Direction Change of the Interactive Design Application Approach in the Age of Big Data

Kai Liu

Henan University of Engineering, Zhengzhou 451191, China

Abstract

The enormous growth of information in recent years pushes people into the era of big data, which has caused great changes to the traditional design method. The advent of the era of big data not only realizes interdisciplinary and cross-cutting interactive design, but also introduces a great number of big-data-based interactive design products to the market, bringing great convenience to people's daily life. Through the analysis of the concept, principles and methods of interactive design, this paper discussed the typical application of interactive design products in the era of big data and probed into the direction of change of the application approach of interactive design in this era.

Keywords: Era of big data, Interactive design, Application approach, Direction of change.

1. RESEARCH BACKGROUND

1.1 Research overview

In the era of big data, information presents a huge growth trend, and people have deeper access to information and more extensive contact channels. There are also huge changes of the design approach in the era of big data. Compared with the traditional design approach which is relatively single, the modernized design approach can realize the interdisciplinary and cross-cutting interactive design, greatly improving the applicability of interactive design products. For instance, smart phone is a typical interactive product, which can be used not only for calling but also for watching video, playing games, etc., so as to greatly enrich the users' experience and meet the needs of different users. Big data plays a great role in the interactive design, which also brings essential change to the application approach of interactive design products. A large number of scholars conducted in-depth research on interactive design. Some scholars discussed the application of interactive design in industrial design and confirmed that interactive design plays an important role in the field of industrial design (Lv, 2014). Other scholars made the in-depth analysis of interactive design in the age of big data, pointing out that large amounts of information is the core and basis of interactive design and has a very important role in promoting the changes of interaction design (Qin, 2015). Still others conducted researches on the design form and calculation method in the process of interactive design and discussed the changes in both aspects (Liu and Lu, 2010).

1.2 Research purposes

This study aims to analyze the changes brought by the era of big data to interactive design ideas through the discussion of the concept, principles, targets and methods of interactive design, present the changes of people's daily life brought by interactive products through further identifying the application approaches of the products in the era of big data, and explore the future direction of change of interactive products in this era.

2. SUMMARY OF INTERACTIVE DESIGN

2.1 Concept of interactive design

Interactive design refers to a kind of design method aiming to facilitate people's life through the communication between people and systems, products and services. In interactive design, the communication between people and systems, products and services is mainly divided into two levels: spiritual and material. Interactive design...
presents its own value through different functions and forms of systems, products and services, and the value is reflected in people's experience and design as well as the improvement of their living quality.

2.2 Principle of interactive design

The core principle of interactive design is being customer-centered. In interactive design, information technology is the basis of its value realization, and only by really grasping the actual needs of users can the products, systems and services better meet the demands of users (Gu, 2010). In conducting interactive design, designers need to set up a corresponding model, which helps to represent objects in the real world, so that the objects can reflect and express the user's own experience (Zhang and Mr Kong, 2010). Designers in interactive design should grasp the actual needs of users by going deep into the users' group and follow the following principles so as to carry out the user-centered principle all the time: first, the principle of focus, because the number of users' group is huge, which causes huge differences between users; therefore, designers must have a keen insight to find out the nature of the problems so as to fit it tightly to the perspective focus of the users' group. Second, the principle of cooperation, because the task of interactive design is so large that designers can ensure the orderly development of interactive design tasks only through close cooperation. Third, the principle of coherence, because designers can make the interactive design more efficient only by ensuring its consistency. Fourth, the principle of interpretation, because the subjective initiative of designers can be fully aroused only by giving the interactive design certain significance (Liao and Yang, 2011). Figure 1 shows the interactive design framework based on user-centered principle.

![Interactive Design Framework Based on User Centered Principle](image)

**Figure 1.** Interactive Design Framework Based on User Centered Principle

2.3 Objectives and methods of interactive design

Interactive design needs to be completed by teams composed of staff of different professional backgrounds and different fields. Interactive design aims to determine the needs and expectations of target user groups, analyze the characteristics and behaviors of their own needs, master the behaviors of users' group during the interaction of the same products, further clarify the related technologies of interactive design, and evaluate the smoothness degree of the behavior of users in the interaction process. After the establishment of these interactive design goals, the following methods can be used to conduct the interactive design, including iterative method, prototyping method, scene method, etc. (Zhang et al, 2011). Iterative method refers to the decomposition of an
interactive design task, splitting it into several design links and ensuring that the relationships among all the links are iterative relationship. There are three steps of the concrete implementation: first, clarify and grasp the needs of target users' group and the problems in the course of design; second, collect the information of the problems more extensively based on the users' needs; finally, establish multiple conceptual model based on the users' needs and test these models to select the best one for the further design (Hao and Lu, 2014). The prototype method can use the foam plastic model, paper model, and so on, which can be used for the limited representation of users' interaction. Before the interactive design is completed, due to the cognitive friction among the designers of the team, it is difficult for the specific interactive design scheme to be unified, and if the final product is taken as an entry point for the prototype construction, not only a lot of manpower and material resources will be cost, but also the design cycle will be greatly extended; therefore, only by continuous improvement when building a physical prototype can the interactive design work be ensured to proceed smoothly. Scenario method can collect and present information based on structural characteristics, and its specific implementation mainly includes seven steps: scenario inquiry, construction of work model, combination, design of users' environment, model production and test and putting into use. The interactive design methods are illustrated as below. Conduct process modeling taking the example of interactive design of city maps. Interactive design requires generating the virtual city road model according to users’ design idea, extracting the relevant data information of the real world, and formulating rules using statistics, to deduce the corresponding model (Cui and Xu, 2014). When making model generation, use random ergodic algorithm to connect the intersection points and generate the virtual road model; the specific algorithm is as follows: set h=1, find the node $v_i$ randomly in the model, which contains the information of h and whose number of connections is within the maximum limit range; set that the number of connections of this node increases by 1, if there is a node that is able to satisfy the condition, then use ergodic algorithm $p(x) = \exp\left(-\frac{1}{2\sigma^2}(x-\mu)^T\Sigma^{-1}(x-\mu)\right)$, in this formula, P stands for the bivariate Gaussian distribution function, where $\mu = (\mu_1, \mu_2)^T$ represents the average and $\Sigma$ represents the covariance matrix. After the ergodic algorithm, the structure should be parameterized, and the parameterized topological structure can be obtained by using the matrix calculation method, i.e., $\sum_{i=1}^{k} \lambda_i v_i = v_0$, $\sum_{i=1}^{k} \lambda_i = 1$; then the derivation can be derived: $\lambda_i = \frac{\omega_i}{\sum_{i=1}^{k} \omega_i}$ and then $\omega_i = \frac{\tan^{-1}(\frac{v_i}{v_0})}{|v_i-v_0|}$.

3. ANALYSIS OF THE APPLICATION APPROACH OF INTERACTIVE DESIGN IN THE ERA OF BIG DATA

3.1 Smart phone

Smart phone is the most typical interactive design product of the era of big data; the way of interactive design makes smart phone break through the single original function of making calls and sending and receiving short messages, and people can use the interactive way of the smart phone to do daily shopping, browse weibo, play games, and so on. Interactive design, as it were, brings a brand new experience to people. The interface of smart phone is richer in colors and more humanized in interface settings and texts compared with that of traditional cell phones, bringing good visual experience to user (Wang and Liu, 2009). Today, many designers fully combine some modern technology such as photography and modeling, making cell phone more concise and comfortable and its performance improved to a great extent in the pursuit of flat design.

3.2 Digital television

Nowadays, digital TV is most common in people's daily life, and it brings a lot of laughter to people. Since it is becoming increasingly difficult for traditional televisions to adapt to the changes of the times, digital televisions of interactive design began to spring up in the market, greatly satisfying the requirements of the era of big data (Zhu and Zhang, 2009). Digital TV is mainly made up of front system, user side and transmission network, and its core component is the video server, which can realize storage and rewind of the programs broadcasted in digital TV and other functions. In addition, the function of digital television is richer than that of traditional television and the picture is more beautiful; moreover, it can carry on independent sessions, prevent illegal users from visiting, and provide some other functions. Users can also play their favorite TV shows according to their hobbies. It can be said that digital televisions designed based on interactive design philosophy have brought great impact to people’s ideas and lifestyles. The human-computer interaction flow chart in the era of big data is shown in Figure 2.
3.3 Social networking platform

Coming of the era of big data makes the quantity of social networking platform keep increasing, various weibo and official accounts make people's communication more convenient, and many government agencies have also begun to use platforms to handle official business, accumulating more and more network fans. According to related statistics, by the end of 2016, China's weibo users has exceeded 500 million; through the use of online social networking platform, people has greatly widened their access of acquiring information and strengthened information sharing, communication and interaction. These social networking platforms are designed based on the interactive design concept, so as to enrich the network users' experience of social platforms, which makes social platforms more humanized and inclusive.

4. DIRECTION CHANGE OF THE INTERACTIVE DESIGN APPLICATION APPROACH IN THE AGE OF BIG DATA

4.1 Transformation of design elements organization and integration form

In the era of big data, people use big data tools to conduct interactive design of products, so that the interactive products designed can serve people better. However, the modules in these interactive tools are relatively scattered and lack of internal relation on the function presently, which makes it difficult for interactive design products to play a perfect role in certain cases (Niu and Zhou, 2016). Researches indicated that the interactive design products at present have been transforming towards the integrated processing and organic integration of design elements, which also makes a fundamental change to the organization ways and integration mode of elements; as a result, designers are no longer limited to the independent design and simple overlay of product function modules, but focused more on the more efficient organization and integration of each element in the process of interactive design, so as to design and research the products in an organic whole.

4.2 Change of scenario

According to the analysis of people's cognitive principle, when people present interactive behavior in an interactive scenario, a lot of information in the scenario they are in will assist people to extract the information and interact with the current scenario, and then perform cognitive operation according to the information and evolve into behavior operation. Relevant scholars' studies show that people in the process of interaction assist the perception of scenarios and industry operation by continuous extraction of effective information, which is the most effective method of acquiring new knowledge (Li, 2016). Therefore, the construction of interactive scenario is very important for the extraction and practice of effective information in the interaction process. In the era of big data, the construction of scenario is formed by the combination of various information. In addition, the construction theory also emphasizes the importance of the construction of scenario to people's interaction of information. The theory believes that only by good construction of scenario can users be made to be involved in the interaction behaviors autonomously and actively. This also brings great change to the pure and single interaction course, and the interactive design can make the interactive scenario transform. Designers help users to extract the information by constructing a more effective interactive scenario, which needs to coordinate and support multiple services and mechanisms based on users' demands. For example, design a humanized interactive scenario which is easy to operate based on the interactive design concept to ensure the smooth operation of the interactive activities among users or among people and machine and help the sharing of...
information among users, so as to expand the thinking and innovation of users and create good interactive atmosphere.

4.3 Transformation of virtual interactive scenarios

In recent years, the coming of the era of big data makes designers no longer just focus on the design of the tools and procedures in the interactive design but pay more attention to a more complex scenario simulation and construction (Xiao, 2016). It makes interactive design concept shift to the construction of virtual scenario, which is one of the important directions of interaction design in the era of big data; simulation of relevant real-life scenarios through the construction of virtual scenario can provide users with stronger and real visual experience. It also makes the information interaction among users and among users and each participator more efficient and more natural, so as to help the extraction, understanding and learning of information in the scenario. In the past scenarios, virtual interactive scenario can be used to enhance the experience of the user to interactive product through the simulation of scenario, plot, and character. In the present scenarios, the construction of virtual interactive scenario can be used to select the information in the real world, so as to help the designer to manage and organize the whole interaction process of the user. Virtual interactive scenarios can also be constructed to realize the full application of multiple interactive components and multimedia. When designing virtual interactive scenarios, due to the increasing enhancement of technical level in the era of big data, the gradual decrease of technical restriction facilitates designers in the construction of virtual interactive scenario to conduct corresponding integration of each component in the scenario to realize the construction (Tang, 2012). The designers need to make precise positioning, statistics and organization of each relevant element and conduct settlement and screening of the elements using big data tools to build intelligent and humanized interactive scenarios. All in all, in the era of big data, the huge growth of information data and the application of high efficiency make the scenario creation of interactive design concept begin to shift to the virtual interaction scenario.

5. CONCLUSIONS

To sum up, the advent of the era of big data make people pay more attention to the exploration and use of information data. The integration of value information and data into the interactive design can realize interdisciplinary and cross-specialty design of products, so that user-centered interactive design concept can be better accepted and the interactive design products can give the user more intense sensory experience and greatly strengthen the exchange and sharing of information. In the near future, the concept of interactive design will be better transformed to meet the needs of users, so as to further promote the progress and development of the time.

REFERENCES