

Collaborative Design Platform for Clothing Industry from the Perspective of Consumer Participation

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Abstract: In combination with the pain points of clothing manufacturers as well as the necessity of building up a new design platform to realize knowledge sharing among consumers, designers and manufacturers, this paper presented a Collaborative design platform(CDP) for clothing industry. The main functions and framework of the platform were discussed. Three core subsystems including fashion information collection & forecasting system, fashion custom-design system and digital fashion design system are collaborative to provide a viable solution for customers involved design process.

1 INTRODUCTION

China has become world's largest manufacturer after forty years of rapid development. However most manufacturing enterprises have still been placed in the bottom of value chain with low - and medium-grade products. On the "demand side", traditional production pattern in clothing industry with information asymmetry between consumers' requirement and design part, design part and manufacturing, can not satisfy the changing personalized needs of consumers. Accurate customer needs can not be identified in the design process. Information sharing failed among supply chain partners.

In addition, longer production life cycle and chain in clothing industry have brought high inventories. Although clothes have become largest category of online shopping, rate of return remains higher than other categories. There are three main reasons: lack of personality, poorly fitting and longer production cycle make consumers change their attitude towards the clothes they preferred three weeks ago. According to TrueFit's report for global online clothing market, the rate of return reached up to 50%. One-way flow of traditional supply chain in clothing industry has made each part including design, manufacturing or retailing as the information island without interaction data flow. In particular, it is truly troubling for ever-changing consumers'

demand to be sent accurately and instantly to design and manufacturing part.

In order to deal with slow response to the market changes and shorten production cycle in clothing industry, we aimed to propose new design platform and mechanism by intelligent measures, realizing information sharing among consumers, designers and manufacturers.

2 PAIN POINTS OF CLOTHING MANUFACTURER

With the improvement of Chinese consumers' living standards, increasing enterprises should face the coming of consumption upgrading. Consumers' requirement for clothes appears diversification and individuality. There is a serious mismatch between supply and demand because merchandising planners forecast consumers' needs in advance in traditional design and production mode, then manufacturers just begin to reserve raw materials from their suppliers. Consumers' requirement has been regarded as an "external" information node. Problems of inventory and high rate of return have become outstanding. Thus new design mode with consumers' automatic involvement by intelligent measures may solve the problems above.

2.1 Problem of Inventory

Production cycle of clothing industry is longer than other industries due to the long industrial chain and geographic dispersed production. Traditional production cycle from merchandising, design, purchasing fabric and accessories, garment manufacturing to final sale is about 6 months. Clothing enterprises generally adopt supply mode forecasting sales and supplying in advance. Therefore, it is probably occurred that most companies may encounter the problems of supply exceeding demand and high inventories. Figure 1 presents four famous Chinese clothing companies (Hailan Home, Metersbonwe, Joeone and Busen) and their stock-to-sales ratio from 2012-2016. It is obvious that stock has been troublesome issue considered by clothing industry even for outstanding companies.

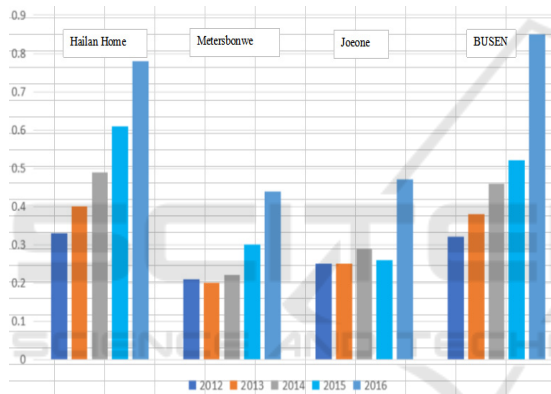


Figure 1: Four clothing enterprises' stock-to-sales ratio from 2012-2016.

2.2 High Rate of Return

Clothing products are considered as non-standard goods need to be physically inspected by touching and tried on to evaluate the quality(Ji and Pang, 2007). It is commonly recognized that perceived risk is high when consumers purchase apparel products online because of the inaccuracy and uncertainty of garment color, fabric and details. However, it is easily overlooked by researchers that consumers are fickle - they may dislike clothes received three weeks after they ordered them online even though these clothes are quite same with what they saw on the website before. They could return the clothes without any reasons.

From the perspective of retailers, shortening delivery cycle can promote the customers' satisfaction as well as to some extent reduce rate of return without reason or impulsive consumption.

2.3 Solution: Consumer Participation and Intelligent Measures

To realize consumers' individual demands, we need design a platform as a bridge connecting consumers, designers and manufacturers. Intelligent measures are adopted to ensure accuracy and efficiency of automotive embedded consumers' requirements as well as self-correction of process.

2.3.1 Consumer Participation

The traits of design with consumer participation include value co-creation, enthusiastic to communicating and uniqueness of products(Smets et al, 2013; Fang, 2008; Guixin, 2014). Regulated processes are important for success of new design mode. Structure of platform and information communication between supply and demand were also regarded as crucial(Sunley et al, 2008).

2.3.2 Functions of Collaborative Design Platform(CDP)

Different parts can acquire and provide different information to shorten and promote their efficiency.

- Designer: directly meet the customer, saving a lot of costs and time;
- Manufacturer: acquire fabric fashion trend, prepare yarn and fabric in advance, shortening fabric preparation cycle;

For manufacturers, they need open some ports, upload data about capacity of production, equipment, progress of orders etc.

- Retailer: obtain information about manufacturers' capacity, current production arrangement, choose proper supplier according to purchase order.

For retailers, they need upload data about consumers' needs, feedback and body size from measuring in stores.

3 LAYER CONSTRUCTION OF CDP

Building up a cloud platform for intelligent clothing design can improve traditional clothing design process. Structurally, this collaborative design platform is composed of three core systems interrelated:

- Fashion information collection and forecasting system;
- Fashion custom-design system;

- Digital fashion design system.

3.1 Fashion Information Collection and Forecasting System

By means of cloud platform for collecting data of fashion trends, development and forecasting system can be adopted into manufacturing enterprises. This system will undertake two main tasks: collecting fashion trends and analyzing fashion elements of fabric, silhouette, color, pattern, style and accessory, see Figure 2. The sources of fashion trends can be runway show, web fashion information from web crawler software or sale data and customers' evaluation. Fashion design is an activity with both objective market feedback and sensual creation. Therefore designer team need to be integrated into this analyzing system to obtain final fashion elements which are crucial for connecting to the next system: fashion custom-design system.

Various analysis modules will also contribute to the success of sharing data flow throughout fashion enterprise's life cycle. For example, the fabric analysis module will help implementing fabric network manufacturing, global purchasing and flexible supply chain with collaborative manufacturing.

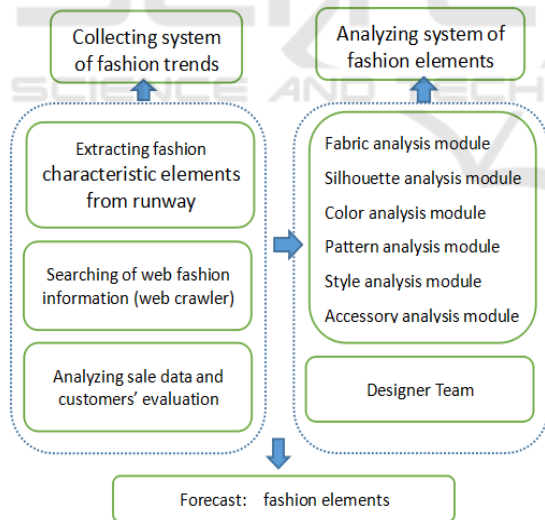


Figure 2: Fashion information collection and forecasting system.

3.2 Fashion Custom-Design System

Fashion elements extracted from fashion information collection and forecasting system can be regarded as the key part in fashion custom-design system, see Figure 3. Based on fashion elements, design service

and popular styles can be provided to clothing manufacturing inclined to be out of market under traditional design mode. Meanwhile, according to online customization (body shape's characteristic collecting by mobile application) and offline experience (3D body data collecting by multi-functional physical stores), customers' shape classification is gradually enriched and consumers can receive accurate style recommendation automatically from large data sets. After consumers decide the style, they can choose fabric, color and other details in a modular way within individual virtual fitting room. Finally, customers place the order while new preference has been generated.

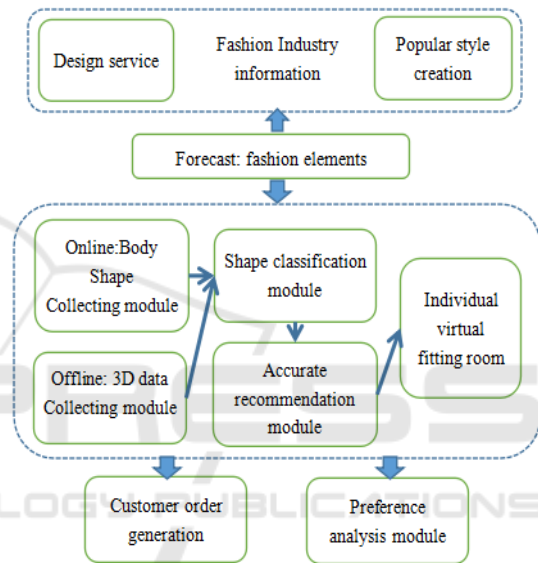


Figure 3: Fashion custom-design system.

3.3 Digital Fashion Design System

According to customers' orders, digital fashion design system (Figure 4) is responsible for transferring consumers' demand to technical document suitable for manufacturing.

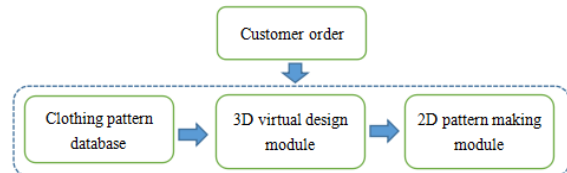


Figure 4: Digital fashion design system.

Clothing pattern database will be searched base on specific module. Then 3D virtual design module will provide unique design according to the customer's body shape database established in

fashion custom-design system. The final step is 2D pattern making module which creating technical documents including pattern, process sheet, material purchase orders, even additional service with the arranging of garment procedure and cost calculation. In short, this system aims to provide necessary information to manufacturer timely which guarantee keeping pace with design process.

3.4 Database for CDP

These three systems above are mutually connected based on various databases. Considering cost saving, current individual clothing design still have to refer to the existing style to a large extent. Therefore, clothing databases (Figure 5) need to be knowledgeable and feasible to be queried, including:

Knowledge expressing database: building up clothing conceptual model including style, color, material, pattern, technology and so on;

Fashion style database: mapping data of apparel elements to corresponding conceptual model, constructing clothing logical model. A great mass of fashion styles collected from consumers are stored and shared in the cloud;

Material and pattern database: combining function superposition method to time-space transform measure to deal with model based on chaotic mathematics theory and fractal theory.

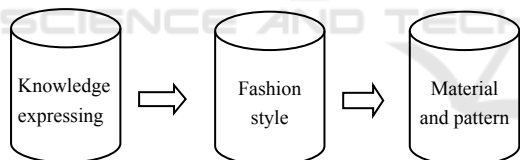


Figure 5: Main databases for CDP.

4 CONCLUSIONS

This paper has presented an collaborative design platform(CDP) for clothing industry to solve problems of inventory and high rate of return. Three core subsystems including fashion information collection and forecasting system, fashion custom-design system and digital fashion design system are collaborative by consumer involved and various databases to promote design process more accurate and instant. Some intelligent measures will be adopted to ensure accuracy and efficiency of automotive embedded consumers' requirements, it is still a beneficial attempt to change traditional developing, designing and manufacturing process.

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