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The Construction of Visual Cognitive Decision-making Platform with User Insight and The Fashion Trend in the Era of Big Data

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Abstract. With the rapid development of the Internet, big data have brought better tools and perspectives for the research and development of precise fashion products. In this paper, based on the fashion design industry, interactive operation principle and consumer demand, the relevant data are integrated and the innovative technology architecture is utilized, a decision-making system for data visualization is constructed, and the structural problems among fashion trend prediction, market sales and consumer behavior are accurately described so as to realize accurate fashion trend prediction and user behavior insight, help to predict the precise fashion trend of the brand and complete the rapid recognition of consumers and the adjustment of design strategy.

1. Introduction

Driven by the background of innovation and transformation in China's fashion industry, the trend prediction of most fashion enterprises still tends to the perceptual judgment of decision makers, and this makes the decision-making work more random in objectivity, scientificity and accuracy[1]. Without accurate guidance and scientific product decision-making and early warning mechanism, product development severely separates the intrinsic relationship among popular trends, product strategies and consumer demands, thereby resulting in blind and disorderly product development and market release, and a large amount of inventory. However, essentially, as a data-driven business form centered on consumer experience, new consumption integrates relevant data of prediction, market and user around consumer demand, innovates technological framework, constructs a large data closed-loop and visualization platform of fashion trend from trend prediction to product, market and consumer behavior, and helps enterprises to complete the judgment of fashion trends, consumers' quick recognition and design strategy adjustment, flexible product lines, and effectively reduce the inventory of fashion industry.

2. Research on Visualization System of Fashion Trend and Consumer Behaviour Insight

The core of fashion trend and consumer behavior insight decision-making platform based on data visualization is to collect and extract all kinds of real-time sales, consumer and fashion trend data reflected in the design and development process, and use mature mathematical models to accurately



calculate and authentically describe the status of trend prediction and consumer behavior, and display the results to brand/design decision makers through the visualization software platform system. This is a complex system project. In other fields, visualization is more familiar, but it has not been widely used in the fashion industry, involving computer information technology, data visualization software platform technology, and fashion prediction technology[2]. The specific situation is described below.

2.1. Construction of Basic Data System

The premise of data visualization is the collection, analysis and application of fashion trends, user portraits and marketing data, which can be divided into three categories:

The first one is the sales data of the macro market, including sales volume, colour, channel, style, promotion, region and price. The next one is the data described by consumers, including basic characteristics, social contact, behaviour, interest, psychology and income. The last one is the data oriented to fashion trends[3-4], including events, materials, colours, styles and popular elements. Through the collection, collation, induction, analysis and prediction of massive data, the causality behind various kinds of data is excavated from complex data, and various mature modeling techniques are applied to promote these basic data from quantitative to qualitative changes, so as to realize the deep application of massive basic data and timely presentation of data and support brand/design decision makers to make scientific decisions[5]. As shown in Figure 1.

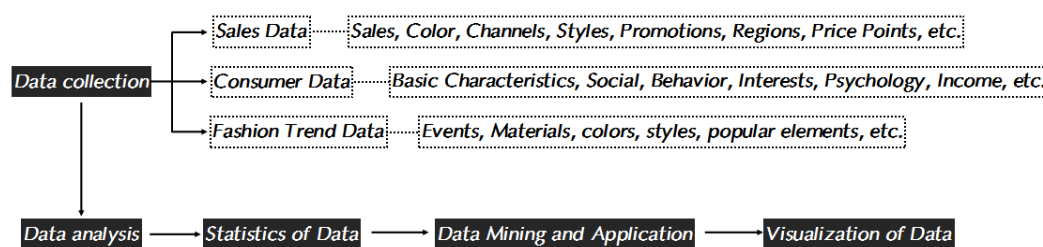


Figure 1. Application of Basic Data.

2.2. The Connotation and Essence of Visualization Research

Instead of simply displaying the big data system of fashion trend and sales system operation to brand/design management decision makers through data visualization software platform, data visualization is to reassemble, analyze and deep mine the basic data system through complex data calculation, analysis and fitting, so as to truly reflect the value of data. The fashion trend and the connotation and essence of consumer behaviour insight data visualization can be divided into the following levels:

- The first is the presentation of key market sales data, which mainly reflects the overall situation of market sales, the trend forecast and sales situation of product attributes (style and colour), and the distribution and layout of consumers. Through the presentation of diverse data, it provides an intuitive decision-making basis for brand/design management decision makers.
- The second is the deep correlation of all kinds of data. The data of market, product, and trend and consumer behaviour are deeply integrated and correlated, and the integration of multi-source data is used to dig out the deep relationship among all kinds of data, so as to form a closed loop of fashion trend big data and find the potential rules.
- The third is the application of all kinds of key data and rules. All kinds of key data and rules are summarized to give alternative decision-making ideas for brand/design management decision makers and provide support for the final management decision.
- The fourth is to realize the interactive experience between brand/design management decision makers, data presenters, fashion trends and consumer behaviour insight visualization platform so as to form a smooth and real-time information sharing channel among the three, break through the barriers from the data level to realize the data closed loop of the whole industrial

chain, and establish an efficient brand/design decision cycle mechanism. The business model is shown in Figure 2.

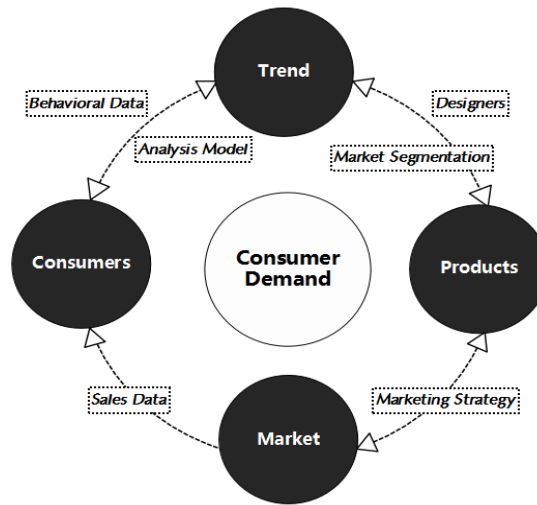


Figure 2. Business Model of the System.

2.3. Service Mode of Visualization Platform

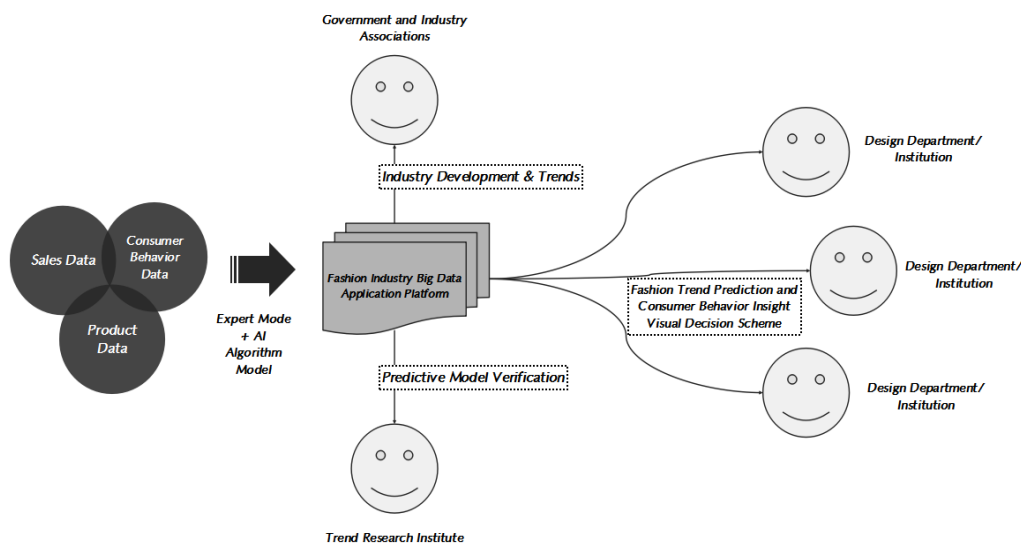


Figure 3. Service Mode of the System.

The main users of the system include brand trend research department, brand product design decision-making department, government and industry associations. Through user interviews, they hope that the visual decision-making platform can help them show their prediction results to high-level decision makers in real time and in an intuitive way. Their needs mainly focus on three aspects: Firstly, for trend research departments or institutions, they hope to improve the accuracy of trend research and influence other related departments by assisting them to provide data verification of prediction results through prediction models[6], especially the design strategy of the design and development department. Secondly, for enterprises or brands, they hope to monitor the trend prediction and sales results in a real-time and whole-process manner, guide consumers to complete the rapid cognition and behavioural insight, so as to adjust the error between trend prediction and product direction, define the design strategy, and improve product sales. Thirdly, for the government and industry associations, they hope that the big data application platform of the fashion industry can provide direction and trend guidance for the industry development.

According to the above needs analysis, the visualization platform needs to integrate sales data, product data and consumer behaviour data, and construct a large data application platform for fashion industry through expert model and AI algorithm model, accurately describe and solve the structural problems between brand product design and fashion trend prediction, design positioning and consumer demand, purchase behaviour and fashion trend research. The service model of the system is shown in Figure 3.

3. Design of Decision-making Platform Based on Fashion Trend and Consumer Behaviour Insight

Based on the real data provided by a fashion luggage brand, the distributed processing platform is used to pre-process and store the accessed data. According to the function orientation of the decision-making platform, the key decision-making index data based on the needs of the fashion industry are listed, and the visual cognitive decision-making platform for fashion trend and user insight is designed.

3.1. Function Setting and Key Index Extraction of the System

3.1.1. Real-time Sales Situation Description Function Real-time sales data of brand/product are described and displayed dynamically, and the overall operational situation is accurately described. After screening, it mainly includes cumulative sales and year-on-year situation, cumulative sales and year-on-year situation, annual index, annual index and completion status, average unit price, proportion of price and sales, monthly sales volume, best-selling colour, best-selling style and proportion of cities and sales, etc., as shown in Table 1.

Table 1. Key indicators related to sales.

Main indicators	Definition of Indicators	Specific description and examples
Cumulative sales and year-on-year situation	Accumulated Sales and Year-on-Year Analysis of Brands	XX (Unit: 10,000 RMB), up/down XX% year on year
Accumulated sales and year-on-year situation	Accumulated Sales of Brands and Analysis of Year-on-Year Situation	XX pcs, up/down XX% year on year
Annual Indicators and completion status	Brand Annual Indicators and Completion Analysis	XX (Unit: 10,000 RMB), completed XX%
Average unit price	Average unit price of products sold by brands	XX RMB, up/down XX% year on year
Proportion of price and sales	Proportion and distribution of various sales price ranges	Proportion below 350, 350-450, 450-550, 550-650, 650-750, 750-850, 850-950, and above 950
Monthly sales volume	Monthly sales in recent two years	Monthly sales from January to December 2017 and 2018
Best-selling colour	Top ten colours of sold products	Black, brown, red, white, orange, camel and pink-orange colours and their proportion
Best-selling style	Main styles and proportions of sold products	Styles and proportions of shoulder bag, S-M bag, handbag, messenger handbag, messenger bag, chest bag, backpack, dinner bag, handheld shoulder bag, etc.
Proportion of cities and sales	The cities where the brands are mainly sold and the proportion of sales volume	Guangzhou, Shanghai, Beijing, Chengdu, Shenzhen and their sales proportion

3.1.2. Fashion trend prediction and sales status comparative analysis function By dynamically focusing on sales data such as product style, color and the proportion of city sales, comparing the difference between trend prediction content and actual sales, real-time fashion prediction bias warning function, and guiding the discovery and prediction of discrepancies, the relevant data behind a SKU and a certain color under the problem point are tracked, including the basic sales situation (cumulative sales and year-on-year situation, cumulative sales volume and year-on-year situation), the comparative analysis of trend forecast and current situation (age comparison, income comparison, monthly sales volume comparison, sales proportion and distribution in cities), and the sales data links of similar products. As shown in Table 2, the prediction results of a popular color are compared with the current sales situation by labeling the following indicator data values of different colors.

Table 2. Main indexes for comparing the current situation with the prediction of a popular color.

First-level index	Second-level index	Definition of Indicators	Specific description and examples
A popular color (Take yellow for example)	Yellow bags Best-selling styles TOP 1 to TOP 5	Cumulative sales and year-on-year situation	The predicted situation is marked in blue The actual situation is marked in yellow Contrastive analysis
		Cumulative sales volume and year-on-year situation	
		Age comparison	
		Income comparison	
		Monthly sales comparison	
		Sales proportion and distribution in cities	

3.1.3. Consumer Behavior and Multidimensional Dynamic Portrait Function By tracking the sales data of SKU and each series collection in real time, and updating the consumers behind the sales data in real time, the dynamic and visual user portrait can be formed finally. The content of the portrait includes the basic information of consumers (including gender, age, income situation, new and old customers) and consumer behavior habits (including discount sensitivity, browsing preferences, purchase preferences, search adjectives, etc.), as shown in Table 3.

Table 3. Key Indicators of User Portrait.

First-level index	Second-level index	Definition of Indicators	Specific description and examples
Basic information of consumers	User gender	Gender composition of users	Male, female, unknown
	Age	Age and composition of users	18-25, 26-30, 31-35, 36-40, 41-50, above 50, unknown
	Income situation	Income and proportion of users	3k-5k, 5k-8k, 8k-10k, 10k-20k, above 20K
	New and old customers	Number and proportion of new and old customers	New and old customers
Consumer behavior habits	Discount sensitivity	Consumers' sensitivity to discounts can assist in formulating appropriate pricing strategies.	High, medium, low and unknown
	Browsing preferences	Consumers' browsing	Luggage leather/Hot selling

	preferences help to configure promotion or cross-border cooperation in relevant preference categories	women's bag/Men's bag, Women's wear/ boutique, Women's shoes, Women's underwear/Men's underwear/Home wear, Makeup and skin care/Body care/Essential oil, etc.
Purchase preferences	The purchasing preference of consumers facilitates to adjust the width and depth of product line	Women's bags, low-heel shoes, dresses, T-shirts, trousers, mobile phone accessories, wallets, sweaters, China Mobile recharge cards, shirts, etc.
Search adjectives	The adjectives that consumers search for help match the relevant goods under the relevant adjectives	Bag-female, canvas bags, ladies' bags, Little bag- female, ladies' bags 2019, handbags, messenger bags, new shoulder bags 2019, ladies' messenger bags, etc.

3.2. Technical Architecture of the System

Traditional visual data analysis is based on A, B, C, D... The system collects data from the bottom to the top, stores data through data storage, distributes data through Hadoop, and data mining with Mahout through customized programs, and finally presents a visual interface.

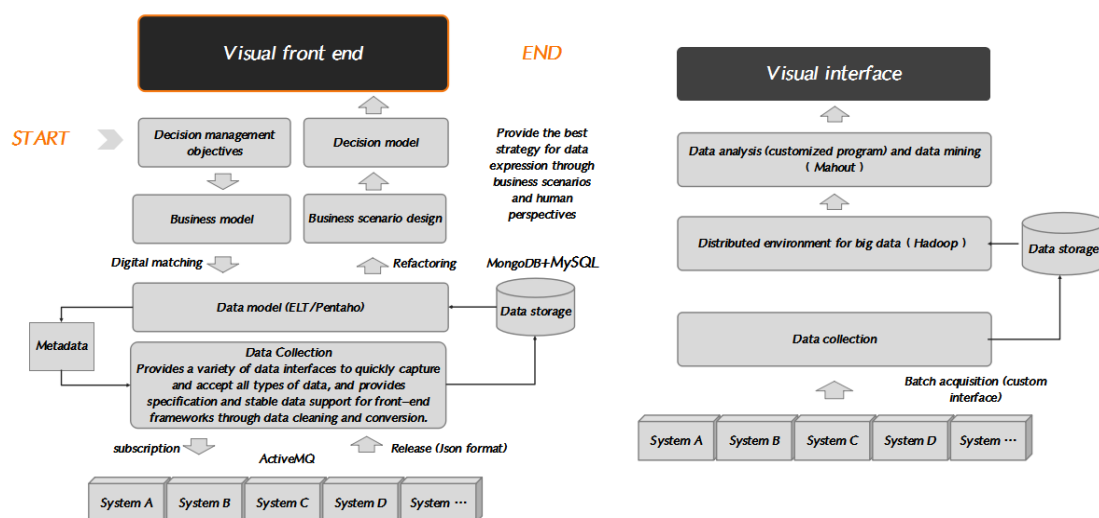


Figure 4. Comparison of Innovative Technical Architecture and Traditional Visual Data Analysis System.

The technical framework of this paper is that the decision-making system based on data visualization should accurately describe and solve the structural problems between brand product design and fashion trend prediction, design positioning and consumer demand, purchase behavior and fashion trend research according to the interactive operation principle, using the standardized model base of each system function.

Based on the target analysis of decision management, after deeply laying out the business model, the data models from A, B, C, D are completed by ELT/Pentaho, etc. The metadata of different data interfaces of the system is collected and cleaned by software, which can be converted into front-end framework to provide normative and stable data support. The distributed processing platform is used

to pre-process and store the accessed data, and the key decision-making index data based on the needs of the fashion industry are obtained. The business scenario design and decision-making model are used to import the front-end of shaping visualization, as shown in Figure 4.

3.3. Visual presentation of the system

After all the data presentation, data association and data application of the decision platform are completed, the last step is to realize the visualization of the platform. Based on the data of fashion luggage brand, the visualization platform of fashion trend and consumer behavior is formed, which is shown in Figure 5-7. The real-time sales situation, fashion trend prediction, comparative analysis of sales status, consumer behavior and multi-dimensional dynamic portrait are realized.



Figure 5. Visual presentation illustrations of real-time sales situation

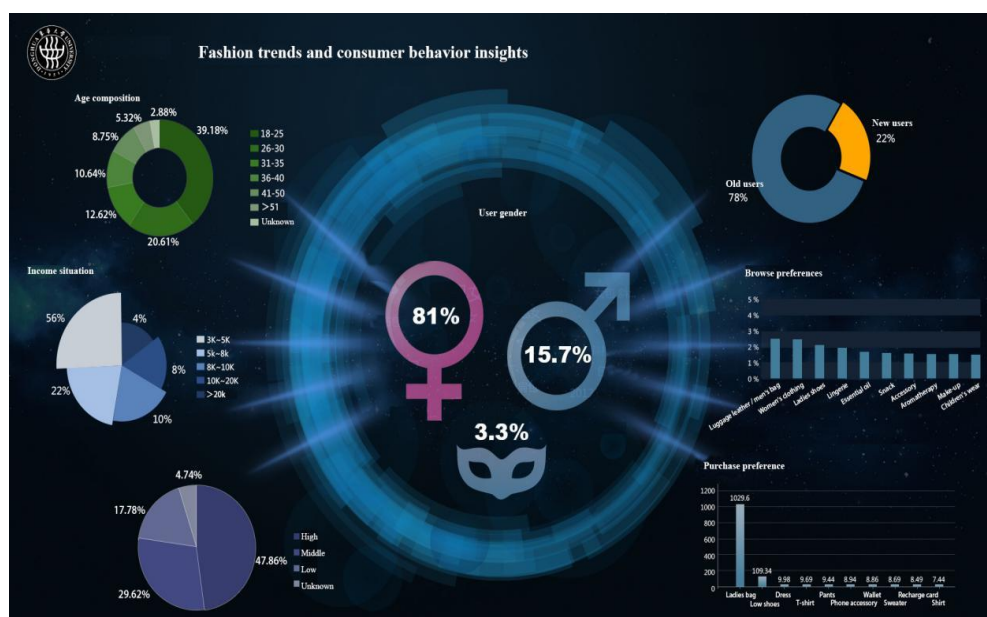


Figure 6. Visual presentation illustrations of consumer behavior insight

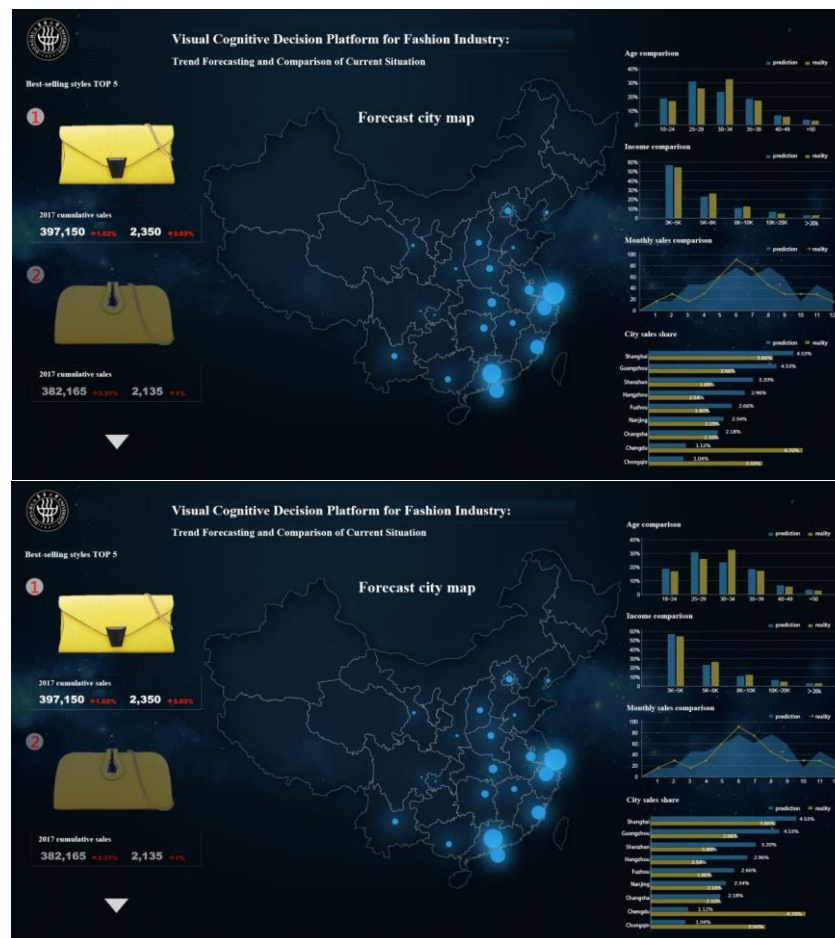


Figure 7. Visual presentation illustrations of fashion trends comparative analysis of sales status

4. Conclusions

The construction of user behavior insight and visual decision-making platform for fashion trend calibration based on big data is a complex system which combines many new technologies. By combining fashion trend prediction data, user's basic data, real-time sales data and decision-making management objectives, the data closed-loop is realized through opening barriers from the data level, and the massive data are effectively utilized and viewed. User portraits, consumer behavior and fashion trends are presented sensitively in order to provide great convenience.

Acknowledgments

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