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# A Study on Consumer Behavior in Online Shopping Using AI and Big Data Analysis Technology

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***Abstract***

*It's had rapid development of mobile communication technology and the Internet. Nowadays, people's consumption patterns are no longer only through physical stores. Consumers can browse and compare products through the Internet. The consumption pattern of online shopping has long been regarded as an option. Therefore, the development of the Internet platform is a popular sales strategy for enterprises recently. From the perspective of "online shopping behavior", this research mainly focuses on the influence of shopping site interface and message evaluation on online purchase behavior, and the interference effect of enterprises adding artificial intelligence and enterprise adding big data analysis technology to online purchase behavior. Through predictive analysis, we examine the influence of shopping websites and information evaluation on shopping behavior, and further compare whether companies add artificial intelligence and big data analysis technology to consumers' shopping behavior. The research results show that information evaluation has an effect on online shopping behavior. There is a positive correlation. The shopping website interface has a positive correlation with online buying behavior. The enterprise adding big data analysis technology also has interference effects on the shopping website interface, and the enterprise adding artificial intelligence has no interference in the shopping website interface effect.*

***Keywords*** *: Artificial Intelligence (AI); Big Data; Website and review; Consumer Behavior; Online Shopping*

## 1. INTRODUCTION

According to the report of "Taiwan Internet Report 2019", the total number of Internet users in Taiwan has been inferred and estimated to be 18.66 million, with an Internet rate of 79.2%. However, this survey shows that 60 % of users are online It is applied in e-commerce (TWNIC, 2019). At the same time, artificial intelligence and big data have also become hot topics in recent times, and have had a huge impact on traditional online marketing methods. By collecting various data of Internet users, such as location, search terms, browsing websites, After the relevant shopping behavior and other data, the manufacturer's recommendation system can analyze preferences based on the above behavior records, and push accurate and personalized information to users. This method has been widely used in e-commerce. This research explores how to use appropriate and effective marketing solutions to approach consumers under the thinking of combining big data and artificial intelligence. The purpose is to understand consumer behavior and thoughts. Through artificial intelligence and the technology of a large number of dramas, survey consumers on the Internet shopping behavior and evaluation. This research explores different influencing factors through five dimensions. The purpose of the research is as follows:

1. Explore the buying behavior of different consumers when using online shopping.
2. To explore the influence of consumers on the interface of online stores on online shopping.
3. Explore the impact of consumers' online reputation on online shopping.
4. Explore the impact of big data and artificial intelligence on online shopping.

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5. Provide enterprises with effective marketing strategies when developing online shopping.

## 2. Literature

### 2.1. Artificial Intelligence

Artificial Intelligence (AI) is an important branch of computer science. Winston (1992) put forward the view of artificial intelligence. At present, artificial intelligence is used in different fields, such as face recognition, expert systems, intelligent search, theorem proving, gaming, automatic programming, and aerospace fields. There are four main categories of enterprises that are most widely used in artificial intelligence systems: expert systems, neural networks, genetic algorithms, and intelligent agents:

***Expert system:***

A programming system that requires specialized knowledge and experience must be inferred based on the knowledge and experience provided by the expert, and imitate the expert's decision to alleviate the manpower problem of insufficient experts (Horvitz et al, 1988). The expert system uses a large amount of information to aggregate from different sales channels, through analysis and investigation, screening and targeting target customers, and at the same time solving the problem of which types of consumers are sold.

***Neural network-like:***

It is a structure for processing information, which is like the human brain and imitates its biological nervous system to transform data (Jain et al., 1996). Companies receive a large amount of information every day. Using the two functions of discovery and prediction in the neural network function, they can analyze and predict product sales and profit and loss from customer information, including product sales, number of visitors, and inventory statistics analysis and forecasting from various angles, such as volume, product structure, capital occupation ratio, etc. According to the neural network-like system, we can get a lot of usable information, such as the expected purchase volume of the product, the expected return, and the capital plan.

***Genetic algorithm optimization service:***

The optimization system will provide better service (Karaboga & Basturk, 2007). Target, the second largest retailer in the United States, uses expert systems to identify consumer groups based on consumers' consumption records over a period of time, and then uses neural networks for data analysis to classify the products purchased by customers and simultaneously Refer to the frequency of purchase to find the consumer's internal needs, and finally identify the consumer's identity. The genetic algorithm system can calculate products to be marketed based on various data. Decision-makers can use genetic algorithms to adjust the product structure in a timely manner to increase competitiveness. In addition to solving the problem of product mix, genetic algorithms can also be used for scheduling vehicle problems and logistic distribution problems.

***Smart agent mining and promotion:***

It can add the function of artificial intelligence and play the icing on the cake (Ramchurn et al, 2012). It is used to promote sales to target customers. After identifying consumers, advertisements, gift coupons, emails, etc. can be used to remind customers and inform about recent preferential activities.

***AI in e-commerce:***

The recommendation system will actively collect the user's characteristic data, analyze the user's personality, habits, and preferences, and customize and provide users with interesting information. Recommendation system is a new type of intelligent information service, which has a wide range of applications in various fields, especially in e-commerce. The recommendation system can help e-commerce visitors to turn into buyers, and can also improve the cross-selling ability of the website, and finally, it can be more established Customer loyalty (Schafer et al., 2001).

### 2.2. Big Data

The official name of Big Data is huge data, also known as massive data. In which refers to the huge or complex data that traditional data processors cannot handle. The definition of big data changes over time. At present, big data refers to any data that is too large and cannot be analysed and placed on the computer desktop. It requires specialized processing software and computing technology (Jacobs, 2009).

***"4Vs/5Vs" characteristics:***

Scholars proposed that big data should contain the characteristics of "4Vs", including Volume, Velocity, Variety, and Veracity (Wang et al., 2022).

1. Volume: It is a huge amount of data at a glance. In the past, it was necessary to collect data manually. However, with the development of technology and the Internet, the data collected can easily reach TB (Tera Bytes). Even look at the data volume of PB (Peta Bytes, gigabytes) or EB (Exabytes, exabytes); this has caused every industry to attach great importance to it and collect and accumulate huge amounts of data at any time.
2. Velocity: With the improvement and development of machinery and equipment, the data search speed on the Internet is soaring every second, and the amount of output content is increasing. Any organization or company needs to deal with a huge amount of information. How to quickly respond to the huge amount of information has become an important challenge in processing data. The data needs to be reacted in real time and given feedback to maximize its value.
3. Variety: It can be roughly divided into structured and unstructured data. Structured data is numerical, and the data is easy to analyze; unstructured data is text, images, videos, music, emails, web pages, etc., which are relatively difficult to analyze and store.
4. Veracity: When processing data, data deviation, forged data, abnormalities, etc. will occur. To

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prevent garbage from entering and leaving "dirty data", it is to protect the integrity of the data and prevent "dirty data" Influencing subsequent decisions, so it is also an important link in big data.

Due to the participation of many researchers, the research of big data has become a trend, from "4Vs" to "5V s" characteristics. Anuradha (2015) proposed that "5V s" adds "Value". In order to bring the value of the collected data, after processing and analysing the big data, the benefits brought by the data can be learned.

***Big Data in e-commerce***

Mining user behavior data represents segmenting the market, making more accurate predictions for users, providing precise user needs, and processing a large amount of user behavior data through collection and processing methods to determine the interests and consumption of specific groups or individuals' Habits, propensity to consume and consumer demand, and then promote consumer-related consumer behavior. Different from the traditional marketing in the past, in addition to saving costs and increasing the effect of marketing, it can also increase the added value of the platform and even establish a high-viscosity relationship with consumers; strive for more manufacturing resources. Scholars proposed that enterprises should establish marketing data collection systems. There are two ways to collect marketing data collection systems. One is to collect user characteristics and behavior data. Users will store information on Internet browsing, shopping, social networking, etc. The characteristics are like the name, age, gender, phone number, and email of a member account. The second is to collect behavioural data, covering the user's browsing history, click-through rate, purchase information, consumer evaluation, and financial information on the Internet; in addition, Companies can also connect to external systems to obtain information, such as governments, other companies, e-commerce platforms, social media, etc., and the closest channel to customers is social media.

### 2.3. Online Shopping

The history of online shopping is derived from Interactive Home Shopping. According to Alba et al (1997), interactive home shopping is a communication behavior between consumers in the process of buying and selling. Interactive family shopping covers two dimensions, namely response time and response context. Kalakota & Whinston (1997) believe that e-commerce is a modern business model. It can operate on computers and sell products and services through the Internet, combining various commercial activities. In addition to reducing costs, Shopping provides consumers with the needs they want, such as trial period, returnable service, or related after-sales service, etc., to increase consumers' willingness to spend. Internet Online Shopping (IOS), referred to as online shopping, is used in e-commerce. The business model of e-commerce is distinguished by transaction objects. It can be divided into the following four types:

1. Business to Consumer (B2C)
2. Business to Business (B2B)
3. Consumer to Business (C2B)

Fourth, consumer to consumer (Consumer to Consumer, C2C)

***Website interface design***

Many scholars have many different views on web design topics. In which believes that web design is divided into three elements, including content, usability in the website, and visual appearance.

It is proposed that the website design covers three aspects: information design, navigation design, and visual design. Information design is to enrich the content of the website. After integrating different information, it is built in each unit of the website frame to clearly communicate to users; navigation design In order to plan a clear website structure and avoid the complexity of the website structure and make it difficult to use, users can quickly find the information they need on the webpage; the visual design is to create the uniqueness of the style, using the basic visual elements of the website, such as text, logos, and images, Color, layout and other elements make the website more attractive, and it also assists the information conveyed by the website through visual presentation.

Web page design should be presented and delivered on the web page, keeping the information to be delivered clear and consistent, so as to avoid the burden on users browsing. When creating a website, the designer of the structured website needs to understand the information of the website itself and the background of the user group and improve its website design through continuous evaluation and testing. It can be seen that the website needs to be constantly updated to deal with the terminal target group change. In the process of designing a website, in addition to repeatedly testing the usability of the website, it is also necessary to check whether the image of the website can successfully guide browsing and construct the correct user mentality.

***Internet message evaluation***

Internet word-of-mouth is divided into positive and negative word-of-mouth. "Positive word-of-mouth" refers to the positive evaluation or satisfaction generated by consumers after purchase, and recommends sharing product-related information or service experience with others (Brown et al., 2005); "Negative word-of-mouth" means that consumers are dissatisfied with the purchase experience, such as having unpleasant experiences about the product or after use, and notifying others of the negative reviews, and even warnings or suggestions not to consume The behavior of others (Anderson & Gerbing, 1998). Bayus (1985) proposed that the use of positive word-of-mouth to promote can reduce the marketing budget needed by the company while increasing sales performance and consumers will reduce their trust in the company when viewing negative word-of-mouth.

***Online consumer behavior***

Engel et al. (1984) proposed the EKB consumer behavior model, which is divided into five stages. The first stage is the cognition of the problem, which affects various consumer behaviors. When the consumer's perception ideal, and there is a distance from the actual situation, they will be aware of the

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existence of consumer demand, such as preferential promotion or the release of new products, the stimulus generated will give consumers the desire to shop. The second stage is the search for product information. The thought of need will start to search for internal memory or find information from the external environment. The third stage is choice evaluation. When consumers search for and obtain sufficient information, they will evaluate the possible choices. The evaluation criteria are the beliefs, attitudes, and purchase intentions generated by individual differences and environmental factors. The fourth stage is the purchase after careful evaluation and is regarded as a decision made by consumers. The fifth stage is post-purchase behavior. Or use the product or the evaluation made by the service, assuming that after the purchase is in line with the expected expectations, consumers will decide whether they are willing to buy again based on the feeling of the purchase, as shown in Figure 1.

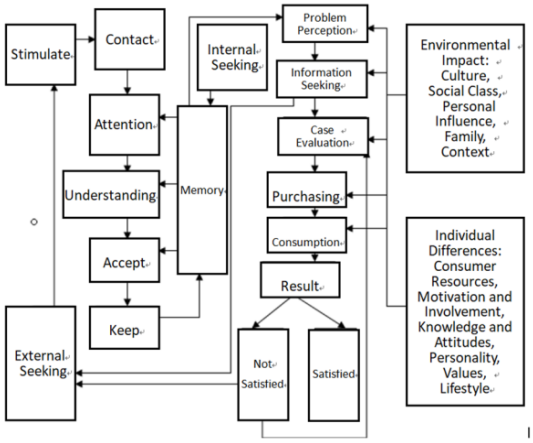


Figure 1, EKB mode diagram (Engel et al, 1984)

***Consumer Buying Behavior***

Pratt (1974) puts forward that consumer buying behavior refers to any action that includes purchase, in exchange for goods, goods, or labor in cash or fulfilling the promise of payment. Kotler (1994) proposed that consumers' purchasing behaviors are to meet their personal needs, and then consider how to choose, purchase and dispose of goods, services, personal ideas, or consumer experience. Based on the statements made by the above-mentioned scholars on consumer purchase behavior, we know that it generally refers to the behavior of consumers engaged in various consumptions, and the extended definition is the process of obtaining goods, which is like the processing after obtaining the goods, the interaction and relationship with the economic environment.

## 3. Methodology

### *3.1. Research Framework*

In this study, the shopping site interface, information evaluation, enterprise adding artificial intelligence, enterprise adding big data analysis technology, and online buying behavior, set up hypotheses of various dimensions to construct, and form the structure of this research as shown in Figure 2.

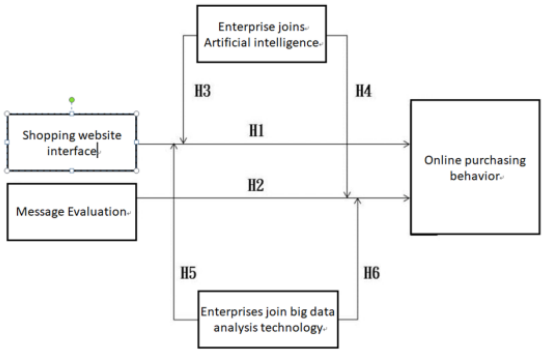


Figure 2 Research Framework

### *3.2. Hypothesis*

According to the research framework shown in Figure 2, this research mainly discusses: (1) the relationship between shopping website interface and online purchase behavior, (2) the relationship between information evaluation and online purchase behavior, and (3) the effect of artificial intelligence on online purchase by enterprises The interference effect of behavior, (4) The interference effect of enterprises adding big data analysis technology to online purchasing behavior. The hypotheses of this research are as follows:

$H_1$: Shopping websites have a positive relationship with online purchases.
$H_2$: Message evaluation has a positive relationship with online purchase behavior.
$H_3$: Companies that add artificial intelligence to online shopping sites have a positive relationship with online purchases.
$H_4$: The addition of artificial intelligence by companies in the message evaluation has a positive relationship with online purchase behavior.
$H_5$: Companies that add big data analysis technology to online shopping sites have a positive relationship with online purchases.
$H_6$: Companies that add big data analysis technology have a positive relationship with online buying behavior in message evaluation.

### *3.3. Tools*

According to the above-mentioned operationally defined development scale, there are 5 dimensions and 41 questions. The five-point Likert scale is used to measure this questionnaire. The testees will select five according to their actual feelings and cognition. Options: strongly disagree (1 point), disagree (2 points), normal (3 points), agree (four points), and strongly agree (five points). The higher the score is in the option, the higher the degree of agreement. The more I agree with the content of the question.

### *3.4. Sample*

In this study, the questionnaire was distributed in two ways. The first type is to distribute online questionnaires in Facebook clubs. Netizens in the clubs are asked to fill in the questionnaires. The subjects are college students or graduate students. The second type is to distribute paper copies to universities in person. Questionnaire, and randomly selected

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college students as the subjects to fill in the questionnaire. A total of 450 questionnaires were collected, of which 139 were invalid and 311 were valid.

## 4. Research results

### *4.1. Sample Data*

The subjects of this study are mainly Gen Y young people aged 18 to 28, because the emergence of smartphones makes Gen Y children more dependent on the Internet. Among the sample testees, the majority are females as high as 193; the young population sample testees are 216 from 19 to 28 years old; the majority are those with a university education level, and the average income is less than $20,000 as the majority; Most of the testees who have more than 3 years of road shopping experience; those who are very familiar with Internet browsing have an average of more than three years of online shopping experience; the number of people who spend 1 to 3 times on the Internet and 7 to 9 times a month They are similar, and the average consumption amount is less than $1,000.

### *4.2. Main Effect Analysis*

The shopping website interface is used to analyze the multiple regression analysis of online shopping behavior and information evaluation on online shopping behavior. After adjustment, $R^2$ is 0.314. The interpretation of this data is that there is a variation of 31.4% of online shopping behavior, $F$ value is 46.949, $P< 0.05$, it can be proved that the interface of shopping website and online shopping behavior and information evaluation have a predictive relationship with online shopping behavior. The DW value is 2.033, which means there is no self-correlation. Therefore, $H_1$ and $H_2$ in this study are established.

***Enterprises add artificial intelligence to the interface of shopping websites***

The interface of shopping websites, information evaluation companies and companies are added to the interactive items of artificial intelligence, and the hierarchical regression analysis is used, and the standardized regression coefficient β values are respectively 0.147, 0.287, 0.323, -0.01 and 0.079, and $P$ <0.001 Significantly, the adjusted $R^2$ is 0.006, which shows that after adding the interaction item, the hypothesis $H_3$ in this study, the interference variable of artificial intelligence added by the enterprise does not strengthen the influence of the interface of shopping websites on online purchase behavior, so the research hypothesis $H_3$ is not supported, which means that there is no positive interference between the interface of the shopping website and the online purchase behavior when the company joins artificial intelligence; however, the hypothesis $H_4$ in this research, the interference variable of the company adding artificial intelligence has enhanced information evaluation The impact on online purchase behavior, therefore, if $H_4$ is supported, it means that the addition of artificial intelligence by companies has a positive interference between information evaluation and online purchase behavior.

***Enterprises add big data analysis technology to the interface of shopping websites***

The interface of shopping websites, information evaluation companies, and companies are added to the interaction items of big data analysis technology, and the hierarchical regression analysis is used, and the standardized regression coefficient β values are 0.151, 0.317, 0.341, 0.016 and 0.046, and $P$ <0.001 Significantly, the adjusted $R^2$ is 0.003, which shows that after the interaction item is added, the hypothesis $H_5$ in this study is that the interference variable item of the enterprise adding big data analysis technology can strengthen the influence of the interface of the shopping website on the online purchase behavior, so this study Accept Hypothesis $H_5$, which means that if companies add big data analysis technology, there is a positive interference between the interface of shopping websites and online purchase behavior; Hypothesis $H_6$ in this research, the interference variables of enterprises adding big data analysis technology have enhanced information Assess the impact on online buying behavior, so this study accepts Hypothesis $H_6$, which means that companies adding big data analysis technology has a positive interference between information evaluation and online buying behavior.

## 5. Conclusions

### *5.1. The impact of shopping site interface*

The shopping website interface has a positive and significant effect on online shopping behavior; the beauty of the shopping website and the complete information provided can encourage consumers to shop online, and consumers will pay attention to the information, navigation, and visual design of the shopping website when shopping.

### *5.2. The impact of information evaluation*

Message evaluation has a positive and significant effect on online buying behavior; if the buyer leaves a positive evaluation, the consumer will refer to the experience of others and purchase.

### *5.3. The interference effect of enterprises adding artificial intelligence to the interface of shopping websites*

The influence of interference effect does not exist, perhaps because consumers care about the brand, the quality of the product, or the price of the product during online shopping. When people browse different shopping sites on the Internet to compare products, they will give priority to the price. Discounted products are therefore less affected by artificial intelligence.

### *5.4. The interference effect of enterprises adding artificial intelligence in information evaluation*

This part has interference effects, artificial intelligence can make detailed calculations and recommendations, and recommend products to users through deductive methods.

### *5.5. The interference effect of companies adding big data analysis technology to the interface of shopping websites*

This part of the interference effect exists. It can be inferred that the content settings on the website will directly affect the number of visits by consumers. Suppose that if you use the

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statistical data of users to log on to the website to mine the information of user visits, and calculate the ordering rules based on user characteristics, use the above In the data, modify the appearance and structure of the website based on user data, put together products with a certain degree of interconnection, or set up links, etc., to establish a friendly interface for users.

### *5.6. The interference effect of enterprises adding big data analysis technology in information evaluation*

This part of the interference effect exists. It can be inferred that using data mining to analyze user behavior, analyze and recommend user comments, and recommend sales through user data is very efficient, and even predict the loss of customers.

The application of big data and artificial intelligence has brought about the digitization of consumer behavior and decision-making, and the data flow of e-commerce has become an important foundation of today's business operations. Traffic includes search data in search engines, keywords, direct contact to the website, and external links outside the website. Enterprises use data platforms to analyze the source of traffic. The main reason is to understand customers and provide good user experience. Alerts and keywords have become an important key to increasing traffic.

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