A Study on the Balance and Optimization Measures in Industry-University Collaborative Innovation of Interaction Design

Jianxin Cheng, Miao Liu(✉), and Junnan Ye

East China University of Science and Technology, Shanghai, China
cjx.master@gmail.com,
{183787975,yejunnan97ll08}@qq.com

Abstract. Based on the "material" homogenization tendency in the background of industrial production, this paper analyzes the current application status of interaction design in domestic product design, and discusses the reasons of five aspects. On the basis of analyzing the current situation of the interaction design, this paper combines the characteristics of the Experience Economy and the Age of Big Data, establishing the important position of market information and customer demand information in interaction design, exploring the feasibility of the corresponding method of process experience, identify experience and emotional experience in the field of interaction design, reducing the influence of human misunderstanding in this area and rising the effectiveness of interaction design. Then through analyzing the real cases, offering the theoretical foundation for the interactive technology, industrial design, new media design and other subjects and provide methodological guidance.

Keywords: Interaction design · Industry-University collaborative innovation · Optimization measures

1 Introduction

Interaction design, also known as interaction design in early stages, combines the advantages of industrial design, HCI, cognitive psychology, computer science, anthropology and sociology. It is a novel design tool in the 21st century that breaks through the classification barrier of traditional strip design. With the increase of communications between domestic and foreign universities and research institutions, Chinese designers become increasingly aware of interaction design and thus pioneer its development especially in some untraditional areas. However, many designs are deviated from the original concept because of their cognition. It has created an unbalanced situation for interaction design in China, and precluded the development of industry upgrading.

2 Interaction Design in China

It's been more than a decade since interaction design came into China. The recent interaction products independently designed by Chinese show that the local manufacturers have realised that availability and usability are needed to be assessed. However, the dominant players who design and implement the interaction are still engineers and product managers, which causes that human factors in interaction are limited to a superficial level, and not considered further as emotive factors. Emotive factors are usually pursued by means of emotional artistic processing rather than engineering technology. Therefore, it's doomed that interaction designer can't be replaced by engineers. On the other hand, most of the interaction designers in China can't fulfill the core part (responsibility of User Experience) of the interaction, because their professional self-cognition and the industrial position lag far behind. There are several reasons.

2.1 The Late Introduction of Interaction in the Product Development in China

Chinese interaction started appearing in the area of software design, and was sorted into the category of user interface, which is yet regarded as the external part beautifying the core function, that is to say, the least significant end of the whole design, so interaction earns little attention. The result is that the developments of user interface and core function are always independent of each other, and are not combined until the last step of the whole process. It extremely restricts the interaction and can cause high risk, as the modification of the core function in the last step may bring great costs, and the mere solution is to give up the user interface. It's obvious that this sort of speculative and gamble-like product development is hardly able to ensure a satisfying user experience.

2.2 The Block of Large State-Owned Enterprises in Interaction Development

Nowadays, in Chinese enterprises, the department of user experience basically exists as a completely new section in the original system, whose decision-making body and R&D facility mainly consist of engineers and technicians. Whereas the department of user experience is only an appendage, which plays an role as an "art designer". The reasons include:

- State-owned enterprises got inadequate knowledge about interaction design;
- Enterprises lack of motivation to change the original product development framework, because of good social and economic situation and less intense rivalry among enterprises;
- The transformation of development means requires businesses to invest a large quantity of costs and to bear high risk, which stops lots of them;
- Companies value marketing, while despise product development.

In this framework, therefore, the product manager is the actual interaction designer. As the typical organiser, product manager can effectively eases the tension among departments in a functional organisation, coordinates various marking functions, and reacts faster to the market changes. Nonetheless, without the support of across functional areas, the product development always turns out to be a lone battle, which is bad for interactive development. Moreover, compared with those of marketing, the costs of product development are much higher and riskier, its payback period is longer, and its result is less predictable. As a result, in terms of no matter risk management or cost-benefit, product manager must attach more importance to the product marking instead of development, which then results in the narrowing of production knowledge system, and invisibly weakening of the real value of user experience in the production flow.

2.3 The Ineffective Usage of User Experience Channels of the Medium and Small Private Enterprises

Plagiarizing others' ideas, ignorance of intellectual property, and the pattern of "short, adaptable and fast" has become a routine for medium and small private enterprises to develop products. Short (short duration): quickly grasping the market heats; adaptable (fair price): occupying the markets with the lowest price; fast (rapid release): shortening the product development period, and sparing time for marketing and promotion. With this pattern, proprietors incorporate interaction into daily marketing, test user demand by tentatively developing products of multi-variety and small-lot, and improve products according to the feedback gained in the distribution channel. This approach to user experience is totally random, though the only advantage is convenience – it's easy to obtain the market information because the medium and small private enterprises got more chance to keep in touch with channels, but the true value of UE has never been discovered.

2.4 The Cognitive Errors in the Process of Interaction Design

According to the microeconomic application status of China's domestic product design, the main constrains of the application and development of interactive technology has a direct relationship with the cognitive errors in the process of interaction design. There are five errors: poisoning errors of design problems, motivation errors of design basis, survey errors of user behavior, analysis errors of competition test, assess errors of user experience.

Firstly, the process of interaction design is highly dependent on the model created for the behavior of target users to understand behavioral response on performance design may be made by the users. Designers can handle the human-machine system environment better by locating the questions rightly. In today's product design projects, the products' problems are often not excavated and located by the designers, but appointed by the superior to the project design practitioners. Secondly, the core of interaction design research is transferred from the visual effects to human needs, the assessment of the design is based on the relation between design and users. As a unique

group, product users are quite different with the development team of designers, engineers and salespeople, any non-user groups have biases and errors on figuring out the ultimate service goal of products. Besides, the selection of user behavior depends on the user cognitive level of human-machine work environment. The designers have to consider the manner in which this cognition be presented and the impact strength on guiding the users. Moreover, the function of specific needs should be generated in the process of product use or interaction, rather than designing driven by the positive reputation of competitors' new products. The last but not the least, there is a misunderstanding in user evaluation that formal testing methods can only be applied to mature interaction design ideas. In fact, the experimental stage product is the most valuable subjects, testing the imperfect ideas can contribute to generating new ideas. Therefore, several key issues of user experience in interaction design need to be clarified in order to break these five errors.

3   Unbalanced Development of UE in Interaction Design

With the rise of the industrial revolution and the mass production, industrial design has a long history that is closely related to interaction design. As the main carrier of interaction design, industrial design has been long debated in academic fields, especially among design research professionals. And the authenticity and reliability of user experience reports/research results are constantly questioned and challenged.

3.1   The Balance of the Aesthetic Form and Experience Nature

First of all, interactive activities occurred in the dimension of time. In evaluation of industrial products, users are not only influenced by the aesthetic appearance of the product, but also influenced by the adhesiveness developed with increased usage time. User experience and product design are intertwined and interconnected. Blurring the product design, which is giving up control of aesthetic form, will lead to both positive and negative consequences: on the one hand, users can not accurately understand the product semantics, wrong understanding may cause a negative impact; on the other hand, uncertainty of using products, may result in interesting experience in the process of using, through several times of attempt, there will be a positive impact over fulfillment.

When it comes to the focus on form design of the product itself (aesthetic) or obtaining using experience (create joyful experience), thinking method of interaction design is mainly about usability, and related to the aesthetic ideas, it is believed that awful availability may cause negative effect on the interaction of aesthetic perception. This idea leads to the following design process. The first concern is availability, and then aesthetic perception. But researchers represented by Dr. Kees Overbeeke from TU/Eindhoven also shows great interest in opposite process, which improves from the perspective of aesthetics, improve the availability. They believe that the allure from the aesthetic feeling of the appearance and interaction is part of the reason why user take interactive actions of product.

As for obtaining high quality experience, we believe it is a very efficient way to rank interactive user experience design. It is mainly based on different subjects of experience, divided into three grades from low to high, which are process experience, recognition experience, emotion experience. Among them, process experience is the lower level of the primary experience, its characteristic is the continuity, process experience itself as a kind of experience emerges from a consciousness, and it is the human being who is experiencing, triggered by external time. Recognition experience is discontinuous in time, this level of experience is recorded as the fragment (including the start, progress, results), people only are participants instead of dominants, therefore it's less controlling from people themselves. Emotion experience is the carrier to convey, summary and reflection of recognition experience. This grade of experience return control to people, because when the experience is completed, it is human who to decide how to share their experiences.

3.2 The Balance Between the Concept of Standard Design and Customized Design

In addition, since the efficiency digital integrated circuit and civilian semiconductor chip technology are becoming more mature and perfect, it can provide smoother and more convenient user experience. This should be attributed to mass production and commercial development. We should also admit that private custom with obvious personalized symbols is gradually on the rise as well as the large scales standardized design. This relies on the advancement of experiencing technology. The combine of technical quality and usability produces excellent-Performanced technological products, which directly causes the transfer from traditional products to user experience.

Interaction experience becomes a medicine to reconcile customized and industrial production. If we sum up the participation process of user experience from the perspective of production and consumption, interaction can be divided into three types. (1) Consumers purchase the components and DIY, the experience link here is at the end of consumption, consumers achieve economic and using purpose, their sense of achievement is also fulfilled, the enterprise is only responsible for producing and selling the components. (2) Consumers produce the semi products to end products in the place provided, the experience link here is in the process of consumption. In this form, consumer is buying a experience rather than a product. (3) Consumers put forward the style, function, and requirements of the design according to their own demands, the enterprise is only responsible for manufacturing the required parts and end product according to the requirements. The experience link here moves to the front of production. In this process, consumer participates in designing. It is called as consumer production, which is perhaps the direction of enterprises' future development (Figs. 1 and 2).

The experience value of Interaction design is to let the user participate in experience maximumly and resulting in sense of value. Now most of the interaction are still stay in only amusing oneself, in this case the sense of value is more of emotional value, in some ways it belongs to feeling in material aspect. However, to increase the added value of the interactive experience, the best way is to let the user to participate in the

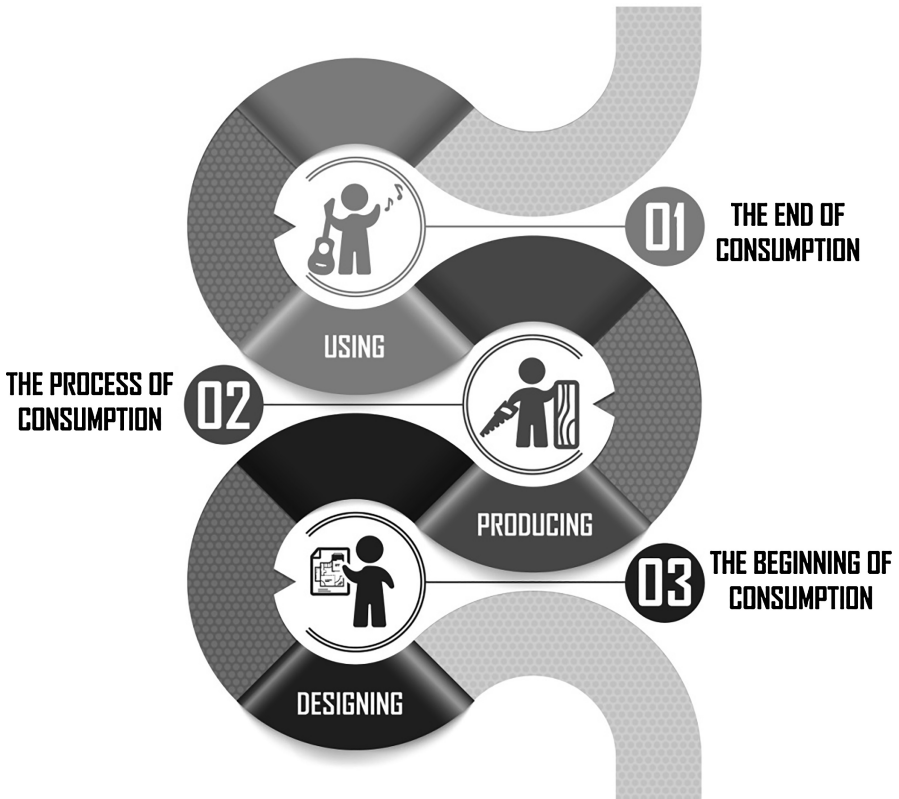**Fig. 1.** Grades of interactive UE design

Fig. 2. Types of UE from the perspective of production and consumption

design and production processes, as in this process embodying the value which user really cares, including aesthetic value of design, science value of function, practical value of life, and self-value. Through the self realization of all these values, users will gain the needs of being respected and social value.

3.3   The Balance of Short-Term Interaction and Long-Term Interaction

In recent years, the concept of "Product" has changed completely. The traditional product more refers to physical properties, such as the length, width, height of products, surface material, the overall weight. The interactive experience of this kind of product is often short lived, even may occurring in a physical store's checkout counter, the information feedback is the user's subjective judgment. But now the products may only appear on the LCD screen and virtual network, such as a financial product of bank or network games, mobile phone games, of course, there is also a part of the products both have software and hardware. Those products' interactive experience are relatively longer, users generally requires a certain cycle to give their feed back, and the final evaluation will refers to group data, such as numbers of online game players' posts, APP download charts etc.

During the design and development period of such product with longer interactive cycle, it should be focus on design of the whole experience scenarios of users, including the predict of user's behaviour, the story board of time using, the consideration about usability and availability. Yet some enterprises will lead the consumer to act according to the expected behavior consciously from the perspective of interactive experience during the sale process. The most typical example is mobile phone industry, in which producers tends to show the colorful interactive interface, menu system, communication functions to the customers, but rarely presents its appearance or the materials. No matter how long of the feedback cycle, great experience can't only depend on the experience itself, but also need the designer to focus on creating scene structure where the experience occurred.

On the basis of agreement on the goal of user experience and interaction design, and to facilitate the best practice, the industry-university collaborative innovation need to be developed comprehensively.

4   The Optimization Countermeasures of Industry-University Collaborative Innovation(IUCI)

As a system engineering of innovation and cooperation, IUCI is the cooperation of production, learning, research, and practical application. It is the connection within technical innovation, innovative environment and the users. It deepens the understanding and practice of the education combined with production and research. With the development of information technology and the evolution of innovative forms, innovative trends characterized with user innovation and open innovation are attracting more and more attention, The role that government plays in building the open innovation platform and policy guidance is highlighted as well as the dominant position

of the user in innovation process. The role of the user in the system engineering is emphasized, the education combined with production and research must be business-oriented, user-centric, and market-oriented.

4.1 Sufficient Condition to Achieve IUCI

Due to the limitations of Chinese enterprises, Industry-University Collaborative mode is most successful. With this combination approach of universities, the enterprises introduces external design institutions to assist their interactive product UE tasks. Industry-university collaboration (IUC) is often seen as a strategic alliance of two or more parties, including industrial sponsors and university research team. Different parties involved in innovative research can mutually benefit, and win what they need.

In the aspect of interest demands, the output of the strategic alliance is the technology conversion. The enterprises' most obvious benefit is to get new ideas (innovation and user experience evaluation system). They position the external institution and enrich their knowledge. So the design can play a real role in their product process. (UE department will be upgraded to the same level of engineering department and marketing department, to avoid the product manager inevitably putting more attention in marketing rather than design) Also they can pay lower the cost to obtain the potential benefits, such as graduates. In the long term, the launch of innovative products will enhance the competitiveness of the entire enterprise.

For universities in the technology conversion process can improve their social reputation as well as their influence in related research areas. From the perspective of collaborative process, the universities mainly contributes their personnel, facilities and equipment to the entire combination, while they might benefit from indirect cost savings and use license of intellectual assets.

University researchers involved in IUC activities have the opportunity to access the projects, purchase the equipment, obtain personal reputation. The participated students can also gain practical education and work experience. Overall, the faculty and students will be improved in a certain degree, and gain organizational prestige.

4.2 Necessary Condition to Achieve IUCI

Research and innovation activities will be considered as the primary task of IUCI. The research team is composed of the university faculties and some enterprise employees. They cross the border of single subject and department, and provide services for the company in the period of time with their funding. The team is very necessary while breaking through the enterprise structure bottlenecks and supplementing the existing university research activities.

Meanwhile establishing IUCI mechanisms must have the following four basic conditions:

- Be able to obtain long-term sustainable funding from enterprises or government.
- In a certain period have a fixed work place and the corresponding facilities and research equipment.

- The IUCI chairman shall be senior officer of the universities or companies.
- Research project can offer help for the higher education training program.

4.3   UE in IUCI

The traditional IUC refers to industries, universities and other research institutions cooperate with each other, exert their respective advantages, integrate research, development and production, create a strong advanced systems, and reflect the comprehensive advantages in operation. With the development of information technology, the evolution of innovation and the arrival of knowledge society, the dominant position and leading role of the user is further highlighted in the innovation process. Upgraded collaborative innovation, characterized by user innovation and open innovation, redefines the user value and the market power. The user and consumer is starting and end of the technology innovation. Thus user experience is also called the soul of IUCI.

User directly participates in IUC, not only to reduce the blindness of technology innovation, shorten new product development cycle, but also effectively reduce the risks and costs of technology innovation. The IUCI history in China shows, in order to make IUCI achievements into actual productivity more effectively, we must strengthen the adhesion of each IUCI component by user innovation and self participation, and achieve the perfect merge of science and technology, education and economy.

4.4   iPod: A Typical Case of PaaS

Apple brought out iPod in 2008, which gave birth to the PaaS mode. After that, many companies followed but no one has surpassed Apple. It is more than a business model innovation—the UE design plays a particularly important role in Paas mode. Compared with the physical product, the PaaS product has its own peculiarities.

The PaaS product's consumption and offering are produced at the same time—it is consumer being directly involved in the production process services, and working closely with the service provider. The fine UE has become a concrete result of production.

Different users have different characteristics, even the same user in different states also has differences. The most effective way to provide a "considerate" product is designing based on user research and user experience.

Physical product becomes free or directly taken the form of rent, precisely because there's no transfer of ownership in the PaaS mode, and it is the service creates real commercial profits for companies.

5   Summary

Based on the previous analysis, it is not difficult to notice that whether in the user experience design department of large enterprises in China, or the shortcut of product innovation in small and medium-sized enterprises, user experience design in China is

not well be transplanted. User experience design is more like support work of verifying product availability rather than creative functions in state-owned enterprises, while in small and medium-sized enterprises, user experience is combined with marketing and sales, which weakens the focus on product design. This is closely linked to the long-term concept of emphasizing on production and technology rather than service and design. To face with the status, a professional organization or agency with flexibility and mobility that can assists different types of enterprises on completing user experience design task is highly needed in China. Universities with integral design theoretical system and sustainable investment of practitioners will be the best choice. Universities can bring human-machine dialogue and interaction without considering the system limitations of enterprises or barriers between departments. The intervention of universities can help the market to break down barriers between users and producers, make industry-university collaborative innovation a bridge between users and enterprises.

Meanwhile, in the era of product is service, the best way to optimize the user experience of enterprise is to provide users with personalized content and interactive services. Customers' loyalty for products and service comes from good experience. The key to compete for more market share is enhancing the interactive experience and optimizing the user experience design. We have reasons to believe that interaction design in China will be more and more exciting if most Chinese enterprises are truly concerned about optimizing the user experience, synchronized with, even beyond and guide the user needs.

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