



Intelligent Prediction and Analysis of Online and Offline Retail Big Data Under the Background of Public Health Emergencies

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Abstract. With the rapid iterative upgrade of digital economy and internet plus, online shopping experience has been more and more widely accepted and loved by the public. Especially in the case of public health events such as COVID-19 outbreak, e-commerce transaction has become the mainstream format. This paper collects the big data of supermarket sales, makes visual analysis of the data through intelligent algorithms such as machine learning with Tableau as the main body, and carries out the transaction situation, profit, sales and sales forecast and evaluation of various provinces and cities. It is considered that online shopping is continuously impacting offline shopping, and experiential scenes are accelerating the replacement of traditional physical stores.

Keywords: big data · online shopping · tableau · intelligent algorithms · predictive evaluation

1 Introduction

With the industrial revolution 4.0 stepping into the historical evolution of panoramic digitalization, online shopping is quietly infiltrating and changing our lifestyle and consumption patterns. E-commerce operation in internet plus has broken the traditional way of exchanging people and goods. Through Internet information transmission and collection and big data statistics, it calculates consumers' accumulated habits, retrieves the information of products in hot areas, submits electronic purchase orders online for each transaction, and attaches private account information or credit card information under the supervision of security information environment. Through the new form of retail logistics, traders complete the delivery, delivery and delivery of goods or services purchased by customers under the supervision of full chain distribution. The reason why online shopping is favored by us is that there are two main features. First, it is convenient. No matter when and where you are, you can "shop" online at any time, and you can choose goods to buy, so you can be free from the constraints of time and place. Second, the price advantage. In the virtual trading world, new retail e-commerce can reduce or

avoid many expenses such as physical stores, labor services, warehouses, inventory, etc., reduce the price difference of middlemen, and realize “face-to-face” direct transactions with customers in the Internet and digital world. The influence of these two leading reasons is still expanding, and the mainstream of online shopping is spreading from the 15–35 age group to the high age group. According to the survey, the main reason of 50% users’ online shopping is convenience, and the main reason of 24% users’ online shopping is that they think the price is cheap.

The 2020 China Economic Annual Report was released by the National Bureau of Statistics on January 18th last year. The report pointed out that the total retail sales of social consumer goods in China in 2020 reached 39,198.1 billion yuan, down 3.9% from 2019; In 2020, the retail sales of online e-commerce in China will reach 1,176.01 billion yuan., an increase of 10.9% over 2019; Among them, the online retail sales of goods in physical form exceeded 9,759 billion yuan, an increase of 14.8% over 2019, reaching 24.9% of the total retail sales of social consumer goods in 2020, 4.2% higher than that in 2019.

2 Research Results of Intelligent Analysis of Supermarket Sales Big Data

Online shopping mall, which focuses on online sales services, is an Internet digital economy operation platform. The platform integrates wholesale and retail services, providing customers with high cost performance, full choice, and fast and convenient consumption experience. With the evolution of digital network architecture, cloud analysis of big data consumption information, and the continuous expansion of unmanned supermarkets, new online retailing on the Internet has entered the fast lane of rapid development in the event of public health emergencies. This paper makes a comprehensive and in-depth analysis based on the four-year operation data of a supermarket chain in Jinan from 2017 to 2020.

Before using Tableau for big data analysis, we collect and sort out the required online sales data of supermarkets, optimize the identifiable unreasonable elements in historical data documents, cover the consistency screening of types of data, centrally clean and comprehensively process invalid data and missing data, and complete all-data connection through Tableau big data intelligent analysis. The specific process will not be explained in detail here, only the analysis process after importing data will be introduced.

2.1 Transactions by Provinces and Cities

In order to maximize profits, it is necessary to implement refined operation, accurately grasp customer consumption habits, timely respond to changes in user needs, and formulate operation strategies tailored to different types of users. Through reasonable and systematic segmentation of customer consumption life cycle, enterprises can formulate accurate portraits of customer consumption characteristics, set operation strategy labels for different consumer groups, get optimal planning and management of customer resources, and tap multi-dimensional potential high-quality customers.

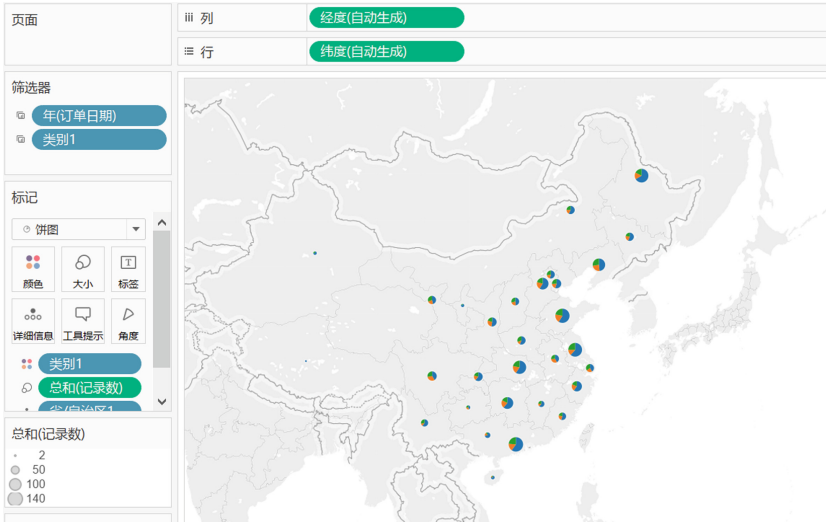


Fig. 1. Number of transactions by province and city.

As a measurement index of purchasing behavior, this paper randomly selects a period of time, counts the transaction times of online and offline shopping related samples in various provinces and cities, and considers the factors such as customer target determination, business model selection, and sales strategy customization of enterprises in the regional market as a whole, and analyzes the number and characteristics of purchasing behaviors of consumer terminals or customer groups facing a relatively fixed kind of goods, which constitutes the specific connotation of purchasing frequency. Statistical analysis of big data shows that during this period, users' consumption behavior has certain concentration, and consumers have certain habits and preferences. As shown in Fig. 1.

2.2 Profits of Provinces and Cities

In a certain accounting period, the net sales revenue after deducting the cost can be used as the operating results of the enterprise, including profit before interest, net profit, economic added value and other forms. This part is uniformly set as profit. This paper analyzes the online and offline shopping cases of supermarkets, and finds that the sales profits of different categories of goods in the supermarkets are quite different in various provinces and cities across the country. In addition, due to the limitation of sales cost, some provinces and cities have negative profits, as shown in Fig. 2.

2.3 Customer Classification Analysis Based on RFM Model

"Customer-centered" personalized service is paid more and more attention by enterprises. Enterprises should study the personalized needs of customers and operate different customers in a refined way. RFM model is one of many CRM analysis models,

省/市	8,304	13,511	10,408
安徽	8,304	13,511	10,408
北京	5,757	5,075	8,422
福建	5,930	15,708	11,137
甘肃	845	-6,100	-7,755
广东	17,658	19,007	22,222
广西	4,791	4,085	5,162
贵州	434	-436	289
海南	1,502	297	2,334
河北	14,143	24,083	5,450
河南	4,606	3,570	9,546
黑龙江	28,408	17,659	20,915
湖北	-7,133	-12,344	-14,015
湖南	13,146	11,413	5,474
吉林	5,866	5,081	6,765
江苏	7,742	-7,083	-17,461
江西	2,586	2,616	2,743
辽宁	-612	-12,395	-16,297
内蒙古	3,937	-1,140	-5,056
宁夏	981		-1,882
山东	19,306	13,853	16,653
山西	5,969	7,870	11,548
陕西	6,385	10,041	4,727
上海	3,129	8,944	5,596
四川	1,388	-5,484	-5,419
天津	6,592	6,569	6,946
西藏	400		
新疆	3,873		810
云南	5,482	4,795	6,660
浙江	-3,554	-15,457	-8,430
重庆	4,000	1,885	5,924

Fig. 2. Profits of provinces and cities.

which is widely mentioned and applied. It is a classic model to judge and evaluate the value of customer status and whether the customer can provide enough creativity and profit space for enterprises. RFM model, which depends on the last purchase time, consumption frequency and consumption amount of users.

R (Recency): the time interval between the last transaction of customers online in the data sample and the present. After setting a current comparison date in advance, the larger the R value, the longer the historical date that indicates that the customer transaction has taken place; The smaller the value of r, the closer the date of customer transaction is to the set date.

F (Frequency): the transaction frequency of customers in the latest period since the relative set date. The greater the value of f, the more intensive the customer transaction phenomenon; The smaller the value of f, the more critical the dormant and sluggish the customer’s trading state is.

M (money): As the core pillar of database report analysis, the amount paid by customers during the above set period. The larger the value of m, the higher the gold content of customer value, and the smaller the value of m, the lower the gold content of customer value.

In this case, we use the time difference between the last purchase date and today as the index of R value prediction, the total customer order number is set as F index, and the total customer consumption amount is set as M index, as shown in Fig. 3.

2.4 Analysis of Sales and Profit of Each Province Based on Matrix Analysis Model

Matrix analysis model, also called four-quadrant analysis method, is a strategic analysis model. The most famous one is Boston Matrix, which divides the existing products

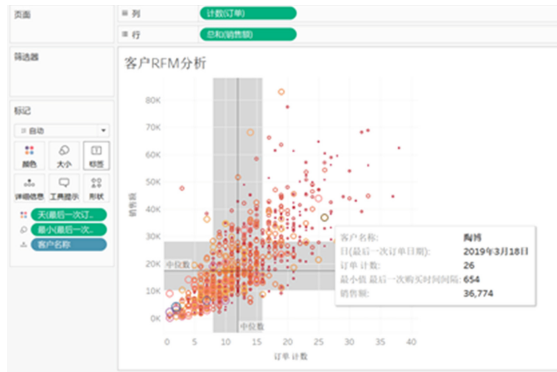


Fig. 3. Scatter diagram of customer RFM.



Fig. 4. Matrix analysis of sales and profits of each province.

of enterprises into four types from two dimensions: product market share and market growth rate. Here, we use the two dimensions of the supermarket’s sales and profits in various provinces and cities to analyze the online product operation status of each province, as shown in Fig. 4.

2.5 Regional Profit Analysis

Generally, profit can be understood and applied in broad sense and narrow sense. The broad concept of profit includes pre-tax profit (i.e. total profit) and after-tax profit (i.e. the remaining part of total profit after deducting income tax expenses); The narrow concept of profit includes gross profit (i.e., total sales revenue stripped of cost consumption), net profit (excluding tax) and profit before tax (i.e., gross profit is superimposed on additional profit income and other expenses are removed).



Fig. 5. Regional profit analysis.

There are differences in the sales profits of commodities in various provinces and cities. In this paper, the intelligent algorithm is used to compare the profits of the supermarket distributed in various regions in the sample in recent years through big data analysis. The profits of various regions in China in 2020 are shown in Fig. 5.

3 The Practical Significance of the Prediction, Evaluation and Research of Business Intelligence in Internet Plus

The information ecology and business environment of the Internet are changing rapidly. Establishing a neural network model, selecting a suitable set of evaluation dimensions, compressing evaluation variables, using statistical methods, machine learning methods, etc., relying on the current and historical big data to quantify the status quo, replacing feelings with structured and unstructured data, and presenting clear, eliminating ambiguity and approaching standard measurement through expert evaluation is one of the greatest utility of internet plus business intelligence prediction and evaluation. In predicting the implementation effect and future performance evaluation of the new retail strategy, the prediction and evaluation results are crucial to the adjustment of the next decision direction of the marketing department’s operation plan, upstream, downstream supply chain, business department, core sales and marketing activities, production and supply department, after-sales service, human resources and other departments. In this case, according to the sales and profits of this supermarket from 2017 to 2020, we can forecast the total sales in 2021 and the sales and profits of various regions. As shown in Fig. 6.

According to the forecast and evaluation, people are very enthusiastic about online shopping, and “internet plus Retail” needs to seize this good development opportunity and constantly improve and perfect it. In the “internet plus retail” model, the way consumers shop has changed, and it no longer takes a long time. Instead, they can complete a product purchase with one click on the website or smartphone-related APP. The “internet plus Retail” model can receive orders in a short time, and the physical retail stores can provide the products that consumers need. After logistics and distribution, the products

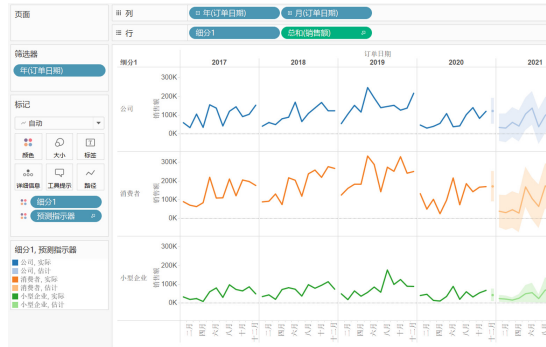


Fig. 6. Forecast and evaluate sales.

can reach the hands of consumers in the shortest possible time, saving time and making them have a good consumption experience. The consumer groups of “internet plus Retail” will continue to expand.

Cost control, financial operation, brand price and product marketing are the main advantages of retail enterprises’ entity management, while the Internet has the advantages of abundant information resources and information transmission rate. The construction of “internet plus Retail” mode has truly realized the complementary advantages, and the function of spreading “internet plus Retail” is more perfect. The combination of shopping websites and distribution storefronts is undoubtedly a good business strategy, which can not only provide high-quality products, but also ensure good distribution and after-sales service, and the business models of retail enterprises become more diversified. Make use of the advantages of information dissemination of the Internet to carry out advertising marketing. Combine traditional retail with online retail to open up a broader business field. Traditional retailing, like online retailing, can provide consumers with convenient and thoughtful products and services, expand sales channels and fully meet the needs of consumers. The construction of “internet plus Retail” model, that is, the breakthrough reconstruction of retail business model, has realized the digital transformation and upgrading of smart retail, making it have a clearer development direction.

4 Conclusion

4.1 The Accelerated Substitution of “Online Shopping” for “Offline Shopping”

It can be predicted that the future shopping methods will basically be done online! Even if it’s generated by offline scenes, it’s mostly done online. For example, online supermarkets place orders with mobile phones, and they will be delivered to your home in a moment, so you don’t need to carry big bags.

4.2 The Accelerated Substitution of “Experiential Scene” for “Traditional Physical Store”

With the accelerated development of smart cities and artificial intelligence, offline stores will transform from selling products to providing experiences in the future! People will no longer go to offline supermarkets to buy things, but to buy “experiences”.

4.3 “Online Customer Acquisition” Accelerates the Way of Replacing “Offline Customer Acquisition”

After public health emergencies such as epidemics, customers are deeply online, which speeds up the online and offline access of merchants. The new retail relying on intelligent algorithms such as “internet plus”, big data analysis, artificial intelligence machine learning, blockchain, etc., guided by customers’ needs and pleasant shopping experience, highlights the main elements of consumer groups, solves the problems of long circulation time, complicated links and high cost of traditional retail industry, improves the accuracy and utility of forecasting and evaluation, and deeply promotes the integration and development of online and offline digital commerce, showing unprecedented customer acquisition ability and operation mode vitality. In the future, various online platforms and community marketing such as graphic, short video, audio (Tik Tok, Wechat business, live broadcast with goods) will become more and more open, which requires new retail to provide higher added value to expand and maintain high-quality customer resources.

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