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Research Article

A Supply Chain Information Pushing Method for Logistics Park Based on Internet of Things Technology

Zhongqiang Zhang

School of Management, Xuzhou University of Technology, Xuzhou 221018, China

Correspondence should be addressed to Zhongqiang Zhang; zzq@xzit.edu.cn

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The existing push methods of supply chain information in logistics parks stay on the analysis of data surface, which leads to higher Mae value. Therefore, this paper proposes a push method of supply chain information in logistics parks based on the Internet of Things technology. Firstly, RFID structure is designed by introducing RFID, GPS, infrared, and other Internet of Things technologies to encode the materials in the logistics warehouse; secondly, the supply chain model of the logistics park is established to obtain the general ontology element model of the node enterprises in the supply chain of the park and the interaction business situation model between the node enterprises in the supply chain of the park. Finally, the average value of the node score is subtracted from the score of the node to calculate the information centralized scoring, as well as the establishment of Spark operation framework, to achieve the logistics park supply chain information pushing. In the simulation experiment, the international land port logistics park of a city is selected as a case to test. The experimental results show that the information pushing method of logistics information park supply chain based on Internet of Things technology has higher recommendation accuracy and better performance.

1. Introduction

Logistics park is the result of spatial agglomeration of logistics enterprises, which is a form of logistics industry collaboration and an important part of regional economic structure. There are nearly 1000 large-scale logistics parks in China. After the completion of the logistics park, the preferential policies and location advantages enjoyed by enterprises in the park have been basically fixed, and the appreciation space has been very limited. However, high-quality information service is an important way for enterprises in the park to provide value-added services. This study provides active and personalized logistics services for the supply chain nodes of the park, so as to improve the efficiency of integrated utilization and optimal allocation of social logistics resources in the logistics park, promote logistics enterprises to gather in the park, and promote the coordinated development of logistics industry and regional economy [1, 2]. Since the concept of "Internet of Things" is first proposed, it has experienced more than 10 years of development and improvement. The Internet of Things has been gradually developed into a strategic plan of various countries and regions, gradually recognized by the international community, and even reached a consensus. The Internet of Things is considered to be the third wave of the world information industry after the computer, Internet, and mobile communications and will promote a new round of development of technological innovation. A supply chain is a network of retailers, distributors, transporters, storage facilities, and suppliers that participate in the production, delivery, and sale of a product to the consumer. It is typically made up of multiple companies who coordinate activities to set themselves apart from the competition. There are three key parts to a supply chain: Supply focuses on the raw materials supplied to manufacturing, including how, when, and from what location. Manufacturing focuses on converting these raw materials into finished products. Distribution focuses on ensuring that these products reach the consumers through an organized network of distributors, warehouses, and retailers. The U.S. government has made a positive response to the "smart Earth" concept proposed by IBM, believing that the smart Earth is the core area of national development after the Internet; in June 2009, the European Commission releases the European Internet of Things Action Plan, which describes the future application of Internet of Things technology and proposes that EU governments should strengthen the management of Internet of Things and eliminate various factors that hinder the development of Internet of Things. In August 2009, Premier Wen Jiabao proposed establishing China's "perception of China" center as soon as possible. In the government work report in March 2010, the development of the Internet of Things was really promoted to the national strategic height and included in the revitalization plan of key industries. The Internet of Things (IOT) technology obtains and processes the relevant information about the environment of logo users through modern information and communication technologies (ICT) such as Wi-Fi, RFID, information sensing, and network services, so as to further understand the user's behavior choice motivation. It provides an important direction for improving user experience training, "active service design," especially in the user personalized service demand response. Therefore, it can provide users with more accurate active push service.

The main contributions of our work include the three following points:

(1) This paper proposes a push method of supply chain information in logistics park based on Internet of Things technology

(2) RFID structure is designed by introducing RFID, GPS, infrared, and other Internet of Things technologies

(3) The supply chain model of the logistics park is established to obtain the general ontology element model of the node enterprises in the supply chain of the park

This paper is divided into 5 sections. Section 2 introduces the related works about supply chain information pushing for logistics park based on Internet of Things technology. Section 3 discusses the supply chain information pushing method. Section 4 describes the experimental results. Section 5 concludes this paper with contributions, limitations, and future works.

2. Related Work

Modern logistics park is a place where multiple logistics entities are concentrated in space, and it is the assembly point of comprehensive logistics service and management facilities with a certain scale. Among them, information construction plays an increasingly prominent role in building a modern logistics park integrating business flow, information flow, and capital flow [3, 4]. With the support of modern information technology, integrating the supply, storage, transportation, distribution, information processing, and other links of the park, optimizing the business process of enterprises, and reasonably allocating and scheduling the relevant logistics resources have become the inevitable trend and urgent requirement of the sustainable development of the logistics park. At present, the former domestic logistics park has made some achievements in the level of information construction, but, due to the problems of asymmetric information, frequent mobile tasks, and highly professional division of labor, it is still in a passive position in the logistics resource scheduling and integration. Due to the increasingly huge resource data, the existing information pushing methods can only stay on the surface of data analysis, resulting in higher Mae value. Therefore, this paper proposes a supply chain information pushing method for logistics park based on Internet of Things technology.

Based on the technology of Internet of Things, this paper studies the information pushing method of supply chain in logistics park. According to the task environment of supply chain nodes in the park, it introduces the perception training calculation analysis model of Internet of Things, abstracts the behavior of information collaborative management in logistics park into "role, event, process, result," and other elements, and constructs a multidimensional and multilevel information collaborative mechanism, in order to solve the problem of low precision and weak timeliness of logistics service information pushing.

2.1. Push Supply Chain Strategies. A push model supply chain is one where projected demand determines what enters the process. For example, warm jackets get pushed to clothing retailers as summer ends and the fall and winter seasons start. Under a push system, companies have predictability in their supply chains, since they know what will come and when long before it actually arrives. This also allows them to plan production to meet their needs and gives them time to prepare a place to store the stock they receive.

2.2. Pull Supply Chain Strategies. A pull strategy is related to the just-in-time school of inventory management that minimizes stock on hand, focusing on last-second deliveries. Under these strategies, products enter the supply chain when customer demand justifies it. One example of an industry that operates under this strategy is a direct computer seller that waits until it receives an order to actually build a custom computer for the consumer. With a pull strategy, companies avoid the cost of carrying inventory that may not sell. The risk is that they might not have enough inventory to meet demand if they cannot ramp up production quickly enough.

2.3. Push/Pull Strategies. Technically, every supply chain strategy is a hybrid between the two. A fully-push-based system still stops at the retail store where it has to wait for a customer to "pull" a product off of the shelves. However, a chain that is designed to be a hybrid flips between push and pull somewhere in the middle of the process. For instance, a company may choose to stockpile finished product at its distribution centers to wait for orders that pull them to stores. Manufacturers might choose to build up inventories of raw materials, especially those that go up in price, knowing that they will be able to use them for future production.

3. Design of Supply Chain Information Pushing Method for Logistics Park Based on Internet of Things Technology

3.1. Introduction of Internet of Things Technology. Internet of Things technology can be said to represent a new generation of information technology. Internet of Things technology uses advanced information technology such as radio frequency identification technology and global positioning technology to connect and communicate objects with the network. Therefore, Internet of Things technology can also be said to be the further development of the Internet. Now the Internet of Things technology has been applied in many fields, such as medical and health field and environmental monitoring field. In this paper, in the process of pushing the supply chain information of the logistics park, the Internet of Things technologies are used, including radio frequency identification technology, GPS technology, and infrared technology [5, 6]. Radio frequency identification (RFID) technology is a noncontact automatic identification technology that can use the principle of radio frequency signal and spatial coupling transmission. RFID technology is composed of two parts, namely, RFID tag and information processing system. RFID tag is mainly used as the carrier of data, RFID tag, and reader. It has the advantages of noncontact identification. The reader reads the tag by radio frequency, long service life, and strong signal penetration. The reader reads the tag data by radio frequency and transmits the read data to the reader information processing system. In the business process optimization of commercial vehicles, RFID technology mainly realizes the marking of vehicles and the preservation of some vehicle information.

In the push supply chain information in logistics park, the real-time update of material information is the basis of accurate push. The Internet of Things is an extension of the Internet. Through the combination of wireless or wired networks and the Internet, RFID, which can store material information, is also known as radio frequency identification technology. Noncontact sensing technology is gradually maturing. In the current logistics warehouse, the main identification technologies include optical identification and bar code identification. RFID technology has its unique characteristics and is more suitable for the daily application of logistics warehouse. Table 1 lists the main parameters of these identification methods.

In the logistics and transportation industry, RFID technology can automatically identify a single object and then has the ability to identify object coding. This technology can quickly, real-time, and accurately collect and process cargo information in the logistics warehouse and can manage the cargo in the warehouse more conveniently. In order to apply the intelligent positioning method in this paper, the framework of RFID identification technology is designed, and the structure is shown in Figure 1.

REID can read and write data through wireless identification. It is encapsulated in a closed shell. The external water, ash, and other adverse conditions have little impact on it, and they have high adaptability to the environment. Labels on materials can be miniaturized and diversified, which is different from traditional barcode and QR code [7, 8]. The traditional bar code can only identify the types of goods. Based on RFID technology, the method in this paper develops a set of its own coding rules. As the unique "ID" for identifying materials, the code can realize the identification and tracking of single object. The material coding structure is shown in Figure 2.

According to the coding rules, the outsourcing classes can be classified and coded with high confidentiality, which provides a good technical basis for the intelligent positioning of the automated logistics warehouse. Through the application of the Internet of Things technology in the warehouse, the data and information flow transmission efficiency of the automated warehouse is ensured. Figure 2 shows the material code of logistics warehouse. Material code is the unique identification code for materials in the warehouse system. It represents a kind of material by a group of codes. The material code must be unique; that is, a material cannot have multiple material codes, a material code cannot have a variety of materials, and the relationship between them is one-to-one correspondence.

GPS (Global Positioning System) is a technology used to determine the target location. It can realize the real-time management of goods in the logistics park. For the commodity logistics vehicle, its transportation process is a moving process. If it can realize the real-time management, it will be of great help to the scheduling of logistics vehicles and the selection of transportation routes. In addition, the use of GPS technology can effectively combine all aspects of the supply chain of commercial vehicle transportation, so that managers can master the operation of vehicles in real time, so as to improve the service level of the supply chain of commercial vehicle transportation. Infrared ray is a kind of light with a wavelength of 0.76 to 400 μm. It is an invisible light. Its ability to pass through clouds is stronger than that of visible light. It has a wide range of applications in communication, detection, medical treatment, military, and so on. Infrared technology is a kind of automatic control device realized by using infrared. It uses infrared transmitting and receiving device to realize an infrared loop. When the infrared receiving line is blocked, the receiving device can immediately send out a warning. In this paper, infrared technology is used to realize the control of transport vehicles in the logistics park, as well as the antitheft control of commodity vehicles.

3.2. Supply Chain Modeling of Logistics Park. The supply chain of logistics park is similar to a huge "magnetic field" system, which is composed of personnel, capital, technology, information, goods, and other basic elements. A simple index evaluation system cannot fully reflect the concept of logistics park. Therefore, it needs a strict and scientific perspective to determine the boundary of logistics park. On

Table 1: Comparison of several identification technical parameters.

Parameter	Optical recognition	Bar code	RFID identification
Data volume	1-100 B	1-100 B	16-64 KB
Read mode	Photoelectric conversion	Laser scanning	Wireless communication
Recognition distance	Very close	Near	Far
Recognition speed	Less than 3S	Less than 4S	Less than 4S
Artificial intelligence	Probably	Restricted	Impossible
Machine recognition	Good	Good	Good
Confidentiality	Nothing	Nothing	Good
Light masking effect	Invalid	Invalid	No impact
Moisture effects	Serious	It is serious	No impact
Azimuth effect	Small	Small	No impact
Multitarget recognition	No	No	Can

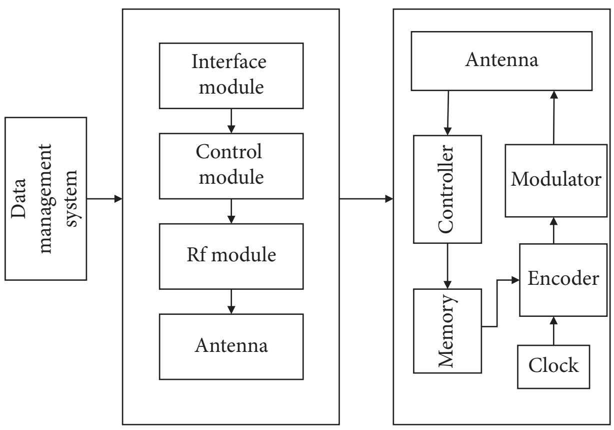

Figure 1: RFID structure.

the whole, the existing research on the boundary of logistics park has achieved some results, but there are still some defects in the data collection and quantitative methods. Therefore, in the specific operation, it is needed to select certain representative indexes pertinently and follow the principles of comprehensiveness, feasibility, scientificity, contrast, and orientation when selecting the boundary index system based on theory and practice [9, 10]. The boundary of logistics park is easily affected by internal and external factors. Because this study is based on the following premise, that is, the determination of the boundary of the logistics park is before the determination of the scale of the logistics park, it is difficult to obtain the internal factors that affect the strength of the logistics park center in the planning stage. There are many internal indicators of the logistics park, such as logistics capacity, facilities and equipment, cargo turnover, service quality, and logistics modernization. In this paper, the author describes in detail the internal impact indicators of nonlogistics park and evaluates it. The author defines the scope of regional logistics park according to the situation. For example, if the park to be analyzed is in different cities, then the city is regarded as the "region" in the "regional logistics park"; if it is in a city, then the "region" can be understood as different urban areas.

Combined with the previous comprehensive researches, based on the availability and rationality of the data obtained by the logistics park and the characteristics of the planning period of the logistics park, this paper evaluates it according to two indicators: the first is to evaluate the comprehensive ability of its location, and the second is to evaluate the impact of its region on the park.

(1) Ability evaluation of logistics park location: the evaluation is aimed at the evaluation of social, economic, and natural environment of the location selected by the logistics park, and the ability of the logistics park should be evaluated according to the evaluation. In general, the better the economic development, the greater the demand for logistics, and the stronger the ability of the logistics park in a certain aspect.

(2) Evaluation of the impact of logistics park location on the park: the main body of the index is the fit degree between the logistics park and its location, which can be measured by the estimation of logistics volume and the support degree of regional policies and guidelines to the park [11, 12]. Under normal circumstances, the greater the degree of fit between the park and its location is, the more support it can get from the outside world, and the larger its boundary becomes.

Ontology can be used to solve the problems of information organization, information retrieval, and the interoperability of heterogeneous information systems. Based on the basic business of the park, such as warehousing, transportation, and freight forwarding, this paper constructs the situation ontology meta model of the park around the user needs of the park management committee, logistics demanders, logistics suppliers, government departments, logistics intermediaries, and auxiliary service providers, as shown in Figure 3.

At the same time, aiming at the interactive business between different node enterprises in the park supply chain, the scenario model of interactive business between node enterprises is established, as shown in Figure 4.

In the intelligent information push service of park supply chain, context is used to describe the collection of user characteristic information, including "role, environment, and event." Role includes node enterprise and its post role of park logistics service chain. Environment information includes park resource distribution, resource status, and resource usage. Event includes interactive business, other events, historical transaction, and customer files.

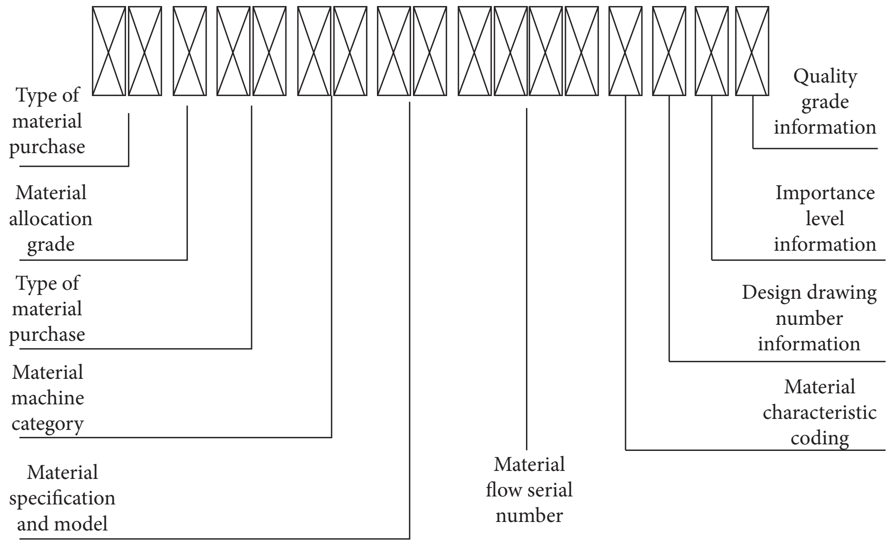

Figure 2: Material code of logistics warehouse.

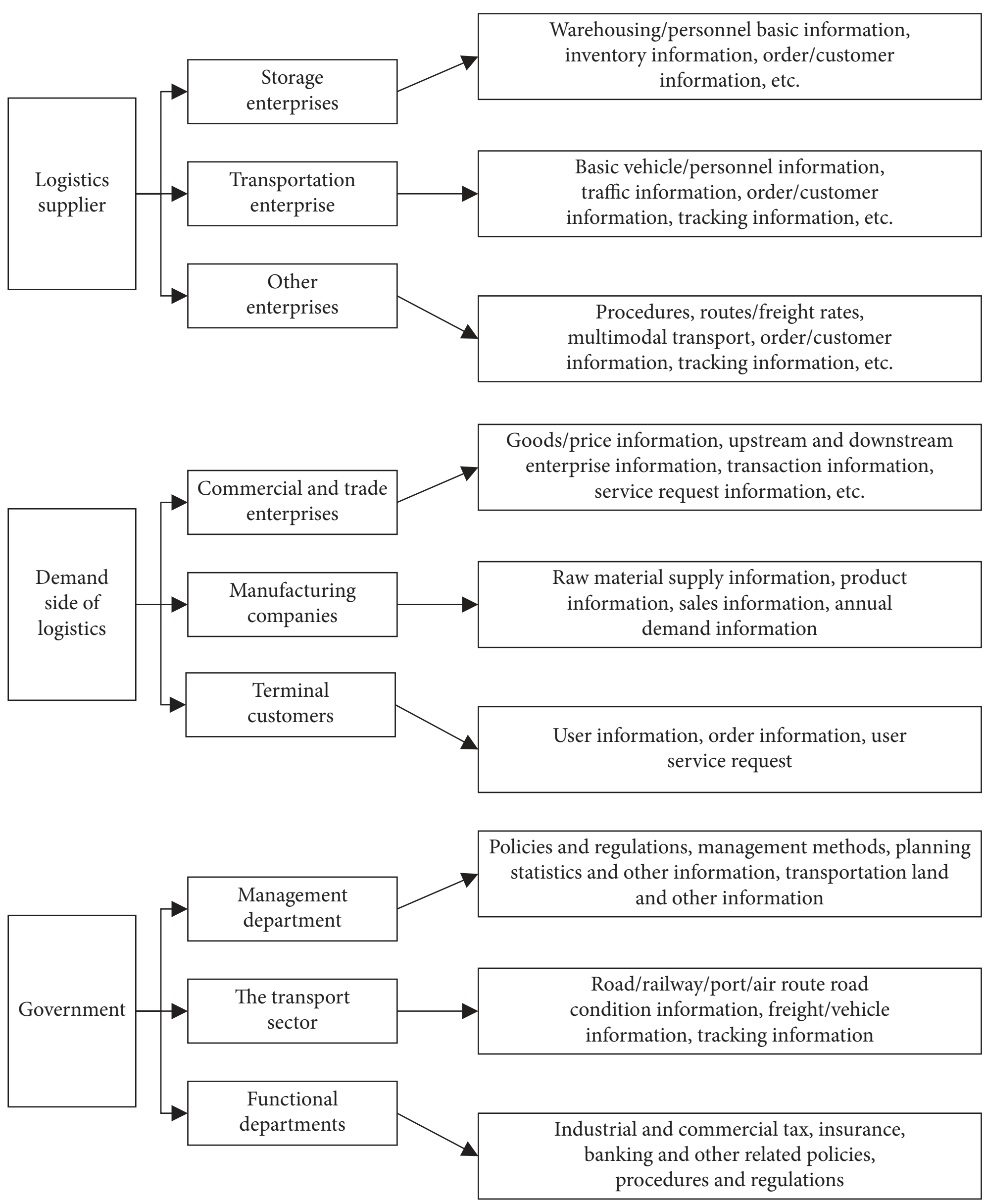

Figure 3: General ontology meta model of supply chain node enterprises in park.

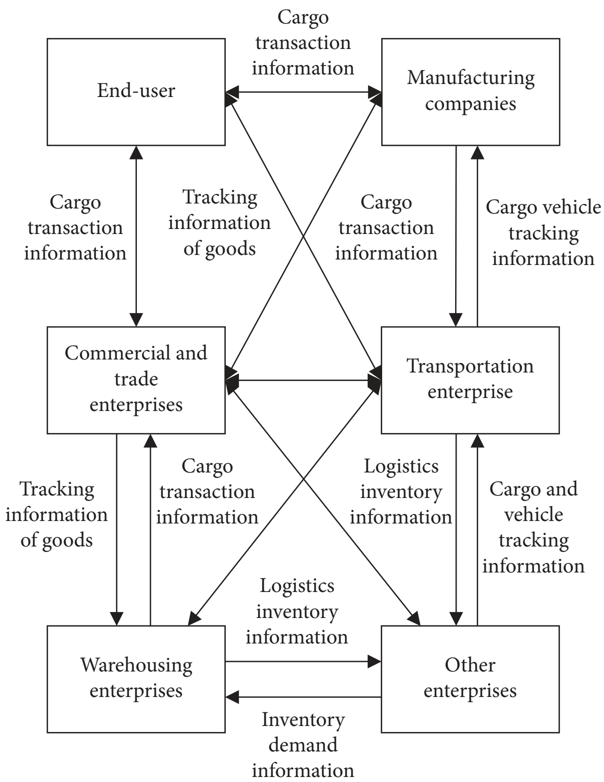

Figure 4: Interactive business scenario model between node enterprises in park supply chain.

3.3. Realization of Supply Chain Information Pushing for Logistics Park. On the basis of the established logistics park supply chain model, in order to achieve the accurate push supply chain information, it is needed to rely on the information balance between nodes to make predictions, and the neighboring nodes need to compare the similarity for selection. Therefore, in the calculation of similarity, it is needed to be able to correctly measure the similarity between node information and node demand, so as to ensure the accuracy of information push. In the traditional algorithm, cosine similarity is used, but cosine similarity ignores the problem that the information is graded. Therefore, it needs to be modified. The average value of the node's score minus the information's score is used for centralized scoring. The calculation formula is as follows:

$$\mathrm{sim}(i,j)=\frac{\sum_{u\in U(i)\cap U(j)}\left(T_{u,i}-\overline{T_u}\right)\left(T_{u,j}-\overline{T_u}\right)}{\sqrt{\sum_{u\in U(i)}\left(T_{u,i}-\overline{T_u}\right)^2}\sqrt{\sum_{u\in U(i)}\left(T_{u,j}-\overline{T_u}\right)^2}}. \tag{1}$$

In the above formula, $\mathrm{sim}(i,j)$ represents the similarity of supply chain information i and j, $U(i)$ represents all nodes that score supply chain information i, $U(j)$ represents all nodes that score supply chain information j, $U(i)\cap U(j)$ represents all nodes that score i and j, $T_{u,i}$ and $T_{u,j}$ represent the scores of node u on supply chain information i and j, respectively, and $\overline{T_u}$ and $\overline{T_u}$ represent the average scores of two supply chain information [13, 14]. There is a certain distance between a single resource information and the set of all information, which is the minimum distance between them. The distance between a single node and the set of nodes can also be obtained by the same principle. In the collaborative filtering algorithm based on MOOC supply chain information, the selection of similarity has an important impact on the accuracy of the algorithm as a whole. The optimization of similarity calculation in collaborative filtering of supply chain information is realized.

In order to achieve accurate recommendation of MOOC supply chain information, spark architecture is needed. Spark is a fast and general cluster computing engine. In the research of recommended algorithm in this paper, memory based data abstraction design is adopted to save the results of the middle part of Spark task. The specific framework is shown in Figure 5.

Spark framework includes SQL query, text processing, machine learning, and other functional components. These components are tightly integrated in Spark, and their computing performance is better. Especially in the working environment of mass information analysis and iteration, the advantages of Spark framework are more prominent. When spark architecture runs in the cluster, the driver first completes the supply chain information application through the supply chain information manager. After the manager allocates the supply chain information, it starts the executor on the corresponding node. After completing the task submitted by the driver, the node finally submits the feedback to the driver. The running process is shown in Figure 6.

The spark architecture is introduced into the algorithm, which can filter a large amount of supply chain information in the process of operation and make deep information prediction score for the remaining supply chain information. The prediction score mainly uses the similarity of supply chain information and the neighbor set $N(i)$ of supply chain information i to evaluate the score of a node on the target supply chain information. The specific information evaluation method is shown in

$$P_{u,i}=\overline{R}_i+\frac{\sum_{j\in N(i)}\left(R_{u,j}-\overline{R_j}\right)*(\mathrm{sim}(i,j))}{\sum_{j\in N(i)}|\mathrm{sim}(i,j)|}. \tag{2}$$

In formula (2), $P_{u,i}$ represents the similarity prediction score of node u for supply chain information i, $\overline{R_i}$ represents the average score of supply chain information i, $N(i)$ represents the neighbor set of supply chain information i, $R_{u,j}$ represents the score of node u for supply chain information j, $\overline{R_j}$ represents the average score of supply chain information j, and $\mathrm{sim}(i,j)$ represents the similarity between supply chain information i and supply chain information j. The higher the similarity prediction score obtained by the formula, the higher the accuracy of the algorithm. According to the score value of node u on the nearest neighbor set $N(i)$ of supply chain information i, the score of node u on supply chain information i is predicted by using formula (2), and the supply chain information recommendation list is generated, which realizes the accurate push supply chain information in logistics park.

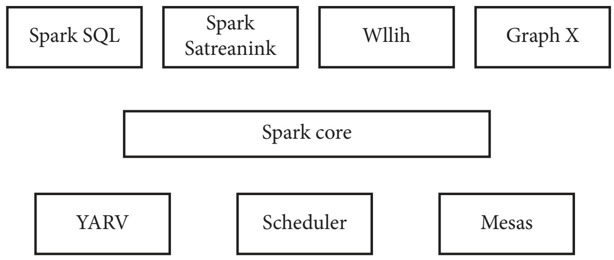

Figure 5: Framework of Spark.

In the last three years, many methods were proposed to handle the supply chain information pushing; here we introduce four outstanding methods: FPGA-IoT [15], ESS [16] Blockchain-IoT [17], and AI-IoT [18], which can be used to solve the related works taking different kinds of Internet of Things work structures. FPGA-IoT is a graph-based network that builds connections between different risk nodes so as to improve the speed of different nodes' communications; and ESS uses a specific loss structure to keep the costs of nearest nodes as lower as possible and decrease the total costs of overall parks [19, 20]. Blockchain-IoT is the basic model that needs more computation consumption to obtain the desired performances and can only keep the information pushing smooth; and AI-IoT uses the deep learning structure to capture the features and assess the distance of different nodes and give the different weights of each pair of nodes according to their importance. However, these methods have their disadvantages, respectively. The first two are too slow, the third is so complicated, and the last one also needs more spaces. Compared with these methods, our proposal can consider both time consumption and calculation speed, so we compared them together [21].

In this paper, we utilize the entropy loss function to build the model for our research problems. It can be defined as follows: $\text{loss}(x, y) = \sum_{i=1}^{n} -p_i \log(1 - p_i)$. The bigger the value of the loss was, the worse our proposal performed; and our proposal is used to train a model that fits the real and predicted values, so that the machine can perform well [22, 23].

Compared with the three methods, our proposal can deal with the problems easily and we also need a smaller computation space to build our model. However, our model may obtain a relatively lower accuracy than others sometimes, which may lead to unstable prediction [24].

4. Experiment

4.1. Case Overview. In order to verify the effectiveness of the supply chain information pushing method for logistics park based on Internet of Things, its performance needs to be verified. The case selected in this paper is an international inland port logistics park with a planning area of 60 square kilometers, covering 3 square kilometers of A town, B17 square kilometers, and the planning area of the core area of 30 square kilometers [25, 26]. The international land port logistics park gives full play to the advantages of location, industry, and multimodal transport and focuses on the construction of cross-border trade e-commerce industrial park, cross-border e-commerce town, and other projects. The planning plan establishes the "four in one" international trade channel of high seas, air, and rail from 2015 to 2025 and strives to build a 100 billion level commercial logistics industrial cluster. The planning plan is shown in Figure 7.

In this paper, the development plan of an international inland port logistics park in the next 10 years is taken as a simulation case. The simulation data comes from the management committee of the international land port logistics park, the management committee of the cross-border trade e-commerce industrial park, and other units and departments. Some data are obtained through field research. Due to the need of commercial secrets and simulation, the data obtained in this paper are preprocessed in advance, so that the cellular automata (CA) model can be directly applied [27, 28].

4.2. Experimental Preparation. For the accurate push supply chain information, it is needed to evaluate the results of the push supply chain information. In order to truly and objectively evaluate the accuracy of information pushing, this paper constructs an index system to evaluate the informatization level of international land port logistics park based on the principles of science, system, and strong operability. In the selection of evaluation method, this paper uses the analytic hierarchy process (AHP). Firstly, the push results to be analyzed are hierarchical; secondly, according to the nature of the problem and the overall goal to be achieved, the problem is divided into different elements, and, according to the correlation between these elements and the relationship between them, the elements are combined according to different levels, so as to build a multilevel analysis structure model. Finally, compare the advantages and disadvantages of the push results and score them.

First of all, according to the evaluation index system mentioned above, the first level index mainly includes 6 items: infrastructure, development, and use of information resources, application of information technology, utilization and cultivation of logistics informatization talents, logistics informatization policies, regulations and standards, and sustainability of logistics informatization development. The average score of each index is taken. In this way, the index weight of each item can be obtained, as shown in Table 2.

The above method can be used to calculate the weight of each secondary index. Due to the layout problem, we will not list them one by one here. So far, the preparation of experimental data is completed.

4.3. Simulation Experiment Scheme. Under the above experimental preparation, it starts to build the experimental test environment of the supply chain information pushing method for logistics park based on the Internet of Things technology. Firstly, a Spark cluster with 6 virtual machines is built, one of which is set as the master node, and the other five are set as slave nodes. The parameters are shown in Table 3.

In the information pushing method of this paper, the main collaborative filtering algorithm uses the mean

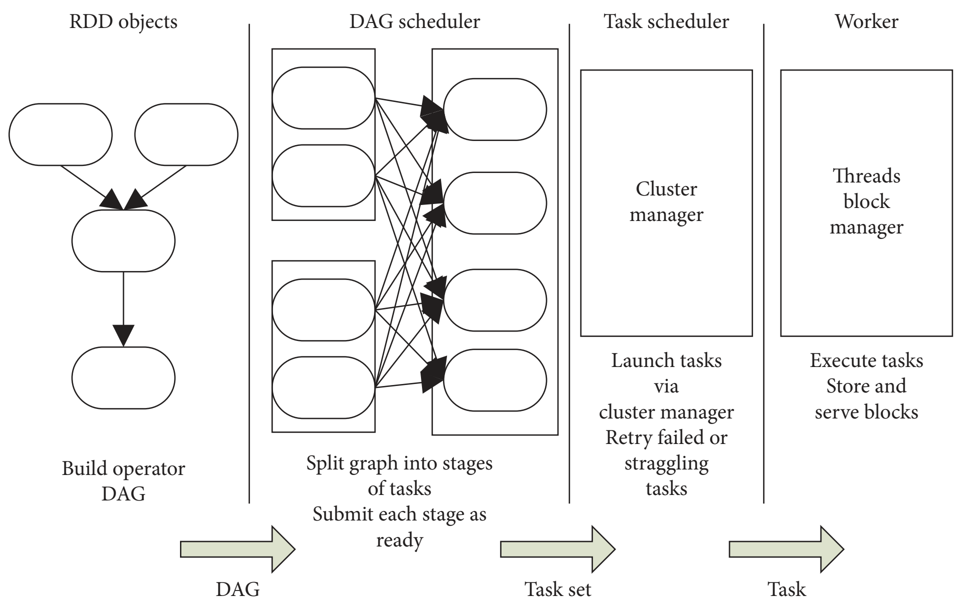

Figure 6: Operation architecture of Spark.

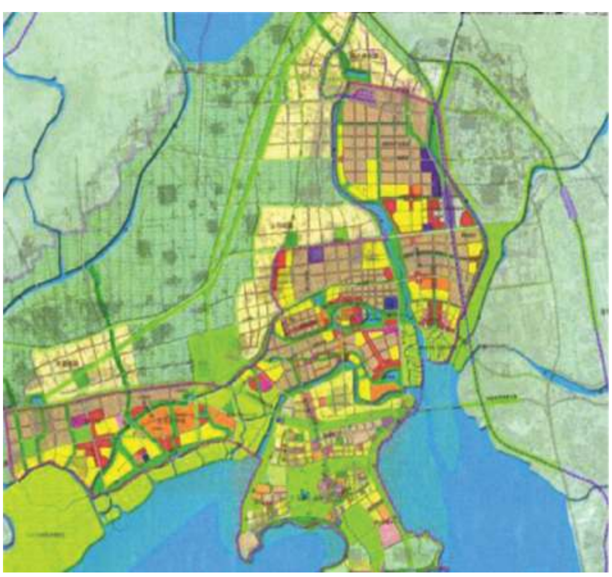

Figure 7: The planning plan of a city's international inland port logistics park.

absolute error MAE as the accurate evaluation index of the algorithm, which is different from the others that use the average values as the accurate evaluation. The calculation formula is defined as follows:

$$\mathrm{MAE} = \frac{\sum_{i=1}^{N} \left| p_i - q_i \right|}{N}. \tag{3}$$

In formula (3), N represents the amount of information, p_i represents the actual score of information, and q_i represents the prediction score of information. The smaller the MAE value is, the higher the accuracy of recommendation is. The proportions of training set and test set are 6:4, 7:3, 8:2, and 9:1, respectively. Based on the relevant research data and literature model of international land port logistics park, the relevant parameters are set: the initial number of enterprises in the international land port logistics park is 1000, the status update interval is 10 days, the boundary of the model is periodic, the simulation time is 3600 days, and the relationship between the Internet of Things and these influencing factors is set as linear correlation. On this basis, the simulation model of the formation and development process of Qingdao international land port logistics park is developed.

4.4. Experimental Results and Analysis. Under the above experimental environment parameters, the traditional push method and the push method in this paper are used for experiments, and the push results of supply chain information of this method and the traditional method are obtained in the simulation software, as shown in Figure 8.

The experimental results show that, with the increase of the proportion of training set and test set, the MAE values of the three algorithms are decreasing, and the accuracy is improving. In the case of each proportion, the MAE value of the proposed algorithm is lower than those of the three traditional methods, which shows that the recommendation accuracy and performance of the proposed method based on the Internet of Things technology are higher.

Figure 8 shows the simulation results of the two methods when the ratio of training set and test set is 6 : 4. Figure (1) shows the simulation results obtained by the traditional method, and Figure (2) shows the simulation results obtained by this method. In order to facilitate comparison, this paper quantizes the simulation results and obtains the experimental results under different training set and test set proportions, as shown in Table 4.

Table 2: Index weight.

Index	R_1	R_2	R_3	R_4	R_5	R_6	W_1	Test
R_1	1	0.75	2	1.33	1.33	1.33	0.23	$C_r = 0.0214, < 0.1$; therefore, the consistency is satisfied
R_2	0.75	1	0.67	1	1	1	0.15	
R_3	0.5	0.67	1	0.67	0.67	0.67	0.13	
R_4	0.75	1	1.5	0.67	0.75	0.5	0.15	
R_5	0.75	1	1.5	1.33	0.67	0.67	0.26	
R_6	0.75	1	1.5	1	1.5	1.33	0.49	

Table 3: Parameters of software and hardware in the experiment.

Experimental parameters	Master node	Slave node
Operation platform	OpenStack cloud platform	OpenStack cloud platform
Virtual core	4 cores	2 cores
Running memory	64 G	16 G
Hard disk	128 G	128 G
JAVA	Java-7-oracle	Java-7-oracle
Linux	Ubuntu 12.04	Ubuntu 12.04
Spark	1.0.0	1.0.0

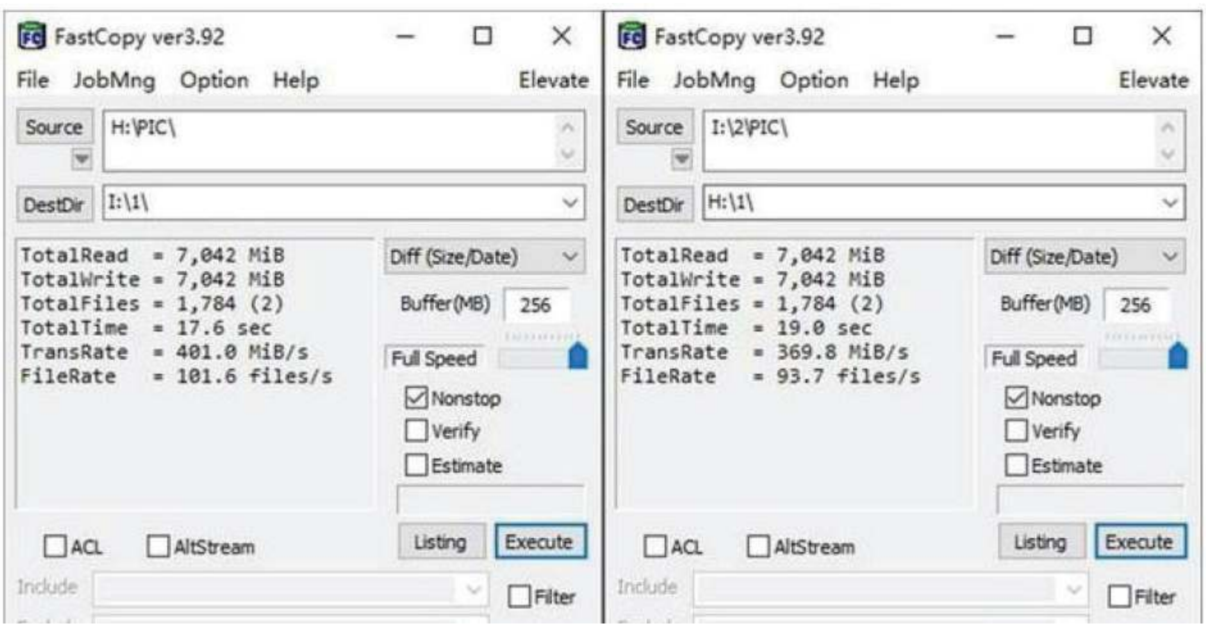

Figure 8: Simulation results of different pushing methods.

Table 4: MAE of different proportions of training set and test sets.

Proportions of training set and test set	MAE value				
	FPGA-IoT	ESS	Blockchain-IoT	AI-IoT	Our method
6:4	0.859	0.896	0.955	0.855	0.763
7:3	0.854	0.832	0.841	0.832	0.741
8:2	0.852	0.811	0.845	0.811	0.726
9:1	0.847	0.766	0.823	0.803	0.709

5. Conclusion

Through the Internet of Things technology, according to the difference of task environment of different users, the task context-aware information processing model of logistics park is constructed, which provides data exchange and distribution services, carries out intelligent push service of business information, and enhances the timeliness and adaptability of the system to meet the needs of complex task environment. At present, aiming at the problems of existing information pushing methods, this paper designs a supply chain information pushing method for logistics park based on Internet of Things technology. The simulation results show that the proposed method can effectively improve the recommendation accuracy. Although this method has achieved some results, there are still two problems. One is the failure to achieve intelligent resource information acquisition, and intelligent resource information acquisition events trigger push information events. Another problem is that the mining of user demand information is not deep enough. If the user need information cannot be completely obtained, then the role of information pushing is not obvious or even cannot push any information.

In the future research, it is necessary to study the following aspects:

(1) Further study the related algorithms of information mining in push technology, and improve the establishment of demand tree by combining scenario modeling and collaborative filtering technology.
(2) According to the nature of each node in the Internet of Things, improve the system code, and combine the information collection event with the push system.
(3) Expand the Internet of Things platform, so that it is not only suitable for simple information pushing service but also suitable for a variety of Internet of Things push methods, such as client tools, web push, and microblog push.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The author declares that there are no conflicts of interest.

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