Integration and Innovation of Enterprise Marketing Data Management Based on Collaborative Filtering Algorithm in The Era of Big Data

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Abstract

At present, due to the rapid development of the Internet, all walks of life are facing enormous challenges. How to attract more customers under the tremendous impact of the Internet is the most important issue for enterprises. Enterprise marketing is a key link in enterprise development. Only by doing a good job in enterprise marketing management can we create ideal conditions for enterprise development, and it is also an important condition for enterprises to enhance their own market competitiveness. For enterprise marketing management, big data impacts the marketing management system of enterprises, and increasingly presents commercial value that cannot be ignored. The application of big data in marketing management can promote the innovation of marketing management based on the background of big data, help enterprises to improve marketing strategies, further tap potential customers, and enhance marketing effects, so as to realize the double improvement of corporate brand influence and economic benefits. In the era of big data, this paper studies and analyzes enterprise marketing data management based on collaborative filtering algorithm.

Keywords*: Big data, Collaborative filtering algorithm, Enterprise marketing data, Integrated innovation*

Ⅰ. Introduction

With the continuous development of China's market economy, the competitive pressure among enterprises is increasing [1]. In order to obtain an ideal development speed in the fierce market competition, enterprises must conduct a detailed analysis of their own marketing work [2]. And ensure that the marketing management of corresponding enterprises has stronger practical benefits, effectively meets the needs of enterprise development, and can create higher economic benefits for enterprises [3]. Using big data to form consumer behavior analysis is the basic point for enterprises to formulate marketing strategies. The calculation and application of big data can help enterprises collect and analyze consumers' online data, and enterprises can make reasonable decisions in marketing management as soon as possible [4]. Big data has changed the data analysis thinking of enterprises and played an irreplaceable role in adjusting marketing strategy [5]. Combined with the implementation of enterprise marketing management, the application of big data is an important basic means [6]. It can better assist enterprises to obtain the basic situation of consumers, continuously optimize market research, fully tap valuable information resources, and ensure that the enterprise marketing strategy has stronger practical value, which should become an important trend of future development [7].

For enterprise marketing management, big data impacts the enterprise's marketing management system and increasingly presents business value that can not be ignored [8]. As an important resource, big data has penetrated into all walks of life to varying degrees. The application of big data in enterprise marketing management is not only conducive to enterprise business activities, but also conducive to promoting national economic development. Therefore, enterprises should formulate big data marketing strategic plans in advance and seize market opportunities [9]. In the fierce market environment, enterprise marketing plays a vital role, and marketing innovation has become the most important work content of many enterprises [10]. Collecting and sorting user information and effectively calculating and processing customer data can help enterprises adjust marketing strategies in time and realize precision marketing [11]. In addition, in the process of market reform, the original monopoly pattern of enterprises has been broken, making the current marketing object focus on power users [12]. Therefore, the current new

situation also urges enterprises to constantly carry out marketing innovation and explore marketing strategies to meet the development of enterprises as soon as possible.

Ⅱ. Application Value of Big Data in Enterprise Marketing Management

In the era of big data, the research and analysis of big data can not only make enterprise decision more scientific and reasonable, but also greatly reduce the internal management risks of enterprises. For the future implementation of enterprise marketing management, the application of big data can also show strong value in the development of new business, which is also the basic condition for enterprises to seek higher development in the future. At this stage, the market development situation is becoming more and more changeable. If enterprises want to achieve an ideal level of development, they must grasp the opportunities in the market, which also requires to effectively improve the timeliness of relevant data and information, and ensure that relevant data and information can show stronger application effectiveness [13]. In view of this demand, the application of big data can show strong value, which can better realize the formulation of new goals of enterprises, promote the timeliness of its new marketing model and create new growth points for enterprise development. Big data can be used to analyze the historical data generated by consumers when browsing and purchasing goods, so as to infer consumers' personal preferences and needs, further predict consumers' future shopping behaviors and needs, and accurately push the corresponding product information to consumers to maximize market opportunities.

In the development of enterprise marketing, an important goal of its management is to achieve precise marketing, which can better enhance the value of enterprise marketing and avoid the existence of ineffective marketing. Based on this requirement, with the help of big data technology, effective adjustment and optimization can be realized, and the application of big data can better realize the induction and collation of a large amount of data information, and then the main preferences and basic characteristics of consumers can be analyzed. Thus, it is helpful to assist enterprises to formulate more reasonable marketing strategies, to ensure that they are more targeted, to ensure that consumers can obtain more effective information in enterprise marketing activities, and to meet the future development needs of enterprises. Tens of thousands of products make it difficult for enterprises to set prices manually, which is time-consuming and labor-intensive, and also make complicated pricing variables unable to be correctly processed and refined. Using big data can enable enterprises to more intuitively capture the price influencing factors and make pricing more reasonable. For the effective application of big data in enterprise marketing management, it does show various effects, and it can orderly summarize and sort out a large amount of data information, thus promoting it to show stronger marketing pertinence in the future. The innovation of enterprise marketing management can simplify the management process to the process of data analysis, and make use of various data collection for modeling and analysis, thus providing guidance for the predictability of marketing work and facilitating the formulation of better marketing measures. In addition, through the innovation of enterprise marketing management, we can build a management system suitable for the era of big data, so as to make it more practical and effective and promote the development of enterprises.

Ⅲ. Collaborative Filtering Recommendation Algorithm

Simply put, big data is a lot of data. In the context of the era of big data, data has four characteristics: (1) A large amount. With the development of information technology, the amount of data has exploded. Social networks and smart platforms can generate huge amounts of data every day. (2) Diversity. Diversity refers to the variety of data forms. (3) High speed. The data update speed is very fast, coupled with the popularization of the Internet, the data transmission speed has been greatly increased. In the face of massive amounts of data, the platform can only ensure that the server will not crash unless it is quickly screened, analyzed, and cleaned. (4) Value. The manifestation of data value in the context of the big data era mainly depends on the data processing of the platform.

Big data is one of the most potential technologies in the 21st century. From the increasingly electronic and intelligent payment methods, we can see that our consumption and financial management mode will become more and more intelligent and informative in the future. The development prospect of big data technology in commercial banks is also very broad. As the hub of currency circulation in the whole society, commercial banks can rely on retrieval technology to collect a large amount of customer behavior information. These customer behavior information are important reference data for us to recommend bank products, help banks to comprehensively improve their business insight and trend prediction capabilities, increase their profits, quickly respond to market changes, enhance their risk early warning capabilities, meet customers' purchase needs and enhance their core competitiveness.

As the core of recommendation system, recommendation algorithm plays a vital role in the final recommendation result. Therefore, when banks recommend to users, they should choose an appropriate algorithm to serve their own marketing. User-based recommendation mainly focuses on the “users” themselves, and the main goal is to find users who are similar to themselves, and then recommend what these “similar users” like to their own customers, as shown in Figure 1. Item-based recommendation mainly focuses on the “item” itself, and the main goal is to find items similar to those that customers like, and then recommend these similar items to customers, as shown in Figure 2.

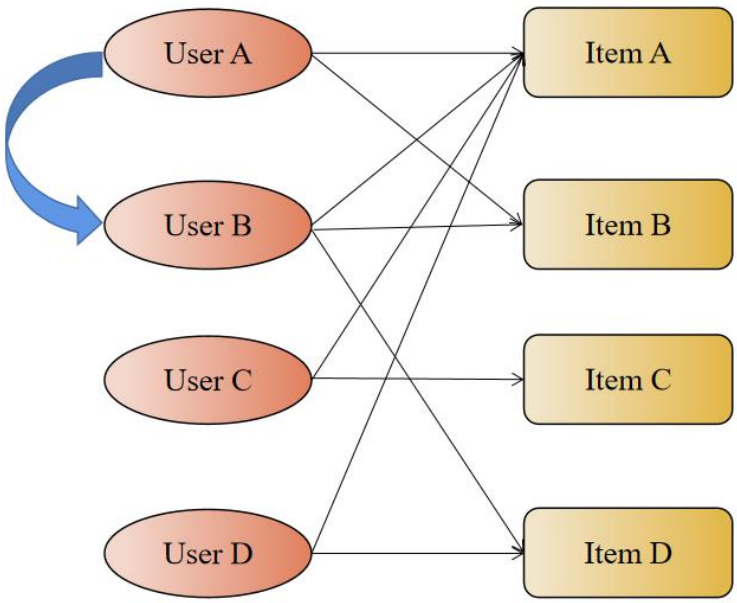

Fig.1 Based on User's Recommendation

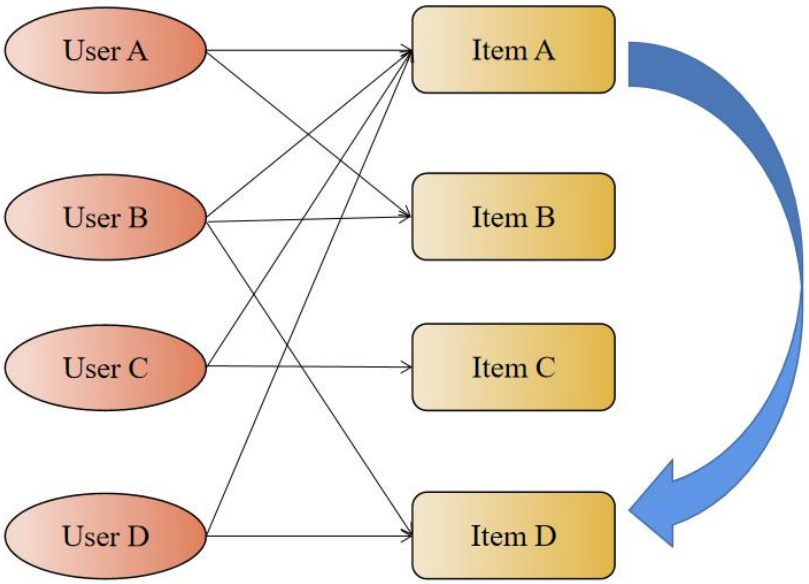

Fig.2 Item-Based Recommendation

Customer-centered, driven by big data technology and providing personalized service for consumers is the important value of big data in marketing management application. Collaborative filtering recommendation algorithm is a process in which computer algorithms analyze and specifically calculate user groups, shape relevant models, and build scoring system to obtain interest model scores, so as to make reasonable recommendations. Widely used in many fields. In the aspect of enterprise marketing, if enterprises want to make products closer to consumers' needs, they can use collaborative filtering recommendation algorithm to judge consumers' preferences and requirements for product quality and performance, and make targeted product production, so as to increase product sales.

Ⅳ. Enterprise Marketing Based on Collaborative Filtering Algorithm

Management is the core of promoting the continuous development of modern enterprises, which is very important for the development and survival of enterprises. Strengthening the marketing management of enterprises will directly affect the future development of enterprises. Under the background of big data, it is necessary to reduce the empirical marketing management mode and attach importance to data analysis, so as to provide data support for enterprises to improve management efficiency. Marketing strategy refers to the fact that enterprises take the actual needs of customers as the foothold in the business process, and obtain data information such as customers' purchasing power, demand information, market expectation and so on according to the purchasing experience accumulated before. So as to arrange and organize various production and business activities in a planned way. Marketing strategy mainly studies all kinds of marketing situations faced by enterprises under the current market conditions.

Collaborative filtering recommendation algorithm originated from information filtering, and was applied to the classification of mail and news. The earliest sales company received a lot of mail, but it could not be classified reasonably. Can't find out which emails will be of interest to you. The same is true for the classification of news. This filtering algorithm is different from simple text filtering. Besides some keywords, it can also make some content that needs manual analysis possible. An important link for enterprises to do a good job in marketing is to find out the specific needs of users, recommend related products in time, and enhance the purchasing interest of users. Collaborative filtering algorithm can play an important role in understanding the needs of unknown user

groups. The flow of collaborative filtering recommendation algorithm in enterprise marketing data management is shown in Figure 3.

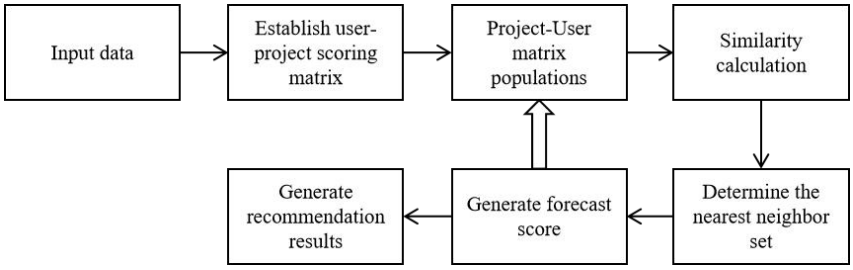

Fig.3 Collaborative Filtering Algorithm Flow

As the name suggests, precision marketing is a type of marketing strategy. Compared with traditional marketing strategies, precision marketing has a clearer focus. The first step of precision marketing is precise positioning and the use of modern information technology to establish a personalized customer communication system so that companies can achieve capital expansion in a low-cost manner. Precision marketing has become the backbone of network marketing, and it is also one of the core views in the attitude of network marketing.

Predict user interest:

$$P_{u,i} = \overline{R}_u + \frac{\sum_{m=1}^{n} \left(R_{m,i} - \overline{R}_m\right) \times sim(u,m)}{\sum_{m=1}^{n} sim(u,m)} \quad (1)$$

Among them: $\overline{R}_u$ is the average rating of the product by user u, $R_{m,i}$ is the rating of the product i by user m, $\overline{R}_m$ is the average rating of the resource by user m, and $sim(u,m)$ is the similarity between users u and m.

Calculate the predicted score of the target user u for the u*nrated product i:*

$$P_{u,i} = \overline{R}_u + \frac{\sum_{v \in N_u} sim(u,v) \times \left(R_{v,i} - \overline{R}_v\right)}{\sum_{v \in N_u} |sim(u,v)|} \quad (2)$$

Among them: N_u represents the nearest neighbor set of user u, $sim(u,v)$ represents the similarity between user u and its nearest neighbor v, and $R_{v,i}$ represents the score of user v on product i. $\overline{R}_u$ and $\overline{R}_v$ respectively represent the average scores of target user u and neighbor user v.

Using big data to improve enterprise marketing management is the trend of adapting to the development of information age, and it is an urgent need to provide personalized service for customers and comprehensively promote the marketing management concept. Combined with the effective application of big data technology, it mainly shows the advantages of abundance, rich value, high speed and diversification, and has become an important trend in the development of many industries at this stage. At present, many enterprises have realized their own optimization and innovation with the help of big data in marketing management, which has played a strong role in

promoting the development and progress of enterprises. At present, many enterprises are able to conduct market research by means of network channels in marketing, so that they will be able to acquire a large number of investigation information resources, and the detailed analysis and application of these data information resources will be able to show a stronger effect, which will help to achieve the accuracy of future enterprise marketing work and avoid the threat of wasting a large amount of data information.

Ⅴ. Conclusions

In the era of big data, the internal and external environment of enterprises has changed. In the face of fierce market changes, only by analyzing a large number of historical and realistic data and making correct decisions can we seize opportunities, which is the magic weapon for enterprises to succeed. The enterprise marketing management information system faces all members of the enterprise, and it provides strong support for enterprise decision-making. For the implementation of the current enterprise marketing work, it is an important basic means to make full use of big data, which can assist enterprises to formulate more reasonable marketing strategies and ensure more pertinence and accuracy of enterprise marketing management, which also requires big data to better match the marketing needs and improve the level of data information analysis. To realize the integration of marketing data and management innovation, enterprises should fully understand the characteristics of big data and the challenges faced by enterprises, and adopt new technologies and methods to realize the integration of marketing data and marketing management innovation, so as to improve the core competitiveness of enterprises and promote the sustainable development of enterprises.

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