The Concept of Port Logistics

Port logistics refers to relying on the advantages of the port, integrating various logistics links, realizing the unity of logistics, information flow and capital flow, to form a complete supply chain and comprehensive service system [8]. Port logistics has the characteristics of multi-function, informatization and distribution. Port logistics can strengthen the driving effect of port cities on other logistics production activities around the port, and improve the operation efficiency of distribution goods, warehousing goods, distribution goods and other links. Port logistics enterprises take information technology as their core competitiveness, realize resource integration and resource optimization, and promote the development of modern comprehensive logistics hub. Modern port logistics has the functions of loading and unloading goods, transit goods, transporting goods, information processing and so on. Information processing function is closely related to the establishment and improvement of information port, which is conducive to the standardization of logistics process.

3.2. The Concept of Information Technology

Based on the basic principles and methods of information science, information technology is the general name of application technologies to realize information generation, information transmission, information transmission, information reception and so on. Informatization and multi-function of information is the goal of developing modern logistics and the goal of port logistics enterprises [9].

3.3. The Concept of Risk

Risk is what we often call uncertainty. Risks are caused by threats, and the greater the threat, the greater the risk. The exposure of assets is closely related to vulnerability. Because assets have value, the greater the value, the greater the risk. When risks arise, our awareness of risks will lead to the need for protection. Through the protection requirements, our resistance and adaptability to risks will continue to improve.

4. Characteristics and Causes of Port Logistics Information Technology Risk

4.1. Characteristics of Port Logistics Information Technology Risk

Port logistics information technology risk has transmissibility. Transmissibility is reflected in the information technology risk characteristics of logistics, which means that problems of information management or system in one logistics link will affect other links of the logistics chain, and problems of port logistics enterprises will affect other upstream and downstream enterprises. This characteristic is determined by the unique organizational structure of logistics industry. Logistics industry combines the enterprises of each node together, each node enterprise is either upstream and downstream relationship, or supply and demand relationship. With the cooperation and communication between upstream and downstream enterprises, the risks in any off-street link will be transferred to the industry and other enterprises, and transferred in the logistics network related to risk.

Port logistics information technology risk has complexity and diversity. Port logistics industry has a certain organizational structure, it not only faced internal risk, such as warehouse distribution data errors, system vulnerabilities, lead to loss of data distribution, employees operating mistakes system collapse affect the operation of the logistics, etc., also face some risks, such as data from the criminal's steal, some malicious viruses attack the computer. Therefore, compared with general enterprise information risk, logistics information risk is more complex and the problems are more diverse.

Port logistics information technology risk has uncertainty. The cooperation among logistics enterprises between ports can bring complementary advantages of enterprises to improve competitiveness, and achieve mutual benefit and win-win cooperation through such methods. The development degree of information technology regulations and management system of each logistics enterprise is good and bad, which is reflected in the information system failure of some logistics enterprises or other information technology problems, which may lead to the long backlog of port goods, delivery is not timely, goods damage and other problems. Logistics enterprises are full of uncertainty in the process of relying on ports for logistics operations.

Port logistics information technology risk has virtuality. The existence of port logistics information system is virtual, such as electronic forms, electronic pictures and so on. Under the environment of logistics informatization, all logistics enterprises use information technology to realize information sharing among all participating enterprises in the supply chain, which makes the whole port logistics ecology with the characteristics of virtualization. Based on the virtualization characteristics brought by the extensive application of information system, the information technology risks in the process of application of information technology also have the characteristics of virtualization. For example, possible flaws in the design of physical management software, server stability of logistics systems, and virus and hacker attacks. Network security and data integrity problems will bring virtual risks to the supply chain and affect the stable and efficient operation of the whole port logistics chain.

4.2. Causes of Port Logistics Information Technology Risk

4.2.1. Low level of Infrastructure Construction

There is a certain gap between the infrastructure construction level of information management center in most ports and the requirements of information risk prevention and control. Some port information technology equipment is old or low privacy, which does not meet the security technical standards. In some ports, the network runs slowly, resulting in the slow transmission of logistics information. The machine room lacks reasonable layout and basic disaster recovery facilities. Low power supply capacity, prone to power failure.

4.2.2. Imperfection of Safety System

Lack of scientific data backup system. At present, there is a misunderstanding in the cognition of information risk management that it is a simple technical problem, so there is a lack of systematic planning for it. At present, only a few large international ports can make data risk backup, and the management departments of most ports do not make daily data backup. Once the system crashes, it is difficult to recover effectively in a timely manner. At present, many port practitioners are insufficiently aware of information risk. Port logistics industry deals with a large number of cargo waybill data every day, the security of information technology affects its lifeblood. And some competent departments for information security work lack of understanding, the lack of information technology risk prevention and treatment of important awareness. At the same time, most people think that information technology risk control is only the work of the relevant individual departments, so they ignore the hidden dangers of information technology risks and lack the awareness of risk management.

4.2.3. Threats to Data Security

The security of port logistics network and logistics data is vulnerable to threats. Although some ports pay more and more attention to operating system security and key data encryption, they still cannot achieve a very safe level. By analogy to the banking industry, according to incomplete statistics, in the bank information and data leakage cases in, the accidental leakage cases caused by human negligence accounted for 32.5% of the total cases, malicious attacks by hackers accounted for 32.5%, and accidental leakage cases accounted for 14.4%. If the information technology risk management system is very mature, so is the banking industry, not to mention the port logistics industry in the developing stage.

4.2.4. Defects of the System Itself

The information technology products and equipment used by some port logistics enterprises may have some complete hidden dangers. When some equipment leaves the factory, bad businesses put viruses such as Trojan horse virus into it, or use the loopholes of the system itself or the publicity of the network itself for illegal access to sell the illegally collected logistics data, electronic information, user personal information and other data, to make illegal profits. It is not only the defect of the system itself, but also has an impact on the interior of the enterprise. For the exterior of the enterprise, the system quality between enterprises is uneven and the degree of perfection is not the same. It is easy to cause the lack of connection in logistics loading and unloading, production, distribution and activities, which further leads to the difficulty of completing the follow-up demand.

5. Risk Prevention Measures of Information Technology

5.1. Risk Prevention Measures for Infrastructure

In order to prevent the risks that infrastructure may cause to the normal operation of logistics information system and the possible loopholes of equipment itself. Port logistics enterprises can introduce more scientific facilities management system and regular maintenance and updating of infrastructure and information equipment.

5.2. Risk Prevention and Response Measures for Internal Personnel

First, we can strengthen the management thought of personnel risk prevention and control and formulate an appropriate information risk management plan. Then, we must change the old idea that information risk prevention and control is only a single department and achieve full participation. The development of logistics enterprises in each port is different, but some problems are common. In this case, it is very important for personnel quality training. Management should take the lead in work deployment, and focus on information technology in daily operation, grass-roots staff in the port of ships berthed registration, the goods to the port

of loading and unloading, warehouse a series of logistics activities to pay close attention to the practice application to computer, always stay for information technology risk awareness. They say we should nip it in the bud. Logistics personnel need to identify various apparent and potential risks. Risk identification should not only identify the types, sources and manifestations of information technology risks, but also pay attention to their consequences and consequent losses. When identifying specific information technology risks, relevant departments can use experience, risk judgment and common sense, and then rely on data and data accumulated from the historical lessons of previous peer enterprises, or consult experts regularly. Through the scope and structure of logistics links to identify risks, the proportion of information technology in logistics links and the nature of information technology components, logistics links and other content analysis, to reduce the uncertainty in port logistics operations. And with the help of some technologies and tools can also achieve the purpose of risk prediction.

5.3. Risk Prevention and Response Measures for Management System

Logistics information system can run smoothly, safely and efficiently, which is an important guarantee for the whole operation of a port. The failure of information system hardware and software and the lack of management system will not only bring direct economic losses to the port logistics enterprises, but also affect the subsequent port operation. When a small amount of data goes wrong, the entire information system can be implicated. Therefore, to establish and perfect the scientific information system operation system. We can effectively use the system log, data analysis and other technologies to monitor and control the stable operation of the system. A set of scientific information system operation system includes the organization and leadership structure of information department, the daily management of information system, the management responsibility of information technology personnel and so on. There are strict rules and regulations to ensure that the computer room and all computers are monitored. They include logistics warehouse, logistics operation area personnel inspection registration system, logistics personnel operation computer system management and monitoring system, for information technology security personnel reward and punishment system. In the rules and regulations, there should be a special person to manage the computer system and check it regularly. Record, monitor and track the running information of information system in daily life. Require personnel to do nothing unrelated to work during the work. Ensure that production systems are separate from development and test systems. Application development and maintenance personnel are prohibited from entering the production system under normal circumstances. Only after approved by the management, no relevant personnel can enter the production system, and must be registered and audited immediately. Standardize and record information in time, check the computer regularly.

5.4. Post-event Risk Prevention and Response Measures

Once data loss, system errors and other information security problems occur, no matter how serious the situation is, all relevant system data, personnel operations and results should be sorted out, summarized and edited into a case, and then the case is analyzed to make the relevant risk management report. The management of logistics information technology risks is to be carried out for a long time, which requires uninterrupted and coherent risk management reports. Therefore, the risk report should not only focus on the time period after the occurrence of security problems, but should summarize the operation status of the information system according to the relevant time period and form a report in the three time periods before, during and after the occurrence of security problems. In order to provide information reference for the implementation, management and decision-making of information technology risk prevention and governance projects.

6. Take N Company as an Example for Case Analysis

6.1. N Company Profile

N company's main business includes the import, storage and transportation of iron and steel raw materials, freight forwarding agent, storage service, instrument sales and packaging service. It has the information technology development strategy of a port logistics enterprise, but lacks the awareness of related information technology risk management. After a series of institutional and technical reforms, N company has expanded its scale and performed better than before.

6.2. Port Logistics Information Technology Risk of N Company

The basic warehousing links of N company are carried out by automated warehouses, and equipped with in-and-out delivery lines and storage management control information system. The whole operation process of the warehouse system is scheduled and managed by professionals with the help of the computer system, which automatically scans the goods when they enter the warehouse. In the follow-up work, the staff tracked and registered the barcode information throughout the process. The sorting system of the logistics company also adopts manual automatic stocking and replenishment through the computer. Some goods are sorted in the form of channels, and assisted by the combination of electronic label picking. At the same time, the logistics center of the enterprise is subdivided into command and dispatch center, real-time monitoring center and computer maintenance center. The main command and dispatch center is also the dispatching center system of the logistics center. The management and decision makers conduct command and dispatch through the multimedia information platform composed of the large screen display system, computer remote monitoring system and audio broadcasting system of several centers. With the help of the command and dispatch center storage, sorting and handling, road driving and safety management to achieve visual display and real-time command and dispatch of port logistics activities and operation activities. In accordance with the principle of shortest route, least time and most load, the company directly delivers goods to enterprises within a transport radius of 15 kilometers in real time, and delivers relay goods to other retailers beyond 15 kilometers to ensure that the logistics network responds within the whole day, thus reducing logistics costs and ensuring efficient operation. The computer maintenance center is the nerve center of logistics center, which is the foundation of digital logistics. All logistics data in the company's logistics center is stored, combed and published here. The computer system realizes the exchange and sharing of data inside and outside the center through gigabit optical fiber. Logistics information system is divided into three layers. The bottom layer is logistics operation and execution layer, which consists of intelligent sorting system, automatic overhead storage and electronic scanning system. The middle level is the management level of logistics operation, which is composed of intelligent storage management system and intelligent distribution management system. The upper layer is the command and decision-making layer, which consists of work inquiry, unified command and scheduling, and visual display. The system realizes data sharing with retailers and manufacturing companies through the framework of unified network, unified platform and unified database.

6.3. Port Logistics Information Technology Risk Optimization Measures of N Company

With its advanced electronic information technology, N company strives to create maximum economic benefits while ensuring the efficient completion of logistics activities and reducing cost waste as much as possible. But once it comes to the operation mode of information technology, there are a series of hidden dangers of information technology security. The following is a brief security analysis of the current situation of information operations.

The handling of incoming goods is the main work, which is mostly operated by manual and mechanical equipment. The scanning process of bar code has a direct impact on the work efficiency. At present, most of the information data of incoming goods come from bar code scanning technology. Although the advantages of this technology are faster than other ways of information input, simple and flexible operation, other costs are cheap, but the scanner can only identify the registration of valid bar codes, sometimes there will be a case of scanning missing goods. If the bar code on some goods is stained or damaged, the bar code scanning technology will not be able to identify the normal, once such risks occur, it is easy to affect the company's sorting and warehousing work. Therefore, the collection of goods warehousing information of N company cannot guarantee the integrity of 100%. The use of bar code technology and other hardware facilities does make information transfer faster, more accurate and can shorten the process, but the technology is not very mature, and there is a lack of industry standards, which exposes some security issues. Most of the logistics operation process has been automated, and a small part of the work needs personnel operation. At this time, careless operation is easy to lead to data loss and other problems. Loading, unloading and handling efficiency is an important factor affecting the logistics process, in the process of loading, unloading and handling personnel in charge of such operations are mostly grass-roots staff of N Company, and the security of information system and data plays a crucial role in loading, unloading and handling efficiency. Some basic staff are not strong in ability, unfamiliar with the work process, weak in data security, risk assessment and risk response, and lack of cooperation. Any problem may make the normal operation of the computer in the port warehouse go wrong or even down, resulting in the efficiency of the whole logistics process decline or even stagnation. In the process of improper operation or data errors may choose the wrong distribution method risk. N company knows that technology is the core in the sorting process, so it makes full use of advanced information technology such as RFID, POS and infrared applied in the logistics industry. Through these technologies, a more secure logistics security system is established to ensure the safe and efficient operation of all normal logistics links. N company through the system reform to make the information security platform information real-time update and timely feedback. Once a problem occurs during maintenance, it will be solved in time. Respond immediately when attacked. Automatic feedback in case of data errors. This series of technical improvements are conducive to ensuring efficient port logistics operation efficiency and ensuring the completion of the work schedule. In order to ensure the smoothness and security of the sorting system, N company equipped the sorting channel with monitoring and standardized computer operation procedures of employees, thus reducing the probability of information technology risks. In terms of information risk response with cooperative enterprises, in order to complete sorting and warehousing tasks on time, N company has stricter requirements on data entry, automatic warehousing and other information technology operations.

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References

- [1] Daidi Teng. On China's Information Industry [J]. Journal of Information,1994(06):22-25.
- [2] Xiaopei Yan. The Concept and Classification of Information Industry [J]. Areal Research and Development,1998(04):17-19.
- [3] Lina Zhou. Research on Development Mode of Coastal Port Logistics in China [D]. Wuhan University of Technology,2006.
- [4] Lijun Zhang. Research on Layout Planning of Logistics Industrial Cluster in Shenyang Economic Zone [D]. Shenyang University of Technology, 2012.
- [5] Jing Li. Research on the Optimization of Port Oriented Logistics Network Based on Location in Shandong Peninsula [D]. China University of Petroleum, East China,2019.
- [6] Ying Guo, Wei Pan. Research on Optimization of Recycling Logistics Based on Cross Warehouse Distribution mode [J]. Logistics Technology, 2014,37 (06): 128-131 + 136.
- [7] Jun Shao. Research on Development Strategy of Port Logistics in G City [D]. Chongqing Jiaotong University,2020.
- [8] Hapnan Gao. Research on Measurement of Rizhao Port Logistics Development Level under New Development Pattern [D]. Shandong University of Finance and Economics,2021.
- [9] Jian Yang. Research on Information Integration of Port and Logistics Park Based on Supply Chain [D]. Nanjing University of Finance and Economics,2010.