Customized Button Design Platform Construction and Implementation

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Abstract

Because of the lack of comprehensive button product model library, the enterprise and customer cannot communicate conveniently and new product stereotypes cannot be created quickly and efficiently. This problem severely restricts the development of the industry. In view of the regular characteristics of button shapes, a mobile smart button design cloud platform including a button popular cloud design library, a button standard part cloud library, and a button material library is built. The platform can quickly combine, simulate, improve, and design buttons, so the customers can quickly realize more intuitive and realistic new button shapes. The platform changes the tedious communication process, and accelerates the product shaping process.

Keywords

Button Design, Cloud Platform, Model Library, Parts Library, Modular Design.

1. Introduction

With the advent of the network information era, customer needs have shown innovative, short-cycle trends, enterprises need to quickly understand customer needs and win the Market competition, personalized customized products and3D virtual display has emerged [1]. At present, the research on customization platform is mostly applied in furniture and apparel design. For example, the design and implementation of a customization-oriented 3D printing service platform proposed by Ying He of Qingdao University [2]. A study of a customization-oriented eyeglass modeling and design system proposed by Yannan Gu at Jiangsu University [3].Zeng Li of Hunan College of Arts and Crafts proposed a method of personalized design and customization of ceramic household product network [4]. No custom platform research and practice has been conducted in China for the button industry.This paper combines the existing research base of the custom platform, based on the modular design concept, to build a model library containing buttons, buttons standard cloud Parts Library's mobile smart button design cloud platform. The platform acts as a bridge for rapid communication between enterprises and customers. On the one hand, enterprises through the provision of a fully functional, competitive custom platform, to achieve economies of scale; on the other hand, the customer Individual customization needs are met through such platforms.

2. Platform Needs Analysis

2.1 Pain Points in the Button Customization Industry

China's button industry occupies a significant share of the global button market, due to relatively low labor prices and abundant supply of raw materials. The Chinese button industry also has a strong competitiveness in the international arena. But at the same time China's button industry is also facing many problems, such as the lack of three-dimensional virtual product shelves, product homogeneity serious. Difficulties in communication between companies and customers, inability to quickly shape products, etc.These problems seriously hindered the development of the industry [5].

Due to the lack of virtual shelves for 3D products, traditional enterprises can only borrow pictures or videos to showcase their products to customers. Interactively introduce product details to customers. Traditional button customization process is cumbersome, need to go through the customer base style selection, design pattern communication, sample mailing, sample adjustment, etc. It takes many iterations of the loop to finalize the button product that the customer needs, which is time consuming and extremely inefficient. As shown in Fig. 1.

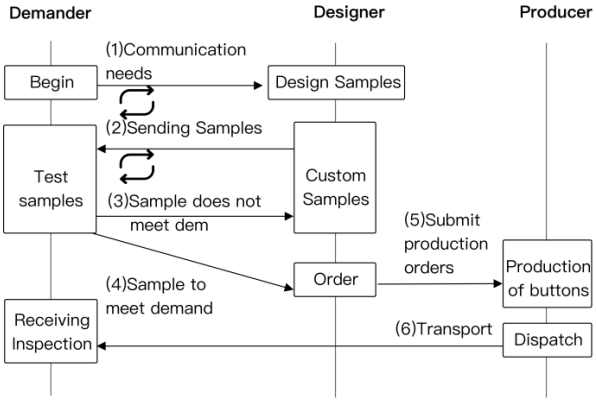

Fig. 1 Traditional button design customization process.

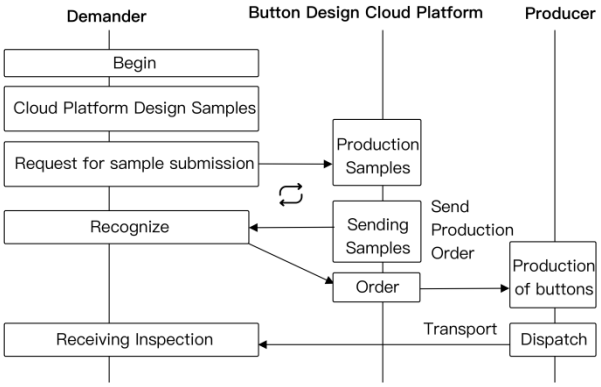

Fig. 2 Optimized button design customization process with the cloud design platform.

2.2 Realistic Needs

Based on the existing pain points in the twist button industry, customers want to select the right button with precision, and are concerned about the appearance and shape of the button, the basic parts, the size, the materials, colors and other aspects of different needs. The enterprise needs to quickly understand the needs of users, and design the corresponding product. Thus, if there is a button design cloud platform on the market, you can showcase the enterprise product model, can be the customer on the product of the various Components can be freely combined. The basic shape of a button can be designed without the need for advanced design skills. By delivering samples electronically, the platform solves the communication problems associated with traditional delivery processes. Accelerate the product sizing process. See Fig. 2.Based on this, the core function of this platform is to support the customer's online button appearance design, color selection, and the design of the button through the Internet. Material rendering and other operations. Customers can collaborate on virtual designs, preview custom buttons, and turn requirements and ideas into Industrial Design Works.

3. Platform Framework Analysis and Design

3.1 Platform Design Process

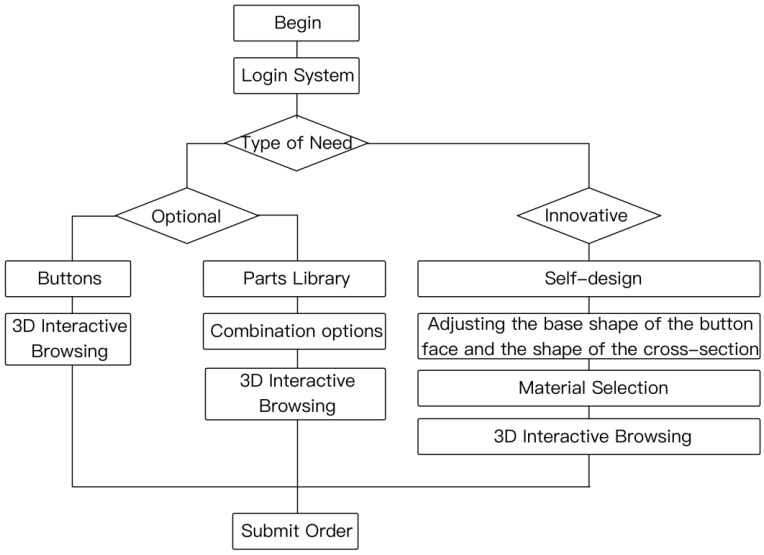

Fig. 3 Design process for different types of customer platforms.

According to the degree of participation in product design, platform customers are divided into two categories: demand matching and innovation.The basic work flow of the platform is as follows: demand-matching customers enter the platform and directly select products that meet their needs from the model library. Or confirm your order by choosing the free combination of modular components. For innovative customers, additional personalization is available, with the possibility of modifying the basic shape of the button in terms of cross-sectional shape, size, color, material, etc. to match the individual requirements and finally submit the order, See Fig. 3.

3.2 Platform Architecture

In order to make the system have good scalability and maintainability, and reduce the coupling of various parts, the system uses a hierarchical architecture to provide System Services. The system consists of seven layers: storage, data access, service, data interface, Web, cache and App [6]. The storage layer is mainly responsible for data storage and physical file storage. The data access layer mainly encapsulates the access service to the database and is a bonding layer that provides services for the storage and business layers. The business layer, as the core service layer of the system, interfaces with the data access layer to operate the database service and storage service; the upper layer is the core service layer of the system. WEB service, cache service and JSON interface service provide data support. The data interface layer provides standard Json interface services for Web clients and App clients. Web backend services. The cache layer mainly serves the data access layer and data interface, which can effectively reduce the number of database accesses.App layer uses Qt QML. and Qt 3D to achieve, and use three.js to assist in the display of 3D scenes.See Fig. 4.

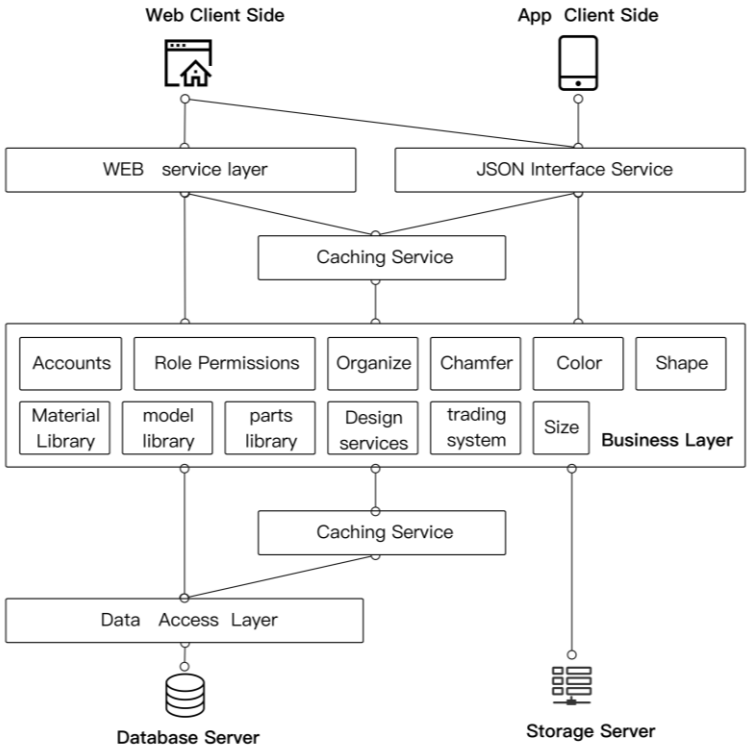

Fig. 4 Server-side software architecture diagram.

The platform has four functional modules: system management, basic data management, design library management and business management.See Fig.5. Among them, the basic data management module has button material management, button shape management and standard size management; design library management modules are Two databases, Parts Library Management and Model Library Management.

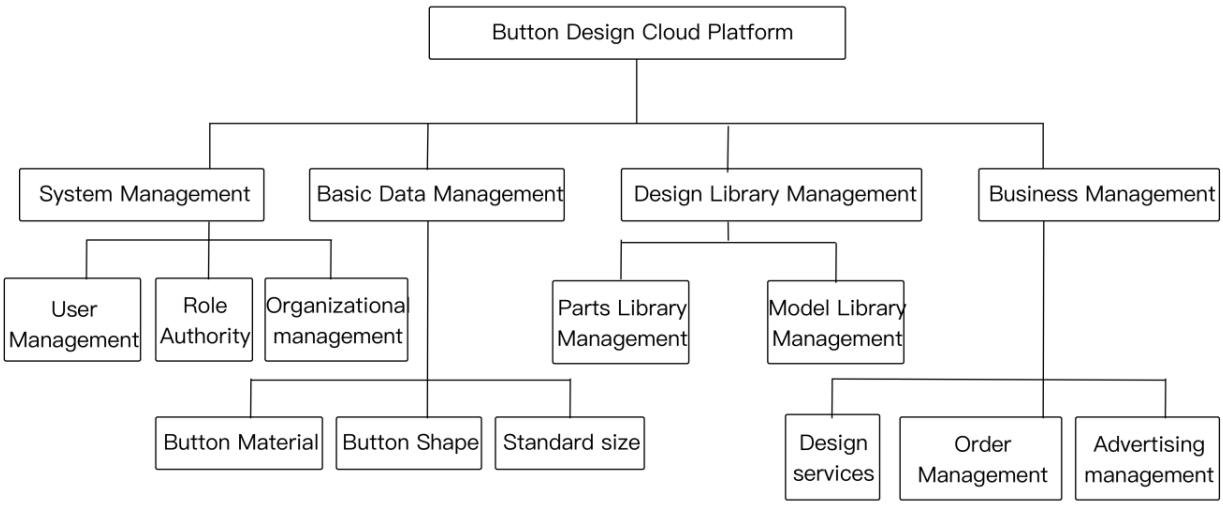

Fig. 5 Cloud Platform Function Module Diagram.

4. Platform Core Function Module Implementation

4.1 Button Model Library

After analyzing and researching the existing market for buttons, we used the 3D design tool Rhino to organize the designer's research on various styles of buttons. Buttons are modeled in 3D and entered into the system's standard button model library. Based on the rich model repository, buttons are classified according to standardized techniques in the button field, i.e. by shape, size, material and application. Four major categories for collection and classification, and the establishment of a fast and efficient retrieval system. Among them, the shape class button model library subdivided into round buttons, polygon buttons, imitation buttons, combined shaped buttons; size class subdivision For diameter system, thickness system, width system and length series; material category subdivided into metal buttons, chemical, natural, textile and other materials. Material class, combined material class; use class is subdivided into clothing buckle, home textiles buckle, shoes buckle and bags buckle for quick search.

4.2 Standard Parts Library for Buttons

4.2.1 Modular Design

Modular design refers to the division of the product into a series of functional modules, according to the needs of the customer to select the module components for combination, modification and generation of New products. Subdividing the modular components as much as possible is the basis for being able to provide the most flexible configuration. Buttons in different forms, this study is based on the international product design form beauty rules, product architecture in the open modular modeling approach for the Theoretical basis, the whole to zero, follow the "less change for more change, in order to combine for innovation" development strategy, the button is divided into button body, buttonhole! There are four modules of buckle body, buckle foot and decoration. The independent design of buckle body can be decomposed into three core steps of basic modeling, convex modeling and edge modeling.See Fig.6. Users in the modular accessories in accordance with their own needs for free choice, adjustment, design, and then can carry out their own combination of various levels of This is to achieve the purpose of user participation in design, user experience design and user-centered design.

4.2.2 Self-design of Buckle Body

The basic shape is the first step in the implementation of button morphing and is used to build the first embryo of a button shape. There are single shape and composite shape of the button form. Among

them, the single modeling focus on the size and size of the button, with a circle, triangle, quadrilateral, hexagonal, unequal, equal, and so on. Edge shape is most common. Composite modeling that is more than a single modeling in the position of the relationship between the basis of change, modeling plus, minus, melting, from the operation, the formation of modeling Composite. Composite modeling to some extent suitable for the evolution of the creation of button modeling, reflecting the differences in the form of buttons and form of beauty, can be applied to customization Button Styling.

Under the premise of determining the basic shape, the concave and convex shape will enrich the three-dimensional texture of the button, shaping the undulating shape of the button. Single concave and convex: the common convex shape have a spherical, hemispherical, floating plastic shape, etc.; common concave shape have a bowl, pockets, dimple shape, etc. . Single embossed is more reflective of the visual effect of the volume and quality of the button. Composite embossed embossment is embossed progressive, composite, nested, etc.. Composite embossed shape reflects the visual effect of the level of craftsmanship and detail of the button.

To meet the definition of morphological shape and concave and convex shape, the button edge is categorized into rounded edge and cut edge. The rounded edge as the edge of the shape, expressing the rounded texture of the shape, reflecting the human function of the button shape. Take the edge of the cut corner as the edge of the shape, to express the hard texture of the shape, and reflect the simplicity of the button shape structure.

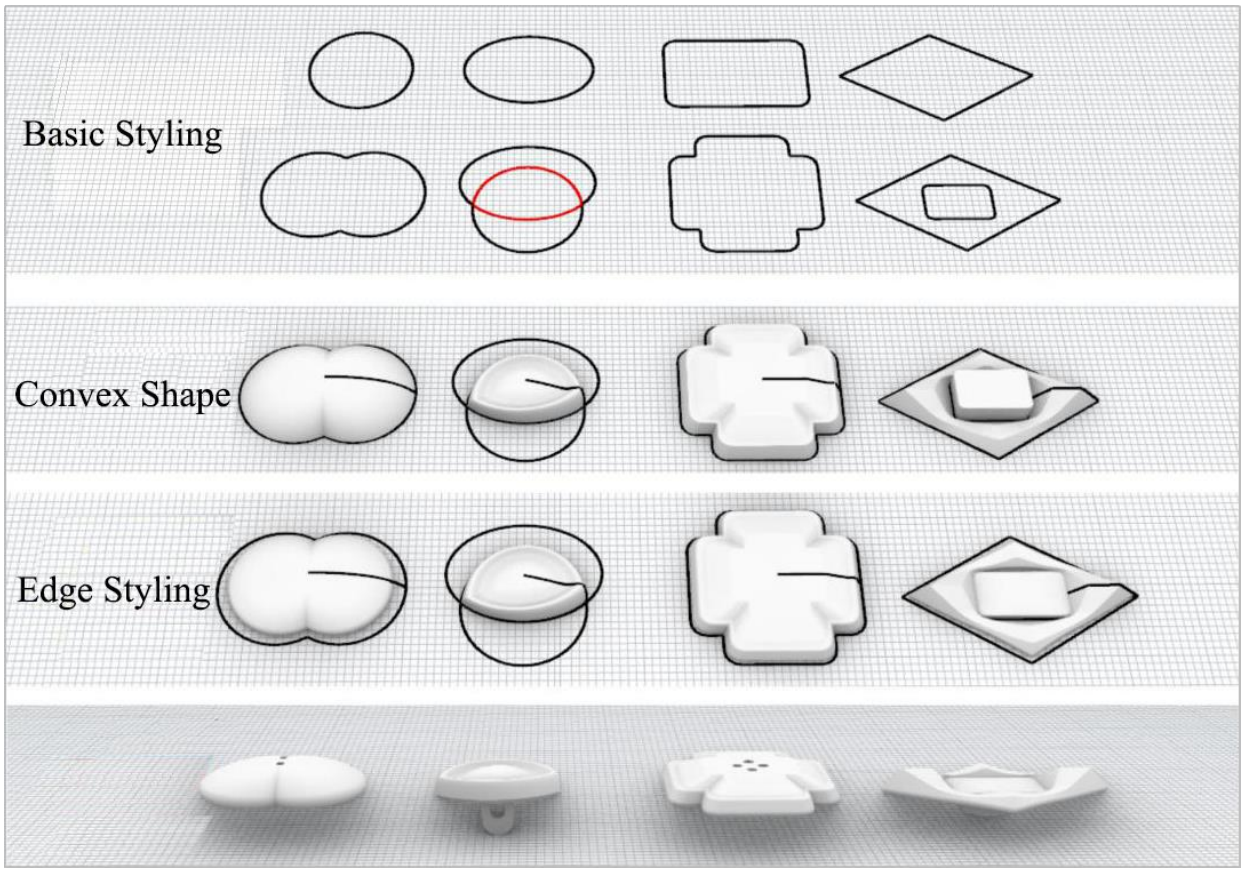

Fig. 6 Schematic representation of the clasp design process

4.3 Button Material Library

After years of development and practice of 3D design software, 3ds max, Maya, keyshot and other software will be material In the form of data packets for unification, derived from the visual simulation of multiple types of materials and data packets. In keyshot software, for example, there are nearly 4000 material packets, not including personal definition and multiple types of composite

pattern materials. It provides a huge data resource for the construction of button material library. The button material is the visual representation of the final shape of the button, in order to meet the complex surface effects and texture rendering requirements of different button models, to Visual realism is the core requirement for visual expression. Based on the international IMDS classification and the analysis of the applicable materials of buttons, the button design cloud platform, based on the existing data package. Combined with the production process of button products to make a reasonable choice.The button material library will be divided into four categories according to the material classification, respectively, chemical (unsaturated polyester resin, ABS plastic, nylon, urea, melamine, epoxy resin), metal (copper, iron, stainless steel, zinc alloy, aluminum, etc.), natural (organic biological shell, wood, stone, etc.) and textile materials, forming a targeted material library.The key parameters of material characteristics are shown in Table 1. .Due to the manufacturing process and other requirements, there is a range of values for the materials used for buttons. By presetting the four basic performance parameters of surface color, diffuse reflection, glossy color, refraction, transparency, and texture, the customer is able to set the value of the button to the basic performance parameter. The choice of product material for the qualitative process is subject to certain reasonable restrictions.

Table 1 Typical material characteristics

Material types / Material parameters		Diffuse reflection effect	Reflection effect	Refractive effect	Texture effect	Effect of processing
Chemical Buttons	Plastics	Based on PANTONE international standard for opaque and transparent color selection for plastics.	35%~50%	GPPS:1.52 PC:1.58 ABS:1.56	Material Mixing, material overlay, Material gradient	Electroplating, sandblasting
	Polymers			PMMA 1.50 PS 1.54~1.59		
Metal Buttons	Copper and alloys	Based on PANTONE international standard for metal color selection.	40%~55%	\	Material Mixing, material overlay, Corrosion and Oxidation	Welding, casting, cutting, clamping
	Iron and steel		35%-50%			
	Aluminum and aluminum alloys		35%~65%			
Natural Type Buttons	Bone and shell products	Natural color based texture mapping effect	35%~50%	No refractive effect except for special light-transmitting materials	Natural Texture	Cutting, grinding, gluing
	lumber		<30%			
	stone		<30%			

5. Cloud Platform Interaction Design and Practice

5.1 Interaction Design

The platform further plans each content part of the core function module and organizes the visual hierarchy and information layout of each module. The platform arranges the information acquisition functions such as customization process and button model library on the home page; integrates the parts library and material library into the self-service system design interface.The home page interface is divided into four sections: customization process, button model library, button parts library and self-service design, which are divided for users with different needs of the platform. Different features and content areas.See Fig.7-8. Button design flow: to show the user the button self-service design step-by-step instructions; button model library: to provide the user with the classification of features by the Retrieve found examples of button models. Button Parts Library: provides users with freely selectable and combinable button parts models.

Button styling self-service design interface is divided into two modules, the upper side of the interface for the button 3D real-time effect preview box, the lower side of the interface for the Four styling toolboxes: button body, buttonhole, button foot and material. The buckle panel contains the operation menu of basic shape, cross-section shape and edge chamfering. The menu provides the functions of base shape selection, shape size adjustment, cross-sectional shape key node adjustment, chamfer type selection and adjustment.

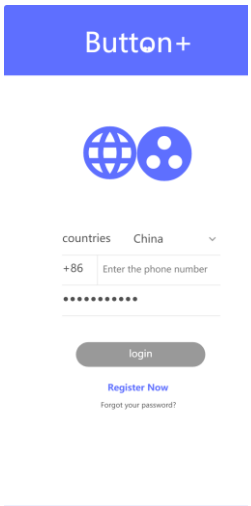

Fig. 7 Landing page

Fig. 8 Home

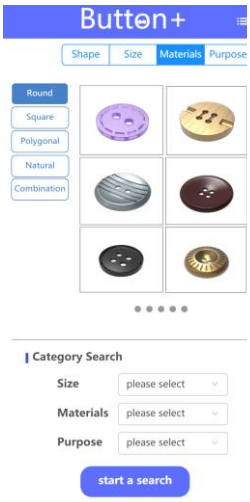

Fig. 9 Button Model Library

Fig. 10 Model display page

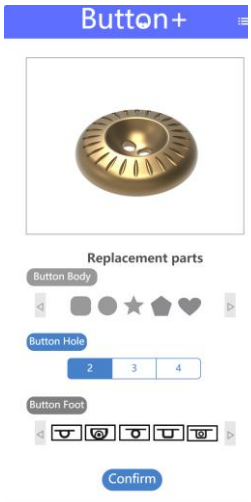

Fig. 11 Parts Library

5.2 Cloud Platform Practices

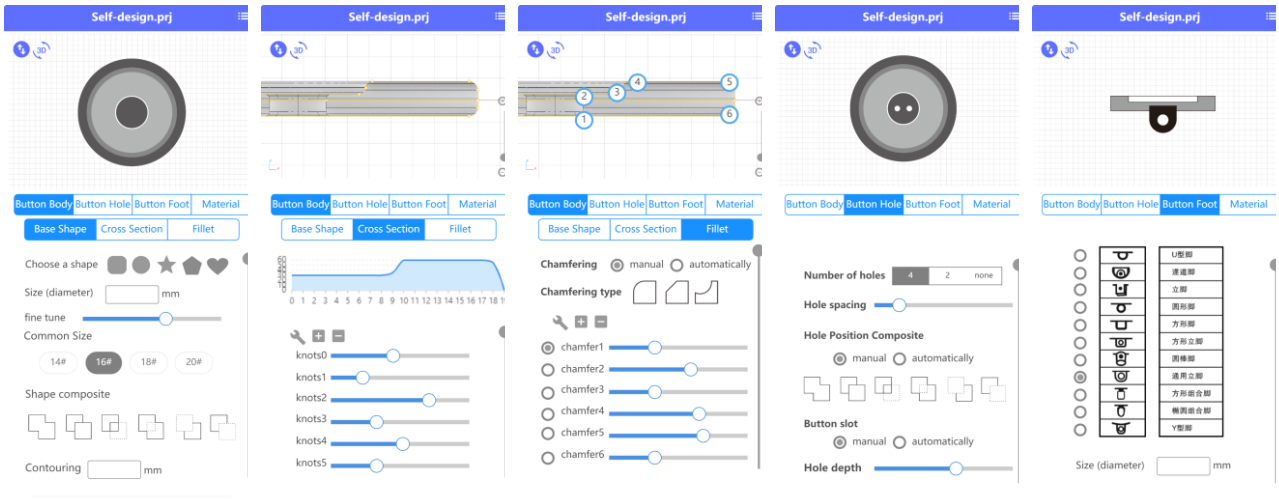

Figure 12 Self-designed interface - buckle body

Figure 13 Self-designed interface - buttonhole

Fig. 14 Self-designed interface -button feet

Customers who require options enter the platform interface and enter the model display area through the model library. See Fig.9. The customer can continue to set the parameter options for precise search,

or click on an expected button to browse the product 3D interactively. The system displays the button 3D model, size and other specific information. See Fig.10. If the customer is satisfied with the current shape of the button, you can directly submit an order, if not satisfied, enter the personalization stage. Some of the innovative customers from the home page into the button parts library, free to choose, combination of button body, buttonhole and button foot and other parts. See Fig.11. If users need to add their own design ideas to this button, they can modify its size and fine-tune the cross-section through the button face panel. The key nodes of curves, modify the chamfering type and size to adjust, or re-match the foot and material, and then finish the independent design. Place an order for proofing.

Customers who are driven by innovation and have unique needs can directly enter the self design interface through the self design button on the home page. First of all, you can select the basic shape from the basic shape library, and perform Boolean operation according to the needs of the shape to complete the initial embryo of the button shape. Build; then modify the size, cross-sectional shape and other buttons under the corresponding data to complete the size, bump shape and other operations. After completing the design, the user selects the material panel and enters the material matching interface. See Fig.12-14. Through the material, texture selection to complete the button material design, select the corresponding material ball as needed, adjust the four basic parameters, and then press the corresponding data under the button to complete the size, bump styling operations. Give the product the right material performance. See Fig.15.

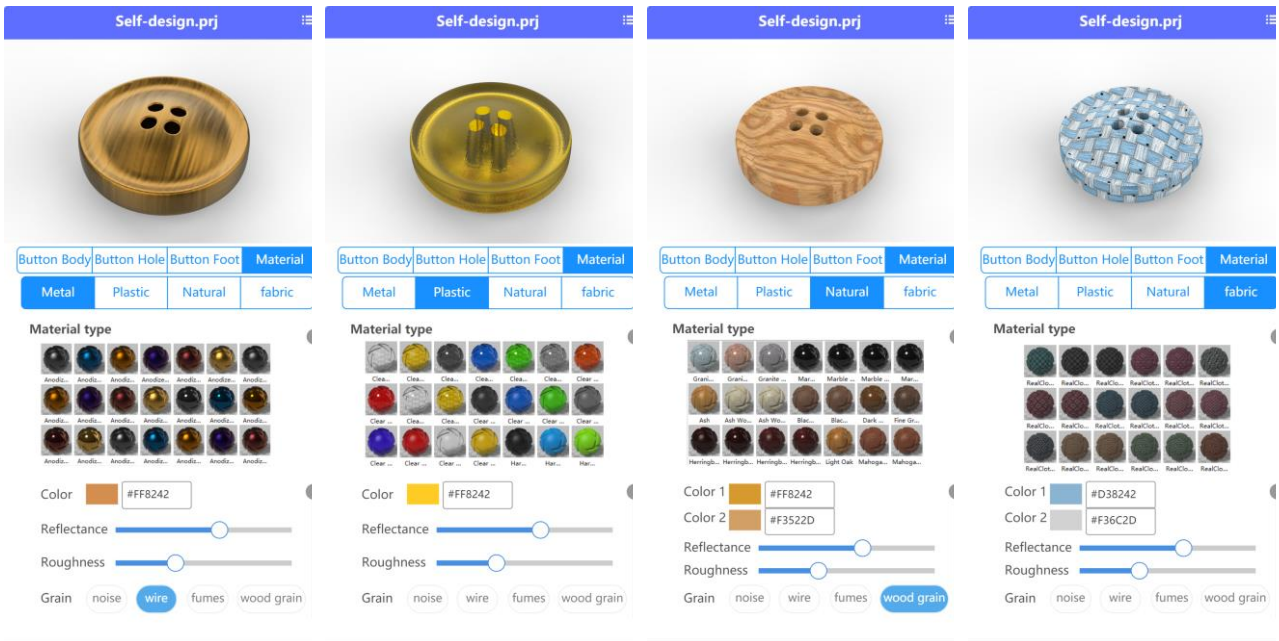

Figure 15 Self-designed Interface - Materials

6. Conclusion

The platform is designed for easy communication between button design manufacturers and the demand side. The use of the platform can effectively avoid repeated time-consuming logistical processes in the traditional button design transaction process, reducing the length of time from design to product delivery. Speeds up button design and manufacturing. Demand can be based on the button base part model, texture, material combinations, adjust parameters, real-time modeling and rendering. The promotion and application of the platform, will become an accelerator of the traditional button industry development, greatly improve the level of personalization of the enterprise, and promote the development of the button industry. The traditional manufacturing industry from batch manufacturing

to batch customization transformation. At this stage, there is no similar application platform in the button design industry at home and abroad, this project can be used as a mobile intelligent industrial design in the button industry. Sample projects and extension to similar design areas.

Acknowledgements

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