Application Research of Artificial Intelligence in E-commerce Industry

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Abstract: With the development of information technology, the trading mode of e-commerce has also undergone great changes. In particular, the emergence of artificial intelligence technology has enabled the rapid development of e-commerce and promoted the progress of the global science and technology economy. Based on the general trend of artificial intelligence and e-commerce integration, this paper studies the specific application of artificial intelligence in the e-commerce industry. Firstly, the development history of e-commerce and its development prospects are introduced. Then the concept and development of artificial intelligence are expounded. Finally, the application of artificial intelligence in 12 aspects of e-commerce industry is analyzed in detail, and it has a certain meaning in the development of e-commerce industry in the future.

1. Introduction

E-commerce is a revolution in the field of circulation with the application of computer networks represented by the Internet. It is a new growth point of the information industry in the new century, and it is a new market with great development potential and attractive development prospects [1]. The impact of the rapid development of e-commerce on the global economy is enormous. In the field of e-commerce, artificial intelligence technology has also been well applied. E-commerce based on artificial intelligence technology will better bring a good foundation for its development. This process is an inevitable trend of e-commerce towards benign development [2].

2. E-Commerce

2.1 The Development of E-Commerce

E-commerce began in North America and has been spread all over the world. "Electronics" in e-commerce refers to e-commerce technology. We believe that it is not simply a combination of e-commerce technology and business activities. E-commerce is not a simple addition of electronics and business, but an effective integration of electronics and business.

E-commerce has come to this day, and its development model has begun to turn to B2B. Obviously, compared to B2C, B2B e-commerce has the highest profit, and it is also the new model with the most challenges and the most difficulties. According to statistics, the global e-commerce market was 50 times that of the previous year in 2004, while the B2B market accounted for 7%. The number of mainland Chinese enterprises is 50 million, and the existing .com domain name is 22220. The B2B e-commerce market is vast, far from saturation, and a large number of services and profit channels are still in a blank state [3]. E-commerce is not only for companies to build websites, to promote corporate products and images, nor for simple online shopping. The real e-commerce should be the business technology and enterprise resource processing based on the internet as the core information technology. Simply speaking, it is the efficient management and value-added application of information flow. Since the 1990s, the enterprise information system model that has achieved remarkable results is the EDI system of the foreign trade department, the shopping mall information system of the commercial department, and the MRPII system of the manufacturing industry. The success of these systems is mainly to solve the problem of slow and inefficient manual work in the past. Some examples of foreign success at this stage are the cals system of manufacturing, the EDI of the circulation industry, and the e-commerce system of the financial

industry. The biggest feature of these systems is the collaboration between enterprises. In 1996, Japan united the automobile companies and component companies such as Mitsubishi Motors and Denso, and established the "v-cals consortium". Their goal is not only to shorten the development cycle of new vehicles by half, but also to share information on various parts transfer activities, cad design information, various conflicts, noise test information, etc., to form a multi-enterprise organic complex.
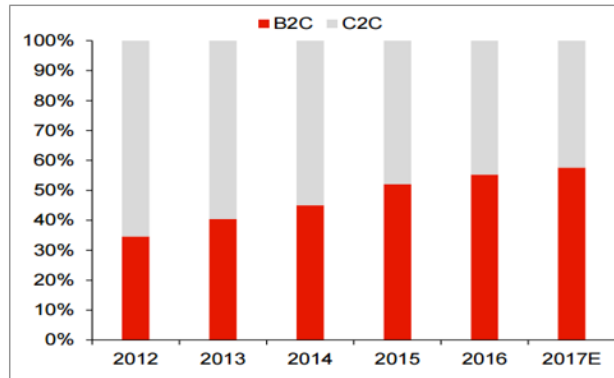

Figure 1 China's online shopping market transaction size structure

2.2 The Development Prospects of E-Commerce

With the increasing popularity of network technology in China, new e-commerce models for shopping, transactions, and payments through the Internet have developed rapidly. With its low cost and high efficiency, e-commerce is not only favored by ordinary consumers, but also effectively promotes SMEs to find business opportunities and win the market. It has become an important driving force for China to change its development mode and optimize its industrial structure [4].

According to relevant data, during the "Eleventh Five-Year Plan" period, China's e-commerce industry has developed rapidly, the scale of the industry has expanded rapidly, and service enterprises such as e-commerce information, transactions and technology have emerged. In 2010, the transaction volume of China's e-commerce market reached 4.5 trillion yuan, a year-on-year increase of 22%. In 2011, the total amount of e-commerce transactions in China reached a new high, reaching 5.88 trillion yuan, of which the e-commerce transaction volume of small and medium-sized enterprises reached 3.21 trillion yuan [5]. In the first quarter of 2012, the overall transaction scale of China's e-commerce market was 1.76 trillion yuan, a year-on-year increase of 25.8% and a decrease of 4.2% from the previous quarter. In the second quarter of 2012, the overall transaction scale of China's e-commerce market was 1.88 trillion yuan, a year-on-year increase of 25.0% and a sequential increase of 7.3% [6]. As of 2017, the national e-commerce transaction volume reached 29.16 trillion yuan, a year-on-year increase of 11.7%. In 2018, China's e-commerce transaction volume reached 37.05 trillion yuan. At the end of the year, China's e-commerce transaction volume exceeded 30 trillion yuan, reaching 31.63 trillion yuan, and it increased 10 times during the decade of 2008-2018.

It can be seen that China's e-commerce is developing rapidly and with great momentum. In the future, relying on artificial intelligence it will achieve more rapid and stable development.
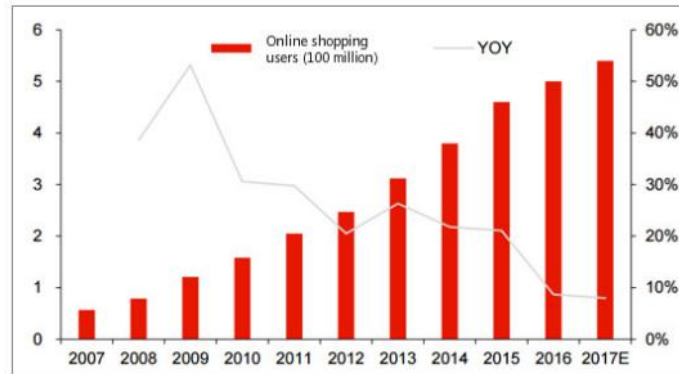
Figure 2. The number of online shopping users in China and its growth rate

3. Artificial Intelligence

3.1 Artificial Intelligence Concept

Artificial intelligence is a new technical science that studies and develops theories, methods, techniques, and application systems for simulating and extending human intelligence. Artificial intelligence is a branch of computer science that attempts to understand the essence of intelligence and produce a new intelligent machine that responds in a manner similar to human intelligence. Research in this area includes robotics, speech recognition, image recognition, and nature language processing and expert systems. The term "artificial intelligence" was originally coined at the Dartmouth Society in 1956. Since then, researchers have developed a number of theories and principles, and the concept of artificial intelligence has expanded. Artificial intelligence is a challenging science, and people who do this work must understand computer knowledge, psychology, and philosophy. Artificial intelligence is a very broad science that consists of different fields, such as machine learning, computer vision, etc. In general, one of the main goals of artificial intelligence research is to make machines capable of doing what is usually required by human intelligence. But different eras and different people have different understandings of this "complex work." For example, heavy scientific and engineering calculations are supposed to be undertaken by the human brain. Now computers can not only perform such calculations, but also can do it faster and more accurately than the human brain. Therefore, contemporary people no longer see such calculations. It is a "complex task that requires human intelligence to complete." It can be seen that the definition of complex work changes with the development of the times and the advancement of technology. The specific goal of artificial intelligence has naturally evolved with the changes of the times. On the one hand, it continues to make new progress, and on the other hand it turns to more meaningful and more difficult goals. The main material means that can be used to study artificial intelligence and the machines that can realize artificial intelligence technology are computers. The development history of artificial intelligence is related to the development history of computer science and technology. In addition to computer science, artificial intelligence involves many disciplines such as information theory, cybernetics, automation, bionics, biology, psychology, mathematical logic, linguistics, medicine, and philosophy. The main contents of artificial intelligence research include: knowledge representation, automatic reasoning and search methods, machine learning and knowledge acquisition, knowledge processing system, natural language computer vision, intelligent robot, automatic programming and so on.

3.2 Development of Artificial Intelligence

From the historical development of artificial intelligence, it is roughly divided into three stages: the gestation period, the formation period and the development period.

The gestation period: the rise and fall of artificial intelligence in the 1950s: After the concept of artificial intelligence was first proposed, a number of remarkable results appeared, such as machine theorem proving, checkers program, general problems solver, LISP table processing language.

However, due to the limited ability of reasoning and the failure of machine translation, artificial intelligence has entered the bottom. The characteristics of this stage are: attach importance to the method of problem solving and ignore the importance of knowledge.

Forming period: From the late 0s to the 70s, the emergence of expert systems led to a new upsurge in artificial intelligence research. The research and development of expert systems such as DENDRAL mass spectrometry system, MYCIN disease diagnosis and treatment system, PROSPECTIOR prospecting system, and Hearsay-II speech understanding system have brought artificial intelligence to practical use. And, in 1969, the International Joint Conference on Artificial Intelligence was established.

Development period: In the 1980s, with the development of the fifth-generation computer, artificial intelligence has been greatly developed. Japan began the "fifth-generation computer development plan" in 1982, that is, "knowledge information processing computer system kips", its purpose is making logical reasoning as fast as numerical operations. Although this plan eventually failed, its development formed a wave of research on artificial intelligence.

4. Application Of Artificial Intelligence In E-Commerce

With the development of science and technology, artificial intelligence technology is becoming more and more mature. It is even considered to be the fourth technological revolution following the steam engine revolution, the power revolution, and the information revolution, and is changing the work and lifestyle of people [7]. Especially in the field of e-commerce, artificial intelligence technology has gradually developed into a powerful tool to boost sales growth and optimize e-commerce operations. At present, the application of artificial intelligence in the field of e-commerce is mainly reflected in the following aspects.

4.1 Intelligent Customer Service Robot

Intelligent customer service robots involve many artificial intelligence technologies such as machine learning, big data, natural language processing, semantic analysis and understanding [8]. The main function of the AI customer service robot is to automatically respond to customer questions, respond to simple voice commands, and provide product recommendations through the use of natural language processing systems. Chat dialogs on e-commerce sites and mobile pages are based on machine learning algorithms that are programmed to communicate with customers in a personalized way. Intelligent customer service robots can help consumers find the right products, check the supply of products, compare various products, and finally help consumers pay; if there are any complaints or questions, the intelligent customer service robot can also help customers to contact the corresponding service personnel. Consumers can "talk" to these robots via text, voice and even pictures. In March 2017, Alibaba released the artificial intelligence service robot "Shop Xiaomi", which is the intelligent customer service robot of Taobao merchants. After the merchant authorized and debugged, the intelligent customer service robot can replace some customer services, thus reducing the manual customer service. The workload can also add a personal style.

4.2 Recommendation Engine

The recommendation engine is a complete recommendation system based on the machine learning algorithm framework. The AI algorithm can realize deep learning, statistical programming and prediction of massive data sets, analyze customer behavior, and use algorithms to predict which products may attract customers. Each enterprise site provides search function, which is the most direct way for users to find the information they need. The keywords and input times that users input during the search can reflect some interest and hobbies of the user. Analyze the number of occurrences of keywords, comprehensively utilize data warehouse and olap technology, and dig out the products and services that are most concerned by different user groups, so as to provide users with different interests and hobbies with information that meets their needs, which will greatly improve the user's return rate and loyalty. In terms of specific implementation, the enterprise must be

able to record the basic information of the user and the keywords input by the user in the background. By collecting keywords for a user, find different interests of different users. Through the entire database, the data is integrated into the data warehouse summary. Through the number of occurrences of the same or related keywords, it can find the needs of the public. After the company finds these valuable information, it provides different information for different interested users, increases the convenience of accessing keywords with high search rate and provides more abundant keywords. The information, which will greatly increase the number of online transactions of enterprises. The application of the dimension reduction algorithm opens the transformation of artificial intelligence to the recommendation system. The most profound change of artificial intelligence to the recommendation system is that the recommendation system is no longer considered as independent. The combination of recommended results, which is the whole human-computer interaction behavior, introduces the time dimension to realize the dynamic dimension of the system and users. Many e-commerce companies, such as Amazon, Alibaba Taobao, Jingdong Mall, etc. use the recommendation engine to identify their products towards target consumers.

4.3 Image Search

Between the merchandise display of the e-commerce platform and the description of the consumer's needs, the search link is used to generate contact. However, text-based search behavior is sometimes difficult to direct users to find the products they want. Through computer vision and deep learning technology, consumers can easily search for the products they are looking for. Consumers only need to upload the product image to the e-commerce platform, artificial intelligence can understand the style, specifications, color, brand and other characteristics of the product, and finally provide consumers with the same type of merchandise sales portal.

4.4 Inventory Intelligence Forecast

Multi-channel inventory planning management is one of the biggest problems that plague e-commerce. When the inventory is insufficient, the time wasted by the replenishment will have a great impact on the income of the merchant. However, if there is too much inventory, it will increase the business risk and capital demand. Therefore, it is not an easy task to accurately predict inventory. At this time, artificial intelligence and deep learning algorithms can be used in order turnover forecasting. They can identify the key factors of order turnover, and calculate the impact of these factors on turnover and inventory through the model [9]. In addition, the advantage of a learning system is that it can become more intelligent as it evolves over time, which makes inventory predictions more accurate.

4.5 Intelligent Sorting

Intelligent robot sorting is not only flexible and efficient, but also highly applicable. The robot has relatively low requirements on the site, and the number can be increased or decreased according to the site conditions. Compared with manual sorting, in the case of the same sorting quantity, the sorting of goods is more timely and accurate, and the reduction of sorting links reduces the number of times of cargo handling, and the goods are more secure.

4.6 Trend Forecast

In general, there is a lot of user information hidden in the picture. Therefore, according to the pictures viewed by the user, the deep learning algorithm can be used to analyze the popular trends of a certain category, such as color, specification, material, style, etc., which is also an important basis for the e-commerce platform to negotiate with the supplier.

4.7 Commodity Pricing

In the traditional model, companies need to rely on data and their own experience to determine the price of goods. However, in an increasingly competitive market environment, commodity prices

are subject to timely adjustments as the market changes. This long-term continuous price adjustment is a big challenge even for an online retailer with only small-scale inventory. This kind of pricing problem is what artificial intelligence is good at. Through advanced deep learning algorithms, artificial intelligence technology can continuously evaluate market dynamics to solve commodity pricing problems [10].

4.8 Improve Website Structure

The website structure refers to the page layout and business process of the entire website. A reasonable website structure enables users to quickly find the information they need, and greatly increases the user's stay time and number of transactions on the website. E-commerce websites are often launched as enterprises. There may be many areas that are not suitable for user experience, which requires a comprehensive analysis of user access logs, data warehouse, data mining and olap technology to analyze what kind of page access form users like, what kind of user preferences business process, thus improving the structure of the website and obtaining a better user experience. In terms of specific implementation, the websiteserver keeps the logs of user access, pre-processes these logs, extracts meaningful content, analyzes the user's access behavior and preferred business processes using olap and data mining techniques. The data mining technology used is more classification and association rule technologies, they are classified according to different pages or page time, and the number of users and the stay time of each page are obtained to determine the user's access behavior. The association rules can also be used to analyze the user's access. The related pages accessed during different pages and the number of visits, thus adjusting the content of related pages and increasing the number of links of similar content, which will increase the user's stay time and number of transactions on the site.

4.9 Transaction Relevance

Transaction relevance refers to the relevance of a user purchasing an item while purchasing an item in the online mall. This mainly applies the association rule analysis technology of data mining. On the trading page, some goods and services related to the transaction goods are often placed, and the content and number of related links are clicked when the user enters the transaction page, and the number of transactions added by the related links of the click is further analyzed. In the case of support and confidence, the user's transaction relevance is judged. This will improve the position of online products and the similarity of related products or the concentration of related products, thus increasing the transaction volume. In the implementation, the user access log can be mined and analyzed, or the transaction correlation result can be obtained by directly analyzing the association rule of the transaction related page. The latter needs to record the time of each page access in the database, as well as the access to a page and other pages accessed by the link and the time of stay, as well as the success rate of the transaction. Recording these requires a lot of storage space, which involves the dumping of data and timely access to transaction correlation data.

4.10 Analysis of Transaction Amount

Analysis of the user's transaction amount can greatly help the company to implement customer relationship management, thereby improving customer loyalty. By using olap and data mining technology, the user's analysis of the transaction quantity and transaction amount and transaction content at a certain time is different. The time period of the user's different transaction quotas on different content items, thus managing the transaction. For example, for different customers, provide different after-sales service, give different levels of gifts and give different degrees of preferential treatment. In the early stage of high time period, vigorous publicity is adopted to further promote transaction consumption. In actual operation, as long as the transaction content, transaction amount and transaction time in the transaction table of different users in the database are analyzed, classification and cluster analysis are performed, to get the users of different transaction quotas, as well as the time period and transaction content with the most transaction amount, so as to provide accurate decision on the relevant marketing and marketing strategies of the enterprise.

4.11 Return Processing

Online transactions are not the actual goods, but only the pictures of the traded goods, there may be a certain gap with the actual goods that the user imagines, so there are more cases of online goods return. By mining and analyzing the return data, we can recognize the defects in the quality of goods and services provided by the company, which will greatly help the company to improve the quality of its own goods and services and improve the competitiveness of the company. In practice, the customer back-end database records the reason for the customer's return at each return processing. By integrating the data into the data warehouse and integrating the product table and the customer table, the company analyzes the defects of the returned goods, the reasons for the customer return, and the cost loss caused by the return. The result is a return solution and preventive mechanism that improves the quality of the goods and services provided by the company.

4.12 Network Security

After all, online transactions have broken through the real form of physical exchange, realizing a new form of electronic money and goods exchange. The various fraudulent behaviors and security problems that arise are unpredictable and may bring huge economic losses to enterprises. Through the business intelligence technology, the user's existing fraud and security vulnerabilities and possible hacker attack methods are analyzed to improve the enterprise's risk prevention and emergency measures. In the implementation, use the clustering and classification technology in data mining to mine the background transaction log and network bank use the log to analyze the inconsistencies and abnormal conditions, and obtain possible fraud and security vulnerabilities, so as to provide a basis for further measures.

5. Conclusion

Artificial intelligence technology has entered the fast lane, and as technology matures and applications become more widespread. Although artificial intelligence currently only integrates e-commerce through these methods, the e-commerce field will be able to clarify broader development prospects, establish better customer relationship management, promote sales, bridging personalization and privacy under the blessing of artificial intelligence technology. As time goes by, the e-commerce sector will continue to be affected by artificial intelligence, and we have reason to believe that artificial intelligence will become an important boost for e-commerce transformation.

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