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Research on the Digital Marketing Strategies in the E-commerce Logistics Service Mode under the Influence of Big Data

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Abstract. One of the important tasks facing the e-commerce field is to innovate the logistics service model and use the power of big data to comprehensively improve the level of e-commerce logistics services. This paper combines big data technology and Internet of Things technology to analyze the current e-commerce model and build an e-commerce logistics service model innovation system. Moreover, this paper discusses the electronic issues of logistics from the aspects of e-commerce logistics operation system, logistics operation process, logistics information system design and so on. On the basis of determining the meaning of logistics, the relationship between e-commerce and modern logistics, and the development of China's modern logistics industry, this paper constructs an innovation system for e-commerce logistics service models based on big data technology. Through research, we know that big data technology can play an important role in the innovation of e-commerce logistics service models.

Keywords: big data; internet of things; e-commerce; service model; innovation; Digital Marketing Strategies
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1 INTRODUCTION

In recent years, in the shopping spree dominated by e-commerce companies and joined by consumers frantically, the multiple growth of product sales is behind the multiple growth of express parcels, and e-commerce companies have gained huge profits and expanded the market scale. However, most of the express logistics companies that serve it are overwhelmed under this huge pressure [1]. At present, there are many types of goods sold on the Internet, with different sizes, weights, and storage, distribution and transportation methods. Moreover, the strength of different logistics companies is also different, and the distribution methods, distribution time and network coverage are also quite different, resulting in great differences in consumer satisfaction [2]. The essence of sub-commerce is collaborative commerce, which is a complex and new industrial chain system with strong industry driving force and wide-ranging coverage. The logistics service process is composed of multiple links, which coordinate and promote each other. E-commerce companies and logistics companies build cooperative alliances in the form of industrial chains to jointly promote development and share risks [3].

From the perspective of the industry chain, the e-commerce logistics industry chain starts from the perspectives of customers, suppliers, logistics distribution and service platforms. From the perspective of e-commerce companies and logistics companies, the object of transactions is logistics services, where logistics services include collection, sorting, transportation, and delivery. Moreover, each link is closely linked and very important. It requires close communication and close cooperation between e-commerce companies and logistics companies in order to achieve business process coordination, so as to provide end consumers with high-quality logistics services. Therefore, logistics service is a complex transaction activity that requires the cooperation of multiple links to complete. Therefore, both parties should actively create a healthy, stable and lasting industrial chain under the premise of safeguarding their respective interests to achieve a win-win situation. The core of online shopping lies in logistics, and the core of logistics lies in improving efficiency and reducing costs. High logistics costs have become an important issue facing the development of e-commerce. At present, more than 90% of e-commerce companies choose to cooperate with third-party logistics companies to distribute products, and self-built logistics will face huge difficulties and pressures in the future. As the market scale and commercial format of e-commerce become more perfect, the importance of customer service perception has become increasingly prominent. Efficient logistics distribution capabilities and high-quality logistics services will become the focus of the next round of competition among e-commerce giants. E-commerce companies will also differ greatly in the quality of logistics services that consumers perceive due to the differences in the logistics mode they choose and the logistics service capabilities they carry. Therefore, the research on e-commerce logistics service quality has certain practical significance.

By integrating digital marketing into e-commerce logistics, companies can address the challenges of high logistics costs, improve customer service perception, and gain a competitive edge in the market. Emphasizing efficiency, cost reduction, and customer satisfaction, digital marketing becomes a crucial tool for enhancing e-commerce logistics service quality and driving the success of the industry.

At present, the e-commerce sector must strengthen the construction of logistics network service platforms, actively cater to the country’s One Belt One Road development strategy, expand the scope of logistics services, achieve rapid deployment on the Internet platform, and fully integrate more logistics resources. , To achieve integrated development and form a logistics platform with full network coverage. After the big data processing technology and the Internet link are successfully matched, a nationwide shared logistics network will be formed. Logistics companies of all sizes across the country will become a part of the shared logistics network, and the shared logistics network platform will also provide logistics The company provides transportation guarantee for the whole process such as line connection, waybill transshipment, tracking monitoring, etc., to ensure that all waybills can be transported to the majority of users according to quality, quantity, and time. This is very important for improving the level of logistics services. significance.

Based on the above analysis, this paper combines big data technology and Internet of Things technology to analyze the current e-commerce model, and build an e-commerce logistics service model innovation system.

2 RELATED WORK

In terms of logistics distribution network structure, literature [4] proposed the function, structure and organization of logistics nodes, and constructed a logistics network containing different nodes and routes. Moreover, it proposed a modern logistics network with logistics bases, logistics centers and distribution centers as the main body. The literature [5] analyzed the network topology, node structure and information structure of the logistics distribution network, summarized the logistics operation mode of the logistics distribution network, and established the performance evaluation index system of the logistics distribution network. The literature [6] believed that the logistics distribution network is a collection of interconnected organizations and facilities in the logistics distribution process. The purpose of distribution network optimization is to reduce the cost of enterprise logistics, improve customer satisfaction rate, and then realize the service value of the logistics distribution network and enhance the service capability of the logistics distribution network. Typical logistics facilities are manufacturers, logistics centers, distribution centers, warehouses, docks, etc., where logistics operations are implemented, as well as retail stores. The literature [7] described the role, function, classification, and scale of different logistics nodes, and proposes the main method of urban logistics node system layout. In terms of the layout of logistics distribution network nodes, literature [8] took logistics network nodes as the research object, used dynamic planning technology, and used static location selection conclusions as the basis to find out the dynamic optimal layout of logistics network nodes. Based on the comprehensive analysis of the related theories of logistics distribution network and the influencing factors of the node layout of the logistics distribution network, literature [9] gave a method to optimize the layout of logistics distribution network nodes that combines qualitative and quantitative, and evaluated the selected schemes through empirical analysis. The literature [10] took multi-level logistics nodes as the research object, established a mathematical model consistent with the diversified business model of real enterprises, and designed a genetic algorithm to solve it. The literature [11] divided the logistics distribution network into a static network and a dynamic network, and constructed a network design and redesign model with the supply capacity as the constraint condition and the goal of minimizing the total cost. Finally, it converted the model into a variational inequality problem, used a modified algorithm to solve it, and obtained the optimal node layout and logistics organization plan. In terms of path optimization of logistics distribution network, the literature [12] analyzed the complexity of the path planning problem of logistics distribution network, and established a logistics distribution network optimization model with multiple distributions and multiple models. Moreover, it improved the ant colony algorithm to optimize the logistics distribution path by introducing genetic operations in the ant colony algorithm and modifying the pheromone update strategy. The literature [13] took the total length of the logistics distribution path as the optimization goal, converted it into the classic traveling salesman problem to solve and establishes a mathematical model, and proposed a genetic algorithm to solve the problem of improved operators. The literature [14] believed that logistics center location and distribution route optimization are two important contents of logistics distribution network optimization. Furthermore, it established a location-route optimization model with a time window and a location-multi-vehicle transportation route optimization model in a dynamic environment, and designed a hybrid genetic algorithm to solve it.

The experience store is a new type of retail store under the 020 model. After its concept was formally put forward, scholars' research on the experience store mainly focused on the business model of the experience store, and there was little research on the location of the experience store. In recent years, some scholars have gradually learned from the research methods on the location of retail facilities and began to study the location of experience stores. Based on the theory of commercial location, literature [15] believes that urban planning, accessibility, population distribution, parking lots, etc. affect the experience The key factors of store location, and emphasized the importance of parking lot for the location of experience store. Finally, through the evaluation of the experience store site selection project with the analytic hierarchy process, recommendations for location decision-making are given; literature [16] For example, Hengshoutang analyzed the influencing factors of experience store location, combined with business circle theory and consumer demand analysis, established an experience store location model based on traditional coverage. However, in the traditional coverage model, the assumption that consumers within the coverage distance are completely covered and receive the service of the experience store, and the consumers outside the coverage distance are not covered at all is not true, that is, the dual limitation of the traditional coverage function. Literature [17] proposed the concept of a gradual coverage model, and further described the gradual coverage model with linearly decreasing demand: Literature [18] established a gradual coverage model based on service quality, proposed the concept of minimum acceptable service level, and gave different forms Based on the perspective of service quality, literature [19] established a multi-objective gradual coverage model that maximizes the total demand coverage level, maximizes the minimum demand coverage level, and minimizes the uncovered total demand. The coverage model and algorithm are studied. In the gradual coverage model based on service quality, consumers are fully covered when they are within the coverage distance, and the service quality is fully guaranteed; when the coverage distance is exceeded, the coverage function shows a decreasing trend and the service quality decreases; when the distance continues to increase to a certain level No coverage at a critical value, and the service quality drops to zero.

3 LOGISTICS NODE ALGORITHM BASED ON BIG DATA TECHNOLOGY

In order to be able to analyze the key nodes more accurately in a large-scale complex e-commerce network, it is necessary to introduce the unique attribute of the complex e-commerce network-the strength of the relationship, usually when analyzing the complex e-commerce network, the connection between nodes The weight can not be obtained directly, but the edge weight obtained by modeling the collected data and then quantifying it in a reasonable way.

The concept of relationship strength correlation was proposed relatively late, and the research on relationship strength in the past ten years is still at a relatively preliminary stage. It simply describes whether there is a relationship between two nodes in a complex e-commerce network, or whether the relationship is strong or weak. relation. In response to this problem, this paper proposes to quantify the strength of the relationship by considering both static data and dynamic behavior information.

The similarity of static data will affect the strength of relationships between individuals. This main idea is based on the homogeneity of complex e-commerce networks. It means that people prefer to interact with those who have common characteristics, and reality shows the strength of those relationships. There is a higher similarity between taller individuals.

We use $PV^{(i)}$ and $PV^{(j)}$ to represent the data vector of node master and node j, respectively, and $S\left(PV^{(i)},PV^{(j)}\right)=\left[S_1^{(ij)},S_2^{(ij)},...,S_n^{(ij)}\right]$ is used to represent the data similarity vector of node i and node j. If two nodes have the same data, the corresponding similarity parameter is $S_p^{(ij)}=1$. If they are not the same, it is $S_p^{(ij)}=0$. Then, we use ω to represent the weight of different data. For example, if attributes such as age and personality have less influence on the strength of the relationship, the corresponding weight is smaller. However, attributes such as home address and hobbies have a greater impact on the strength of the relationship, and the corresponding weight is greater. However, it is necessary to ensure that the sum of the weights of each data is I. Therefore, the conditional probability between the relationship strength s_{ij} and the similarity vector of the data of the two nodes obeys the Gaussian distribution, and the volume relationship is as follows[20]:

$$P\left(s_{ij} \mid PV^{(i)}, \mathrm{PV}^{(j)}\right) = N\left(\omega^T S\left(PV^{(i)}, PV^{(j)}\right), v\right) \tag{1}$$

Among them, S is used to calculate the similarity vector between $PV^{(i)}$ and $PV^{(j)}$, ω is an N-dimensional weight vector to be estimated, and v is the variable in the Gaussian model, which is defined as 0.5 in the experiment of this paper.

The strength of the relationship affects the dynamic behavioral interaction between individuals. Since everyone has limited resources such as time and energy for exchanging information and maintaining relationships between individuals, people are more inclined to devote limited resources to people they consider important. If in an academic exchange network, this kind of behavioral interaction may be co-publishing an article, participating in an academic activity together, publishing articles belonging to the same research direction, and so on. The stronger the relationship between individuals, the higher the probability of their behavioral interaction. We use $B_t^{(ij)}$ to represent an interaction relationship between node i and node j, where t = 1,2...m.

Because the probability distribution of behavioral interaction $B_t^{(ij)}$ is conditionally independent of s_{ij}, this section uses the Logistic function to model the conditional probability of $B_t^{(ij)}$:

$$P\left(B_t^{(ij)} = 1 \mid s_{ij}\right) = \frac{1}{1 + e^{-\left(s_{ij} + b\right)}} \tag{2}$$

Through the above analysis, it can be seen that the relationship strength is affected by the similarity of basic data between individuals and affects the behavioral interaction between individuals. Therefore, the relationship between the two and the relationship strength can be modeled as shown in Figure 1. The left half of the model can be expressed as $P\left(s_{ij} \mid PV\right)$, and the right half can be expressed as $P\left(B_t^{(ij)} \mid s_{ij}\right)$.

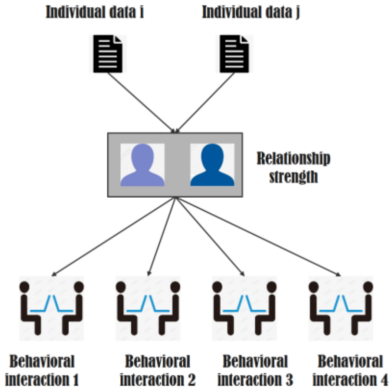

Figure 1: Relationship strength model.

The above model not only shows the determinants of relationship strength, but also shows the causal relationship between data and behavior interaction and relationship strength. Therefore, the joint distribution of the model can be expressed as:

$$P\left(s_{ij},\mathrm{B}^{(ij)} \mid PV^{(i)},\mathrm{PV}^{(j)}\right)=P\left(s_{ij} \mid PV^{(i)},PV^{(j)}\right)\coprod_{t-1}^{m}P\left(B_t^{(ij)} \mid s_{ij}\right) \tag{3}$$

$$NR(i)=\sum_{j\in M_i}\frac{s_{ji}NR(j)}{\sum_{k\in L_j}s_{jk}} \tag{4}$$

After considering the strength of the relationship between nodes, the importance of nodes needs to be redefined:

In the formula, M_i represents the set of all points pointing to the node with node i as the end point, L_j represents the set of all pointed nodes with node j as the starting point, s_{ji} is the strength of the relationship from node j to node i, NR(i) is the importance of node i.

The core idea of this definition is to divide the importance of a node into the nodes it points to according to the relationship strength of its associated nodes. In order to prove the feasibility of the algorithm, this chapter will rewrite the definition into a matrix form, and the NodeRank value of all nodes can be represented by a matrix R:

$$R=\left[NR(1),NR(2),\ldots,NR(N)\right]^T \tag{5}$$

Then, we use w_{ij} to represent the proportion of relationship strength:

$$w_{ij}=\frac{s_{ij}}{\sum_{k\in L_i}s_{ik}} \tag{6}$$

In order to make each row of the matrix the proportion of the link-in relationship strength of the i-th node, when storing the relationship strength proportion in the matrix, the elements are directly transposed, that is, using W to store all w_{ji} as:

$$W=\left[w_{ji}\right]_{N\times N} \tag{7}$$

Then the formula in the definition can be rewritten as:

$$R=WR \tag{8}$$

Next, it is necessary to prove that the equation has a solution, and then formula 5 is expressed as follows:

$$\left(W-I\right)R=0 \tag{9}$$

The I in the formula is an identity matrix.

In addition, in order to make the sum of importance of all nodes equal to 1, a standardized condition is introduced:

$$\|R\|_1 = 1 \tag{10}$$

Among them, $\|R\|_1$ is the Ll norm of R, and R is a non-zero vector. Therefore, according to formula 6, it can be known that R is an eigenvector of matrix W, and the following results can be inferred from formulas 6 and 7:

$$\sum_i w_{ji} = 1 \tag{11}$$

Then, we select the vector $[1,1,...,1]_N$ left multiplied by W-I, and the result is a zero vector, which proves that the matrix W-I column vector group is linearly related. Furthermore, it can be determined that the determinant value of the matrix W_I is 0, as follows:

$$|W - I| = 0 \tag{12}$$

In summary, equation 8 is solvable.

It can be seen from Equation 7 that w is a random matrix. If the e-commerce network graph associated with the random matrix is a strongly connected network, the eigenvalue $\lambda = 1$ can be clearly obtained according to the Perron-Frobenius theorem. Moreover, in this case, there is already a positive eigenvector corresponding to the eigenvalue a=1, then the other eigenvalues of the random matrix W must satisfy $|\lambda| < 1$, so the solution of equation 8 is unique.

Since the number of nodes in a large-scale complex e-commerce network is very large, the application of formula is very important, and it needs to be implemented through matrix operations and iterations.

First, the algorithm introduces:

$$x = [0,0,...,0,1]^T_{(N+1)\times 1} \tag{13}$$

$$\tilde{W} = \begin{bmatrix} W - I \\ e \end{bmatrix} \tag{14}$$

Among them, e is the all-one column vector. Then formulas 8 and 10 can be integrated into the following formula:

$$\tilde{W}R = x \tag{15}$$

By multiplying both sides to the left of $\tilde{W}^+$ at the same time, the following formula is obtained:

$$R = \tilde{W}^{+} x \tag{16}$$

Among them, $\tilde{W}^{+}$ is the generalized inverse matrix of $\tilde{W}$, and then what is needed is to iterate the equation 8 to convergence, that is, the result will converge when the random matrix is irreducible. However, this condition is too harsh, and the robustness of the algorithm is insufficient, so a processing method of PageRank is cited here, which uses the convex combination U of two random matrices to replace the random matrix W:

$$\begin{cases} U = \alpha W + (1-\alpha) E \\ E = \dfrac{ee^T}{N} \\ 0 < \alpha < 1 \end{cases} \tag{17}$$

This ensures that the newly obtained matrix U is an irreducible matrix, and no matter how the initial value is set, R(n) will eventually converge to a unique and stable vector. Then, after initializing R(O), the formula R=UR can be iterated until the result converges. When judging whether the result is convergent, it is necessary to perform vector subtraction on R(n) in the current state and R(n-1) in the previous state. At the same time, the concept of the positive infinity norm of the vector needs to be introduced, that is, the maximum value among the absolute values of all elements in the vector. When the positive infinity norm of the difference between the two states is less than the given standard common, the result converges, namely:

$$\left\| R(n) - R(n-1) \right\|_{\infty} < \varepsilon \tag{18}$$

The obtained vector R(n) is the NodeRank value of all nodes-importance. Next, by sorting the importance of each node, the analysis of the key nodes in the large-scale complex e-commerce network is completed.

In order to be able to prove the feasibility of the NodeRank algorithm and explain the general idea of the entire algorithm, this section constructs a network with only 4 nodes and directed weighted edges for a concise analysis, as shown in Figure 2:

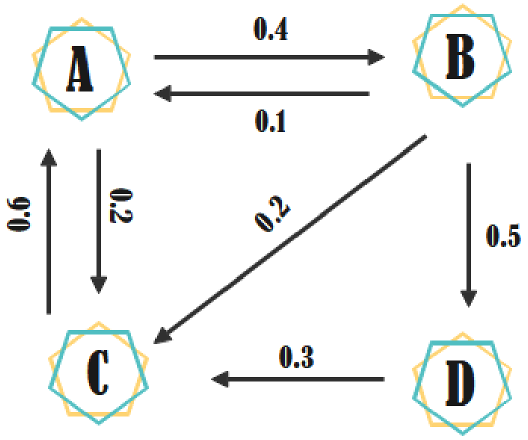

Figure 2: Schematic diagram of NodeRank algorithm case.

In terms of network representation, the NodeRank algorithm is somewhat different from the PageRank algorithm. PageRank algorithm needs to use the adjacency matrix to represent the topological structure of the entire network, and then use the adjacency matrix to calculate the transition probability matrix and transpose it. However, the NodeRank algorithm directly transforms the network into a transposed matrix w of the relationship strength ratio. Each element w_{ji} in the matrix represents the proportion of the strength of the relationship from node j to node i in the sum of the link-in relationship strength of all the neighboring nodes of node i. The figure shows:

$$W=\begin{bmatrix} 0 & 2/3 & 1/3 & 0 \\ 1/8 & 0 & 1/4 & 5/8 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}=\begin{bmatrix} 0 & 1/8 & 1 & 0 \\ 2/3 & 0 & 0 & 0 \\ 1/3 & 1/4 & 0 & 1 \\ 0 & 5/8 & 0 & 0 \end{bmatrix}$$

Since there are 4 nodes in the network, it is known that:

$$E=ee^T/N=\begin{bmatrix} 1/4 & 1/4 & 1/4 & 1/4 \\ 1/4 & 1/4 & 1/4 & 1/4 \\ 1/4 & 1/4 & 1/4 & 1/4 \\ 1/4 & 1/4 & 1/4 & 1/4 \end{bmatrix}$$

In a sparse and complex e-commerce network, ɑ=0.85 is usually taken and brought into $U=\alpha W+(1-\alpha)E$ to obtain:

$$U=\begin{bmatrix} 0.0375 & 0.14375 & 0.8875 & 0.0375 \\ 0.60417 & 0.0375 & 0.0375 & 0.0375 \\ 0.32083 & 0.25 & 0.0375 & 0.8875 \\ 0.0375 & 0.56875 & 0.0375 & 0.0375 \end{bmatrix}$$

Next, the algorithm initializes 4 nodes, sets the initial value of each node's importance to 1, which is $R=[1,1,1,1]^T$, and then calculates the importance of the node through loop iterations. The first step is to calculate R(l). The process is as follows:

$$R(1)=UR(0)=\begin{bmatrix} 0.0375 & 0.14375 & 0.8875 & 0.0375 \\ 0.60417 & 0.0375 & 0.0375 & 0.0375 \\ 0.32083 & 0.25 & 0.0375 & 0.8875 \\ 0.0375 & 0.56875 & 0.0375 & 0.0375 \end{bmatrix}\begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}=\begin{bmatrix} 1.10625 \\ 0.71667 \\ 1.49583 \\ 0.68125 \end{bmatrix}$$

Then, the algorithm performs a convergence check. Since the positive infinity norm of R(1)-R(0) is 0.49583, the error is relatively large, and the next iteration is needed to calculate R(2). In the same way, we can get:

$$R(1)=UR(1)=\begin{bmatrix} 0.0375 & 0.14375 & 0.8875 & 0.0375 \\ 0.60417 & 0.0375 & 0.0375 & 0.0375 \\ 0.32083 & 0.25 & 0.0375 & 0.8875 \\ 0.0375 & 0.56875 & 0.0375 & 0.0375 \end{bmatrix}\begin{bmatrix} 1.10625 \\ 0.71667 \\ 1.49583 \\ 0.68125 \end{bmatrix}=\begin{bmatrix} 1.4976 \\ 0.77688 \\ 1.19479 \\ 0.53673 \end{bmatrix}$$

Furthermore, the convergence check is performed on the results of the current state. If it does not converge, continue the cycle iterative process above until the positive infinity norm of $R(n)-R(n-1)$ is less than the allowable error range ε, that is, the result converges. The R(n) obtained at this time is the importance of each node.

4 RESEARCH ON THE INNOVATION SYSTEM OF E-COMMERCE LOGISTICS SERVICE MODEL BASED ON BIG DATA TECHNOLOGY

When evaluating e-commerce logistics services, according to the system's point of view, the evaluation index system is a whole composed of several individual evaluation indexes, which should be comprehensive, reasonable and scientific. The indicators that reflect logistics services are mainly composed of the following four indicators: transportation, warehousing, informatization level and development potential. Each indicator is divided into service productivity and quality indicators for evaluation, as shown in Table 1.

Transportation	*Service productivity*	*Transport costs as a percentage of the value of the item*
		Freight per ton-kilometer
	Service quality	*Loading efficiency*
		Item damage rate
Warehousing	*Service productivity*	*Equipment time utilization*
		Warehouse utilization
	Service quality	*Good preservation rate*
Information level	*Service productivity*	*Response rate to customer changes*
		Completion rate of customer changes
	service quality	*Network coverage*
		Error rate of information dissemination
Development potential	*Service quality*	*Average delivery time*
	Service productivity	*Asset utilization*
		Market share

Table 1: Comprehensive evaluation indicators of e-commerce logistics services.

Logistics service productivity index refers to the efficiency of logistics service input and output in the evaluation system. It is the process of certain service consumption and service input to complete a certain service output, including manpower, technology, resources, etc. Moreover, the value of each input is represented by the cost of service. Service quality indicators are also an important part of the evaluation of logistics services, which mainly include the reliability of the service in terms of quality, time, and location, as well as customer satisfaction after the service. The current evaluation indicators of logistics enterprises are mainly based on the evaluation of the main department functions, and cannot evaluate the service status of logistics enterprises very well, while logistics services based on business processes can accurately reflect the performance of logistics services.

The composition of the logistics service evaluation based on department functions and the evaluation based on business process is shown in Figures 3 and 4, and the difference between the two can be seen from the figure.

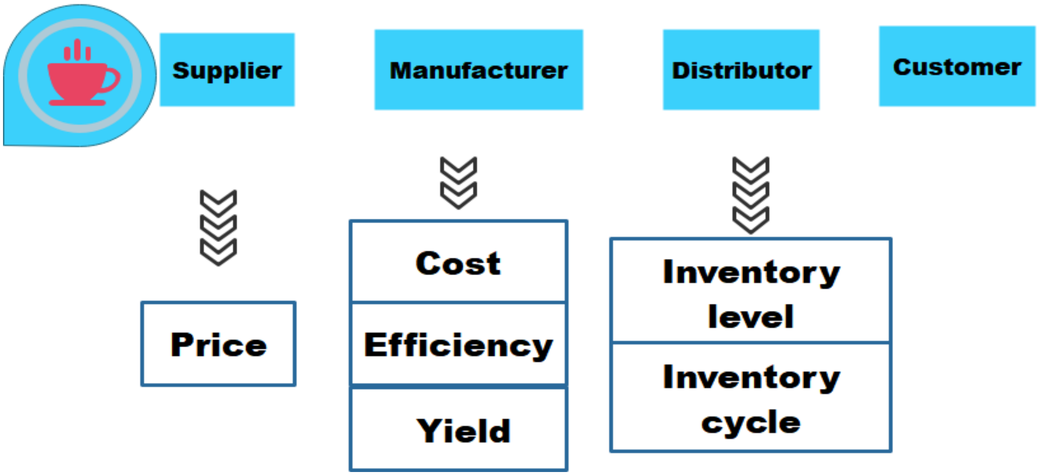

Figure 3: Schematic diagram of logistics service evaluation based on department Functions.

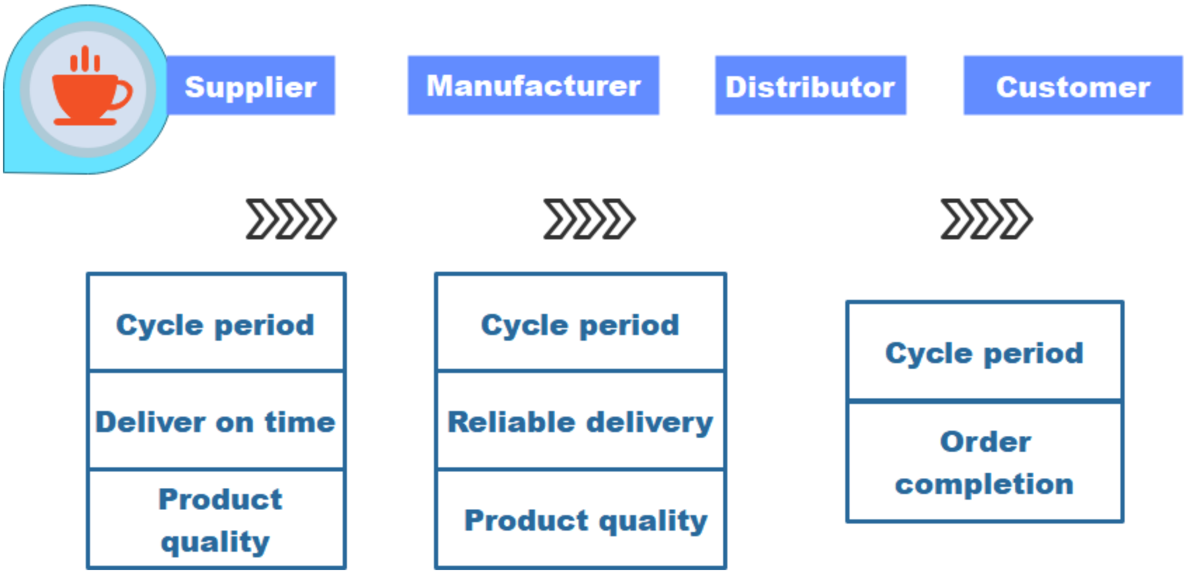

Figure 4: Schematic diagram of logistics service evaluation based on business process.

The establishment of the logistics service index system must first determine the exploration of the core competitiveness of logistics enterprises, which is crucial to the overall operation of logistics services. The logistics service of each logistics company is different, and its competitiveness is also different. The process of determining the core competitiveness should be determined from the perspective of the customer, customer-oriented operation, and the relationship between the overall goal and the goals of each partner company should be determined. The determination of the evaluation index should be consistent with the index of the previous step, which requires the coordination of various inspection points. Determine the real-time changeability of the logistics service evaluation system in the implementation process, effectively operate and provide feedback. To this end, it takes value-added activities as the core, expands outward, and is driven by the customer market, creates value through service innovation, and realizes the long-term development of customers and strategic partners. Its overall framework model is shown in Figure 5.

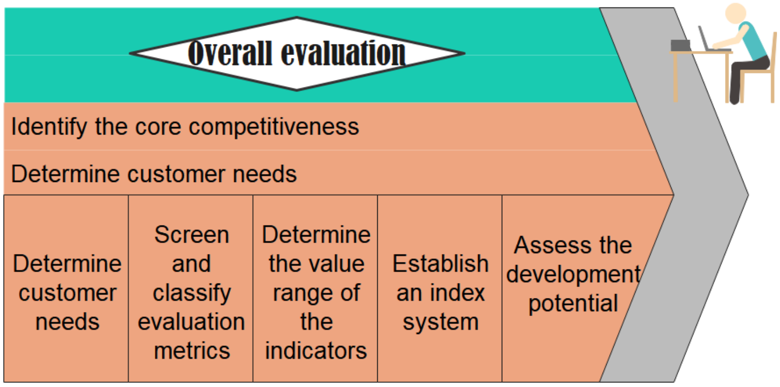

Figure 5: The overall framework model of the logistics service evaluation system.

According to the characteristics of the modern logistics service value chain, the modern logistics service value chain can include three systems: primary service system, technical service system and value-added service system. In economic life, these three systems can operate independently or be linked to each other to maximize the value-added of the service value chain.

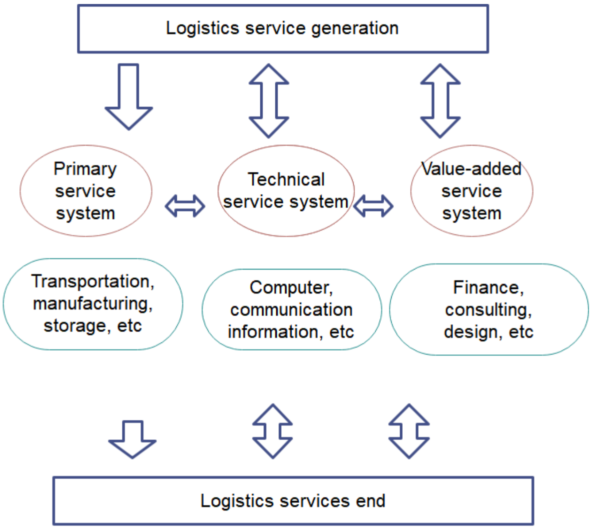

Figure 6: Modern logistics service value chain system.

In the value-added process of the logistics service value chain, from the analysis of value-added capabilities, R&D, manufacturing and after-sales service contribute the most to the value-added of the service value chain, showing a curvilinear growth trend. For example, the value-added in the manufacturing process is mainly manifested in the transformation of the product or service, and the resulting value-added, of which the proportion of value-added is about 30%, and it is in a declining trend. What is involved in the R&D link is technical, professional, and knowledge-intensive. It is the core value-added link of the value chain. The value-added ratio in the value chain is about 50%, and it is increasing. The after-sales service link is mainly manifested in the value-added of the downstream value chain, which can realize the value of the service, and its value-added is intangible. The value-added ratio in the value chain is 20%, showing an increasing trend (Figure 7). Therefore, in the value-added research of the logistics service value chain, according to the value-added law of the value chain, the focus should be shifted from the manufacturing link to the links with added value such as R&D and service.

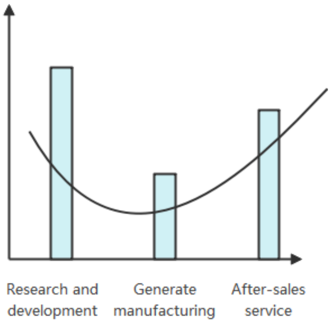

Figure 7: The smiling curve of value chain value-added.

In the logistics service value chain, the value added of each link is different, and due to the development of production technology, the differences in the logistics services provided in manufacturing are getting smaller and smaller. When the manufacturing process completes its transformation in the service value chain and realizes value added, its cost control and efficiency continue to weaken, resulting in less and less value added to them, which is located in the lower jaw part of the value-added smile curve of the value chain. The modern logistics service value chain based on service science emphasizes the importance of service on the basis of technical support. Under the influence of these two concepts, two trends will emerge. One trend is that the lower jaw of the value-added smile curve of the value chain is concave, and the other is that as the technology content of the value chain increases, the curve corresponding to R&D and after-sales service is stretched upward (Figure 8).

The establishment of an integrated logistics integration model based on e-commerce-based supply chain management information organization and supply chain management can be shown in Figure 9. As a strategic partner of the client company, the third-party logistics company's own development will also affect the supply chain company's strategy formulation and supply chain management performance. The primary goal of third-party logistics service providers for logistics services is to provide high-quality logistics services to achieve the purpose of promoting supply chain management innovation, as shown in Figure 10.

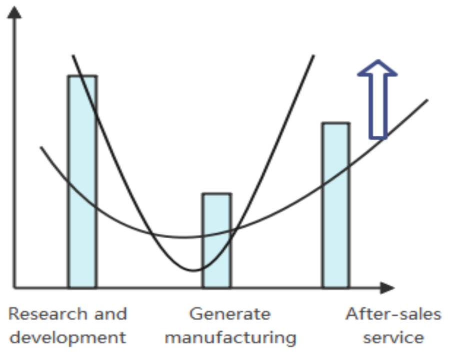

Figure 8: Value-added trend of logistics service value chain.

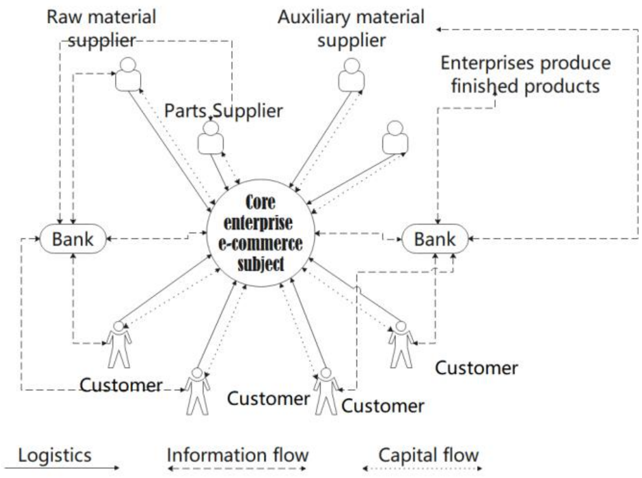

Figure 9: The integration model of supply chain management information organization and integrated logistics based on e-commerce.

The integrated logistics agency model cannot be achieved overnight in the implementation process. However, it should gradually deepen, and gradually develop, and from immature to mature and perfect. This process conforms to my country's specific national conditions and is suitable for the development of my country's logistics industry, as shown in Figure 11.

5 CONCLUSION

The emergence and application of big data has rapidly changed the development process of the entire society. Big data is an important foundation for the development of e-commerce, and it is an important force to promote the innovation and improvement of e-commerce logistics service models.

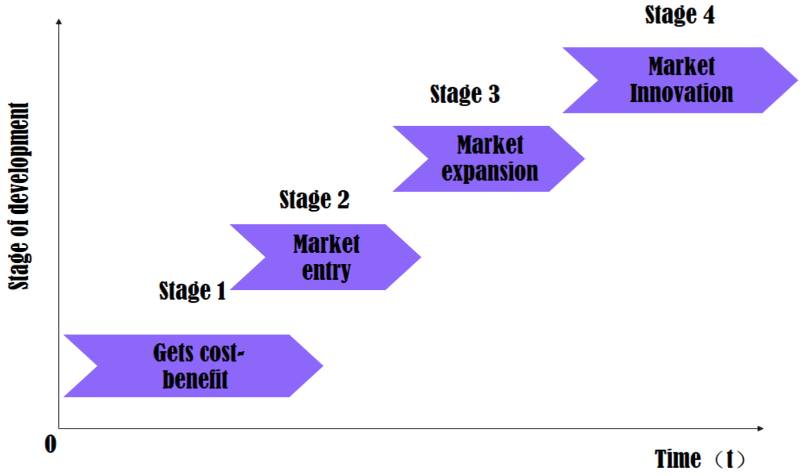

Figure 10: The development model of third-party logistics enterprises based on logistics Capabilities.

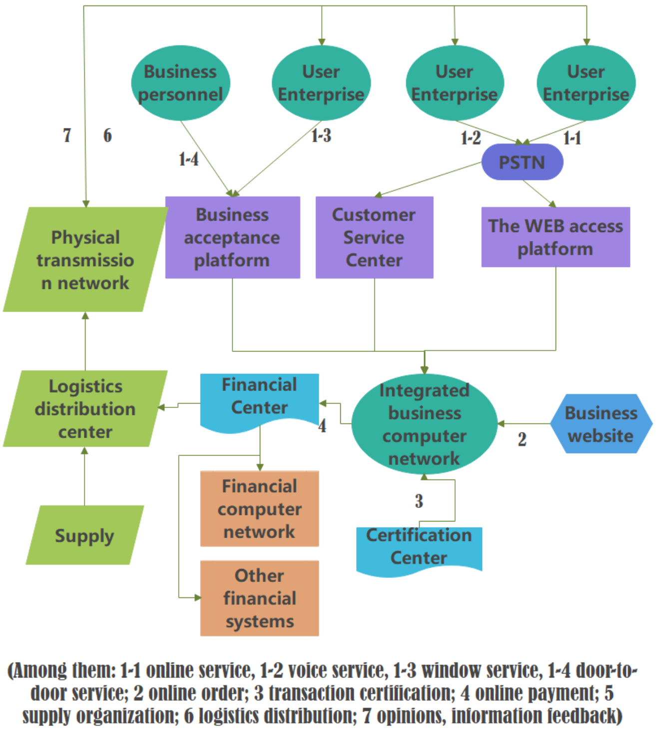

Figure 11: Business flow chart of integrated logistics agency.

In the context of big data, e-commerce logistics companies must make full use of advanced big data technology to further innovate e-commerce logistics service models in order to better meet the higher needs of users. With economic globalization and fierce market competition, traditional promotion methods only provide a platform (trade show, B2B e-commerce platform, procurement catalog, etc.) for suppliers to participate in the display of enterprises and products. This can no longer meet the needs of enterprise development, and enterprise users have also put forward higher requirements for the application requirements of B2B e-commerce platforms. Therefore, under the current situation, B2B platform service functions should target the actual application needs of enterprise users. This paper combines big data technology and Internet of Things technology to analyze the current e-commerce model and build an e-commerce logistics service model innovation system. From the research of the paper, it can be seen that big data technology can play an important role in the innovation of e-commerce logistics service model.

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