

Analyzing Marketing Issues in China's Juice Market Using Visualization Tools

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Abstract: China's juice market has been slow in recent years, and the market share is gradually decreasing. Based on the importance and research value of online reviews on e-commerce platforms today, this paper uses the python crawler tool to crawl the top three 100% juice product reviews on the JD platform, extract new words and keywords, and analyze positive and negative emotions, and then visualize them. According to the research results, it is suggested that fruit juice enterprises carry out taste innovation; Optimize packaging design, materials, and specifications; and make suggestions such as timely promotion activities on holidays. It aims to put forward targeted tips for recovering China's juice market.

Keywords: juice market, python, visualization, natural language processing

1 Introduction

In recent years, the performance of China's juice market could have been better, and the growth rate in 2019 is lower than the market average. In addition, the market share of other categories, such as carbonated drinks and milk tea, has gradually increased in recent years [1]. The juice industry must break through the existing bottleneck to progress. Among many fruit juice categories, "100% fruit juice beverage" has a significant advantage in the market competition. Due to the continuous development of China's economy in recent years, people are paying more and more attention to health issues, so whether the beverage is healthy is also one of the main considerations for people to choose from [2]. Therefore, 100% fruit juice has excellent development potential and is expected to break through the current predicament of China's fruit juice industry by vigorously developing this category. In addition, the popularity of the Internet and e-commerce has also made more and more consumers form the habit of online shopping [3]. And consumers usually ask for comments on goods or services after closing the transaction. User comments can not only provide a meaningful reference for new customers but also provide a lot of valuable feedback information for merchants. By studying the content of the review, they can understand the quality of goods, service quality, user satisfaction, change trends, and existing problems of the whole industry [4]. Finally, problems in juice sales based on e-commerce could be more challenging to quantify or even find.

Based on the above five points, this paper will crawl three representative product reviews in JD.com, one of the largest e-commerce platforms in China. Text mining and visualization methods

will quantify the characteristics and problems of the current 100% juice retail of e-commerce and then put forward reference suggestions for recovering China's juice industry from consumers' perspective.

2 Literature Review

At present, domestic research on e-commerce retail has been very rich. Shi used the PEST model, Porter's five forces model, and 4P and 4I marketing strategies to analyze the current situation and problems of marketing strategies for good stores. This paper puts forward targeted optimization suggestions based on the successful experience of other similar enterprises' marketing strategies [5]. Xie analyzed the shortcomings of Hema Fresh and proposed improvement measures for marketing problems, providing some thoughts and inspiration for formulating marketing strategies for new Chinese fresh retail enterprises [6].

In addition, there are many studies on retail e-commerce reviews. Wang and others collected online reviews and text mining the collected online review text content, sorting out 10 factors affecting consumer satisfaction [7]. Zhou et al. obtained the influencing factors of online customer evaluation of B2C network platforms based on previous research and combined with the latest actual situation. Then the intermediary variable - consumer perceived risk is introduced, and the corresponding conclusions are drawn [8]. Similar studies include scholars such as Lai, who analyze the service quality of the tourism market based on online reviews [9].

Although the existing literature is very rich, little research on the Chinese juice market uses visual tools. Based on this, this paper applies visual tools to online e-commerce reviews on mainstream e-commerce platforms, aiming to put forward relevant suggestions for the bottlenecks in the current Chinese juice market.

3 Methodology

3.1. Data Selection

This paper selects the brands with 100% fruit juice category from the top 20 brands in China's fruit juice beverage industry market share in 2020-2021, released by the Prospective Industry Research Institute (China's famous segmentation industry research institute). Finally, it selects three representative 100% fruit juice products based on the sales volume and evaluation number of JD Mall. Wei chuan Daily C, Nongfu Mountain Spring NFC juice, and Huiyuan 100% juice. And because JD Mall can only display the latest 1000 comments, it is far less than the number needed for research. Therefore, this article selects three flavors of each product. Select 1000 comments for each flavor (3-4 months before February 28, 2023), so there are 3000 comments for each product and 9000 words for the three products.

3.2. Data Acquisition

This article uses web crawler technology to obtain e-commerce reviews, and Python language is by far the closest programming language to human language; At the same time, it is an interpreted, object-oriented, free, and open source, dynamic data type high-level programming language. Its third-party library is very rich and can meet the research needs of this paper [10]. Take Huiyuan 100% juice as an example. Search on the JD e-commerce platform with "Huiyuan 100% juice" as the keyword, and import python third-party libraries: requests, re, time, and pandas in the Spyder development environment configured by Anaconda to build a crawler environment. Then get the URL of the initial page. In crawling the web page, we constantly extract new URLs from the cur-

rent page until we are satisfied with crawling all 1000 displayed e-commerce comments. The basic process of web crawler as in Fig.1.

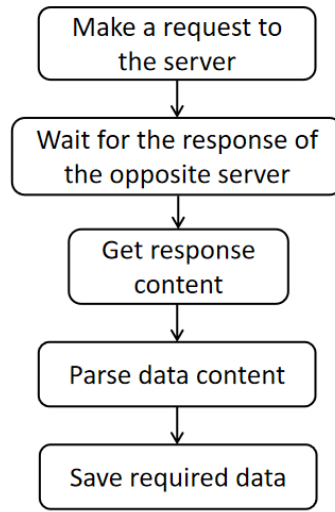


Figure 1: The basic process of web crawler.

3.3. Text Mining

Keyword extraction is extracting core words or phrases from an article [11]. Neologism discovery refers to mining new concepts from the text to explore the changes and trends of consumers' attention in advance.

Dynamic analysis refers to making positive, neutral, and negative judgments about the text. The results of the emotional study in this paper can only be divided into two categories, namely "positive" and "negative".

Uniformly adjust text encoding to UTF-8 format. Then import the text into Notepad++, edit - line operation - arrange the text lines in ascending order. Click Edit again to delete consecutive duplicate lines inline operation. This operation is used to remove the duplicate and water from the text. There are 2640 valid comments from Wei chuan, 2440 from Nongfu Mountain Spring, and 2040 from Huiyuan.

The keywords and new words are extracted as Fig. 2. The data analysis software in this paper is the NLPPIR semantic analysis system, developed by the Chinese Academy of Social Sciences, and has a powerful Chinese segmentation extraction function [12]. NLPPIR system extracts Chinese word segmentation to find the top ten new words and keywords.

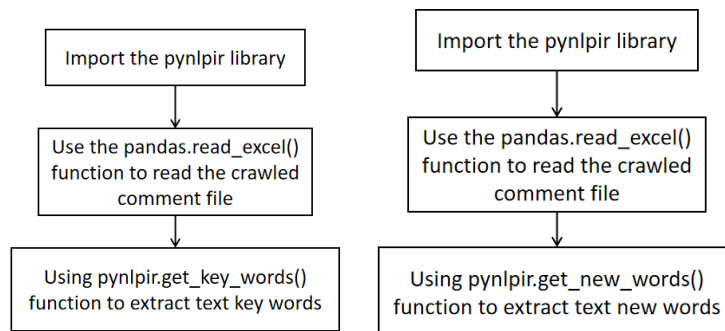


Figure 2: Keywords and new words extraction flow chart.

3.4. Visualization

Visualizing text-type data is visualizing the information in the text through graphical means through the existing visualization technology. To achieve the purpose of in-depth analysis of text data [13]. The current visualization methods are very rich, and the word cloud map is the most common. The word cloud is composed of different words of different colors, and the font size of each word can be felt according to the frequency of each word. The word size with high frequency is significant, while the word size with low frequency is small. There are many online word cloud tools on the Internet, such as WordIt Out, Tagul, etc., in foreign countries, and Tuyue, Microworld Cloud, etc., in China. The tool for making the word cloud image in this paper is the online platform of the word cloud. The results of the word cloud are as Fig.3.

Table 1: Visualization results of New words, key words, positively words, negative words for the three products.

	Wei chuan	NongFu Spring	Huiyuan
New words			
Key words			
Positively words			
Negative words			

4 Analysis

The research crawls the comments on the JD e-commerce platform and analyzes the extracted high-frequency keywords, new words, positive words, and negative words, and concluded the similarities and differences of the feedback from consumers to three major juice brand products of Wei chuan Daily C, Nongfu Spring NFC, and Huiyuan Juice, and finally conducts relevant discussions to summarize the positive and negative feedback of consumers and consumers' current preferences for

product and service characteristics and future prediction preferences and discover the current marketing problems of the fruit juice industry.

The analysis of the keywords in the reviews shows that consumers pay attention to the taste, texture, packaging, and price of the three major brands of fruit juice products and have a high degree of loyalty to orange juice. The difference is that consumers of Nongfu Spring NFC pay attention to product shelf life and delivery speed; consumers of Huiyuan Juice pay attention to brand and quality; consumers of Wei chuan Daily C pay attention to the delivery speed and variety of tastes. Consumers' demand for fruit juice products is mainly taste, packaging, and price. Consumption is characterized by high loyalty to traditional juices such as orange juice; a certain proportion of consumers like to buy big-brand juice products and value the efficiency of express logistics; meanwhile, the juice's shelf life is also a significant factor affecting consumers' purchase decisions.

The analysis of new words in the reviews reveals that consumers prefer fruit juices with a sweet and sour taste, such as berry drinks and peach juice. The difference is that Wei chuan Daily C consumers prefer more convenient purchase channels, such as convenience stores. There is a demand for family packs for the whole family to drink. Nongfu Spring NFC and Huiyuan Juice consumers tend to have good customer service, high brand trust, and willingness to repurchase. In the comments of consumers of Huiyuan Juice, vitamins, and other nutrients frequently appear, indicating that consumers have an increased demand for healthy, functional juices. The word-of-mouth of Nongfu Spring has deteriorated in recent years, and the frequency of negative reviews in new words is relatively high. Consumers complain that the taste is slightly bitter. With the change in consumer demand and the upgrading of the consumption structure, the need for low-sugar or sugar-free drinks has increased [1]. The analysis of new words shows that consumers prefer juice products with a sweet and sour taste; the variety of packaging specifications meets the increasing demand for different consumption scenarios. Large-package barreled juices are suitable for daily drinking at home, while small-package juices are suitable for sale in convenience stores, bringing convenience to consumers. In addition to the high quality of the products, the attentive and thoughtful customer service has also improved consumers' trust in fruit juice products and the repurchase rate [14].

The analysis of the positive words in the reviews shows that most of the positive words with the high frequency of the three major brands are consistent, such as fresh, healthy, cost-effective, convenient, reassuring, quality, and pure. The difference is that Nongfu Spring NFC consumers do not have a strong awareness of the Nongfu Spring brand, but Nongfu Spring NFC will carry out marketing activities in due course. Huiyuan Juice's logistics service capability is slightly weaker than the other two brands. Therefore, among the three major fruit juice brands, the frequency of fresh and pure taste, affordable price, and convenience of drinking are higher. These three aspects are relatively mature in the product optimization process of big brands, especially in 100% fruit juice products. Regarding brand marketing and cold chain logistics services, the level of different brands is uneven.

Analyzing the negative words in the comments, it can be found that the negative comments of consumers are mainly concentrated in the following aspects: the taste of the juice is bitter and sour; the packaging is cheap; the channels for purchasing juice are troublesome; there is hesitation and worry in the purchase process. The difference is that the packaging of Wei chuan Daily C and Huiyuan juice is relatively simple, and the storage temperature is too low, resulting in a cold taste of the juice; Wei chuan and Nongfu Spring juice products are easy to deteriorate and have a short shelf life; Nongfu Spring tastes disgusting. The quality of 100% fruit juice is greatly affected by the cold chain transportation service system. Because 100% fruit juice needs to enter the cold chain system for storage and transportation, it will deteriorate once the product leaves the cold chain. Therefore, consumers need more trust in purchasing fresh products such as 100% fruit juice and are worried about the quality of the product. At the same time, if there is a problem with the product in the mid-

dle of the cold chain service system, there is an excellent risk of deterioration, which will affect the quality of the product and cause negative reviews from consumers. Too low a storage temperature will also affect the taste. Secondly, the monotonous and crude juice product packaging reduces the satisfaction of consumers [15].

To sum up, based on the feedback from consumers in the comment section of JD.com's e-commerce platform, most consumers prefer orange juice-like juice drinks in terms of taste. They like the sweet and sour taste and use fruit juice as a daily supplement of vitamin C and other nutrients. Efficient cold chain transportation logistics, good customer service, affordable prices, and diversified packaging specifications can significantly improve consumer satisfaction with products. At the same time, they pay attention to the packaging materials and the convenience of purchasing fruit juice products and tend to buy certain trusted brand juice products.

5 Results

With the continuous development of the refrigerated fruit and vegetable juice industry, some juice brands are facing more significant competitive pressure. Increasing user retention rates and catching new user groups' attention in the vast market competition environment have become critical issues for enterprises to maintain success in the juice industry. This paper puts forward suggestions for improving the existing marketing problems in the fruit juice industry from the four aspects of taste, packaging, price, and brand.

It is recommended that enterprises carry out taste innovation in terms of taste. Many young consumers firmly accept and try new ideas in the taste innovation of fruit juice products. Juices that can innovate sweet and sour tastes, such as berry, grapefruit, kiwi, and other flavors.

In terms of packaging, companies can highlight product functionality and taste characteristics by improving packaging design. The bottle packaging is marked with words such as "no additives", "low sweetness", "sweet and sour", and "rich in vitamin C" to highlight the functional characteristics and taste characteristics of juice products and promote them to consumers. Secondly, design diversified product packaging specifications. The production of small bottles allows consumers to meet their drinking needs at any time when purchasing in convenience stores. At the same time, it produces large-sized family bottles to meet the needs of the elderly and children. Finally, you can choose high-quality packaging materials to avoid cheap packaging.

Regarding prices, enterprises timely carry out preferential activities during the Double Eleven Shopping Festival and other holidays, presenting consumers with more cost-effective and affordable prices. Enterprises can prioritize promoting orange juice products and adopt preferential promotional activities. Because orange juice beverages have a large and loyal consumer base, the first promotional activities can stimulate consumption to a greater extent.

Regarding brand marketing, enterprises can conduct marketing on social media network marketing platforms with a large user base, such as Weibo, WeChat official account, Tiktok, Kuaishou, and Xiaohongshu through live broadcasts or short videos. Enterprises highlight the healthy and green functional characteristics of 100% fruit juice products and taste attributes such as sweet and sour to consumers, accurately place product advertisements, carry out product brand culture and content promotion, and enhance popularity and core competitiveness.

6 Conclusion

This research is based on consumer feedback on Wei chuan Daily C, Nongfu Spring NFC, and Huiyuan Juice products on the JD e-commerce platform, crawling, cleaning, and processing. Based on the frequency of keywords, new words, positive words, and negative words to analyze consumer

feedback, we found the marketing problems of fruit juice products in today's market. We put forward marketing suggestions for enterprises to refer to.

The results show that orange juice has a large loyal consumer group regarding taste choice. In terms of taste, consumers tend to choose juices with a sweet and sour taste, such as berry juice, peach juice, and bayberry juice, and cannot accept bitter and sour juices. Consumers are highly health-conscious regarding nutritional ingredients and pay attention to functional features such as vitamin C supplementation. The cold chain logistics service system occupies a significant share in affecting consumer satisfaction. Still, the current cold chain transportation service could be better, and there are problems of product deterioration. An efficient cold chain transportation system guarantees product quality while giving consumers a longer shelf life. At the service level, good customer service increases consumer trust and repurchase rates and enhances user stickiness. There are certain problems at the packaging level. The simple and monotonous packaging design leads to cheap juices and insufficient packaging specifications to meet the diverse needs of consumers. The price of 100% fruit juice is generally higher than that of low-to-medium-concentration fruit juice products, so the affordable price can attract more consumers to pay attention to purchase. Consumers will pay attention to brands when purchasing fruit juice products and buy products from brands they trust and are familiar with. Therefore, building a good brand image and conducting appropriate brand marketing is conducive to improving consumer loyalty and trust. In terms of convenience, consumers tend to purchase fruit juice products in physical stores such as convenience stores.

Given the above consumers' preferences for fruit juice products and the marketing problems of enterprises, this research suggests that fruit juice enterprises carry out taste innovation, and then optimize packaging design, materials, and specifications, and at the same time carry out promotional activities during holidays in due course, among which orange juice products are given priority. Finally, fruit juice companies can use live broadcasts or short videos on various social media platforms, accurately place advertisements, and increase brand awareness.

This research uses information visualization technology to display consumer feedback more intuitively and clearly through a word cloud map. At the same time, information visualization technology has been widely used in e-commerce, such as describing the information of commodities and merchants in a visual form. In addition, information visualization technology has successfully played a hugely positive role in methods such as medical care, education, and traffic management. However, some things could be improved with the current e-commerce information visualization application status in my country. For example, the information coverage is mainly limited to commodity information and concepts, the visualization structure needs more diversity, and the low level of visualization makes the data difficult to understand. In the future, it is expected to build a more intuitive and efficient visualization system by improving the shortcomings of the application of information visualization technology in e-commerce. At the same time, this technology is expected to be better combined with artificial intelligence to enhance information visualization technology's interactivity and bring users better experiences.

However, this research has limitations: the selected samples must be more representative. This study only extracted consumer reviews of three domestic fruit juice drink brands, and the feedback came from the e-commerce platform of JD.com. In the future, relevant research will increase the diversity of samples by analyzing the sales of multiple domestic fruit juice manufacturers on different e-commerce platforms to summarize consumer preferences more comprehensively and convincingly. Finally, the marketing problems existing in the fruit juice industry and the perfect and practical marketing suggestions and measures are put forward for the reference of enterprises.

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