Information Systems and Economics (2025)
Clausius Scientific Press, Canada

DOI: 10.23977/infse.2025.060110
ISSN 2523-6407 Vol. 6 Num. 1

Consumer Behavior Based on Network Integration Data in the Context of Big Data

Chanjuan Li*

College of Digital Business, Jiangsu Vocational Institute of Commerce, Nanjing, 211168, Jiangsu, China
lcj-215@163.com
**Corresponding author*

Keywords: Big Data Analysis, Network Integration, Consumer Behavior, Online Consumption, Intentional Factors

Abstract: In the modern society with the prevalence of online consumption behavior and Internet technology, online big data has penetrated into various industries. As people gradually enter the era of data explosion, the consumption mode of consumer behavior has changed to some extent, and there are more diversified ways. Based on the era background of Internet information explosion, this study studies the consumer behavior based on online consumption under the condition of big data integration from the perspective of big data integration, combined with the current consumption situation of online consumer behavior. Based on the literature research at home and abroad, combined with the specific practice of online consumption, this paper focuses on the factors of website platform affecting online consumption behavior. Through the empirical research on the relationship between individual differences of consumers, product factors, safety factors, convenience factors, interaction factors and third-party evaluation factors and consumer behavior, this paper finds out the main factors that consumers pay attention to and worry about in the process of online consumption, as well as the importance of these factors. Then it provides the corresponding theoretical basis for the marketing strategy formulated by the e-commerce website platform, and promotes the development of online shopping and online marketing. The experimental results of this paper show that the factors evaluated by others play a very important role in the impact of online consumer behavior. After the analysis and summary of the collected survey samples, the average values of sample identity are calculated, which are 4.51, 4.41 and 4.35 respectively, and the number of identity is more than 100. The second is security and interactivity, which is also important factors affecting consumer behavior.

1. Introduction

1.1 Background

With the rapid development of big data technology with the popularization of the Internet, today's social networks have been integrated into people's lives and learning, such as online learning

platforms, live entertainment, and online payments. Internet consumption has now become the most common thing in many people's lives. Because the previous methods of studying consumer behavior pay more attention to consumers themselves, under the background of integrating big data, traditional behavior research methods are no longer applicable. The rise of the website platform and consumption conditions have undergone certain changes, so there has been a behavioral study of integrating data under the background of big data, and has achieved good results. The rapid development of the Internet has prompted a change in consumer behavior, and the consumption of online information has become a bright new economic growth point. Big data especially plays an important role in the competition of electronic commerce. Big data has an absolute advantage in collecting consumption information and analyzing it. In the era of big data, consumers are affected by the rapid development of the Internet, and consumer behavior has also changed.

1.2 Significance

Whether it is product research and development, price determination, channel selection, advertising design, or product positioning, the research on online consumer behavior affects the formulation of marketing strategies. This also includes market opportunity analysis and market segmentation. The protection of consumer rights and interests is a topic of concern for the whole society. With the flourishing of commerce, various behaviors detrimental to consumer rights and interests continue to occur. Free choice of goods and services, the right to obtain safe and correct products and information, as a member of society Consumers also own it. These rights are also the basis of the market economy that constitutes network electronic commerce.

1.3 Related Work

With the progress of society, more and more scholars are focusing on the research of consumer behavior. Among them, Bardhi F introduced a new dimension of liquid or solid consumption. Liquid consumption is defined as short-term, visit-based and material, and solid consumption is defined as persistent, field-based and material. Liquid and solid consumption is conceptualized as existing in a range. There are four conditions that cause consumption to become liquid, solid, or a combination of both: relevance to the self, the nature of social relations, the accessibility of the mobile network, and the instability Type experienced. Mobile consumption is needed to explain behavior in the digital environment, access-based consumption, and global mobility [1]. Aagerup U stated that this article aims to expand the emerging field of symbolic green consumer behavior (GCB) by investigating the impact of the expected significance of consumption scenarios on consumers' choice of organic products[2]. Ribeiro R's current work aims to perform cluster analysis and adjust the mixed effects linear regression model to analyze the factors that affect consumer purchases. The factors analyzed are the size, skin color and texture, and the presence of information about the variety name, use, and quality seal. Age, education, region, and income are important parameters that determine group purchase intentions [3]. Gao L's article mainly studies the research of big data on consumer finance credit risk management. With the gradual improvement of the credit investigation system, credit investigation big data has effectively made up for the lack of credit investigation research and has been widely used in the financial industry. In this context, the specific application of big information credit risk analysis in credit financial management and the application of big data credit research in credit risk management will be deeply analyzed. His experimental results show that the model has good predictive ability, can distinguish between normal loan customers and default loan customers, and is suitable for actual personal credit risk control business [4]. Ghose A uses a large number of personal-level data sets to capture the effectiveness of display advertising in various consumer behaviors. Two unique characteristics of

our data set distinguish this article from the previous work: 1) information about the actual visibility of the display, because an average of 55% of display ads cannot be displayed; 2) the duration of the display ad, whether it is at the individual user level. Using quasi-experiments enabled by our settings, we use differences in differences and corresponding matching methods and instrumental variable techniques to control unobservable and observable confounding factors [5]. Si Y uses 5G to track consumers' consumption habits and consumption costs. First, based on existing literature and qualitative dialogue with online consumers, it is determined that e-commerce service quality evaluation factors are the core of system reliability, efficiency, support and completion, and after-sales service quality related to service quality. Secondly, according to the data obtained from the questionnaire, SPSS statistical analysis software is used to analyze the samples of certain variables to improve the sample quality of the data. Statistical analysis describes the measurement of these items. Calculate the importance of each dimension of each attribute [6]. Zhang X clarified the formation principle, development path and future direction of the online consumer behavior research jungle by analyzing the origin, frontier and prospects of online consumer behavior research. Finally, based on the economic changes in the post-pandemic context, he integrated and proposed the evolutionary mechanism of studying online consumption behavior, aiming to pry into and reveal the jungle of online consumption research [7]. Demchenko M said that big data not only led to changes in consumers' basic needs for goods, but also led to changes in their preferences and expectations, and the factors that led to changes in their value orientation were determined. The development of digital technology has led to a reduction in consumers' reliance on and commitment to workplaces, places of residence or communication channels. Fast-moving well-known brands conduct research on instrumental consumption. One example is the analysis and study of consumer behavior and their preference for a product technology, as well as the possibility of a targeted influence on the adoption of related decisions. Revealed the reliability of the data obtained through traditional quantitative research methods [8]. However, these studies have the disadvantages that the limited resources of the survey sample data are not broad enough, the entire population cannot be shown, or the experimental verification methods are too complicated.

1.4 Innovation

The innovations of this paper are: (1) learning, sorting and analyzing based on network-based integration of data, effectively improving efficiency and accuracy, researching wireless technology based on Internet applications, reducing time spent through network processing tools, and extracting information from big data. This study examines the whole process of consumer consumption behavior from an academic perspective, and surveys consumers' awareness of consumer behavior through online data collection and integrated statistics, as well as online questionnaires. On this basis, various factors affecting consumer behavior are analyzed. (2) On the basis of inheriting the traditional research paradigm, the research on online consumer behavior has gradually formed its research system and analysis model, focusing on the internal mechanism of consumption patterns explained by consumption activities. Through the extension of consumer objects, consumer psychology, and consumer concepts, a broad research network is formed.

2. Consumer Behavior Based on Network Integration Data

2.1 The Relationship between Big Data Technology and Consumer Behavior

In the era of rapid development of science and technology, the coverage and popularization of the Internet is gradually spreading to all towns and villages, bringing with it a large number of cumbersome data sources, and the prosperity of the network has changed the way people demand

[9]. Drove the transformation of various industries such as entertainment, education, finance, information and e-commerce [10]. The data sources of early consumer behavior research are mainly the tracking and analysis of consumers' consumption records. Traditional consumer behavior research usually limits the research objectives because the source of survey data does not lack many elements of today. In the current prevailing online consumption environment, consumer behavior is slowly shifting to a mode of no physical consumption [11]. The data resources that are rising every year penetrate into people's lives. Big data technology constantly monitors consumer behavior traces left on various online platforms and mobile devices. The integrated analysis based on big data can locate target consumer groups more quickly and accurately, and can improve the efficiency of e-commerce and reduce costs [12]. Consumer behavior research explores the transition from consumer behavior to perceived consumer behavior, and the transition from research to emerging consumer consumption records to data sources.

(1) To understand big data, we need to understand its 4 characteristics, namely:

Volume (large): the rapid development of big data with the popularization of the Internet has ushered in rapid development, and the annual data storage volume is increasing in a discontinuous manner [13]. Variety: every change in our behavior, location, and even physical data has become data that can be recorded and analyzed. More than one billion people are becoming a huge number of data sources at all times, and the complexity of people themselves determines the diversity of big data [14]. High speed (high speed): refers to the speed at which data is obtained. The sources of big data are wide and complex, and a powerful information data processing platform is required to cope with the complex data volume brought by network transmission. Value: the value of big data is to extract trending data conclusions from seemingly related data with efficient analysis, and bring real-time predictability to the future planning of various industries [15].

(2) Big data technology: Big data collection technology: the most fundamental step in processing big data is data collection. The sensor technology transfers the data obtained from the client to the database, and the user can initially query the data. Data collection is to understand the initial appearance of data, including the background of data generation, such as the conditions and forms required for data generation. This can effectively control the data generation and collection process, so as to avoid data-related problems caused by violation of relevant collection regulations. Of course, abnormal changes in logic and data are what we must pay attention to in the data collection process [16]. The application of big data collection technology has greatly enriched the number and types of online consumption objects, changed the way of thinking of consumers' behavior and consumption, and made consumption patterns more abundant and diverse. Big data storage technology: processing and integrating data is a step that we must take before storing data. Originally, the data collection side already has a data storage library, but the data cannot be analyzed accurately. The received information needs to be preprocessed, and it is simply cleaned, and then it is sent to another large database for storage. The application of big data storage technology makes the utilization of massive data possible, and network consumption provides a vast data space. As a result, the data in network transmission can be completely preserved, reflecting the organic connection of data in time and space, and digging into the deep-seated regular problems in network consumption. Big data analysis technology: big data analysis mainly includes two aspects: data mining and data visualization analysis: big data analysis technology for consumer behavior reduces the phenomenon that consumers consume too much time and energy due to information flooding during consumption. Big data forecasting technology: Big data forecasting is the use of mathematical methods to predict the possibility of things happening on the basis of massive amounts of data. Big data prediction is a manifestation of the results of big data analysis, which can assist consumers in making more scientific and effective decisions during consumption and avoid risks [17]. Build a suitable prediction model, reduce system errors, and the function of big data

prediction will be more accurate. In addition, the application of big data prediction technology will also cause certain security risks in consumer behavior and consumption. For example, personal behavior trajectories are recorded and private information is leaked. The big data prediction process is not only the output of the results of the entire big data processing process, but also the last obstacle to controlling the results. Therefore, the literacy of consumer behavior in an environment where big data forecasting technology is maturing also needs to be further enhanced.

2.2 Considering Consumer Behavior and Optimal Pricing Research

This study adopts the theory of consumer rational expectations, where the theory of consumer rational expectations refers to the net of consumer expectations.

The probability of network neighbors buying in the first period is consistent with the probability that the game model finally realizes.

Use X_i to represent the expected demand of consumer i in the first sales period, and use Y_i to represent the demand in the second sales period. For $0 \le A_{i2} \le A_{i1} \le 1$, $X_i = 1 - A_{i1}$, $Y_i = A_{i1} - A_{i2}$ is available at the time. The threshold A_{i2} and A_{i1} can be rewritten as follows:

$$A_{i1} = 1 - X_1 = \frac{p_{i1}}{(1-\delta)} - \frac{\delta p_{i2}}{(1-\delta)} + \frac{\delta\kappa}{(1-\delta)} \sum_j g_{ij} X_j \tag{1}$$

$$A_{i2} = 1 - X_i - Y_i = p_{i2} - \kappa \sum_j g_{ij} X_j \tag{2}$$

Write these two equations in the form of a rectangular array to obtain;

$$1 - \frac{1}{(1-\delta)} p_1 + \frac{\delta}{(1-\delta)} p_2 = [I + \frac{\delta\kappa}{(1-\delta)} g] X \tag{3}$$

$$p_2 = 1 - (I - \kappa g) X - Y \tag{4}$$

Based on equations (3) and (4), $p_1(X,Y)$ and $p_2(X,Y)$ can be obtained as follows:

$$p_1(X,Y) = 1 - X - \delta Y \tag{5}$$

$$p_2(X,Y) = 1 - Y - (I - \kappa g) X \tag{6}$$

Based on consumer expectations in the first and second periods. For the constraints in the optimization problem, for any $i \in \{1,2,\ldots n\}$, the optimal strategy needs to satisfy $0 \le A_{i2} \le A_{i1} \le 1$.

$$\begin{aligned} &\max_{\{X,Y\}} \prod = p_1^t(X,Y) \cdot X = \delta\, p_2^t(X,Y) \cdot Y \\ &= 1^t X - X^t X - \delta Y^t X + \delta 1^t Y - \delta Y^t Y - \delta X^t (i - \kappa g^t) Y \\ &s.t. 0 \le X \le 1, 0 \le Y \le 1, X + Y \le 1 \end{aligned} \tag{7}$$

Use t_{ij} to represent the element in the i-th row and j-th column of the matrix t, let:

$$R = (i - \frac{\kappa}{2} g)(i - \frac{\kappa}{2} g^t), t = [i - \delta R]^{-1} \tag{8}$$

$$\text{Definition} \qquad A_i = \sum_{j=1}^n (tg)_{ij} = \sum_{j=1}^n \sum_{I=1}^n t_{il} g_{lj} \tag{9}$$

$$B_i = \sum_{j=1}^n (G^t T G)_{ij} = \sum_{j=1}^n \sum_{r=1}^n \sum_{t=1}^n g_{ri} t_{rl} g_{lj} \tag{10}$$

Here $(TG)i_j$ represents the element in the i-th row and j-th column obtained after the product of the matrix T and G. The following definition condition 1, when it is established, can guarantee the existence and uniqueness of the optimal solution in the optimization problem (7).

Condition 1: $(i)\lambda_{\max}(R) < \frac{1}{\delta}$, (ii) For any $i \in \{1,2,\ldots n\}$, the parameters δ and κ satisfy $0 \le A_i \le \frac{4}{\kappa}$ and $\frac{2A_i}{\kappa} - \frac{4}{\delta\kappa^2} \le B_i \le \frac{4}{\delta\kappa^2} - \frac{2(1-\delta)A_i}{\delta\kappa}$.

When condition 1 is established, the optimal differential pricing strategy is:

$$p_1^* = \frac{1}{2}\cdot 1 - \frac{\delta\kappa^2}{8} G^t TG \cdot 1 \tag{11}$$

$$p_2^* = \frac{1}{2}\cdot 1 - \frac{\kappa}{4} G\cdot 1 - \frac{\delta\kappa^2}{8} G(I - \frac{\kappa}{2} G^t)TG \cdot 1 \tag{12}$$

It can be found that under the general consumer social network structure, the optimal pricing strategy is very complicated with respect to changes in the network structure. On the whole, the optimal pricing of goods will be affected by consumers.

3. Empirical Research Based on the Influence of Big Data on Consumer Online Shopping Behavior

Since the survey group in this study is the main body of students, most people spend relatively low amounts on online shopping, but their behavior in online shopping has also shown a significant increase. It shows that most people consume more rationally and do not consume blindly. The level of online shopping is not high, but it can be seen that there will be a substantial rise in online shopping in the future. The sample is shown in Figure 1.

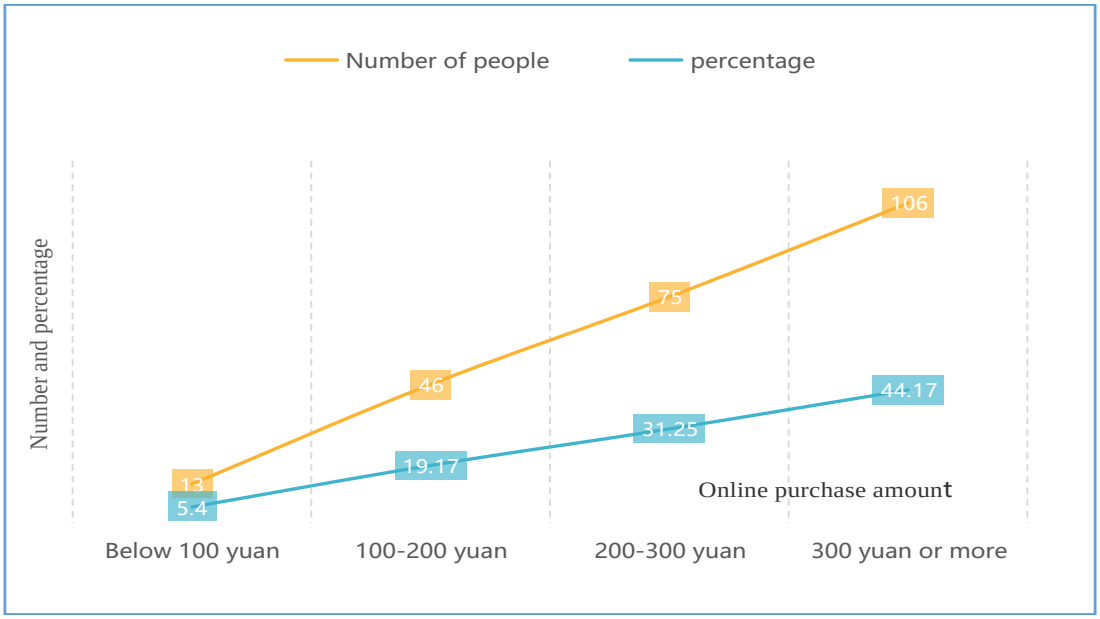

Figure 1. Distribution of consumption amount of survey samples

Due to the underdevelopment of the Internet in the past, there is relatively little research on the behavior of online consumers. However, the popularity of the Internet is closely related to the development of the Internet market, and the future product catalog will be detailed and subdivided.

In recent years, special promotional discount days such as "Double 11" and "6.18" have also been launched. Consumers' desire for purchase has been stimulated under the influence of such discounts on similar holidays. It focuses on attracting female consumption in personalized products, and has ushered in rapid growth in segmented products such as feminine products, food and health care, and house modification. The data is shown in Figure 2:

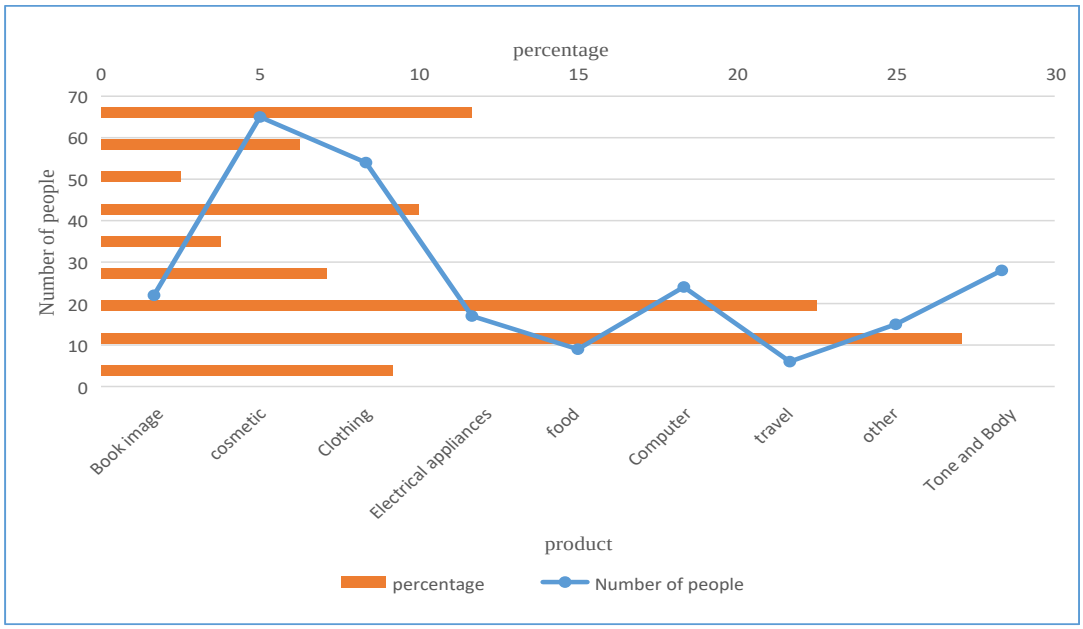

Figure 2. Comparison of online shopping products of survey samples

The data in Figure 8 shows that cosmetics and clothing accounted for 27.08% and 22.5% of the most eye-catching consumer spending, and the rest came in second place. It can be seen that this is also the bulk of consumer spending.

The sample statistics of this survey show that the main factors that consumers like to shop online are that they are not restricted by region, convenient for shopping, and preferential prices. As shown in Figure 3:

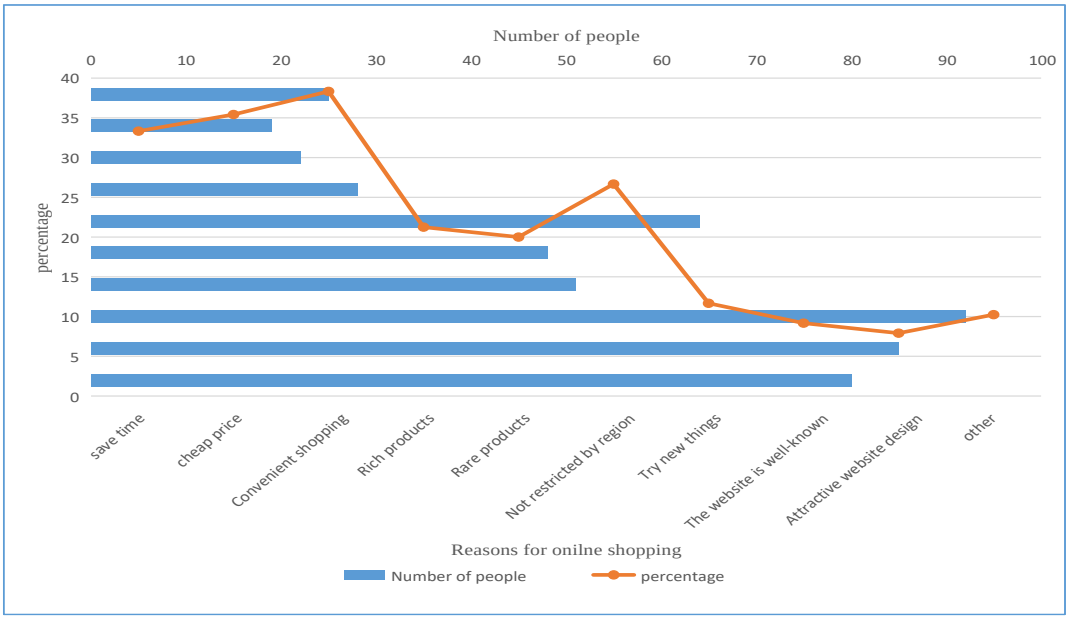

Figure 3. Network factor diagram of the survey sample

According to the data, it is important to buy affordable goods that are more convenient and time-consuming regardless of geographical influence, and the proportions are 33.33%, 35.42%, and 38.33%, respectively. Comparing these three sets of data, we can find that shopping convenience and cheap prices are the top priority.

4. Sample Variables

4.1 Security Analysis Based on Big Data

Table 1. Safety data sheet of the survey sample

Safety factor	Very disagree	Disagree	Uncertain	Agree	Very much agree	Average recognition
1	0	7	55	115	63	3.98
2	0	5	32	127	76	4.14
3	0	2	46	106	86	4.15

From the data in the above table, it can be seen that consumers are more worried about online consumption in terms of financial payment and the inconsistency of physical and commodity descriptions. Table 1 shows that in the case of insufficient sample data, the factors affecting network security are 3.89 and 4.14 levels of concern crossing the border. Inconsistent consumer product descriptions accounted for 4.15 in the list. It can be seen that the security of funds and the inconsistency of products and descriptions in the process of online payment are also issues that consumers worry about, and they are also important factors that restrict the development of the Internet.

4.2 Evaluation Factors of Others from the Perspective of Big Data

Table 2. Data table of other people's evaluation of the survey sample

Others' Evaluation Factors	Very disagree	Disagree	Uncertain	Agree	Very much agree	Average recognition
1	0	1	14	86	139	4.51
2	0	2	37	98	103	4.41
3	2	7	17	92	122	4.35

From Table 2 above, it can be seen that the general consumers are very concerned about the evaluation of other people's products. The recognition degree of the three items is above 4 points, and the number of people who strongly agree is above 100. It can be seen that other people's evaluations of online consumers Behavioral influence. And because of its influence on their own decision-making behavior, consumers prefer shops with good evaluations and high scores. In the network environment, consumers judge the credibility of websites and businesses through the evaluation of others.

5. Conclusions

Empirical research shows that: the individual characteristics of consumers are different; Age, education level, consumption level and time of contacting computer are obviously related to consumer behavior. Website factors have a significant impact on consumers' online consumer behavior. The vast majority of consumers will choose a well-known platform, and whether the website platform is fast, beautiful and whether the information is complete will have an impact on consumers' behavior. The ultimate goal of consumer behavior is to meet consumers' demand for

products. The reason why consumers choose online consumption is that the price is affordable and is not affected by region. They can search for scarce or trendy products. Therefore, product factors can independently affect consumers' behavior. Most consumers are extremely concerned about others' evaluation of websites or commodities, and tend to choose Website platforms or commodities with good scores, high praise rate and high credit rating. After the analysis and summary of the collected survey samples, the average recognition degree of the samples is calculated, which are 4.51, 4.41 and 4.35 respectively. The number of people who agree very much is more than 100. The second is the two factors of safety and interactivity, and the average recognition degree of other evaluation factors has reached more than 4, which is higher than that of other items. Therefore, from the experimental results, it can be concluded that the evaluation factors are important factors affecting consumer behavior.

References

[1] Bardhi F, Eckhardt G M. Liquid Consumption - why the consumer increasingly prefers access to goods and services over ownership[J]. Journal of Consumer Research, 2017, 44(3): 582-597.

[2] Aagerup U, Nilsson J. Green consumer behavior: being good or seeming good?[J]. Journal of Product & Brand Management, 2016, 25(3): 274-284.

[3] Ribeiro R, HM Pinheirosant, J G P ádua, et al. Consumer behavior and the effects of the supply of french cultivars of potatoes [J]. Bioscience Journal, 2016, 32(2): 308-318.

[4] Gao L, Xiao J. Big Data Credit Report in Credit Risk Management of Consumer Finance[J]. Wireless Communications and Mobile Computing, 2021, 2021(4): 1-7.

[5] Ghose A, V Todri-Adamopoulos. Toward A Digital Attribution Model: Measuring The Impact Of Display Advertising On Online Consumer Behavior[J]. Mis Quarterly, 2016, 40(4): 889-910.

[6] Si Y. Research on the Balanced Relationship between Online Consumer Behavior and E-Commerce Service Quality Based on 5G Network[J]. Mobile Information Systems, 2021, 2021(5): 1-12.

[7] Zhang X, Liu H, Yao P. Research Jungle on Online Consumer Behaviour in the Context of Web 2.0: Traceability, Frontiers and Perspectives in the Post-Pandemic Era[J]. Journal of Theoretical and Applied Electronic Commerce Research, 2021, 16(5): 1740-1767.

[8] Demchenko M. Quantitative methods of studying the consumer needs and behavior in the context of modern marketing communications[J]. Communications and Communicative Technologies, 2019(19): 41-47.

[9] Isaac P, Cleverly J, Mchugh I, et al. OzFlux data: network integration from collection to curation[J]. Biogeosciences, 2017, 14(12): 1-41

[10] Wen Z. Analysis of the Impact of Interest Rate Changes on Chinese Consumer Behavior[J]. Asian Agricultural Research, 2019, 11(01): 30-32+36.

[11] Paynter N P, Ridker P M, Chasman D I. Are Genetic Tests for Atherosclerosis Ready for Routine Clinical Use?[J]. Circulation Research, 2016, 118(4): 607.

[12]Huang Q, Li X W. Research on the Design of Government Affairs Platform in the Context of Big Data[J]. Scientific Programming, 2021, 2021(12): 1-13.

[13] Krca M, Akku M. Internet Usage, Economic Growth And Electricity Consumption: The Case Of Eu-15[J]. Ekonomi Politika & Finans Araştırmaları Dergisi, 2020, 5(3): 576-594.

[14] Nobre G C, Tavares E. Scientific literature analysis on big data and internet of things applications on circular economy: a bibliometric study[J]. Scientometrics, 2017, 111(1): 463-492.

[15] Mahmoud M S, Mohamad A. A Study of Efficient Power Consumption Wireless Communication Techniques/ Modules for Internet of Things (IoT) Applications[J]. Advances in Internet of Things, 2016, 06(2): 19-29.

[16] Yuan C, Wu C, Wang D, Yao S, & Feng Y. Review of Consumer-to-Consumer E-Commerce Research Collaboration. Journal of Organizational and End User Computing, 2021, 33(4): 167-184.

[17] Xu A, Li Y, & Donta P K. Marketing decision model and consumer behavior prediction with deep learning. Journal of Organizational and End User Computing, 2024, 36(1): 1-25.