Analysis on Innovative Models of Strategic Marketing Management for E-Commerce Enterprises under the Internet of Things: Case Study in China

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Abstract

The strategic marketing management of traditional e-commerce enterprises can lead to user experience being limited by technology and platforms, reducing user purchase intention and loyalty. The Internet of Things (IoT) technology can be used to innovate the strategic marketing management of traditional e-commerce enterprises and overcome the shortcomings of traditional e-commerce marketing management. By collecting a large amount of data through sensors and other IoT devices, including user behavior data, logistics data, etc., this study conducted comprehensive analysis and deep mining of the data. It provided an in-depth understanding of user needs and purchasing behavior patterns to develop personalized marketing plans. Through the connection of smart wearable devices, this provided users with personalized product experiences and customized services. Finally, this study regularly evaluated and offered feedback on marketing effectiveness, and continuously optimized marketing strategies. It utilized IoT technology to innovate the strategic marketing management of e-commerce enterprises, resulting in an average increase of 8.7% in sales and a return on investment (ROI) of 45%. Compared to traditional methods, IoT can improve the efficiency and effectiveness of marketing activities, and enterprises can be more flexible in conducting market experiments and quick trial and error. The application of IoT technology brings more opportunities to e-commerce enterprises.

Keywords: *Internet of tTings, Data Analysis, E-commerce Enterprise, Strategic Marketing Management, Innovative Models.*

Introduction

Innovative strategic marketing management refers to the process by which enterprises focus on innovative thinking and methods when formulating and executing marketing strategies to achieve strategic goals and maintain competitive advantages (Adams et al., 2019). Through innovative strategic marketing management, companies can better understand consumer needs, flexibly respond to market changes, and uniquely shape their brand image. Furthermore, it also helps to increase market share, increase profitability, and establish a long-term competitive advantage (Chen, 2012). Therefore, effective innovative strategic marketing management is one of the keys to the success of an enterprise.

In today's digital landscape, the e-commerce has evolved into a dynamic arena where strategic marketing management plays a pivotal role in shaping the success trajectory of enterprises (Ling, 2023). With the relentless advancement of digital technology, the strategic marketing maneuvers of e-commerce entities have become increasingly sophisticated and influential in navigating the competitive market terrain (Shah and Murthi, 2021). This study delves into the strategic marketing management within e-commerce enterprises, exploring its significance, objectives, and impact amidst the backdrop of technological innovation and evolving consumer behavior.

The rapid proliferation of digital technologies has catalyzed a paradigm shift in consumer behavior, with an escalating reliance on the Internet and mobile devices for shopping and communication. In this digital ecosystem, the Internet of Things emerges as a transformative force, facilitating the seamless interconnectivity of smart devices, sensors, and wireless networks. This interconnected landscape offers e-commerce enterprises an unprecedented opportunity to harness vast troves of data for the formulation and execution of targeted marketing strategies.

Against this backdrop, the primary objective of this study is to investigate the strategic marketing management practices employed by e-commerce enterprises, with a specific focus on leveraging IoT technology to drive innovation and enhance competitive advantage. This study also aims to elucidate the pivotal role of strategic marketing in achieving enterprise goals amidst the evolving digital landscape, wherein differentiation, innovation, and personalized customer experiences are paramount.

Literature Review and Theoretical Framework

The Internet of Things (IoT) describes a network of physical objects embedded with sensors, processing ability, software and other technologies, the purpose of which is to connect and exchange data with other devices and systems through the Internet. IoT devices can collect a large amount of real-time data, including information such as product usage, consumer behavior, and preferences (Kumar et al., 2019). By analyzing these data, companies can better understand market needs and trends, thereby guiding the formulation of innovation strategies. Many studies show the widespread application of IoT in different fields. Song and others combined sensors, information technology, artificial intelligence, and existing dynamic network devices. They used the IoT to achieve remote communication between hospitals, patients, and medical devices, ultimately improving the current medical situation (Song et al., 2020). Ding and others revealed the main technologies for research and application of smart logistics based on the IoT and demonstrated the role and impact of the IoT on smart logistics. This promotes the application of various IoT technologies in logistics practice, and the development of advanced technology and management systems (Ding et al, 2021). Lv and Li researched on the origin and current status of the IoT technology to understand the relevant theories and cutting-edge technologies of the IoT technology. They introduced IoT technology into intelligent management, providing an opportunity to break through bottlenecks for the development of intelligent management (Lv and Li, 2012). The IoT technology can improve energy efficiency, increase the share of renewable energy, reduce the impact of energy use on the environment, and play a role in optimizing energy systems (Dahlqvist, et al., 2019). Suppatvech and others integrated the IoT and service-oriented business models. They classified the emerging business models of the IoT as innovative service-oriented business models for preliminary consideration and determined the application scope of the IoT in achieving service-oriented business models (Suppatvech et al., 2019). Rehman and others overturned traditional agricultural practices and used IoT technology to collect useful data for the agricultural sector for agricultural testing and control. It demonstrated the application and benefits of the IoT in smart agriculture, improving the productivity of agricultural activities (Rehman et al., 2022).

The strategic marketing management of e-commerce enterprise refers to the design, implementation, and control of effective marketing strategies to achieve the goals set by the enterprise. The content of this management includes market positioning, target market selection, product pricing, product promotion, and promotional strategies, which can be considered a key component of implementing innovative models in enterprises (Adams et al., 2019). There are 282 Chinese high-tech companies investigated by Liu and others. In a fierce competitive environment, they emphasize the customer-oriented creative marketing is fundamental to a company's survival (Liu et al., 2018). Quaye and Mensah proposed a strategic marketing direction that combines innovative marketing practices with dynamic marketing capabilities using the Resource Capability-based View (RCBV) framework. They combined marketing capabilities with innovative activities to enhance competitive advantage and maintain a sustainable market advantage (Quaye and Mensah, 2019).

Based on survey data from 258 respondents in Iran's high-tech manufacturing industry, the roles of product and process innovation capabilities as two different mechanisms for enhancing new product marketing performance are explored through collaborative innovation networks. It found that the impact of collaborative innovation networks is only significant when absorptive capacity exists (Najafi-Tavani et al., 2018). Ungerman and others used content analysis to conduct research and evaluation on 50 enterprises and proposed a basic tool list for marketing innovation. They evaluated the impact of innovative marketing and confirmed that innovative marketing in enterprises enhances their competitiveness in the current industrial context (Ungerman et al., 2018). Rajapathirana and Hui studied the relationship among innovation, market, and financial performance. They guided enterprises to effectively manage their innovation capabilities through empirical verification of model assumptions, thereby providing more effective innovation outcomes and generating better performance (Rajapathirana and Hui, 2018).

On the other hand, with the continuous development of technology, traditional marketing management is no longer able to meet the user experience and improve marketing effectiveness. The traditional marketing system is difficult to collect information, and there are major shortcomings in the guidance of corporate strategy. However, IoT technology can achieve data monitoring, collection, and analysis. E-commerce enterprises can use this data to develop more intelligent marketing strategies and create more personalized marketing activities.

This study innovates the strategic marketing management of e-commerce enterprises through IoT technology, which can transform traditional lifestyles into high-tech lifestyles. It communicates between customers and electronic devices through the internet for a deeper understanding of customers' demands, making their life convenient.

It also continuously optimizes the marketing strategy to gain a competitive advantage and achieve sustainable development of enterprises.

Research Justifications

With the continuous development of IoT technology, e-commerce companies are facing new market challenges and opportunities. Therefore, the research on innovative strategic marketing management models is of great significance. First of all, the introduction of IoT technology provides e-commerce companies with more data sources and the possibility of precise positioning, making traditional marketing strategies need to be rethought and adjusted. Secondly, researching and innovating strategic marketing management models will help e-commerce companies better grasp market trends, improve their competitive advantages, and achieve sustained growth. In addition, as consumers' demand for personalized and customized services continues to increase, intelligent marketing management through IoT technology is also of great significance to enhance the consumer experience and meet their needs. Therefore, through in-depth research on innovative strategic marketing management models, it will help e-commerce enterprises to achieve sustainable development.

Methodology

With the increasing popularity of online shopping, e-commerce enterprises are making lots of efforts to implement strategic marketing management through online channels and explore new markets (Lo et al., 2018). The IoT technology enables everything in the real world to intelligently connect and communicate. Therefore, the valuable data can be collected through the IoT devices for mining and analysis, and the foundation of corporate marketing management strategies can be strengthened.

Data Population

This study collects data from 254 users of different e-commerce enterprises at 10 regions in eastern, southeastern, and northeastern China.

Data Collection

1-   The Evaluation Data

After purchasing products in e-commerce enterprises, users can choose to publish evaluation information on the products, through which the evaluation information can help enterprises optimize product design, formulate operational strategies, establish a good reputation, attract more consumers to buy products, and help consumers make purchase decisions. Today's consumers face more choices than before and can learn to predict their preferences by listening to their needs, helping them find the most suitable choice (André et al., 2018).

Evaluation information can provide e-commerce enterprises with consumers' real feedback and experience of goods or services, and help enterprises develop more reasonable operation strategies. By analyzing the ratings in the evaluation information, with text description and other information, enterprises can find the advantages and disadvantages of goods and services, understand the needs and preferences of consumers, formulate targeted marketing, and recommend other products that consumers may be interested in.

The evaluation information of the user after purchasing the product consists of a rating, text description, etc. The score is the satisfaction score of the product or service; the use of lit stars represents the user rating; no lit stars represent 0 points, indicating that the user is very dissatisfied; lit 5 stars represent 5 points, indicating that the user is very satisfied. Text description expresses the experience of using a product or service, which can provide more detailed information about this product or service.

This study collects data from 254 users of different e-commerce enterprises in China. Partial data information of these 254 users is shown in Table 1.

Table 1 The Evaluation Information of Users

User ID	Time	Commodity category	Score	Evaluation information
User 001	2022-08-25 18:35	Coat	4	The coat is warm and suitable for winter.
User 035	2022-09-03 07:23	Shoes	5	The soles are soft and comfortable to walk on.
User 088	2022-10-09 17:56	Bag	1	The bag is too small to hold.
User 122	2022-10-09 18:52	Perfume	5	The perfume smells great and lasts for long time.
User 137	2022-11-10 20:09	Scarf	4	The scarf is comfortable and of good quality.
User 183	2022-11-12 16:46	Headphones	4	I used the headphones as soon as I received them, and they worked well.
User 199	2022-12-11 21:45	Hand sanitizer	3	I haven't used this hand sanitizer before, and it looks good.

2-   The Environmental Data

Through user environmental data, more precise services and marketing strategies can be provided to users. For example, it can recommend products based on the user's home temperature and humidity, recommend heatstroke prevention and cooling products for high temperatures, and recommend dehumidifiers, dryers, and other products for high humidity. Based on the environmental conditions of the user's location, corresponding products or services can be recommended to them. Taxi services can be recommended on rainy days, and outdoor products can be recommended in hot weather.

Smart home devices can be used to obtain various environmental data, such as thermometers, hygrometers, and air quality detectors. It can obtain indoor temperature, humidity, and air quality, as well as smart wearable devices such as smartwatches and smart wristbands. Users can collect environmental data, such as specific locations, weather temperatures, etc. The popularization of smart home devices has created new opportunities for research on ubiquitous computing (Huang et al., 2020). By collecting user environmental data and analyzing it, e-commerce enterprises can understand the lifestyle and needs of users and provide more reliable suggestions. Table 2 shows the collected environmental information of users.

E-commerce enterprises can collect and analyze sales data through their own sales platform, including order quantity, sales volume, product categories, sales channels, and other information, to understand the

sales situation of goods and popular goods. Website analytics tools can also be used to get data on website traffic, visitor behavior, conversion rates, and more. Through website analysis tools, it is possible to understand the us-

Table 2 The Environmental Data of Users

User ID	Time	Room temperature (℃)	Indoor humidity (%)	Weather	Outdoor temperature (℃)
User 087	2022-03-14 09:10	21.2	80	Rainy day	19.4
User 123	2022-04-25 16:35	24.2	62	Clear weather	23.1
User 133	2022-04-26 18:48	24.6	60	Cloudy weather	23.5
User 167	2022-05-01 14:30	24.3	68	Clear weather	25.7
User 206	2022-08-10 15:46	30.8	83	Rainy day	32.8

er's access source, access path, stay time, etc., aiming to better adjust marketing strategies, optimize goods and services, and enhance the competitiveness of enterprises.

E-commerce companies can also buy market research reports issued by market research institutions to understand the market size, development trends, and competition of relevant industries. These reports often contain statistical data and in-depth analysis to help companies understand changes in market demand and forecast future trends.

Data Analysis

1- **Data Storage**

The amount of data collected by IoT devices is enormous, and the storage method of this data also needs to be considered. Cloud storage systems provide storage and management services for data, which has become one of the important data storage methods today (Yang et al., 2020). This study uses cloud storage as the storage method for IoT device data and hosts the collected data in the cloud. The process of uploading IoT devices to the cloud is shown in Figure 1.
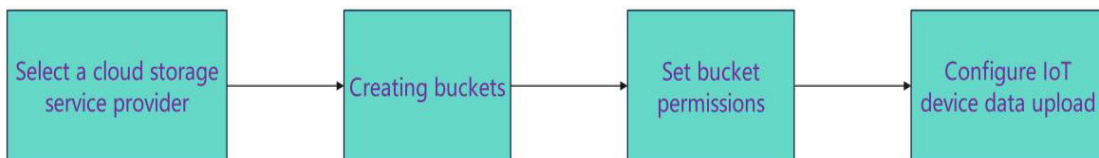

Figure 1 Cloud-based Process for Uploading IoT Data

As shown in Figure 1, cloud storage technology is used to store and manage the collected data from IoT devices. It first needs to select a cloud storage service provider that meets the requirements, and then create storage buckets in the selected cloud storage services for storing IoT device data. To ensure the security of data, it is necessary to set permission control for storage buckets, such as access permissions, based on the characteristics and connection methods of IoT devices. It can choose the method for uploading data. It stores data in the cloud, and its storage capacity can be expanded as needed without worrying about the maintenance and upgrading of storage devices. Its storage cost is usually relatively low, and cloud storage providers usually take various measures to ensure the security of data, such as encryption, backup, recovery, etc. Cloud storage does not require physical or logical connections to access data stored locally. Cloud storage provides a solution to replace physical disk drives, which means data can be accessed and managed through the IoT (Mahalakshmi et al., 2021). Cloud storage has a large data capacity, good data security, and strong accessibility, making it suitable as a storage method for IoT device data.

2- **Data Cleaning and Preprocessing**

The quality of target data collected through widely distributed IoT devices typically depends on the accuracy and completeness of the data. Due to the influence of the environment and the equipment itself, the collected data may exhibit anomalies (Yin et al., 2020). Therefore, before mining data, the data should be preprocessed first.

Firstly, data cleaning is carried out to check for missing values, outliers, and noise, and corresponding processing is carried out. Interpolation methods are used to fill in missing values; anomaly detection algorithms are used to identify and process outliers, and filtering techniques are used to reduce noise. Then it performs data conversion, which is the process of converting data from one format or structure to another. For example, if the temperature data collected in this study is in either Celsius or Fahrenheit format, it is necessary to convert the format of the temperature data for comparison and analysis. Then, it is necessary to integrate and merge data, as the data comes from multiple IoT devices and needs to be merged from multiple data sources into one dataset. This study adopts the method of data concatenation, concatenating multiple different datasets along the same dimension to generate new datasets, thereby improving overall accuracy. Finally, this study conducts data reduction and filtering, compression, and other operations on the collected data to reduce data volume and improve data processing efficiency. This study uses attribute merging to reduce dimensionality, improve data mining efficiency, and reduce storage costs. There is no standard process for data preprocessing, which can be adjusted according to the characteristics of the collected data and the purpose of the experiment (Bai et al., 2023).

Personalized Recommendations

The personalized recommendation is a key part of the innovative model for e-commerce enterprises to achieve strategic marketing management. In the context of the IoT, facing large amounts of data, it is necessary to provide better services to users more efficiently and help them obtain information promptly (Cui et al., 2020). This study uses collaborative filtering algorithms to achieve personalized recommendations. By mining user behavior and preference data, personalized needs of users are identified, and products and services are accurately recommended to them. This can help users discover things they may be interested in, and provide new ideas for the strategic marketing management of e-commerce enterprises.

The collaborative filtering algorithm is a popular recommendation algorithm that can accurately predict user interests and has been widely used in recommendation systems (Chen et al., 2021). The currently widely used collaborative filtering algorithm is based on neighborhood methods. The main idea is to utilize other user groups that share the same interests or historical behaviors as the current user. By analyzing the current preferences of these user groups to predict what they may like or what behaviors they may exhibit, it can be further divided into two types: user-based collaborative filtering algorithms and item-based collaborative filtering algorithms.

1- **Similarity Calculation**

The similarity between products is an important factor in accurate recommendation when recommending products to users (Dong and Zhao, 2023). Similarity calculation is also one of the key steps in collaborative filtering algorithms. In the process of similarity calculation, different users would have their preferred products. If two products are in the same user's interest list, then these two products may belong to similar fields. If two products belong to the interest list of many users, they may belong to the same field, as shown in Figure 2.

Figure 2 shows users and their preferred products. User 022, User 087, User 134, User 168, and User 239 are the users' IDs, and the corre-
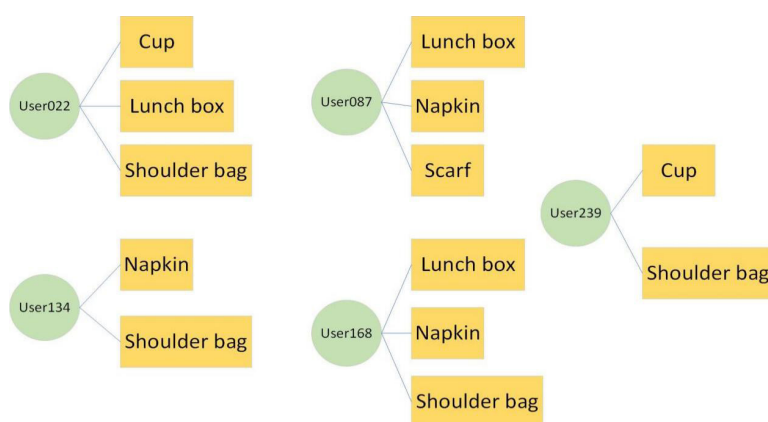

Figure 2 User Favorite Products

sponding yellow rectangle behind each user is their favorite product name. From this, the user structure to which the item belongs can be constructed, as shown in Figure 3.

As can be seen from Figure 3, five products are listed, which are Cup, Napkin, Scarf, Lunch box and Shoulder bag. The corresponding green circle after each product is the user · ID. For example, the users corresponding to the Cup product are User 022 and User 239.

Then, this study establishes an item similarity matrix D, as shown in Figure 4.

In Figure 4, D_{ij} represents the number of users who like both product i and product j which is the similarity matrix between products.

Similarity calculation is one of the key steps in collaborative filtering algorithms, which maps users and items to a high-dimensional feature space, and then measures their similarity by calculating their distance or angle. This study uses the cosine similarity method for similarity calculation. Cosine similarity is the calculation of the cosine value of the angle between two vectors to measure their degree of similarity. The cosine formula for the angle between vector A (x_1, y_1) and vector B (x_2, y_2) in two-dimensional space is:

Figure 3 Corresponding User Relationships of items

Figure 4 Item Similarity Matrix

$$\cos\theta = \frac{x_1 x_2 + y_1 y_2}{\sqrt{x_1^2 + y_1^2}\sqrt{x_2^2 + y_2^2}} \quad (1)$$

The cosine of the angle between two n dimensional sample points a $(x_1, x_2, \ldots, x_{1n})$ and vector b $(x_1, x_2, \ldots x_{2n})$ is:

$$\cos(\theta) = \frac{a \cdot b}{|a||b|} \quad (2)$$

that is,

$$\cos(\theta) = \frac{\sum_{k=1}^{n} x_{1k} x_{2k}}{\sqrt{\sum_{k=1}^{n} x_{1k}^2}\sqrt{\sum_{k=1}^{n} x_{2k}^2}} \quad (3)$$

The cosine similarity method calculates a similarity value range of $[0,1]$, and the closer the value is to 1, the higher the similarity.

2- **Neighbor Selection**

After calculating the similarity value between products, it is necessary to perform neighbor selection on the target product to determine neighboring products with high similarity to the target product and generate a recommendation list for users.
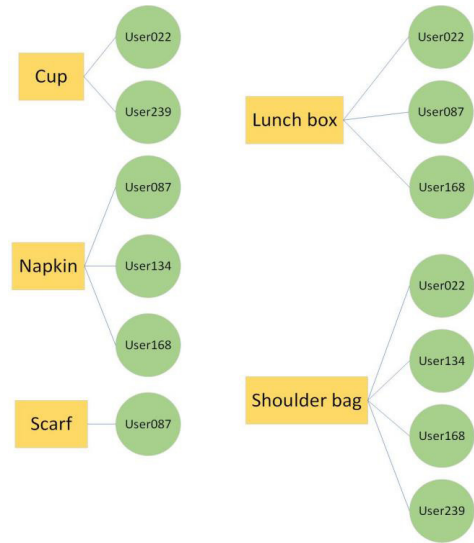
After obtaining the similarity between products, the formula is used:

$$P_{uj} = \sum_{i \in N(u) \cap S(j,K)} w_j r_{ui} \quad (4)$$

P_{uj} can calculate the interest of user u in product j, where $N(u)$ is the collection of products that the user likes. $S(j,K)$ is a collection of K products that are most similar to j, while w_{ji} is the similarity between j and i products. r_{ui} is the interest of user u in product i. (If user u has made a purchase of product i, $r_{ui} = 1$ can be activated). The results obtained according to Formula (4) are filtered and sorted, and the products with the highest ranking are selected as the recommendation results and returned to the user.

3- **Model Optimization**

This study would input the collected data into the collaborative filtering algorithm model for training, which is mainly divided into two stages. It first needs to establish a user product matrix, and user behavior data is constructed into a user product matrix. The user is in the row and the product is in the column, using tag values to indicate the user's level of interest or rating towards the product. If the user does not rate the product, the location will be empty. Then, based on the established user product matrix, this study selects an item-based collaborative filtering algorithm for training. Secondly, there is a training. During the training process, due to the randomness of user behavior, the algorithm may have errors (Ge et al., 2023), and standard model training methods need to be used. The model parameters can be initialized and continuously optimized to improve the accuracy and efficiency of recommendation results.

This study uses the Singular Value Decomposition (SVD) method in matrix factorization to optimize collaborative filtering algorithms. SVD decomposes the user product rating matrix into three matrices, which represent the user's feature vector matrix, the product's feature vector matrix, and the singular value matrix. By calculating and simplifying these matrices, more accurate recommendation results can be obtained, and the efficiency of the model can be improved.

Development of Innovative Marketing Models

With the advent of the digital age, e-commerce has become a key force driving business change, but it also faces many challenges (Yang, 2023). There are differences between e-commerce enterprises and traditional offline retail marketing, so they need to adopt different marketing strategies (Bai, 2023) and adjust and innovate marketing modes according to the actual situation and market characteristics of e-commerce enterprises.

Customized Goods and Services

Due to the industrial changes brought about by the Internet, e-commerce enterprises are more likely to capture the personalized needs released by consumers (Jia, 2023). In the third chapter, the collaborative filtering algorithm is used to analyze the user data, mining the user's interest, and then realizing the recommendation of personalized goods and services. A user numbered User 152 is selected. After the consent of this user, the online shopping behavior data of the user between
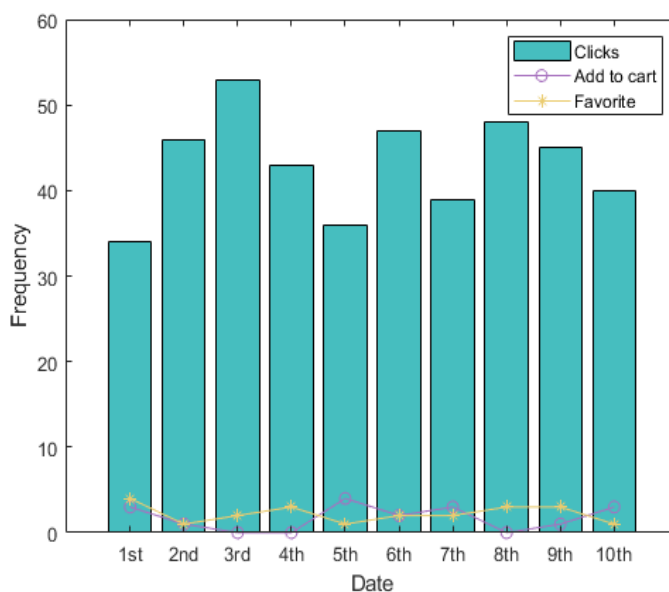

Figure 5 User Behavior Data Records

December 1, 2022 and December 10, 2022 is analyzed, and the corresponding products are recommended on its home page.

The user's online shopping behavior data includes clicking, purchasing, adding to the shopping cart, favorites, etc. If the user's behavior times are recorded and tracked, it can be analyzed whether the user has recent purchase needs, as shown in Figure 5.

Based on the products that users browse, add to their shopping cart, and collect, the products that users may like based on their level of interest can be analyzed and displayed on the homepage, as shown in Figure 6.

Figure 6 Personalized Recommendation Homepage

Customized goods and services are tailored to the needs of consumers and constantly adjusted and improved according to their needs, making consumers feel valued and cared for, and enhancing consumers' satisfaction and loyalty. Customized goods and services can allow consumers to obtain the products and services they may need without searching to save time. On another hand, E-commerce enterprises can establish praise and reputation in the market and gain a leading position in the market.

Integrated Sales and Payment

With the emergence of emerging formats such as "online payment", consumers have new demands for payment methods (Sun and Zhang, 2020). Payment integration by e-commerce enterprises can facilitate users to make online payments and provide a secure and convenient payment experience. First, e-commerce enterprises choose payment service providers suitable for business needs, such as Alipay, WeChat Pay, PayPal, and Apple Pay, etc. According to the requirements of the selected payment service provider, it registers and creates a corporate account, completes account authentication and related procedures, and facilitates subsequent payment integration. Then according to the documentation provided by the payment service provider, the enterprise needs to develop and integrate the payment interface for interacting with the payment service provider's system, initiating payment requests, and receiving payment results. In the process of payment integration, necessary security measures need to be taken, such as the use of secure data transfer protocol HTTPS, encryption of user data and payment information, and compliance with relevant data security and privacy regulations. Finally, enterprises should test and debug payment integration, simulate various payment scenarios, and ensure the synchronization and correctness of payment processes and order status. They also need to check whether the payment notification and callback mechanism is working properly, optimize the payment page and payment process to improve user experience, and regularly check the performance and stability of payment integration to timely detect and resolve payment anomalies.

In addition, E-commerce enterprises can integrate payment functions directly into sales channels, allowing consumers to complete payments simultaneously when purchasing goods or services, simplifying the purchasing process. Consumers do not need to jump to other pages or open other applications to complete purchases and payments directly on e-commerce sales platforms. Due to the large number of payment channels, e-commerce enterprises can use a unified payment platform to integrate different payment methods and channels. Consumers can choose the appropriate payment method based on their preferences and needs. Figure 7 shows the payment page, which integrates multiple payment methods.

The integration of sales and payment can improve the user's consumption experience, reduce payment risks, simplify the purchasing process, and increase payment success rates, thus improving the efficiency and convenience of online sales. Consumers are more willing to conduct transactions through this sales channel, and e-commerce companies can also increase sales volume and customer retention rate.

Figure 7 Payment page

Customer Support Services

The use of intelligent robots to achieve customer support services can provide efficient and immediate help and answers. E-commerce enterprises can choose appropriate intelligent robot platforms after clarifying the specific goals of customer support services. Some popular platforms include Dialogflow, IBM Watson, etc. These platforms typically provide tools and features for chatbot building, training, and testing. E-commerce enterprises design the dialogue process and logic of intelligent robots according to business needs and common problems of customers. E-commerce enterprises can also collect and sort out common questions and answers, and establish a knowledge base and a common question library, so that robots can quickly make accurate responses and answers according to users' questions. Natural language processing technology can also be used to enable intelligent robots to understand and respond to user natural language input and generate appropriate answers, providing artificial intervention options for complex or unanswerable questions for intelligent robots. This increases the option to transfer to human customer service in the conversation flow and provides more comprehensive customer support services.

The use of intelligent robots can help e-commerce companies better communicate and interact with customers and reduce labor costs. It provides efficient and high-quality customer support services, improving customer satisfaction and loyalty to relationships.

5.4 Cooperation and Sharing

E-commerce enterprises can establish partnerships with multiple brands. Sharing resources, services, and customers in certain aspects forms a comprehensive e-commerce industry chain that can meet the needs of different industries (Ling, et al., 2023). It creates its own IoT platform to integrate IoT devices from different brands and provide consumers with unified services. By providing such a platform to brands, e-commerce enterprises can attract more brands to join and establish more partnership relationships. This cooperation can increase the market share and competitiveness of e-commerce enterprises, expand brand influence, jointly develop innovative products, and achieve a win-win situation. E-commerce enterprises can also engage in joint marketing and promotion activities with other brands, attract more target customers, and increase visibility and sales through joint brand promotion and market promotion. It can also collaborate with IoT device companies to optimize logistics and supply chain management using IoT technology. IoT technology can track logistics and orders, improve logistics efficiency, and reduce costs. It cooperates
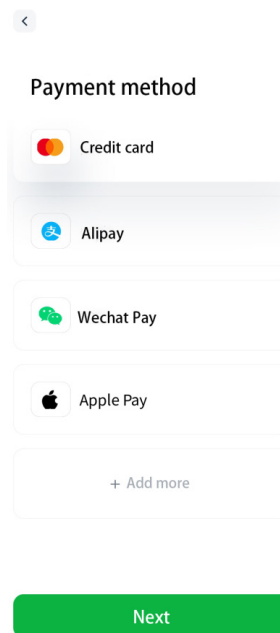
with smart home enterprises to jointly launch smart home products, and e-commerce enterprises can directly use their own sales platforms and marketing channels. Smart home products can be recommended to consumers, and then user behavior and preference data can be obtained through smart home devices for analysis. It continuously improves product services and develops more practical products to enhance the consumer experience for users.

Experimental Results

After data collection and preprocessing, a total of 20675 pieces of data were collected from 254 users in this study. These data were divided into 10 datasets, with 80% being the training set and 20% being the testing set. This study conducted experiments on these datasets and obtained the following results.

Algorithm Accuracy

The accuracy of collaborative filtering algorithms refers to the proportion of products in the recommendation list that users are interested in. Accuracy is the percentage of recommended products that users are interested in compared to the total recommended products. The higher the accuracy, the better the recommendation results of the recommendation system match the user's actual preferences, and the collaborative filtering algorithm performs better. Figure 8 shows the accuracy of 10 datasets during the experimental process.
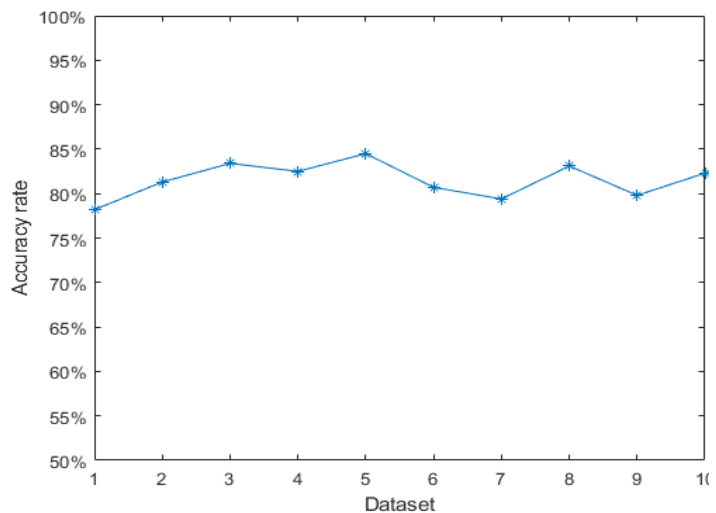
Figure 8 Collaborative Filtering Algorithm Prediction Accuracy

Accuracy after Optimization

During the experiment, the SVD method was used to optimize the collaborative optimization algorithm, and the scoring matrix R was decomposed to obtain three matrices: U, $\sum$, V. The less weighted parts in $\sum$ were removed and then the dimensionality and redundancy of U and V were reduced, thereby improving computational efficiency and accuracy. Figure 9 shows the accuracy of the optimized SVD method.
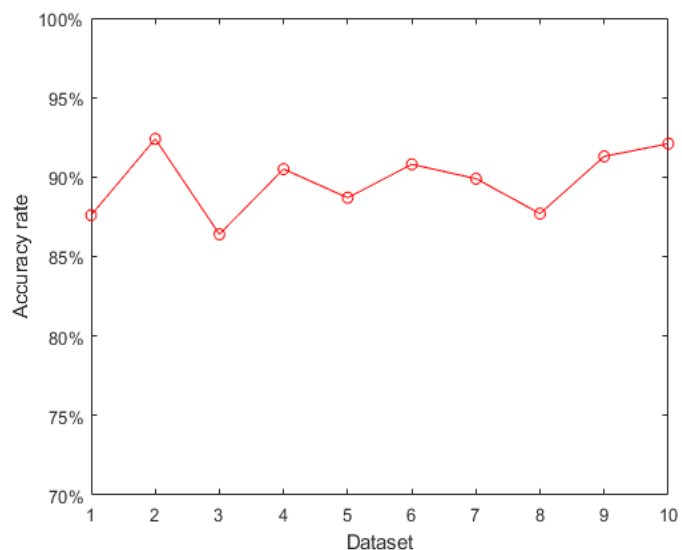
Results of Sales Increase

This study provided statistics on the monthly sales of 254 users on the e-commerce enterprise platform. Compared to before implementing the innovative model of strategic marketing management, the average monthly sales have increased by 8.7%. Figure 10 shows the comparison of sales before and after implementing the innovative model.
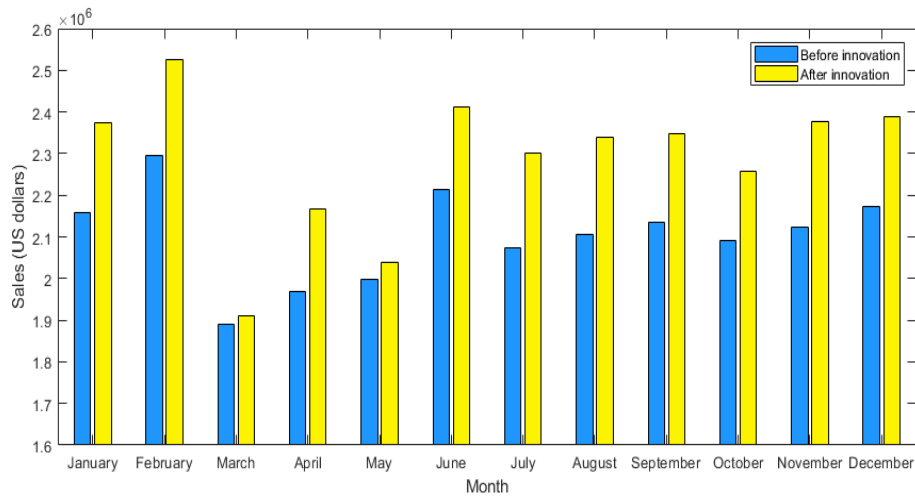
Figure 9 Prediction Accuracy After SVD Optimization

Figure 10 Sales Comparison Results

As can be seen from Figure 10, before the implementation of the innovative model, the monthly sales were 2159077.1130 US dollars, 2295660.0420 US dollars, 1890403.1910 US dollars, 1969012.0710 US dollars, 1998069.2820 US dollars, 2212839.9720 US dollars, 2073028.4640 US dollars, 2107139.1030 US dollars, 2135073.3300 US dollars, 2091417.3270 US dollars, 2122860.8790 US dollars, and 2172693.2940 US dollars respectively. After the implementation of the innovative model, the monthly sales volume was 2374970.7870 US dollars, 2524608.4050 US dollars, 1909353.5460 US dollars, 2165955.3900 US dollars, 2038075.5870 US dollars, 2412029.2590 US dollars, 2300994.2160 US dollars, 2338894.9260 US dollars, 2348580.6630 US dollars, 2258741.9430 US dollars, 2377637.8740 US dollars, and 2389990.6980 US dollars respectively. The average monthly increase was 8.7%.

ROI Results

The return on investment (ROI) of e-commerce enterprises is an indicator of the return on investment. The calculation formula is ROI = (net profit/investment cost) * 100%, and net profit refers to the profit obtained by the enterprise after deducting all expenses and costs. The investment cost refers to the total investment used for the operation and operation of e-commerce enterprises. The higher the ROI value, the better the business results of e-commerce enterprises. Figure 11 shows the ROI results of e-commerce enterprises implementing innovative models.
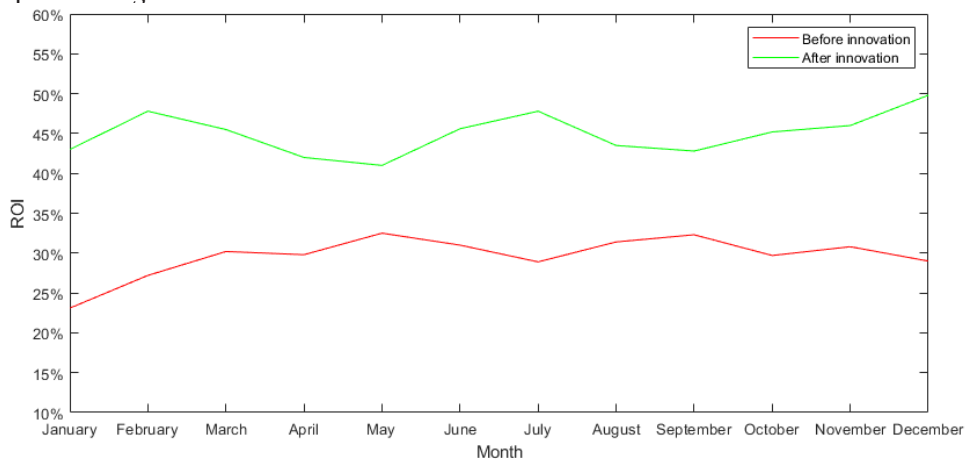

Figure 11 ROI Comparison Results

According to Figure 11, after implementing the innovative model, the monthly ROI values were 43%, 47.8%, 45.5%, 42%, 41%, 45.6%, 47.8%, 43.5%, 42.8%, 45.2%, 46%, and 49.8%, with an average ROI value of 45%.

Conclusions

The innovative model of strategic marketing management for e-commerce enterprises based on the IoT has achieved certain results. This study provided more possibilities for e-commerce enterprises to innovate marketing management by collecting relevant data for processing and analysis through IoT devices. From the research results, it can be seen that after the implementation of innovative strategic marketing management, the monthly sales of e-commerce companies have increased compared to the previous period, indicating that consumers are more satisfied with the products and services provided by the companies. As a result, the viscosity and trust of consumers have increased, and the monthly return on investment has also been greatly improved. It means that the profits brought by the investment of the enterprise increase significantly and gain a competitive advantage in the market.

With the continuous development of the Internet and the rapid advancement of intelligent technology, e-commerce companies will confront with more innovations and opportunities in future strategic marketing management. Among them, the application of IoT technology will become one of the key driving forces. Through the IoT technology, e-commerce companies can realize real-time collection and analysis of user behavior, preferences, and environmental data, so as to more accurately understand consumer needs and provide personalized marketing services. At the same time, the popularity of smart wearable devices will provide users with a more immersive and interactive shopping experience, and further enhance users' stickiness and loyalty to e-commerce platforms. In addition, through the continuous evaluation and optimization of marketing strategies by the IoT technology, e-commerce companies will be able to respond to market changes more flexibly, achieve sales growth and increase return on investment. In summary, the application of the IoT technology will bring more innovation opportunities to e-commerce companies and help them achieve sustainable development and success in a highly competitive market.

Limitations

There are several shortcomings in this study. For example, the implementation of innovative marketing models greatly differs from one country to the other. However, due to the limited time and resources, this study merely focuses on one filed (e-commerce) in one country (China). This would restrict the study scope and impact the research results. Furthermore, the appropriate management and control mechanisms have not been established when collecting user data. This may result in data privacy being easily compromised.

Future Research

In response to the existing problems, several suggestions are recommended for the future studies. For instance, the future researches are recommended to broaden study samples by gathering more empirical data from different sectors in different countries. Moreover, the innovative marketing management solutions should be improved based on paying more attention to user privacy and security. IoT technology can help e-commerce enterprises predict and analyze market trends and consumer demands more accurately, providing new opportunities for strategic marketing management. Meanwhile, e-commerce companies also need to keep pace with the times, use the IoT technology to update marketing strategies and models, create a more efficient, convenient and personalized marketing experience.

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