

Construction of an E-Commerce System Based on 5G and Internet of Things Technology

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ABSTRACT

In order to improve the comprehensive performance of the e-commerce system, this paper combines 5G communication technology and the internet of things technology to improve the e-commerce system and conduct end-point analysis on the e-commerce client data analysis system and smart logistics system. Moreover, this paper uses 5G technology to improve machine learning algorithms to process e-commerce back-end data and improve the efficiency of e-commerce client data processing. In addition, this paper combines the internet of things to build an e-commerce smart logistics system model to improve the overall efficiency of the logistics system. Finally, this paper combines the demand analysis to construct the functional module structure of the e-commerce system and verifies the practical functions of the system through experimental research. From the experimental research results, it can be seen that the e-commerce system based on 5G communication technology and internet of things technology constructed in this paper is very reliable.

KEYWORDS

5G Communication, E-Commerce, Internet of Things, System Construction

1. INTRODUCTION

Describe the general perspective of the article. End by specifically stating the objectives of the article.

With the expansion of the scale of e-commerce websites and the surge in the number of users, traditional data storage technologies and data processing technologies are difficult to meet online application scenarios with high concurrency, low latency, and complex dependencies. Therefore, e-commerce is the first to carry out the research and application of large-scale distributed storage technology. For example, in response to scenarios such as Double Eleven, Alibaba switched its data storage method from open source databases to commercial databases. Moreover, it has independently developed databases when commercial databases cannot meet performance requirements, and has carried out more theoretical and practical innovations based on the open source framework (Abd-Elmagid, M.A., Pappas, N., & Dhillon, H. S. 2019). E-commerce is an important field of computer technology innovation, and the study of key technologies of e-commerce has important historical significance. From its birth to its rise, e-commerce has been accompanied by computer technology innovation. Moreover, similar to the beginning of the development of search websites, the early e-commerce websites have been operating with cheap computers due to cost and other pressures, and continue to explore and innovate technology in the software system architecture, especially the distributed architecture. In particular, many theoretical innovations have been proposed in the aspects of distributed technology, cloud computing, and data consistency technology (Alalwan, A. A., Rana,

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N.P., & Dwivedi, Y.K.,2017).In addition, e-commerce also promotes the development of logistics, express delivery, warehousing, supply chain and other related industries. Large-scale e-commerce companies have strengthened cooperation with industries such as finance, medical care, and social security, and have more applications and practices in encryption technology, federated learning, and artificial intelligence.

At the same time, there are still many technical problems to be solved in the field of e-commerce, and research on key technologies of e-commerce has important practical significance. At the infrastructure level, cloud computing technology solves the basic storage problem of e-commerce and reduces hardware input costs. E-commerce companies such as Amazon and Alibaba not only use cloud computing technology for their own business, but also package them to market (Batra, R., & Keller, K. L.,2016).

Based on the above analysis, this paper combines 5G communication and Internet of Things technology to carry out the innovative construction of the e-commerce system, analyzes the needs of the e-commerce platform in the current state, and builds the corresponding functional modules to further improve the system performance on this basis.

2. RELATED WORK

The relevant research on the application of 5G technology and Internet of Things technology in e-commerce systems is summarized as follows:

Through combing the domestic and foreign literature of the e-commerce industry, we know that e-commerce has strong applicability and its development prospects are very broad. However, the development of the e-commerce industry is still immature, and there are no complete laws and regulations to effectively restrict it, which has caused many problems, such as credit problems caused by the difficulty of information management, complicated management and control of payment and logistics links, etc., and affect the development of the e-commerce industry (Cattaruzza, D., Absi, N., & Feillet, D.,2017). To ensure that e-commerce can give full play to its unique advantages among value creation subjects, researchers analyze from a value perspective and study the key influencing factors of value creation among members of the e-commerce platform ecosystem. Moreover, researchers use evolutionary games to find the optimal strategy for maximizing system value and balancing and stabilizing value distribution to provide reference and basis for core platform companies to make internal adjustments, governance, and participate in the construction of platform ecosystem value maximization. This helps to give full play to the advantages of the e-commerce industry, avoid the possible problems of e-commerce to the greatest extent, and realize the value enhancement of the entire e-commerce industry in the long run (Dobkin, B. H.,2017).

The literature(Erevelles, S., Fukawa, N., & Swayne, L.,2016) studied the characteristics of rapid mass production of e-commerce platforms. The literature(Feng, H., Morgan, N. A., & Rego, L. L.,2015) proposed that one of the ways for companies to increase market value is to realize multi-derivative production by relying on e-commerce platforms. The literature (Germann, F., Ebbes P., & Grewal, R.,2015) put forward the dynamic development viewpoint that e-commerce platform will gradually evolve. The literature (Grabara, J., Kolcun, M., & Kot, S.,2014)proposed to rationally plan and develop e-commerce platforms in order to achieve the best resource utilization efficiency. The literature(Harmeling, C. M., Moffett, J. W., & Arnold, M. J.,2017)) pointed out that open innovation is an important driving force for the development of e-commerce platforms. The literature (Homburg, C., Jozić, D., & Kuehnl, C.,2017) believed that the great value created by e-commerce platforms lies in the establishment of a competitive advantage that is difficult for the industry to imitate. With the development of the industry and the continuous improvement of various production technologies, scholars' research on e-commerce platforms has expanded to focus on e-commerce platform-based enterprises. The literature (Kannan, P. K.,2017). believed that e-commerce platform companies are special tool-based companies that connect different transaction groups in the market. The literature

(Leeflang, P. S. H., Verhoef, P. C., & Dahlström, P.,2014)pointed out that e-commerce platform companies have cross-edge network effects. The literature proposed that other companies can rely on e-commerce platform companies to better utilize their own product, technology or service advantages. The literature (Martin, K. D., & Murphy, P. E.,2017) pointed out that most e-commerce platform companies need to actively take effective measures to establish contacts with various stakeholders. Moreover, it pointed out that e-commerce platform companies need to further evolve to form a unity of mutual influence and restriction with various stakeholders, that is, the e-commerce platform ecosystem. The literature (Mayer, M., & Baeumner, A. J.,2019)pointed out that in the business ecosystem, companies can meet user needs through collaborative competition and cooperative relationships, and achieve corporate development. The literature (Moorman, C., & Day, G. S.,2016) pointed out that technology can increase the value of e-commerce platform ecosystem. The literature(Qadri, Y. A., Nauman, A., & Zikria, Y. B.,2020) constructed the health performance evaluation index of the e-commerce business ecosystem. Literature(Rust, R. T., & Huang, M. H.,2014) proposes that resources are the basis for the value creation of the e-commerce platform ecosystem. Literature(Siboni, S., Sachidananda, V., & Meidan, Y.,2019) classifies the e-commerce platform ecosystem and divides the development of the e-commerce platform ecosystem into four stages.

The literature (Siegel, J. E., Kumar, S., & Sarma, S. E.,2017)pointed out that the e-commerce platform ecosystem is a two-sided market, that is, users on both sides are connected through the platform, and the income from one side's participation can affect the scale of users on the other side. The literature (Tiago, M. T. P. M. B., & Verissimo, J. M. C.,2014) proposed a "divide and conquer" strategy from the perspective of pricing. In the early stage of system development, measures such as free and subsidy were adopted for users on one side, and the value of the system was increased through the continuous expansion of the user scale on this side, and users on the other side were attracted to join the system by paying

At the same time, there are still many technical problems to be solved in the field of e-commerce, and research on key technologies of e-commerce has important practical significance.

3.5G network system model

This article combines 5G and Internet of Things technology to carry out the innovative construction of e-commerce system, analyzes the needs of the e-commerce platform in the current state, applies 5G communication technology to the e-commerce intelligent system, and improves the data processing efficiency of the e-commerce system.

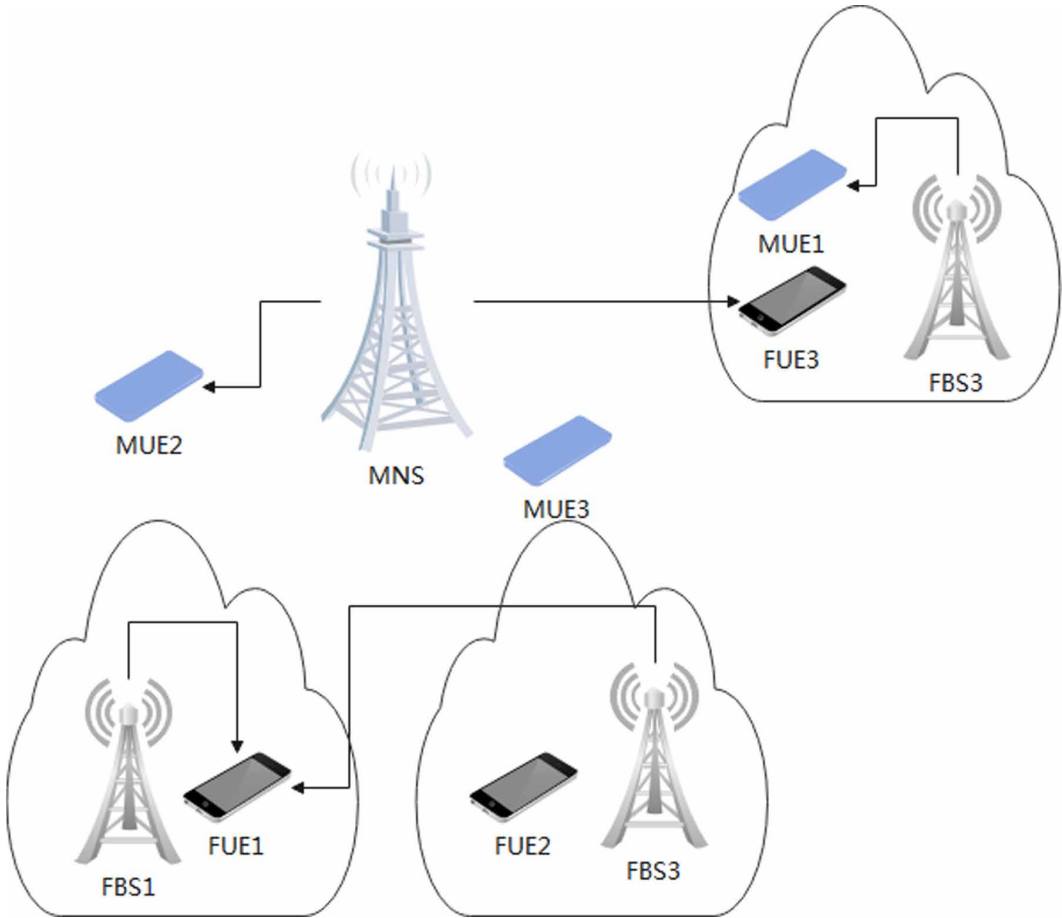
For ease of analysis, we assume that the coverage of FBS (Flexible Bandwidth Sharing)is a circular area with a radius of R_f . The downlink transmission interference in the ultra-dense heterogeneous network is mainly divided into three categories, including: the interference caused by FBS2 to the user FUE1 served by FBS1, the interference caused by MBS(Mobile Broadband System) on FUE3 served by FBS3, and the interference caused by FBS3 on MUE1 served by the macro base station. In the multi-cell heterogeneous network shown in Figure 1, the wireless links between cells and users of different layers and the corresponding received power can be represented by the following five types.

- (1) The service link between the macro base station MBS and the macro user MUE:

$$P_m^k = P_{B,m}^k h_{B,m}^k G_{B,m}^k \quad (1)$$

- (2) The interference link of the macro base station MBS to the micro cell user FUE:

Figure 1. Downlink interference scenario diagram in ultra-dense heterogeneous network



$$I_{B,j_f}^k = \sum_{m \in M} s_m^k P_{B,m}^k h_{B,j_f}^k G_{B,j_f}^k \quad (2)$$

(3) The service link between micro base station and micro user:

$$P_{j_f}^k = P_{f,j_f}^k h_{f,j_f}^k G_{f,j_f}^k \quad (3)$$

(4) The interference from other micro base stations FBS received by micro cell user $FUE j_f$:

$$I_{F^*,j_f}^k = \sum_{f^* \in F^*} \sum_{j_{f^*} \in J_{f^*}} s_{j_{f^*}}^k P_{f^*,j_{f^*}}^k h_{f^*,j_{f^*}}^k G_{f^*,j_{f^*}}^k \quad (4)$$

(5) The interference of micro base station FBS to macro user MUE:

$$I_{F,m}^k = \sum_{f \in F} \sum_{j_f \in J_f} s_{j_f}^k P_{f,j_f}^k h_{f,m}^k G_{f,m}^k \quad (5)$$

Among them, $K = \{k | k = 1, 2, \dots, K\}$ represents the set of all available channels, $M = \{m | m = 1, 2, \dots, M\}$ represents the set of macro user MUEs within the MBS coverage area of the macro base station, and $F = \{f | f = 1, 2, \dots, F\}$ represents the set of FBSs within the MBS coverage area of the macro base station. $F^* : \{f^* \in F^*\}$ represents the set of all FBSs under the coverage of MBS except the micro station $FBS f$, $J_f : \{j_f \in J_f\}$ represents the set of FUEs served by $FBS f$, and $J_F : \{j_f \in J_F\}$ represents the set of all FUEs in the network. In each subscript of the above formula, B represents the macro base station MBS, and $P_{B,m}^k (P_{f,j_f}^k)$ represents the transmit power transmitted from $MBS B (FBS f)$ and $MUE m (FUE j_f)$ on channel k . $h_{B,m}^k (h_{f,j_f}^k)$ represents the channel gain when transmitting from $MBS B (FBS f)$ and $MUE m (FUE j_f)$ on channel k , and $G_{B,m}^k (G_{f,j_f}^k)$ represents the path loss of transmitting on from $MBS B (FBS f)$ and $MUE m (FUE j_f)$ on channel k . s_m^k is an indicator variable for channel allocation. For example, $s_m^k = 1$ means channel k is allocated to $UE m$, and vice versa $s_m^k = 0$. We assume that all cells in the network can use the channel resources in the set K , and the network contains one MBS and N_F FBS (Tofighi, S., Torabi, S. A., & Mansouri, S. A., 2016).

When the macro base station $MBS B$ uses channel k for downlink transmission, the SINR received by the macro user $MUE m$ served by it is expressed as the following formula:

$$SINR_m^k = \frac{P_m^k}{I_{F,m}^k + N_0} \quad (6)$$

For user $FUE j_f$ in the micro cell, the SINR for receiving $FBS f$ on channel k is:

$$SINR_{j_f}^k = \frac{P_{j_f}^k}{I_{B,j_f}^k + I_{F^*,j_f}^k + N_0} \quad (7)$$

Among them, $I_{F,m}^k$ represents the co-channel interference of FBS to MBS on channel k , and I_{B,j_f}^k represents the co-channel interference of MBS to $FUE j_f$. I_{F^*,j_f}^k represents the co-channel interference from other micro cell FBS received by user $FUE j_f$ when the micro base station $FBS f$ shares the channel k with other FBS in the set F^* , and N_0 represents the noise level.

Since the coverage area of FBS is small, in order to quantitatively analyze the influence of interference, for two base stations BS_m and BS_n , Regional Average Interference Strength (RAIS) can be introduced to evaluate the magnitude of interference. For example, the average SINR generated by BS_n for user A_m in the BS_m service area can be expressed by the following formula (Wedel, M., & Kannan, P. K., 2016):

$$RAIS(m, n, A_m) = \iint_{S(A_m)} SINR_{m,n}(x, y) dx dy / S(A_m) \quad (8)$$

$$SINR_{m,n}(x, y) = P_{r,m}(x, y) / (P_{r,n}(x, y) + N_0) \quad (9)$$

Among them, (x, y) represents the position coordinates of the interfered user in the cell where BS_m is located, and $S(A_m)$ represents the size of the area of $BS A_m$, that is, the corresponding integration domain is:

$$A_m = \{(x, y) | x^2 + y^2 < R_m^2\} \quad (10)$$

When the regional average SINR is less than a certain threshold, that is, $RAIS(m, n, A_m) < SINR_{th}$, it is considered that the interference effect of $BS j$ on $BS i$ is obvious, that is, the two base stations should be allocated frequency resources that are orthogonal to each other (Yao, J., & Ansari, N., 2018).

Figure 2 shows a schematic diagram of downlink interference between FBSs. In order to simplify the analysis, we assume that the position coordinates of $FBS k$ and $FBS j$ are $(0, 0), (d, 0)$ respectively, and the coverage radius of the base station is R_k and R_j respectively. When these two base stations use the same frequency resources for downlink transmission, if only the effects of large-scale fading are considered, the received power of the service link and the received power of the interference link of the users in the coverage area of $FBS k$ are (Zhang, J. Z., Watson, Iv. G. F., & Palmatier, R. W., 2016):

$$P_{r,k} = P_k d_k^{-\alpha} = P_k (x^2 + y^2)^{-\alpha/2} \quad (11)$$

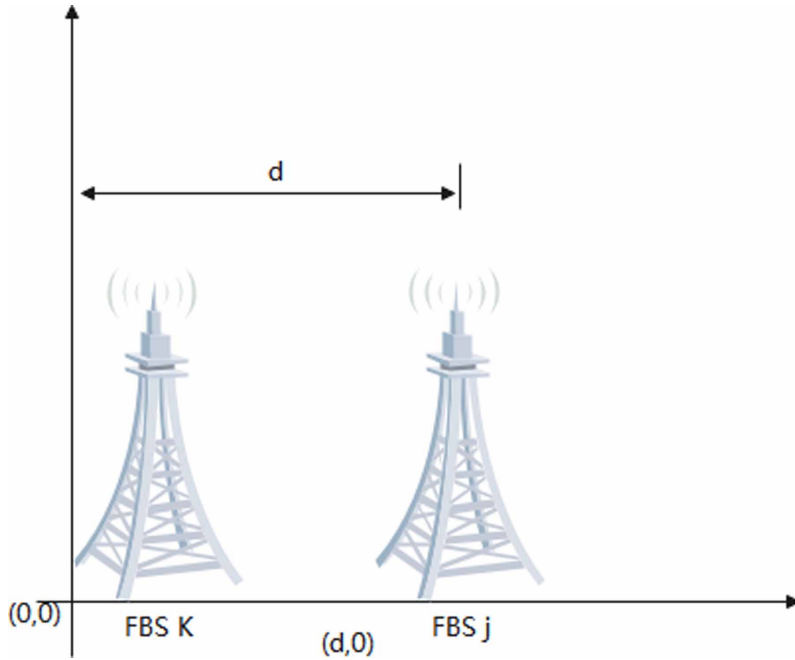
$$P_{r,j} = P_j d_j^{-\alpha} = P_j ((x-d)^2 + y^2)^{-\alpha/2} \quad (12)$$

In the formula, P_k and P_j are the transmit power of $FBS k$ and $FBS j$ respectively, and α is the path loss factor. In the actual scenario, the FBS will keep at least a certain distance from the user. The minimum distance is set to R_{min} , so the area where the interference effect is really caused is:

$$A_k = \{(x, y) | R_{min}^2 < x^2 + y^2 < R_k^2\} \quad (13)$$

According to the area $S(A_k)$ of the area covered by $FBS k$, we set $\alpha = 2$ (free space propagation model), and ignore the influence of noise N_0 . Then, the average signal to interference plus noise ratio of the area $FBS k$ affected by $FBS j$ can be expressed as:

Figure 2. Schematic diagram of downlink interference between FBS



$$\begin{aligned}
 RAIS(k, j, A_k) &= \int_{R_{\min}}^{R_k} dr \int_0^{2\pi} SINR_{k,j} r dr d\theta / S(A_k) \\
 &= \frac{P_k}{P_j} \left(1 + \frac{2d^2}{R_k^2 - R_{\min}^2} \ln \frac{R_k}{R_{\min}} \right) \tag{14}
 \end{aligned}$$

Among them,

$$SINR_{k,j}(x, y) = \frac{P_{r,k}}{P_{r,j} + N_0} \approx \frac{P_k}{P_j} \cdot \frac{(x-d)^2 + y^2}{x^2 + y^2} \tag{15}$$

It is not difficult to find that when the transmit power and coverage of *FBS k* and *FBS j* are fixed, the interference between FBS is only related to the distance $d_{k,j}$ between them. Therefore, the SINR constraint $RAIS(k, j, A_k) < SINR_{th}$ for determining whether there is interference between two FBS can be transformed into a distance constraint:

$$d < d_{\min} = \sqrt{(R_k^2 - R_{\min}^2) \left(\frac{SINR_{th} P_j}{P_k} - 1 \right) / \left(2 \ln \frac{R_k}{R_{\min}} \right)} \tag{16}$$

Considering that *MBS M* at the coordinate $(D, 0)$ in the network is transmitting data with the transmit power P_M , the interference that it may cause to the FUE within the service range of *FBS k* can be measured by the RAIS parameter, for example:

$$RAIS(k, M, A_k) = \frac{P_k}{P_M} \left(1 + \frac{2D^2}{R_k^2 - R_{\min}^2} \ln \frac{R_k}{R_{\min}} \right) \quad (17)$$

When the SINR condition $RAIS(k, j, A_k) < SINR_{th}$ is met, there are:

$$D < D_{\min} = \sqrt{\left(R_k^2 - R_{\min}^2 \right) \left(\frac{SINR_{th} P_M}{P_k} - 1 \right) / \left(2 \ln \frac{R_k}{R_{\min}} \right)} \quad (18)$$

Therefore, the SINR-based interference condition determination can be transformed into a distance-based constraint condition. For ease of description, when the location of an FBS satisfies the above inequality, the FBS is called an internal FBS.

We assume that in the network, there is one *MBS M* for data transmission at the origin of coordinate $(0, 0)$ with the transmission power P_M , and the other *FBS k*, which is located at (x_f, y_f) and has a transmission power P_F , is communicating with the corresponding network node. When a network node *MUE i* being served by MBS is located at (x, y) , its received signal-to-noise ratio is:

$$SINR_i = \frac{P_{r,m}}{P_{r,F} + N_0} \approx \frac{P_M}{P_F} \cdot \left[\frac{(x - x_f)^2 + (y - y_f)^2}{x^2 + y^2} \right]^{\alpha/2} \quad (19)$$

For ease of analysis, the interference noise is ignored in the above equation, and α is the path loss index. In order to estimate the interference between FBS and MUE, it is necessary to first analyze the interference area of MUE to FBS, that is, the area where the UE cannot meet the predetermined threshold of SINR. This area can be expressed as:

$$\begin{aligned} P &= \{(x, y) | SINR_i < SINR_{th}\} \\ &= \{(x, y) | (x - x_0)^2 + (y - y_0)^2 < R_0^2\} \end{aligned} \quad (20)$$

Among them,

$$\begin{aligned}
 x_0 &= \frac{P_M x_f}{P_M - SINR_{th} P_F} \\
 y_0 &= \frac{P_M y_f}{P_M - SINR_{th} P_F} \\
 R_0 &= \sqrt{\frac{P_M P_F SINR_{th} (x_f^2 + y_f^2)}{(P_M - SINR_{th} P_F)^2}}
 \end{aligned} \tag{21}$$

According to the information of MUE_i , FBS_k adds MUE_i to its own interference set, that is:

$$I_M(k) = \{MUE_i(x_i, y_i) | (x_i, y_i) \in P\} \tag{22}$$

4. CONSTRUCTION AND PERFORMANCE VERIFICATION OF E-COMMERCE SYSTEM BASED ON 5G AND INTERNET OF THINGS

The platform uses a 5-layer network architecture model to realize the simulation of the generation, transmission and processing of data packets in the protocol stack. Since the platform mainly focuses on the analysis of the MAC layer protocol, we simplify the layers other than the media access control sublayer of the protocol stack. It does not contain specific protocol standards, but achieves cross-layer transfer of packets through simple interfaces. Among them, the transmission process of different services at each terminal protocol layer is shown in Figure 3. The functions of each part are as follows:

Based on the above, this paper constructs a theoretical framework for the study of value creation game in the e-commerce platform ecosystem, as shown in Figure 4.

In the game research in the business field, the participants of the game can be clarified according to the way of drawing the value network. Therefore, the key members of the platform ecosystem are selected as the research object of the game and the value network is drawn, as shown in Figure 5.

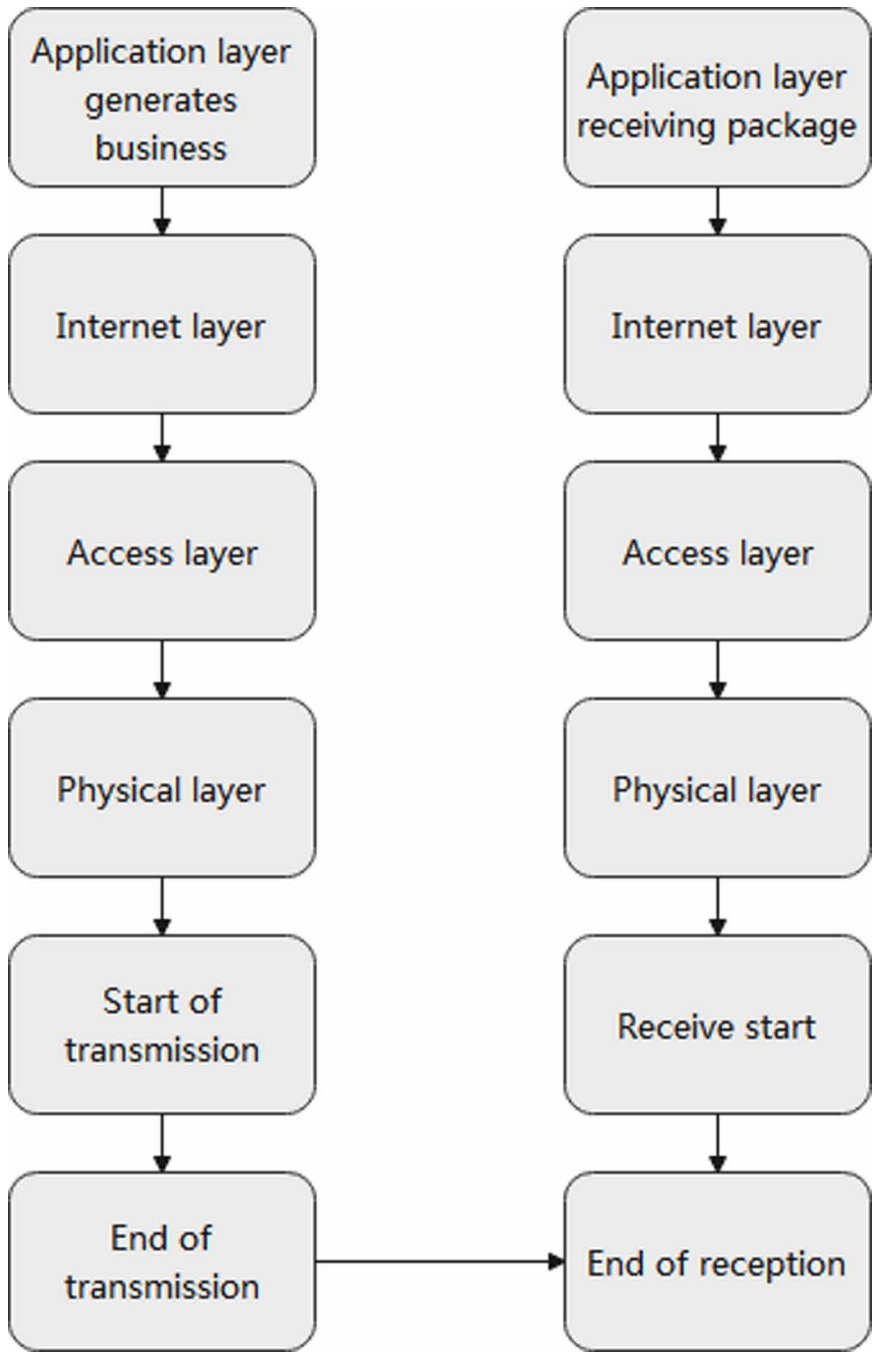
Real-time monitoring of the entire e-commerce system through the Internet of Things, rapid data transmission with 5G communication technology, a combination of the Internet of Things and 5G communication technology, and system integration in a data fusion way.

This article combines 5G technology and Internet of Things technology to construct an e-commerce Internet of Things system, and build a smart logistics system that can be applied to e-commerce. The business process of the intelligent distribution system is shown in the figure: After the customer places an order on the e-commerce website, the e-commerce website enters the consignment note. The warehouse will deliver the goods according to the instructions of the invoice, transfer the goods with the e-commerce logistics department or the third-party logistics company, and then generate the contract. The distribution center carries out vehicle scheduling and cargo stowage on-transit transportation within the final time limit. During the transportation of goods, the intelligent distribution system can realize the tracking of vehicles and the monitoring of goods, and the information is transmitted to the distribution center. The details are shown in Figure 6.

This article builds a simulation system through Matlab, tests the test parameters of this article, combines the statistical methods to process the test results, and expresses the test results in the form of graphs.

After constructing an e-commerce system based on 5G and the Internet of Things, the performance of the system was verified. The system constructed in this paper is mainly applied to the data processing

Figure 3. Platform protocol stack design



of e-commerce, and has the function of intelligent logistics information processing. Therefore, in the experimental research, the data processing effect of the e-commerce system is first analyzed, and 100 sets of simulation tests are set up for analysis. The results are shown in Table 1 and Figure 7.

Figure 4. E-commerce platform ecosystem

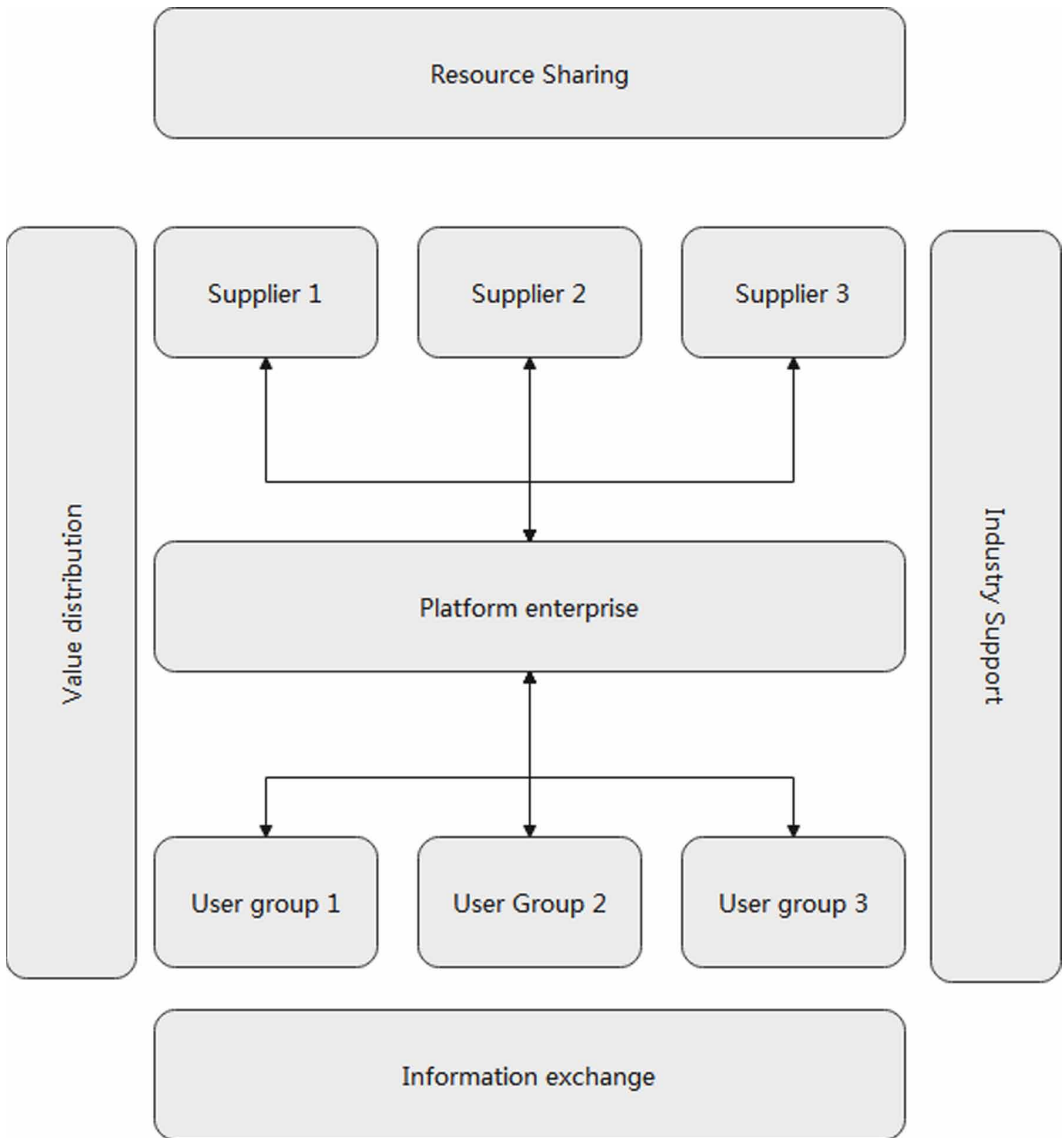


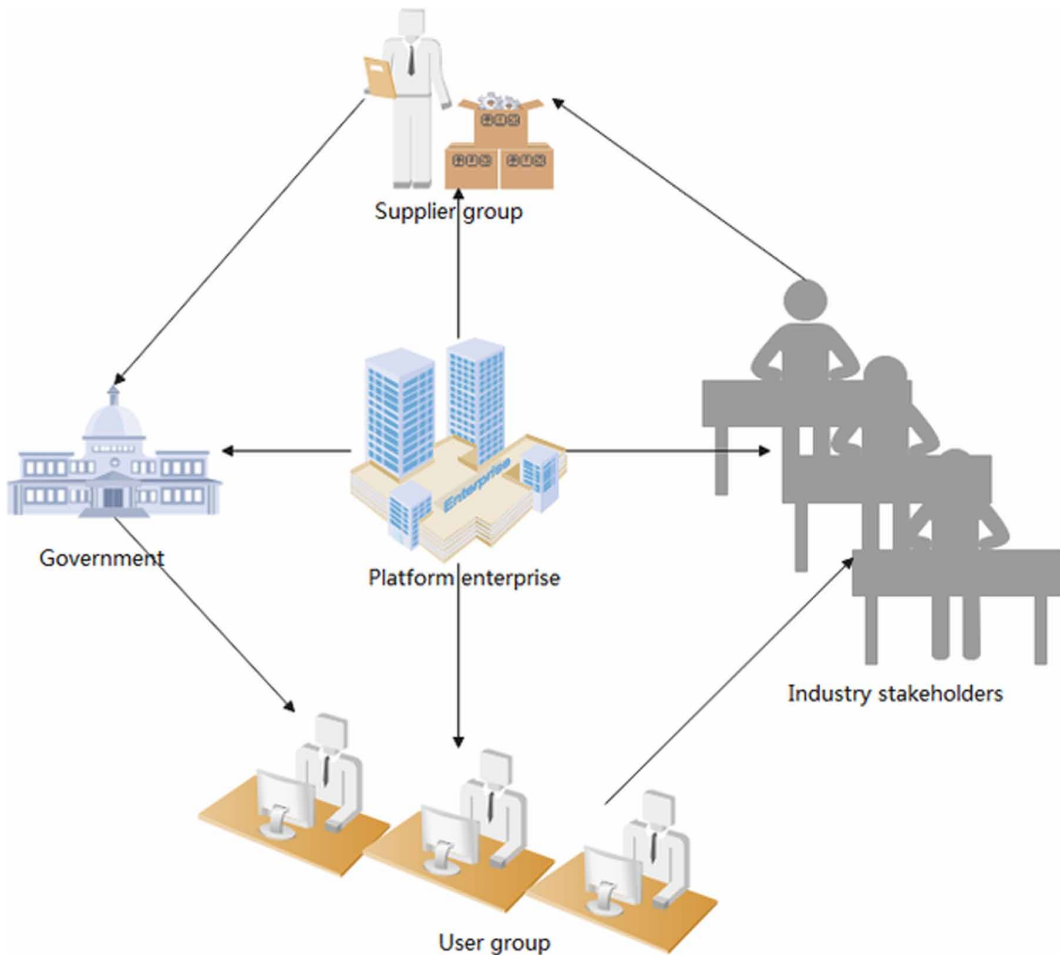
Table.1 Statistical table of evaluation of data processing effect of e-commerce system based on 5G and Internet of Things technology.

Through the above analysis, it can be known that the e-commerce system based on 5G and Internet of Things technology constructed in this paper has good data processing effects. Therefore, the e-commerce intelligent system constructed in this paper has good network service capabilities. Next, this paper evaluates and analyzes the logistics effect of e-commerce, and also conducts experiments through simulation research methods. The results are shown in Table 2 and Figure 8.

Table.2 Statistical table of the evaluation of the smart logistics effect of the e-commerce system based on 5G and Internet of Things technology.

From the research results of the simulation experiment, it can be seen that the e-commerce system based on 5G and Internet of Things technology constructed in this paper has high logistics

Figure 5. The value network of the e-commerce platform ecosystem

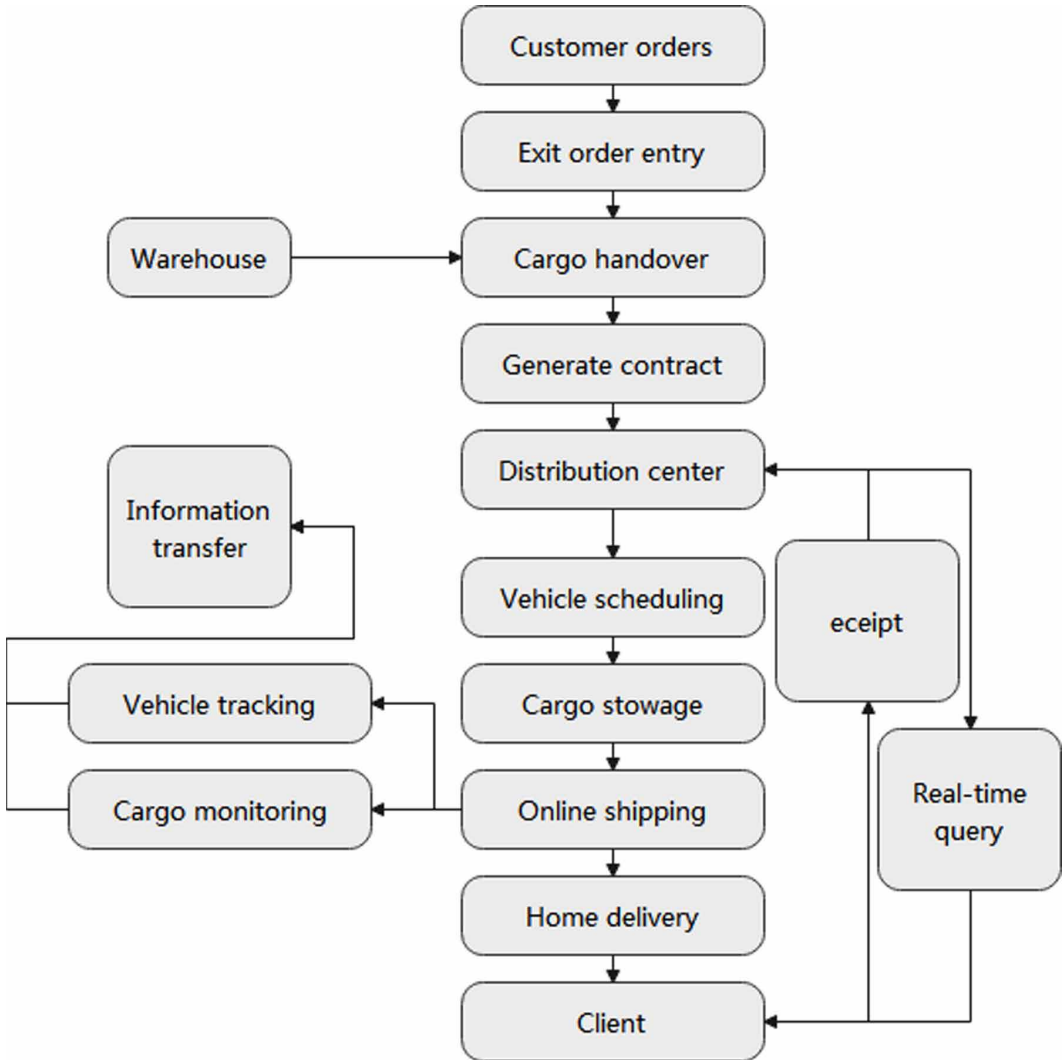


efficiency, which is closely related to the improvement of the effect of 5G communication technology and Internet of Things technology on smart logistics.

5. CONCLUSION

There are still many technical problems to be solved in the field of e-commerce, so the research on key technologies of e-commerce has important practical significance. This article combines 5G and Internet of Things technology to carry out the innovative construction of e-commerce system, and analyzes the needs of the e-commerce platform in the current state. Moreover, this paper applies 5G communication technology to the e-commerce intelligent system to improve the data processing efficiency of the e-commerce system, and combines the Internet of Things to carry out real-time tracking of logistics and express delivery to construct a smart logistics system. In addition, this paper carries out the modular design of the system function structure according to the actual needs of the e-commerce system, and studies the system frame structure and algorithm operation process to obtain a comprehensive system model. Finally, this paper conducts system function evaluation through experimental research on this basis. From the research results of the simulation experiment, it can be

Figure 6. E-commerce smart logistics system based on 5G and Internet of Things technology



seen that the e-commerce system based on 5G and Internet of Things technology constructed in this paper has a high data processing effect and logistics efficiency, and meets the practical needs of the e-commerce system. For the Internet of Things technology, especially its application and technical research in distribution, the research in this article is only a simple preliminary discussion in practical applications, and further verification is needed in combination with practice.

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Table 1.

| NO. | Data processing effect | NO. | Data processing effect | NO. | Data processing effect | NO. | Data processing effect |
|-----|------------------------|-----|------------------------|-----|------------------------|-----|------------------------|
| 1 | 88.64 | 26 | 92.89 | 51 | 94.07 | 76 | 84.63 |
| 2 | 91.77 | 27 | 86.42 | 52 | 94.74 | 77 | 87.89 |
| 3 | 85.96 | 28 | 87.10 | 53 | 92.32 | 78 | 85.62 |
| 4 | 84.56 | 29 | 89.64 | 54 | 91.98 | 79 | 89.38 |
| 5 | 86.72 | 30 | 85.71 | 55 | 85.05 | 80 | 87.49 |
| 6 | 87.51 | 31 | 90.11 | 56 | 92.31 | 81 | 90.07 |
| 7 | 88.65 | 32 | 89.02 | 57 | 88.73 | 82 | 90.71 |
| 8 | 85.08 | 33 | 86.87 | 58 | 84.19 | 83 | 91.22 |
| 9 | 85.77 | 34 | 93.67 | 59 | 84.63 | 84 | 90.91 |
| 10 | 88.19 | 35 | 94.49 | 60 | 89.41 | 85 | 85.16 |
| 11 | 85.13 | 36 | 88.74 | 61 | 85.97 | 86 | 86.78 |
| 12 | 87.06 | 37 | 89.82 | 62 | 90.29 | 87 | 90.59 |
| 13 | 84.18 | 38 | 92.01 | 63 | 90.08 | 88 | 91.78 |
| 14 | 84.28 | 39 | 90.79 | 64 | 92.81 | 89 | 85.64 |
| 15 | 89.00 | 40 | 93.96 | 65 | 92.02 | 90 | 94.68 |
| 16 | 85.46 | 41 | 92.75 | 66 | 84.45 | 91 | 90.35 |
| 17 | 90.06 | 42 | 85.06 | 67 | 84.57 | 92 | 90.24 |
| 18 | 88.81 | 43 | 92.99 | 68 | 94.78 | 93 | 91.22 |
| 19 | 92.15 | 44 | 84.39 | 69 | 86.52 | 94 | 86.28 |
| 20 | 94.09 | 45 | 94.21 | 70 | 86.27 | 95 | 87.64 |
| 21 | 88.50 | 46 | 86.68 | 71 | 90.95 | 96 | 94.96 |
| 22 | 91.48 | 47 | 92.25 | 72 | 89.94 | 97 | 92.75 |
| 23 | 88.44 | 48 | 93.73 | 73 | 88.25 | 98 | 86.90 |
| 24 | 94.40 | 49 | 93.42 | 74 | 85.56 | 99 | 84.20 |
| 25 | 92.21 | 50 | 89.17 | 75 | 89.48 | 100 | 88.11 |

Figure 7. Statistical diagram of evaluation of data processing effect of e-commerce system based on 5G and Internet of Things technology

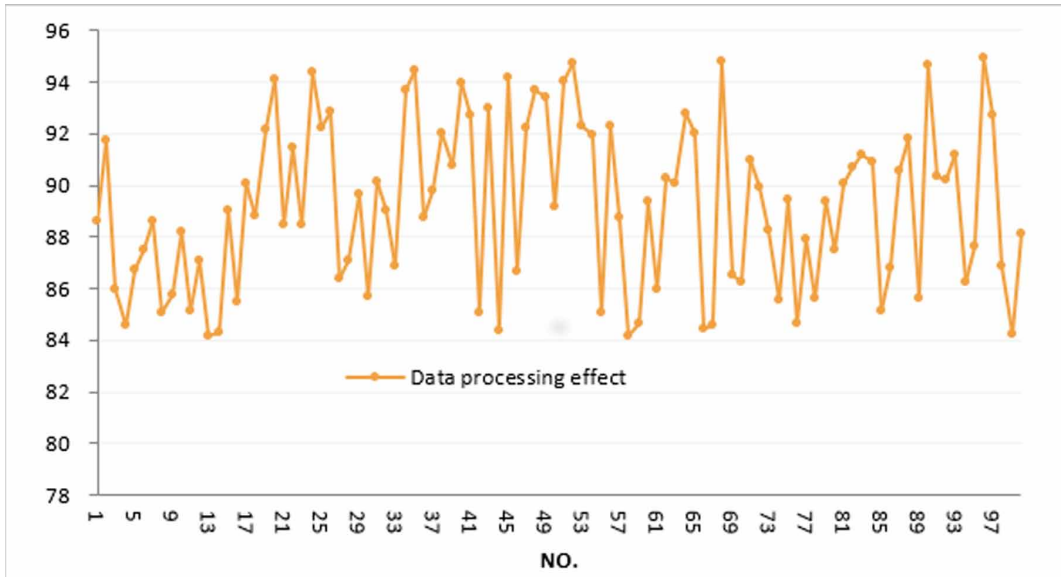
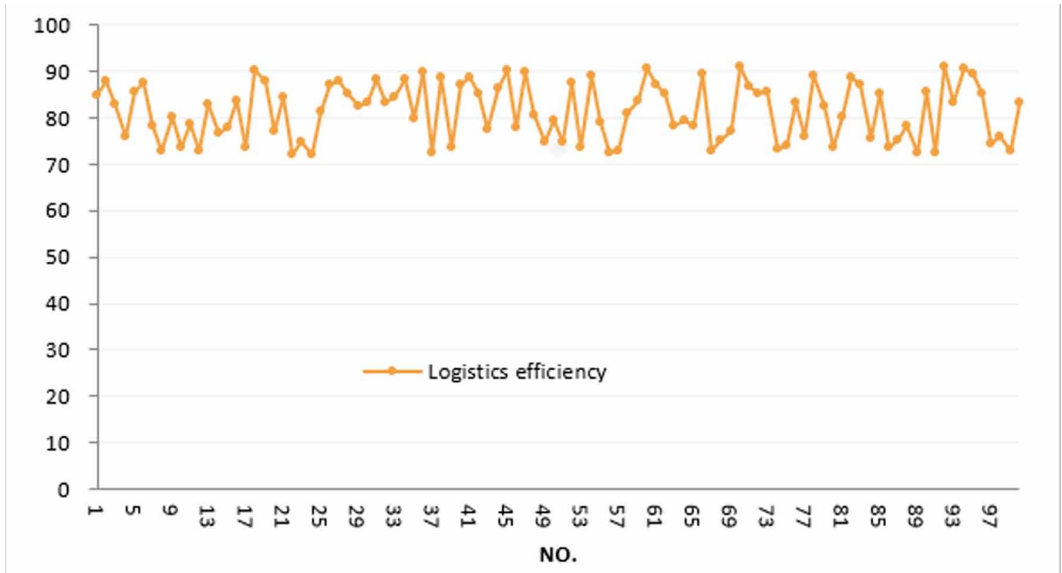


Table 2.

| NO. | Logistics efficiency | NO. | Logistics efficiency | NO. | Logistics efficiency | NO. | Logistics efficiency |
|-----|----------------------|-----|----------------------|-----|----------------------|-----|----------------------|
| 1 | 85.06 | 26 | 87.09 | 51 | 74.87 | 76 | 83.14 |
| 2 | 88.04 | 27 | 87.78 | 52 | 87.58 | 77 | 75.88 |
| 3 | 82.78 | 28 | 85.32 | 53 | 73.73 | 78 | 89.15 |
| 4 | 75.87 | 29 | 82.45 | 54 | 89.18 | 79 | 82.40 |
| 5 | 85.73 | 30 | 83.35 | 55 | 79.17 | 80 | 73.60 |
| 6 | 87.68 | 31 | 88.51 | 56 | 72.42 | 81 | 80.25 |
| 7 | 78.33 | 32 | 83.27 | 57 | 72.75 | 82 | 88.85 |
| 8 | 73.00 | 33 | 84.54 | 58 | 81.16 | 83 | 87.26 |
| 9 | 80.28 | 34 | 88.41 | 59 | 83.72 | 84 | 75.56 |
| 10 | 73.70 | 35 | 79.70 | 60 | 90.69 | 85 | 85.40 |
| 11 | 78.54 | 36 | 89.87 | 61 | 87.07 | 86 | 73.62 |
| 12 | 72.84 | 37 | 72.40 | 62 | 85.08 | 87 | 75.41 |
| 13 | 83.04 | 38 | 88.89 | 63 | 78.44 | 88 | 78.34 |
| 14 | 76.89 | 39 | 73.85 | 64 | 79.57 | 89 | 72.58 |
| 15 | 78.05 | 40 | 87.32 | 65 | 78.23 | 90 | 85.59 |
| 16 | 83.59 | 41 | 88.66 | 66 | 89.40 | 91 | 72.53 |
| 17 | 73.62 | 42 | 85.31 | 67 | 72.72 | 92 | 90.90 |
| 18 | 90.40 | 43 | 77.41 | 68 | 75.39 | 93 | 83.26 |
| 19 | 88.14 | 44 | 86.60 | 69 | 77.23 | 94 | 90.87 |
| 20 | 77.30 | 45 | 90.17 | 70 | 90.90 | 95 | 89.50 |
| 21 | 84.38 | 46 | 77.74 | 71 | 87.00 | 96 | 85.08 |
| 22 | 72.13 | 47 | 90.08 | 72 | 85.26 | 97 | 74.32 |
| 23 | 74.64 | 48 | 80.63 | 73 | 85.67 | 98 | 76.05 |
| 24 | 72.10 | 49 | 74.97 | 74 | 73.29 | 99 | 72.95 |
| 25 | 81.38 | 50 | 79.63 | 75 | 74.12 | 100 | 83.42 |

Figure 8. Statistical diagram of the evaluation of the smart logistics effect of the e-commerce system based on 5G and Internet of Things technology



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