Network consumption demand analysis and structure optimization based on big data

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Abstract. By studying the role and architecture of big data analysis, it is clear that it has a huge supporting role in analyzing customer behavior trajectory, discovering customer consumption habits and preferences, improving online consumption experience and promoting business decision-making. The big data analysis combined with scenario analysis can avoid the misreading of data analysis; strengthen the prediction ability of big data analysis, so as to create a truly satisfying customer experience. Based on the analysis and structure optimization of big data network consumption demand, the whole process network consumption experience theoretical model includes the experience demand model and experience behavior model. In order to deal with a large number of various types of data effectively, enterprises need to master the technology and ability of big data analysis. For online consumption platform enterprises, the most important consideration in the process of delivering customer experience is the customer group and customer needs and motivation, as well as customer perception of product and service experience process.

1. Introduction
Combined with the theory of residents' consumption and network economy, this paper analyzes the development of China's network economy, summarizes the new characteristics of residents' consumption under the network economy environment, and theoretically analyzes the mechanism of network economy promoting the growth of residents' consumption [1]. Internet consumption has gradually become a habitual consumption mode of Chinese residents. In recent years, the academic circles have done some research on the factors influencing consumption and their modeling description methods. However, there is little research and Discussion on the changes of the factors influencing residents' consumption under the network economy environment, and there is a lack of systematic and comprehensive research on the modification and improvement of the modeling description methods under the network economy [2-3]. This paper intends to study the influence and mechanism of the network economic environment on China's residents' consumption, and analyze it from the qualitative and quantitative perspective, so as to clarify the degree of influence and enrich the relevant theories of residents' consumption in the era of network economy. The network economic environment has changed the traditional economic operation mode. In the market environment of network transaction, new changes and new laws have appeared in the residents' consumption behaviour [4].
In the operation process of enterprise logistics service supply chain, logistics service integrators have the ability to manage, integrate and plan logistics resources and capacity task allocation. They cooperate with traditional function providers and choose to allocate logistics service tasks according to customers' needs. In order to meet the needs of customers at the same time, it can save and optimize the logistics capacity resources, give full play to the advantages of various function providers, and meet the needs of customers to the greatest extent [5]. The mechanism based on cooperation ability can introduce competition consciousness, improve the service level of cooperation function providers, and ensure the maximum customer satisfaction. In order to more accurately analyze the user's behavior law and user's interest intention, this chapter combines the knowledge discovery of big data to mine the customer's online data, predict the best delivery time of customers, so as to provide better service for customers.

2. Analysis of network consumption demand under big data

In recent years, under the strong economic pressure, increasing user requirements and more and more complex technologies, enterprises begin to focus on improving the overall user experience to eliminate customer pain points, establish customer trust and form irrational customer loyalty to obtain sustainable business competitive advantage. In order to improve customer experience, online consumption platform enterprises must be able to effectively measure and model customer experience [6,7]. The challenge of establishing the whole process of online consumption experience is: in most cases, customer data is owned by each independent department in the network consumption platform enterprise. For example, visitors are more concerned about the number of hits and the efficiency of each channel, while operators are more concerned about the quality of each channel [8]. Each enterprise department has a partial understanding of its own customer touchpoints, but it lacks a structure that integrates the overall customer perspective of all customer touch points throughout the network consumption platform. Therefore, it is necessary to break the internal barriers of the enterprise to integrate the data of all contact points in the whole process of customer experience. Enterprises need to realize the importance of customer experience management, set up relevant departments and teams, start to carry out top-down strategic layout around user experience management, and establish a real enterprise culture centered on customer experience, so as to gradually form a customer experience management mode, as shown in Figure 1.
In the fourth quarter of 2019, the transaction scale of China's online shopping market reached 3.2 trillion yuan, with a month on the growth rate of 38.5%, 26.9% higher than that in the same period of 2018, higher than the growth rate of total retail sales of social consumer goods. The double 11 Shopping Festival, the rise of live delivery with goods, and the further penetration of the sinking market have significantly increased the transaction volume in the fourth quarter of 2019, as shown in Figure 2.

**Figure 1.** Scale of online shopping and mobile online shopping users in 2015-2020

**Figure 2.** Transaction scale of online shopping market in 2018-2020
The online consumer business model, which focuses on understanding and optimizing their customer experience, has proven to be a better way to enhance innovation. By focusing on the key business objectives related to the entire customer experience, online consumer platform enterprises can guide their operational measures to improve the whole process online consumption experience. The measurement, design, and optimization of the overall user experience of products and services is fundamentally a "big data" problem, which requires enterprises to have the concept of thinking about user experience as a whole, which is conducive to the formation of a customer group with a sense of satisfaction, stimulating customers to consume more and reduce costs, and obtaining higher customer lifetime value. Because the traditional database and business intelligence tools are applied to the data processing of each enterprise's independent department, it can generate reports to solve the business problems of a single organization [9]. These traditional tools are not scalable, and cost-effective for each huge data set, so many customer-centric data are not effectively used, and there is no correlation between the data of various departments. Therefore, network consumption platform enterprises need to learn big data analysis methods and technologies that can handle large-scale massive data to build customer experience management analysis tools to expand the knowledge about users. Through multi-channel data analysis, we can have a deeper understanding of user behavior, and can effectively predict user behavior, and deal with the biggest pain points encountered by users according to the priority order, so as to develop products and services that are most suitable for users' needs.

![Figure 3. Online consumption platform to enhance customer experience](image)

In order to ensure that the method of improving customer experience is appropriate and structured, it is necessary to understand the main elements of customer experience. For an online consumption platform enterprise, there are two areas to consider in the process of delivering customer experience: what is the customer group and customer demand and motivation; and customer experience perception of products and services. Second, understanding the relationship between customers and products and services, as well as the drivers that make customers make choices, are the essential basis for viewing the customer experience shown in Figure 3. This will happen when customer loyalty to the brand has lost its rationality. Therefore, when the intimate relationship between customers and a brand is strong enough, they do not need to go through the early decision-making travel stage in the closed-loop and directly enter the repurchase stage.

A structured approach to improve customer experience requires a good relationship between customer prototype and customer life cycle analysis. This means to create a point-to-point model framework, that is, the demand and behavior model of the whole process network consumption experience. This model framework can give a detailed view of the customer experience in a given period of time and a
view of the overall customer experience in different reference scenarios according to the control scope of researchers. The research work is helpful to enrich the core factor layer of been network consumption business model innovation model framework, so as to promote the innovation and application of the network consumption business model.

3. Network consumption experience behavior model and structure optimization

3.1. Analysis of Customer Demand and Optimal Delivery Time

3.1.1. Customer demand analysis. In the context of big data, according to the customer's click-through rate, browsing time, shopping cart, evaluation information, all sales-related data can predict the sales of goods. If the click-through rate of a product rises sharply recently, the corresponding product is also hot in the near future, so there must be a certain correlation between the click-through rate and the sales volume. The limitation of browsing time ensures the effectiveness of this click, rather than delayed or malicious click, so this paper also considers the relationship between click-through rate, browsing time and sales volume to predict sales volume. Based on the real-time characteristics of big data, adding one more customer's effective click will continuously record the data, so as to predict the customer's real-time demand. Set the sales volume as \( m \), click-through rate as \( a \) and browse time as \( B \), select a large number of users' recent click data, define click as 1, otherwise 0, browse time more than the 30s as 1, otherwise 0, purchase as 1, otherwise 0. The data are shown in Table 1.

| Click-through rate | Browsing time | Purchase |
|--------------------|--------------|----------|
| 1                  | 0            | 0        |
| 1                  | 0            | 0        |
| 1                  | 0            | 1        |
| 0                  | 1            | 1        |
| 1                  | 0            | 0        |
| 1                  | 1            | 1        |
| 1                  | 1            | 1        |

According to the degree of confidence and support of the association, it is judged as follows:

\[
T_{X \rightarrow Y} = \frac{S(X \cap B)}{S(X \cup B)} + \Delta t
\]  

\[
P_{X \rightarrow Y} = \frac{S(X \cap B)}{S(X)} + \ln |\Delta t|
\]  

Equation (1) shows the rule support. It indicates the universality of simple association rules, and the low support indicates that the rules are not general. \( S(X) \) represents the number of simultaneous transactions of event \( X \) and \( Y \), and \( T \) represents the total number of transactions. Therefore, according to the Apriori algorithm, the candidate set satisfying the minimum support degree is mined and the association degree is obtained.

3.1.2. Analysis of customer's best delivery time. After segmentation, all the positions whose location distance is not greater than the set minimum distance are clustered, and their positions are changed to the location coordinates consistent with the clustering center, and then the user's behavior is analyzed by using association rules. To analyze all the customers that need to be served, you can select one week's location data or one month's user data. After data mining, we can get the correlation comparison of the customer period, and select the period with the highest correlation to deliver. If more than one time period is obtained, the nearest period
from the customer's delivery address is selected according to the delivery address of the customer's order. Thus, it can ensure that the express delivery can be received at the most convenient time for customers and improve customer satisfaction.

3.2. Measurement of Online Consumption Experience Model

In order to improve the customer experience, the enterprise and its design team need to use the customer-centric event data from different customer contact points throughout the enterprise to objectively and effectively measure the customer experience. The measurement index is the specification of the data index in the process of measuring customer prototype and customer experience, which is the basis of data collection and application. In addition, metrics can map the influencing factors of the experience model to specific data indicators, so that enterprises and product designers can understand the role of data indicators on the content elements of the experience model, so as to realize the data-driven customer experience improvement.

3.2.1. Measurement index of network consumption experience demand model. The measurement index of network consumption experience demand model can be defined according to the meaning of its content elements and influencing factors. The content elements of the whole process network consumption experience demand model are customer type, customer demand, customer motivation and result analysis. These four elements construct the customer prototype of network consumption, which is the characteristic description of the customer prototype. The prototype is a tool for researchers to explore, evaluate and perfect ideas and get inspiration in the process of user research. Therefore, customer prototype is the description of customer profile in the process of user research, which has the characteristics of rapid iteration, and plays a very important role in the process of product and service innovation.

Therefore, according to the above four elements of the customer prototype of online consumption, combined with the influencing factors of the demand model, we can get the measurement indicators of the customer online consumption demand model under the big data analysis, as shown in Figure 4. ① Accuracy: the product design team is required to be able to create accurate customer portraits for the target customers. ② Authenticity: it is to explore and analyze the authenticity of customers' spiritual or material needs on the basis of customers' accurate portraits. ③ Incentive degree: objectively describes the internal incentive degree of consumers' actual online purchase intention. ④ Satisfaction: refers to the degree of satisfaction of consumers with the results of their consumption behavior, which is mainly related to the consumer psychology of customers.

Figure 4. Whole process consumption demand measurement model

In addition, there are two types of big data analysis: description and prediction. In the measurement index system of online consumer experience customer prototype, the accuracy of describing the
identity and characteristics of target customers and the satisfaction of analyzing the nature of customer consumption behavior results are descriptive analysis. Authenticity and motivation include description and prediction. Exploring and mining customer consumption demand and motivation belongs to predictive analysis, while judging the authenticity of demand and motivation belongs to descriptive analysis. In addition, the accuracy index of customer type is the analysis basis of the other three metrics, and the latter three metrics can improve the accuracy of customer type.

3.2.2. Measurement index of online consumption experience behavior model. The measurement index of the online consumption experience behavior model can be defined according to its content elements and influence factors. The content elements of the whole process online consumption experience behavior model are cognition, interaction, consent/acquisition, consumption, support, reward, leaving, repurchasing and sharing. These seven content elements construct the customer life cycle of online consumers, which is the process description of customer life cycle. Therefore, according to the experience content of different stages of customer life cycle, combined with domestic and foreign literature research, we can summarize the measurement indicators of customer online consumption experience journey under big data analysis, as shown in Figure 5. ① Acceptance: refers to the customer's understanding and acceptance of products and services, which is the first impression of new customers on products and services. ② Completion degree: describe the time, error and exit rate when customers complete online payment and use and feedback the purchased products and services. ③ Pleasure: mainly related to the overall satisfaction of user experience, involving user aesthetic feeling and easy-to-use perception and other factors. ④ Recommendation: an index used to evaluate the likelihood that a customer will recommend a product or service. ⑤ Loyalty: customer's biased behavior response to the brand, product and service. ⑥ Churn: describes the situation of customers leaving the network application platform within the statistical time interval.

![Figure 5. Measurement of online consumption experience behavior model](image)

Based on the above analysis, in the measurement index system of online consumer experience customer journey, the acceptance of new customers' first impression of products and services and the completion of user operation experience are displayed. The main purpose is to summarize the status of customers in the two measurement indexes, and provide the analysis basis for the subsequent behavior reason analysis and experience design. Pleasure degree and loyalty include two kinds of analysis: description and prediction. Through descriptive analysis, customer satisfaction and biased behavior responses to products and services are summarized. On this basis, customer preferences and habits are
determined, customer expected behavior is predicted, and enterprises are guided to make relevant responses. For example, in the customer life cycle reward stage, according to customer preferences and habits, push promotional products and preferential plans; in the customer life cycle support stage, use the customer churn model to find the most likely to lose and the most valuable customers, so as to take early measures to retain these customers.

4. Conclusion
The whole process network consumption experience itself belongs to the big data problem, it needs to break the internal barriers of the enterprise and integrate the data of all contact points of the customer's whole process experience. The measurement index is the standard of measuring data index in customer prototype and customer experience journey, and it is the basis of data collection and application. It can map the influencing factors of the experience model into specific data indicators so that enterprises and product designers can understand the role of data indicators on the content elements of the experience model, so as to realize the data-driven customer experience improvement. Based on the analysis of the content elements and influencing factors of the whole process network consumption experience model, the measurement index of the network consumption experience model is obtained. As the current research on logistics service supply chain mainly focuses on the optimization management of logistics function providers' ability cooperation, there is little research on the combination of big data analysis and logistics service supply chain. Under the background of big data, this paper will put forward the personalized demand of customers, and combine the results of customer data analysis and prediction with the logistics service supply chain, which has great theoretical and practical significance to improve customer satisfaction and the overall competitiveness of enterprises.

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