

A Study of Interface Design Method on Crossing Media-Dimension

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Abstract. With the emergence of new types of design media, design products are becoming more diverse. However, the user's habits of designing are difficult to accompany with the design media to convert. This study analyzes the behavior of users to offer an optimized design method for designers using new design media. Therefore, in this paper, furniture catalog is adopted as a study case, for an analysis of used habit of 2D paper-typed catalog. Then, an experiment is setup with a virtual catalog which is designed by 3D interactive software and induced with original used habit. Subjects participate in this experiment and make use of the certain catalog. Finally, two kinds of evaluations, usability evaluation and Heuristic Evaluation, approach to the analysis of new media design. In conclusion, the designer could have a better design method during crossing media-dimension.

Keywords: Human-Computer Interaction, Interface Design, Usability Research.

1 Introduction

With the development of digital technology, it is resulting in the diversity of media forms. This provides designers with more design choices and also to become more diverse variety of design. Moreover, the interaction between user and design also induces to different possibilities. The interactive technology has been used in movies, programs, public art and other designs. Therefore, there have been several research literatures about new type of interactive design [1], [2], [3]. However, most researches only focus on the usability of single design media. The new media and original media are usually analyzed separately. As a result, the relationship between design media and works usability is rarely discussed.

This neglect allows users to produce a lot of cognitive load during the process of carrying out the task operation. For example, the first steps for people undertaking the visual identification is based on the shape and contours of the object. And then, if you want to find the actual location of objects, it mostly needs the perception of depth of visual. That is to say, if the graphic images failed to perform clear and accurate perspective of three-dimensional space, it would lead people to determine a wrong image location or size of objects. Even though spending more effort on the photography and layout, it is still hard to present a complete picture of object [4], [5].

In order to improve such flaws, designers begin to design products through interactive technology. Nevertheless, they do not take original used habits into account in the design process, so that the new design work made by new design media is like as a whole new product but just similar to one made by original design media. In other words, there is no close connection about used habit between new and original design work.

Therefore, the purpose of this study is to find out a method that could smoothly continue the original used habits into new design work no matter which is made by new or old design media. In addition, this study takes the furniture catalog as a study case, which features user task and visual dimension. And moreover, the following research question is that: what are the habits of users when they are in the use of flat paper catalog? How do designers continue the original used habits into new design media product? And what will be the design evaluation based on the original used habits?

2 Methodology and Steps

In order to solve the previous research problems, there are two steps in this research. First, this study analyzes the usability behavior with the original media. Second, these analyzed data were taken to transfer to the new media design. Then, the evaluation of usability on new media design was also been analyzed by user and expert.

2.1 The Analysis of User Behavior on the 2D Design Media

In this step, this study takes 2D catalog to be the research object represented the original design media. There are thirty users of 2D catalog who have been invited to join this experiment. In order to get more plentiful data, this study also interviews five stakeholders who work in the furniture store with the supply of 2D catalogs.

Issue Survey and Analysis. To get the specific tasks that user could encounter in the use of 2D catalog, this study executes issue survey before the user task analysis. In this stage, this study invites thirty users and five stakeholders to describe and demonstrate the usage of 2D catalog. After collecting the interview data, this study constructs an affinity diagram to find out the main targets of users. Then the user's goals could be found by generalizing these targets. The user's goals and targets when they are using 2D catalog is shown in the Table 1.

In the Table 1, the user's goal of category A is that user tries to understand the characteristics of products. In the target A1, user tries to understand the scale, form, color, material, designer and the design notion of products. And in the target A2, user also tries to understand the price, weight, capacity and place of origin. The user's goal of category B is that user wants to learn how to know the relationship between products and themselves. It includes that how to choose a product suitable for faculty of body in target B1, for example, choosing a pillow suitable for the height of neck. The target B2 describes that user wants to learn how to choose a product suitable for faculty of life, for example, choosing a multiple function office furniture to improve the working efficiency. The target B3 is that user wants to learn how to use and

fabricate the product; it is about the method of fabrication, clean, reposition and maintenance. The user's goal of category C is that user tries to get the information about collocation. The information in target C1 is about collocating product with other products, such as collocation between a desk and a lamp. And the target C2 is the information about collocation between product and space, such as the indoor planning, design style, light design, scenario simulation, etc.

Table 1. The user's goals and targets

User's Goals	User's Targets
A. To understand and compare the information of products	A1. To understand and compare the form of products A2. To understand and compare the function of products
B. To learn the knowledge of choosing and using products	B1. To learn how to choose a product suitable for faculty of body B2. To learn how to choose a product suitable for faculty of life B3. To learn how to use and fabricate the product
C. To get the information about collocation	C1. To get the information about collocation between products C2. To get the information about collocation between product and space

Besides user's goals mentioned above, we could find out during interview that users expect to get other information in the use of 2D catalog. This includes spirit of enterprises, life attitude, the way of paying, after-sale service, information and activity of store, etc. In conclusion, this study keeps these requests of users to make sure that the new media design satisfies users.

User-task Experiment with 2D catalog. This stage is to execute the user-task experiment with 2D catalog. Each of thirty subjects, the same as ones in issue survey, has forty-five minutes to execute the user's task in the experiment environment. This experiment supplies subjects with a 2D catalog, a spatial layout and a scenario essay which is compiled with the user's targets from issue survey. The scenario essay is as Table 2.

Table 2. The scenario in the user-task experiment

You Got an Opportunity to Reconfigure a room FOR FREE!!
You could pick up something from catalog such as a lamp you like, a pillow suitable for your neck or a desk improve working efficiency and even a cabinet to collocate the lamp. All these furniture would be free as long as you help us to describe the form and function of the lamp, how you choose the pillow and desk, as well as the way you collocate the cabinet and how to fabricate it. Now start to choose your furniture for your room!!

After executing user's tasks, the subjects proceed with an interview based on their situation in the experiment so that this study could acquire more complete information about subjects in the use of 2D catalog. Moreover, this study would set up one camera to record the facial expressions of subjects and the other to record the interaction between their hands and 2D catalog. In addition, a directional microphone is also set up to record the verbal data when subjects use the think-aloud method to execute the task during experiment.

Construction of User's Behavior Model. To analysis the interaction data, Contextual Inquiry methodology is chosen to build the cognitive and multi-personal interaction models [6], [7]. Five kinds of models are built based on this methodology: Flow Models show the relationship between roles. Cultural Models show the influence of culture in the interactive behaviors. Sequence Models show the targets and steps that users execute in the interactive activities. Artifact Models show the artifacts that users use in activities, such as tools, objects, products, etc. Physical Models present the environment of the interaction.

Since this study is to identify the used habit in the process of user tasks, these used habits would be regarded as kinds of design factor and be adopted in the process of designing 3D catalog. Moreover, the users are the same no matter in new catalog or original catalog. So models of 3D catalog, those are flow, cultural, artifact, and physical, would be also the same as those of 2D catalog. According to these principles, this study takes the behavior data obtained from user-task experiment with 2D catalog to construct the sequence model which could describe the user's goals and steps. The sequence model of 2D catalog is shown as Figure 1.

At the course of the experiment, we would observe that much of information that user cares about is not presented in the 2D catalog. For example, although there are explanations of words and figures about the size of products, subject still feels not complete. This is because that subject looks at multiple products in the same page, and these different sizes of products are shown in the same scale of figure so that it would make subject misunderstood the correctness of real size of product. If the figures of products are overlapped with each other, it would reduce the opportunity to present the appearance of products.

In addition, for those of subjects who have few concepts about spatial scale, it is hard to understand the correct scale through the text. The subjects also worry about the part not shown in the figure might be different with their expectation, the backside of product for example. Even the color and texture of products might be discrepant as a result of photo-shooting skill and printing. Subjects also indicate that to put price tags beside the products could always attract their attention for they could immediately determine to buy or not according to their financial capacity. Furthermore, a price tag beside the product represents that this product is now on sale even though multiple products are presented in the same figure.

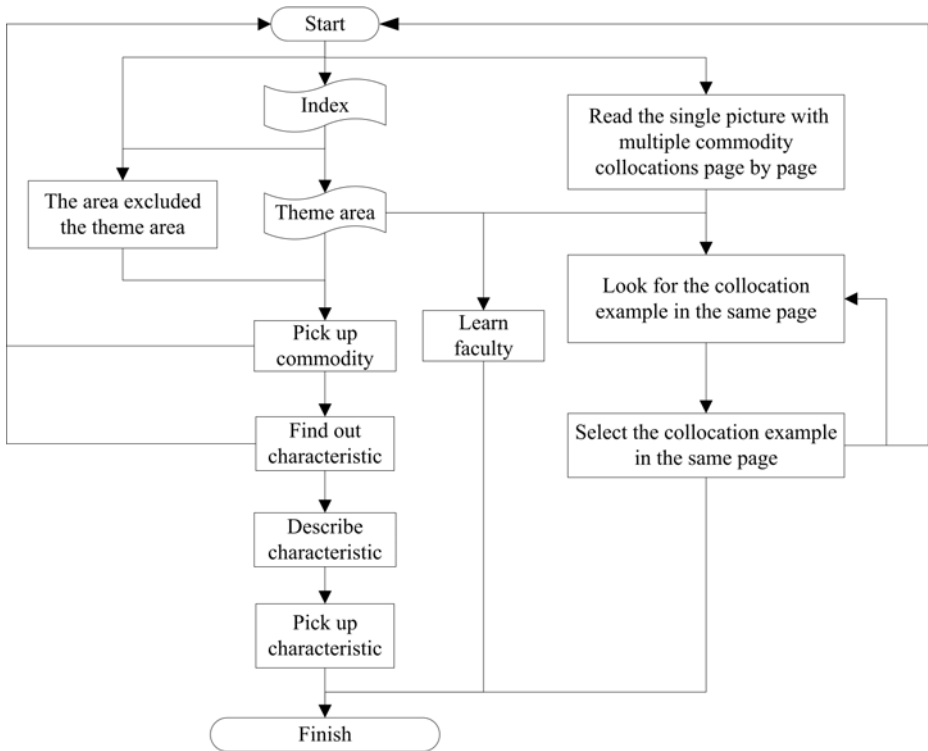


Fig. 1. The sequence model of 2D catalog

2.2 Design and Evaluation of 3D Design Media

In the beginning, this study undertakes to design 3D catalog with the behavior model and date of 2D catalog. Then we invite 30 subjects the same as ones in 2D catalog to execute the user testing of 3D catalog. In addition, there are 6 experts in interaction interface design invited to execute the heuristic evaluation on 3D catalog. Finally the opinions from users and experts are integrated. [8]

Design Method of New Type Media. This study uses AutoDesk 3ds Max and Quest3D as 3D interaction design tool. The content of 3D catalog is a 3D interactive virtual scene, where users could look around the 3D product model. The scene also provides voice commentaries for users to understand the information of product. Meanwhile, the operation way is to control the rocker forward and back. The left bottom is designed to open and close the menu, and the right bottom is to switch the initial rotation setting of XY-axis plane to YZ or XZ-axis, for viewing in 360 degrees.

According to the result of user-task analysis of 2D catalog, this study proposes three main points of the new media design. First point is to provide a product in first person viewpoint to exhibit three-dimensional space of 3D catalog. This metaphor of

design is based on the 2D catalog and the physical store in real world. There are two index models, spatial and product categories, for users to browse. For example, to browse a lamp with a theme of living room, or present all the lamps at the exhibition center. Before beginning, users have to set their height so that they can tour the space at correct height. Besides these two kinds of index mode, user could also choose a specific product to view in 360 degrees.

Second, this study provides a menu for choosing the functions. The menu include index of product, index of marking, index of space classification, height marking, picture marking, teaching information area, voice explanation switch, 360 degrees viewing and route recording. In particular, the picture marking is designed for marking the important page and the metaphor is set as camera photography due to the first person viewpoint.

In third, this study designs a dynamic trigger method for showing the information. When user closes to the products, the dynamic trigger would present the information of the product. And the information would hide automatically when user leaves from the product. This design concept could reduce the information load efficiently. Moreover, user could also use the 360 degrees viewing function to regulate the environmental light and control the function of product.

Evaluation of 3D Catalog. In this stage, subjects are invited to execute the user testing with 3D catalog. The experiment environment, device and task are the same as the 2D catalog experiment. The reason why we invited the same subjects is to let them know their suggestions have already been considered in the design process of 3D catalog. To compare the difference of operating steps between 2D and 3D catalog, this study uses the data from user testing of 3D catalog to build the sequence model. The sequence model of 3D catalog is shown in the Figure 2.

In order to get more complete evaluation data, this study also invites five experts to use the Heuristic Evaluation methodology to offer some advice for 3D catalog design. The “Ten Usability Heuristics” [9] is chosen in the heuristic evaluation process. To let experts could compare the difference between 2D and 3D catalogs; this study also provides 2D catalog and the sequence models of 2D and 3D catalogs. Finally, the user’s suggestion from user testing is combined with the result of heuristic evaluation. The evaluation results of using 3D catalog are shown as below:

1st Usability Heuristics: Visibility of system status. The dynamic trigger presents information, name and price of product. It would let user easily know which product they could buy. As the menu is unfolded, there would appear a small window in the place where the cursor is moving on. And user could easily know the meaning of function and decide to choose it or not.

2nd Usability Heuristics: Match between system and the real world. The metaphor of 3D catalog that user walks in the store are the same as the real world. Users usually bow their heads to read the menu, but the way that menu unfolds in the 3D catalog seems as someone put a paper in front of their face. Also, before users view in 360 degree, they need to set up the rotate parameter of the screen. However, this request is difficult for the user without an axial concept.

3rd Usability Heuristics: User control and freedom. User could walk around the 3D scene through controlling the rocker, but the system cannot allow the user to sit or lie down in bed. So it is difficult for user to choose a product suitable for the faculty of body.

4th Usability Heuristics: Consistency and standards. Because the design style and words in the 3D catalog follow the standard in the 2D catalog, users who used to use 2D catalog would not feel unfamiliar when they contact with the 3D catalog in the first time.

5th Usability Heuristics: Error prevention. Because users could connect system functions through the menu and record routes so that users could use the menu to search their location when they lose.

6th Usability Heuristics: Recognition rather than recall. 3D catalog provide users with remark function to memorize the important location and scant their cognitive load.

7th Usability Heuristics: Flexibility and efficiency of use. After using route-recording function in the menu for a while, the degree of dependence that user use it to remark and search passed location is raising. This function helps users improve work efficiency with the increase of experience.

8th Usability Heuristics: Aesthetic and minimalist design. There is only one menu on the operating interface, and the option levels of menu are not too many, so that users could choose the functions easily. In the other hand, some design issues have to be considered. For example, as users view the screen in the 360 degree, if it is suddenly jumping to another scene, this design point concerns users about how to come back to the original scene. This is because the continuity does not be included into design consideration. Unfortunately, the same situation also occurs in switching the browse modes. In conclusion, the suggestion is that interface designer must try to handle the transition or perform different functions at the same screen as much as possible.

9th Usability Heuristics: Help users recognize, diagnose, and recover from errors. There are few users losing their way in the virtual environment. Meanwhile, most of them would open the menu to check the location where they are. This design point help users find their way to go.

10th Usability Heuristics: Help and documentation. Information signboards are set up in front of the entry of store and each theme area. These signboards could be read directly and trigger the voice of instruction when users are close to them. However, most of users would ignore the signboard at the entry, and the other users who read the signboard would not spend more time listening whole the instruction. In contrast, most of users pay more attention to the signboards set at the entry of theme areas.

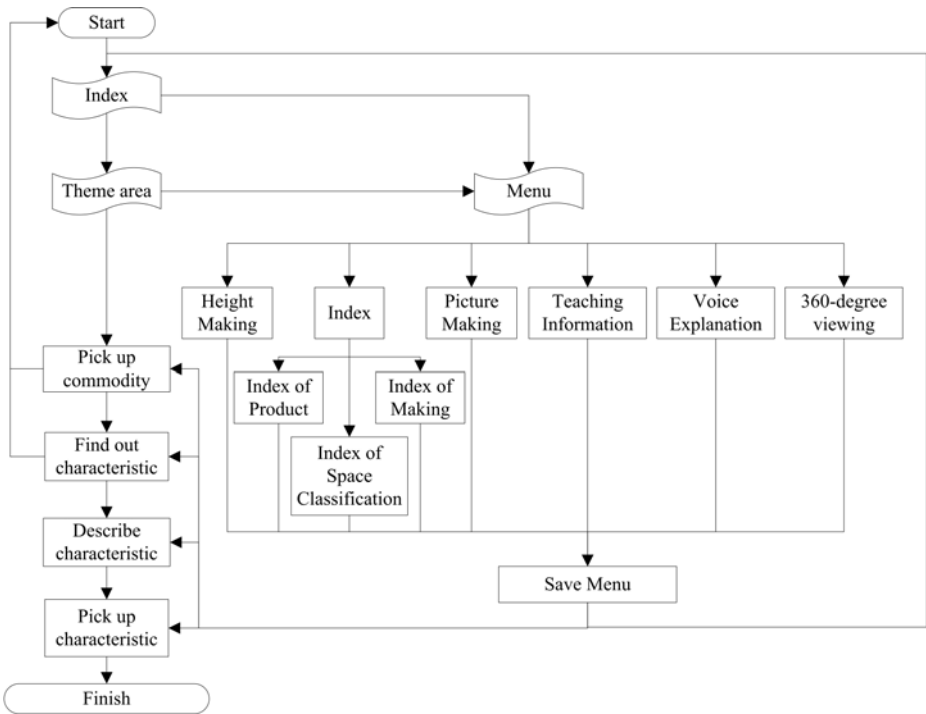


Fig. 2. The sequence model of 3D catalog

3 Conclusions

This study has already presented a 3D interactive catalog as a case designed by new design media. The interactive scene could let user intuitively view, study and collocate products in the metaphor of walking in the store. Through the methodology of this study, designer could cross the limitation on the dimension of design media, and moreover, to transfer used habit from 2D to 3D media design. According to the evaluation result of users and experts, the design of 3D catalog has already been improved and reduced the defect of 2D catalog. Meanwhile, there is no new problem on usability in the 3D catalog. More importantly, this methodology could provide designers in different field to transfer the used habits of users to the new design. However, because of resource constraints, this study only takes the catalog of furniture as the sample. Despite the reason, the methodology of this study could be verified with other design research in different fields.

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