Research Article

Analysis of the Business Model of C2B Cross-Border E-Commerce Platform Based on Deep Learning

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Based on the rapid popularity of the Internet, business can circulate in a wider range of fields. E-commerce integrates traditional offline business resources with a brand-new model, so that products can be sold to consumers everywhere. As a new business model that has emerged in recent years, cross-border EC has largely solved the problem of asymmetry in import and export trade information. This paper studies the business model analysis of C2B cross-border EC platforms based on deep learning. First, it has general understanding of related theories, then uses the deep learning model to analyze the business models of cross-border EC, and finally analyzes the results. It is concluded that when the user loyalty is 0.65, the key variables are constantly increasing. Among them, the trends of active users and costs are similar, and the trends of orders and revenue are similar.

1. Introduction

In recent years, our country has actively developed cross-border EC business, and the service system of cross-border EC platforms has been continuously improved [1, 2]. The traditional business model is no longer suitable for cross-border development, and the EC business model is gradually being replaced [3, 4]. For this reason, business model innovation has become an important research topic in my country's academic circles. With the rapid development of our country's Internet economy, the cross-border EC model has greatly facilitated the cross-border shopping of Chinese consumers. More and more consumers are cross-border EC and tend to purchase satisfactory products through commercial channels [5, 6]. While developing rapidly, enterprises are also facing many challenges. How to obtain living space in the fierce market competition? Business model innovation plays an important role in it [7, 8]. Cross-border e-commerce refers to an international business activity in which transaction subjects belonging to different customs territories reach transactions through e-commerce platform, conduct e-payment and settlement, and deliver goods through cross-border e-commerce logistics and remote warehousing, so as to complete the transaction.

Transnational e-commerce has the following characteristics: network is a media body without boundary, with the characteristics of globalization and decentralization. The development of network makes the transmission of digital products and services popular. Digital transmission is through different types of media, which appear in the form of computer data code in the network, so it is invisible. Due to the decentralized and global characteristics of cross-border e-commerce, it is difficult to identify the identity and geographical location of e-commerce users.

For cross-border EC platform research, some researchers have established a standard system for evaluating cross-border EC platform selection based on DeLone and McLean's EC success model and MA-OWA operators and used the triangular fuzzy analytic hierarchy process to determine the standards. The weight of the hierarchy further establishes a fuzzy comprehensive evaluation model. Finally, the experiment proved the scientificity, feasibility, and effectiveness of the evaluation method of the evaluation standard system [9]. On the basis of the analysis of existing scholars, researchers also examined two payment methods, digital cash payment based on blockchain technology and blockchain applications on third-party payment platforms, then discussed cross-border EC payment platforms of the

blockchain mechanism in China, and creatively proposed the cross-border EC payment platform blockchain, which provides reference and guidance for the further development of blockchain technology in the cross-border field [10]. Some scholars introduced the operation of the LightInTheBox cross-border EC platform in the context of the “COVID-19” epidemic and conducted a comprehensive financial analysis, including operational analysis, profitability analysis, and asset performance analysis. The relevant indicators are supplemented with corresponding data for quantitative analysis. One is business analysis, which shows the role of capital by analyzing turnover; the other is profitability analysis, which shows the return of profits and pays attention to the net profit it generates. Third, asset performance analysis reflects solvency by analyzing the return on net assets [11]. Some scholars have proposed a model that combines CNN (convolutional neural network) and attention mechanism to encode image features and product image features, created a 5-layer CNN without a fully connected layer to extract the initial image features, and then designed a series of attention mechanism strategies that are used to select the image features that have the greatest impact when words are created at different times [12]. In summary, there are many research results on cross-border EC, but there are relatively few related studies on the analysis of the business model of C2B cross-border EC platforms based on deep learning. Note that convolutional neural network is a kind of feedforward neural network with a depth structure including convolution calculation. It is one of the representative algorithms of depth learning. The convolutional neural network has the ability of representation learning and can classify the input information according to its hierarchical structure. The convolution neural network is constructed by imitating the visual perception mechanism of biology, which can carry out supervised learning and unsupervised learning. The parameter sharing of convolution kernel in the hidden layer and the sparsity of interlayer connection enable the convolution neural network to lattice features with less computation.

This paper studies the business model analysis of C2B cross-border EC platform based on deep learning, analyzes the current status of the business model of 2B cross-border EC platform based on relevant literature data, applies research and uses the deep learning model to analyze the business model of C2B cross-border EC platform based on these theoretical foundations, and draws relevant conclusions through the analysis results. Deep learning is to learn the internal law and representation level of sample data. Its ultimate goal is to make machines have the ability to analyze and learn like people. The concept of deep learning comes from the research of artificial neural networks. Multilayer perceptron with multiple hidden layers is a deep learning structure. Deep learning combines low-level features to form more abstract high-level representation attribute categories or features, so as to find the distributed feature representation of data. The motivation of studying deep learning is to establish a neural network simulating the human brain for analytical learning.

2. Research on the Business Model of Cross-Border EC Platforms

2.1. Current Status of C2B Cross-Border EC Platform Business Model. (1) Today, EC’s cross-border platform, C2B, offers three delivery methods: stand-alone delivery, promotional delivery, and electronic delivery. Platform sellers are free to choose according to their needs and the needs of the buyer. The most reliable way of payment is electronic delivery. Electronic Fast Delivery is a logistics services system cocreated by AliExpress, Cainiao.com, and a number of high-quality third-party logistics providers. Compared to offline distribution, online products have the advantages of a network configuration recognition platform, guaranteed compensation for logistics issues, exclusive contract prices, convenient payments, fixed channels, and quick timeliness. The seller is responsible for communicating with both the carrier and the logistics service provider of the carrier. The former requires a lot of work because it is the entire site, while the latter requires sufficient experience to work for a mixed transportation company. Existing logistics solutions can be divided into cost-effective international logistics, simple logistics, standard logistics, high-speed logistics, and storage logistics in terms of price and timeliness.

(2) Cross-border logistics distribution is different from domestic logistics distribution in that there are many traffic connections, long intervals, and high costs. It is difficult to avoid difficulties in identifying logistics information throughout the process and to bear customs barriers, payment and exchange risks, and so on. Many unfavorable factors have caused differences in after-sales logistics problems. Traders need to invest a lot of energy to resolve these differences, which not only consumes time and energy but also affects the reputation of the trader. Moreover, cross-border logistics refers to the planning, implementation, and control management process for the effective flow and storage of physical goods and information at both sides of the customs border. Different from traditional international logistics, cross-border e-commerce logistics has the characteristics of rapid response, functional integration, standardized operation, electronic information, and systematic service. Compared with domestic logistics, cross-border e-commerce logistics is broad, international, high-risk, high-tech, and complex.

(3) The essence of the third-party payment system is to establish an intermediate transfer account between the payee and the payer to control the transfer of funds. Only after the payer agrees can the funds be transferred to the payee, eliminating the information gap between the two parties. Symmetrical obstacles are fair to both buyers and sellers, and the convenience and low rates are recognized by cross-border consumers and traders.

2.2. Elements of the Business Model. Figure 1 is the flowchart of the EC export platform. The cross-border EC industry chain mainly includes upstream manufacturers (product flow), platform profit system (fund flow and promotional services), and consumer services (logistics to visual cross-

FIGURE 1: Flowchart of EC export platform.

border EC platform merchants). This paper starts with three key components, user loyalty, brand cooperation strategy, and user value, and creates an analysis framework as shown in Figure 2.

Besides, China's cross-border e-commerce is mainly divided into business-to-business and business-to-consumer trade models. Under the B2B mode, enterprises mainly use e-commerce for advertising and information release, and the transaction and customs clearance processes are basically completed offline. In essence, it is still a traditional trade and has been included in the general trade statistics of the customs. Under B2C mode, Chinese enterprises directly face foreign consumers and mainly sell personal consumer goods. In terms of logistics, they mainly use airbags, mail, express, and other methods. The main body of customs declaration is postal or express companies, which are not included in customs registration at present. Cross-border e-commerce is divided into export cross-border e-commerce and import cross-border e-commerce.

2.3. Application of Deep Learning in C2B Cross-Border EC Platform. Nowadays, deep learning is increasingly being proposed as an effective tool for investigating and solving complex business system problems. Business models can be viewed as composed of elements. In the synthesis process, these elements have many characteristics. (1) Elements do not exist alone but are related to each other. (2) Data is a complex business model system with an organic structure. (3) The data link has the characteristics of complexity, multidimensional combination, and multilevel projection. It is also constantly complicated by differentiation and deepening.

2.4. Deep Learning Algorithm. Given a set of input samples X , where x is the attribute vector of the i -th sample, corresponding to the point in the attribute space X , the attribute

FIGURE 2: Analysis framework diagram.

value of j , the dimension of the attribute vector x , and the data features are normalized and represented by (1)

$$X^* = \frac{(X - 1_n \times x_{\min})}{(1_n \times (x_{\max} - x_{\min}))}. \quad (1)$$

Among them, 1 represents an n -dimensional column vector with a value of 1 . $x_{\min}$ and $x_{\max}$, respectively, represent the vector formed by the lowest value and more highest values in each feature dimension of the sample set x . In some data samples, each sample is considered to have spatial information. Therefore, for each sample in each sample space, there will be a certain influence, and each data is different in various information entropy values existing in the entire sample space. Let l be the Euclidean distance between the i -th sample and the j -th sample, and the ratio of the influence of sample j to sample i is as follows:

$$P_{ij} = \frac{l_{ij}}{\sum_{i=1}^n x_{ij}}. \quad (2)$$

The calculation involved in generating output from an input can be represented by a flow graph: the flow graph is a

graph that can represent the calculation. In this graph, each node represents a basic calculation and a calculated value, and the calculated results are applied to the values of the child nodes of this node. Consider such a calculation set, which can be allowed in each node and possible graph structure, and define a function family. The input node has no parent node, and the output node has no child nodes. A particular property of this flow chart is depth: the length of the longest path from an input to an output.

3. Business Model Analysis Experiment of C2B Cross-Border EC Platform Based on Deep Learning

3.1. Data Sources. Verify the accuracy of the model by comparing with actual data. The simulation settings are as follows: (1) Simulation object: Yaohawang. (2) Simulation time: 2016–2020, 5 years in total. (3) Simulation software: Vensim PLE. (4) Simulation data source: Yaohawang (China) Co., Ltd. Financial annual report (GAAP accounting standards), iResearch EC research report, China EC research center, and China EC annual report. It should be noted that Vensim PLE mainly has the following characteristics: using graphical programming to establish the model and providing a variety of analysis methods and authenticity test for the model. In other words, for the system we study, for some important variables in the model, according to common sense and some basic principles, we can put forward the basic requirements for their correctness in advance. These assumptions are authenticity constraints. By adding these constraints to the built model and especially simulating the compliance or violation of these constraints by the existing model at run time, we can judge the rationality and authenticity of the model.

3.2. Data Processing. This paper analyzes the financial statements published on the website, detailed reports on the C2B EC industry (source: iResearch), and website case analysis (source: iResearch), revenue, cost, product revenue, orders, and active users. Six variables are used as behavioral recurrence test variables, and the commonly used R2 is used as an index for control model adaptation.

3.3. Data Iterator. When using deep networks for deep learning for big data learning, the data samples used can reach dozens of gigabytes. Generally speaking, the current computer running memory is much smaller than this value, and it is impossible to read so much data in one memory time. Therefore, the basic detailed learning framework uses data iterators to send data samples to the learning network in batches, which can be distributed while saving memory.

In computer science, iteration is the repetition of a set of instructions in a program. It can be used not only as a general term but also to describe a specific form of repetition with the variable state. In the first sense, recursion is an example of iteration, but a recursive expression is usually used. In the second sense, iteration describes the programming style used in an imperative programming

language. Because the numerical iteration gradually approximates the best point to obtain the approximate solution, it is infinitely close to the best point, but it is not the best point in theory. Therefore, it is necessary to consider under what conditions to terminate the iteration and obtain an approximate minimum point with sufficient accuracy. This condition is the termination criterion of iterative calculation.

3.4. Deep Learning Training Process

3.4.1. Creating a Network Model. The powerful MXNet model unit MXNet symbol meets the weight and offset start of each layer, such as creating Symbol Revolution, Symbol Activation, Symbol Pooling, Symbol Fully Connected, and Symbol Soft Max Output.

3.4.2. Training the Network Model. Enter the training and cross data repeater, initialize the network model structure, set the number of iterations to 1000, display the error value every 10 iterations, set the initial learning rate = 0.01, use the optimization method of random gradient descent, and find the local minimum and the world's highest value; then the network model is trained on the computer GPU, and the model training is determined by the loss function in the training phase.

Top-down supervised learning is to train through labeled data, transmit the error from top to bottom, and fine-tune the network. Based on the parameters of each layer obtained in the first step, the parameters of the whole multilayer model are further optimized. This step is a supervised training process. The first step is similar to the random initialization initial value process of neural network. Because the first step is not random initialization but obtained by learning the structure of input data, this initial value is closer to the global optimization, so it can achieve better results. Therefore, the good effect of deep learning is largely due to the first step of feature learning.

4. Analysis of Experimental Results

4.1. User Loyalty. B2CEC companies increase customer value by providing their customers with a great shopping experience. A good user experience can increase user loyalty and increase repetitive purchases and user feedback. This white paper examines the impact of user loyalty on EC-B2C enterprises. User loyalty is set to 0.65 and 0.75, and experimental data is obtained by running the model. Through data comparison, we analyzed the impact of changes in user loyalty on key model variables and measured the impact of changes in user loyalty on specific patterns in the development of B2CEC enterprises. Specific manifestations of customer loyalty: customer loyalty refers to consumers' biased purchase behavior towards an enterprise's products and brands many times when making purchase decisions. Loyal customers are the most valuable customers of the enterprise. A small increase in customer loyalty will lead to a significant increase in profits. The focus of customer loyalty marketing theory is profit. Building customer loyalty is the

most effective way to achieve sustained profit growth. Enterprises must transform the concept of doing transactions into the concept of establishing relations with consumers, from only focusing on the struggle and conquest of consumers to focusing on the loyalty and persistence of consumers. Table 1 shows the main variables.

Figures 3 and 4 show that, for user engagement of 0.65, the key variables continue to rise. Among them, the trends of active users and costs are similar, and the trends of orders and revenues are similar. According to some analysts, user loyalty is repeatedly increasing purchase volumes, increasing order volumes and revenue. Increasing orders increases the bargaining power of the platform and reduces procurement costs for companies as well as users to generate more value and profits. When user loyalty increases to 0.75, the overall pattern change matches the pattern change when user loyalty increases to 0.65. In summary, users are the focus of competition among EC-B2C companies and the source of sustainable business development. User loyalty is about bringing word-of-mouth marketing to your business. You can further strengthen your current trust in the EC-B2C platform. The focus of future e-commerce competition is no longer limited to price but depends on the customer and whether we can provide a good experience.

4.2. Brand Cooperation Policy. Determine the initial value of your brand partnership strategy. The initial value of brand cooperation parameters is 50, and the initial value of other profit margins is 40,000. We can change the brand cooperation policy to obtain different comparison data. Brand cooperation policy 1: cooperative brand parameters are 71, and other profit margins are 65,000. Brand cooperation policy 2: cooperative brand parameters are 98, and other profit margins are 81,000. Run the model to receive control group data, as shown in Table 2.

Figures 5 and 6 show that as brand collaboration increases and the price of brand services decreases, all key variables increase. This shows that the adoption of an open platform strategy will benefit the development of B2CEC companies. With partnership strategy 1, revenue growth outweighs the cost while increasing active users and orders. This is mainly due to the increase in other sources of income. Revenue growth is faster than cost, demonstrating that implementing an open platform strategy can increase a company's profits. Similarly, if the platform is more open, that is, if the brand 2 cooperation policy is adopted, the same result as policy 1 will be obtained. Policy 2 further increases the profits of the company.

4.3. User Value Simulation. User value, as the embodiment variable of the value proposition, is the focus of this paper. User value is the sum of the perception value and experience quality of users when they accept the products and services provided by all parties. In the context of setting the user value to 1, 2, run the model to obtain the data of the control experiment group, as shown in Table 3.

It can be seen from Figures 7 and 8 that when the user value is increased, the key variables show an increase, but the basic trend remains the same. The increase in user value increases the number of active users, so the increase in active users will be more obvious.

4.4. Suggestions for Business Model Innovation

4.4.1. Timely Insight into User Needs to Realize the Value Proposition. It can be said that the competition and occupation of consumer psychological space is an inevitable part of large enterprises. The value proposition in the canvas model of business model elements is mainly described as the concept of creating value for specific segmented customers. Timely understanding of consumer needs is the top priority, and all companies should continue to pay attention to the development process. It satisfies the basic needs of users. Users always look at the dedication of the product from the first try. This way, the retention rate and conversion rate have also been significantly improved, forming a huge user group like the Xiaomi community. Users actively participate in the whole process from product development to product internals and consciously and proactively promote user behavior, and word of mouth spreads quickly.

4.4.2. The User Is Supreme and Always Adheres to the User Experience as the Core. In the past, marketers provided products directly based on experience and less dependent on data to consider the actual needs of users. With the progress of the Internet era, users can freely browse and purchase products on the Internet. Many companies want to stand out from the crowd and get the attention of users, so they need to find out what users need. The function that the target user wants is to design or deliver the product by simulating the behavior path of the target user. In this way, user behaviors can use or purchase products smoothly or very comfortably, and the user experience is successful and complete.

4.4.3. From the Perspective of Performance. If business model innovation provides new products or services, it may create a new profitable industrial field. Even if it provides existing products or services, it can bring more lasting profitability and greater competitive advantage to enterprises. The traditional form of innovation can improve the local internal efficiency and reduce the cost, and it is easy to be imitated by other enterprises in a short period of time. Although business model innovation is also reflected in the improvement of enterprise efficiency and cost reduction because it is more systematic and fundamental and involves the simultaneous change of multiple elements, it is also more difficult to be imitated by competitors, which often brings strategic competitive advantages to enterprises, and the advantages can often last for several years.

TABLE 1: User loyalty affects results.

		2016 (%)	2017 (%)	2018 (%)	2019 (%)	2020 (%)
User loyalty is 0.65	Income	4.67	8.23	10.45	12.12	13.23
	Cost	4.34	7.78	10.21	11.65	12.79
	Active user	4.65	8.12	10.34	11.78	13.1
	Order	4.65	8.12	9.45	11.70	13.1
User loyalty is 0.75	Income	9.34	16.45	21.67	24.45	27.12
	Cost	8.90	15.98	20.78	23.67	26.32
	Active user	9.12	16.21	20.80	24.12	26.23
	Order	9.23	16.21	21	24.23	26.56

FIGURE 3: User loyalty 0.65 affects results.

FIGURE 4: User loyalty 0.75 affects results.

TABLE 2: Brand cooperation policy affects results.

		2016	2017	2018 (%)	2019 (%)	2020 (%)
Brand cooperation policy 1	Income	1.23%	4.78%	7.67	10.23	12.12
	Cost	0	3.34%	6.12	8.34	9.89
	Active user	0	3.34%	6.12	8.34	10.12
	Order	0	3.34%	6.12	8.34	10.12
Brand cooperation policy 2	Income	2.34%	9.45%	15.67	20.67	25.23
	Cost	0	6.23%	11.89	16.12	19.67
	Active user	0	6.23%	12.13	16.45	20.12
	Order	0	6.23%	12.13	16.45	20.12

FIGURE 5: Brand cooperation policy 1 affects results.

FIGURE 6: Brand cooperation policy 2 affects results.

TABLE 3: User value simulation results.

		2016	2017	2018 (%)	2019 (%)	2020 (%)
User value 1	Income	2.23%	5.78%	8.67	11.23	13.12
	Cost	0	6.34%	9.12	9.34	10.89
	Active user	0	6.34%	9.12	9.34	11.12
	Order	0	6.34%	9.12	9.34	11.12
User value 2	Income	3.35%	10.45%	17.67	24.67	27.23
	Cost	0	8.23%	12.89	18.12	20.67
	Active user	0	8.23%	13.13	18.45	21.12
	Order	0	8.23%	13.13	18.45	21.12

FIGURE 7: User value 1 simulation results.

FIGURE 8: User value 2 simulation results.

5. Conclusions

This paper studies the business model analysis of C2B cross-border EC platforms based on deep learning. First, after analyzing the business model elements, several business model elements are selected for experimental analysis. The experimental results show that when increasing user value, the key variables increase, but the basic trend remains the same. The increase in user value increases the number of active users, so the increase in active users will be more obvious.

Data Availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The author declares that they have no conflicts of interest to report regarding the present study.

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