

Definition, Dimensions, and Research Methods of User Experience

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Abstract

UX (User Experience) is a complex concept. In order to clearly explain its connotation, this study will review the theoretical and practical content of UX from the definition, dimensions, elements, and aspects of UX. Furthermore, this paper reviews the research methods adopted by scholars since the concept of UX was proposed. Although this article has some omissions and does not sort out all the scholars' views, it has included the main views in this field of research.

Keywords: Aspects of UX, Dimensions of UX, Research Methods of UX

UX Dimension

ISO 9241-210 defined UX (ISO, 2010) (user experience) as "A person's perceptions and responses that result from the use or anticipated use of a product, system or service". This definition is similar to most researchers' views on the subjectivity of UX, but requires more explanation in the use of terms and lists the objects that may affect UX. (Effie L-c Law & Hassenzahl, 2009). In 2010, the definition of UX (ISO, 2010) in ISO 9241-210 was reconfirmed and released. Hassenzahl defined the UX (Hassenzahl, 2008) as: A momentary, primarily evaluative feeling (good-bad) while interacting with a product or service. Hassenzahl believes that UX should focus on how people feel and evaluate the process of interacting with a product or service. His advocacy of UX as a positive experience that motivates people to interact with a product or service is a new perspective. UX is a relatively new field of research, and current research is not yet comprehensive and in-depth (Effie Lai-chong Law et al., 2012), With the advent of the fifth generation of HCI, research in this area has shifted to measuring user experience (Effie Lai-Chong Law, 2011) (Yong, 2013). "UX is dynamic, context-dependent, and subjective" (Effie L-c Law et al., 2009). Researchers have found that UX is a dynamic concept and is not static. Users have different perceptions or experiences before, during and after the use of a product or service and also the emotions are constantly changing (Minge & Thüning, 2017). It is difficult to precisely define and dimension UX, as well as the researcher's personal interests and background, because it is associated with a wide range of fuzzy concepts, including affective, emotional, experiential, hedonic, and aesthetic variables (Taylor et al., 2006). In addition, UX involves multiple research fields and interaction objects, while

users have different focuses on the pursuit of value, utility, emotion, aesthetic orientation, pleasure, experience, and aesthetics, leading to the complexity and fragmentation of its theoretical models (Law et al., 2009). Compared with the research of systematic literature review, the research of survey method is also worthy of discussion. Through the survey of 275 UX-related research fields and practitioners, (Effie L-c Law et al., 2009) it is found that different background variables will not have a significant impact on the agreement of UX statement, but respondents from different countries have quite different definitions of UX, those from Europe are more focused on the emotional and subjective nature of the user during and after the process than those from the United States, and respondents from Finland agree that UX adopts qualitative research methods. UX can be defined as “A person's perceptions and responses that result from the use or anticipated use of a product, system or service” (Law et al., 2009).

Previously we reviewed that UX has been defined by different researchers from different disciplinary fields and different practice designs, but it is still a relatively vague and dynamic concept. The integration of UX into the field of graphic design has yielded fewer results compared to the field of product development. However, some insights can be gained from research related to the integration of UX into the field of designing user interaction interfaces. UX can be understood in this way: it is the combined result of the characteristics (complexity, purposefulness, usability, functionality, etc.) of the system or product that users use in a given environment, and the internal states (tendencies, expectations, needs, motivations, emotions, etc.) of the users before, during, and after the process of receiving the service (Law et al., 2009); it is the collection of all emotions between the user's interaction with a product or service including aesthetic experience, meaningful experience and emotional experience throughout the process (Desmet & Hekkert, 2007); and its experience ranges from the product to a specific spatial environment (airports, museums, etc.). Show as Figure 1.1

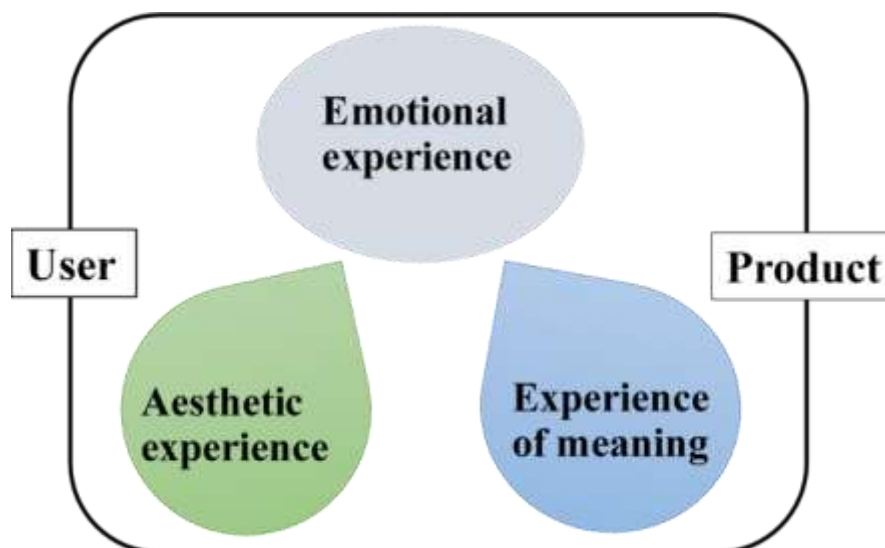


Figure1.1: A framework of user-product interaction

According to the research of (Zarour & Alharbi, 2017a), as the researcher's background and purposes, determine the application of UX in different disciplines. The dimensions of UX main include the following disciplines: VX (Values & Experience), TX (Technologies & Experience), BX (Brand & Experience), PX (Development Process & Experience) and NX (User Needs &

Experience). Zarour & Alharbi (2017) found from the five elements (organization, user, value, design, evaluation) that have an impact on UX that UX is value-oriented and all elements are closely related to it.

Table 1.1
UX main dimensions

UX Dimensions	Value	This means that related studies focus on the value obtained.	Context (This is related to studies focus on the context of use and the interaction between the previous dimensions.)
	TX (Technology Experience)	This refers to technical studies related to the provision of products or services.	
	BX (Brand Experience)	This refers to related studies that focus on the organization's brand image.	
	NX (User Needs Experience)	This refers to studies that focus on the quality of products or services by users.	

It is precisely because the dimension of UX is continuously integrated with different research fields that it presents dynamic characteristics. As the dimension of UX continues to expand, its definition also has the characteristics of advancing with the times. However, no matter how the UX dimension expands, its essence remains the same: providing users with high-quality products or satisfactory services is the ultimate ideal. However, the purpose of this research is to explore how to improve the design of public signs to better provide high-quality products and services for an aging society. This is consistent with the essence of UX, which is designed for users.

UX Aspects

Zarour & Alharbi (2017) uses a defined set of inclusion/exclusion criteria, and selects 114 articles on UX from 2331 articles (including IEEE, ACM, Citeseer, Google Scholar) and uses the SLR (systematic literature review) method to review. Combining the main four dimensions, current UX (Zarour & Alharbi, 2017a) research is mainly used to study the following aspects. Show as Table 2.1

Table 2.1

UX aspects and UX dimensions

UX Aspects	Aspects Category	UX Dimension
Branding	Brand	Brand Experience (BX)
Everyday Operations		
Marketing		
Business Communications		
Context of use	Context	Brand Experience (BX)
Spatio -Temporal		
User Journey		
Cultural		User Needs Experience (NX)
Emotional	Hedonic	User Needs Experience (NX)
Hedonic		
Trustworthiness		
Aesthetics		
Fun		
Privacy		
Sensual		
Usability	Pragmatic	User Needs Experience (NX)
Functionality		
Usefulness		
Platform Technology	Development Technology	Technology Experience (TX)
Infrastructure	Hardware	
Service Response time	Operation	
Visual Attractiveness	UXD	

Compared with the previous research, there are other points of view: there are differences between user experience and other experiences, especially when it comes to brand experience, product experience and service experience. Brand experience is conceptually broader than user experience, but the concept of product experience is relatively narrow, so product user experience should be separated from the user's product-related service experience (Law et al., 2009). The scope of user experience refers to only aspects that include products, systems, services, and objects that interact with users through user interfaces. Taking into account the research field of this subject, the UX aspect is more inclined to this view, but the concept of service is very broad, so we must be careful when discussing service experience. It should exclude face-to-face service between people, and as one cannot "use" human (Law et al., 2009). It means the service of the interactive process generated by people through the interface of the product, system or object. Show as Figure. 2.1

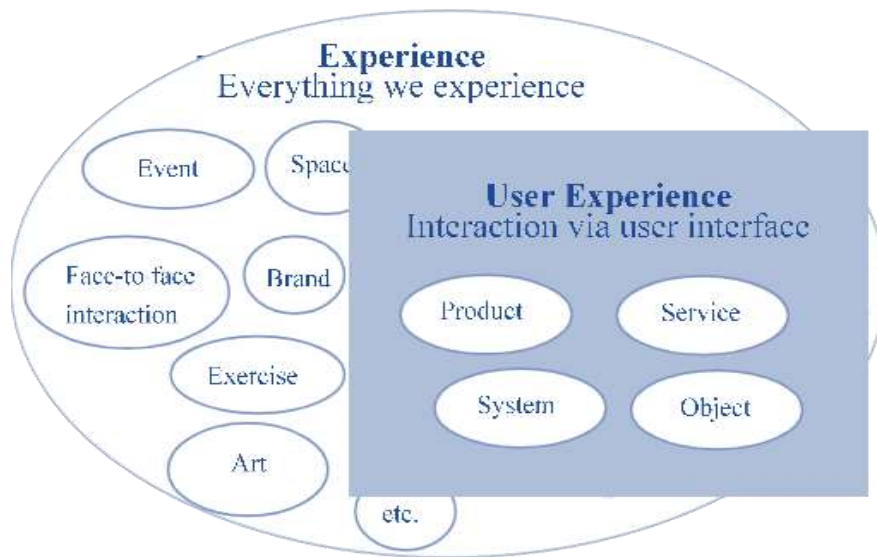


Figure 2.1: UX aspects

The continuous update of equipment technology (graphics, sound, network, miniaturization, etc.) has made functional satisfaction continue to improve, while the continuous growth of the user base has changed the parameters of the user experience of interactive products. The UX perspective takes this shift seriously (Taylor et al., 2006). It focuses on other aspects beyond function, such as emotional, positive, and experiential aspects at the same time. It also put forward new theories on the UX aspect. Show as Figure.2.2

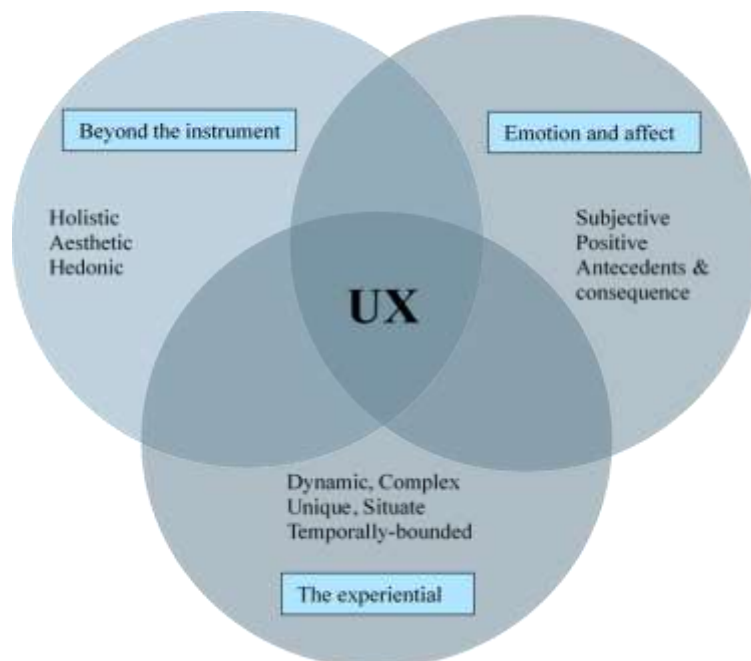


Figure 2.2: Facets of UX

Mahlke and Thüring distinguish between the UX dimension of perceiving product attributes and the emotional response of user experience from two different UX dimensions,

as well as the relationship between the two aspects. This is CUE-Model(Mahlke & Thüring, 2007) (Components of User Experience). Show as Figure.2.3

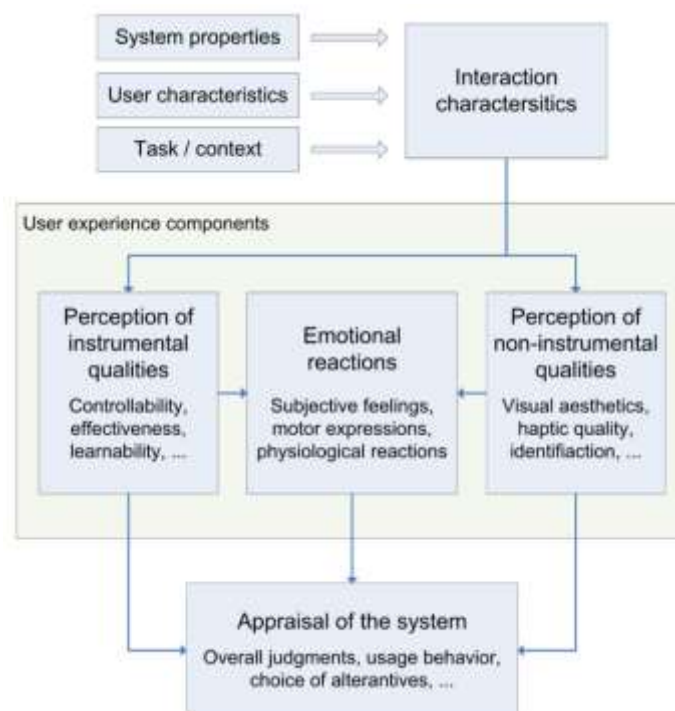


Figure 2.3: Components of User Experience

This model points out that the interaction characteristics with the product will affect the instrumental (i.e., pragmatic) and non-instrumental (i.e., hedonic) qualities, both of which cause emotional reactions. The combined effect of these three aspects will again affect the final overall evaluation and judgment of the product. “Usability as well as aesthetics had the predicted impact on the perception of both types of qualities” (Mahlke & Thüring, 2007).

Considering UX and this research field: elder friendly design of public signs, the research will mainly combine NX (user needs experience) related research scope: Pragmatic aspects (related to functional usefulness), Hedonic aspects (related to emotional pleasure in the experience process) Visual attractiveness (related to the UI elements designs) these three aspects. This is also in line with the late point of view. UX is “focused on the interactions between people and products, and the experience that results” (Forlizzi & Battarbee, 2004), it includes all aspects of experiencing a product (physical, sensual, cognitive, emotional, and aesthetic).

UX Research Approaches and Measurement Methods

UX Research Approaches

The research approaches of UX roughly revolve around its definition and dimensions. Theoretically, and can be divided into three categories: product-centred, user-centred, and interaction-centred(Forlizzi & Battarbee, 2004).

The product-centric model is to provide a direct application for design practice. It usually provides a list for product design in the form of a list of conditions or a list of topics. They describe various experiences and issues that must be considered in the design and evaluation of experiences, services, environments, or systems.

User-centred design (UCD) is the progressive design of products to meet users' expectations around their needs and preferences. UCD explains the different perspectives and positions of designers and users on products. Hassenzahl proposed a theoretical model that explains the purpose and behaviour of people interacting with products from the perspective of designers and users (Hassenzahl, 2003). This theoretical model extends the traditional task-goal realization thinking mode, which includes pleasure, fun, satisfaction and action-oriented modes of behaviour. Show as Figure 3.1

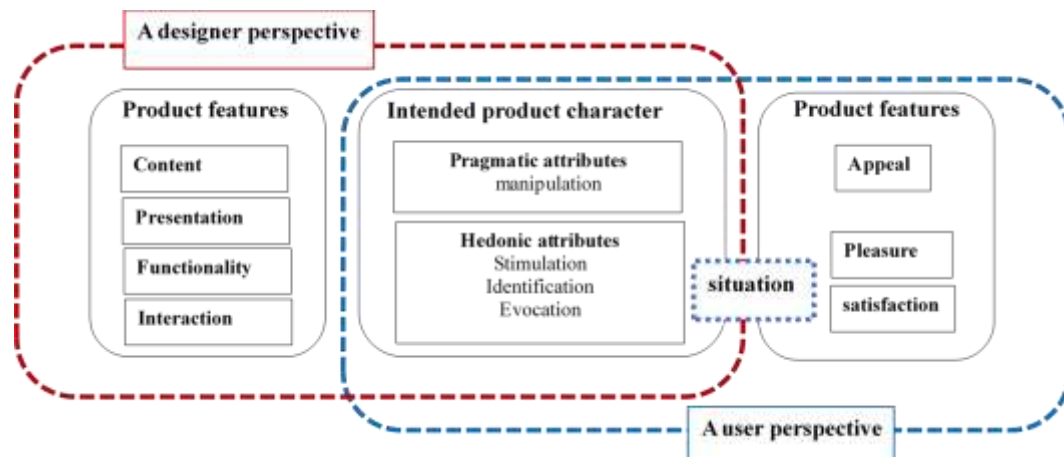


Figure 3.1: The key elements of the model of user experience from a designer perspective and a user perspective

This preliminary model of UX can provide two benefits: First, designers may better understand how people perceive and value objects. Second, it allows manipulation and measurement of key elements (these can provide measurement elements for measurement methods). Both will inform the design and lead to better, more satisfying and more pleasing products. Mäkelä and Fulton-Suri study UX by focusing users' actions and motivations, and point out that changes within particular contexts (Mäkelä & Suri, 2001). However, the experience of "user-centred design" largely depends on user expectations. Expectations are created based on past experience, so if designers can realize this, they cannot successfully design products. In addition, support user-centred design concepts such as Sonic Rim, a company specializing in user research, has developed a defines the categories of "say, do, make" to study user experience and expectations of products. Since different disciplines have their own different approaches to the Interaction-centred model theory. For example, John Dewey, the philosopher, has been instructing designers how to understand the qualitative and definitive aspects of experience (Dewey, 1980). Essentially, experience is the overall feeling of the user with object in a situation.

Researchers and practitioners create interactive relationships between users and products for various research fields on the basis of Dewey's theory. Wright et al. explored experience from the design perspectives of compositional, sensory, emotional and spatio-temporal (Wright et al., 2003). Pine and Gilmore proposed that the transition from the traditional commodity economy to the service economy and then to the experience economy is an important stage of future economic development (Pine & Gilmore, 1998). The value is packaged in the product experience UX process and sold to users. Pine and Gilmore divide the user experience into four types: active participation, passive participation, immersion and

absorption (Pine & Gilmore, 1998). These four types of experience are based on the results of the interaction between the user and the product. Show as Figure 3.2

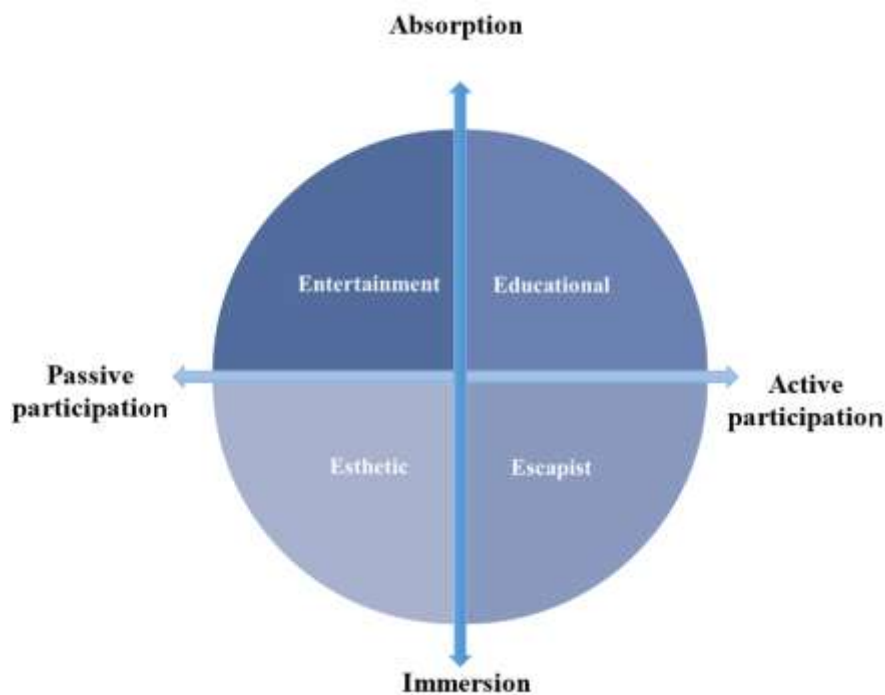


Figure 3.2: The Four Realms of an Experience

Overbeeke and Wensveen created a framework that explores the continuous coupling between user actions and basic functional information from six aspects (time, location, direction, modality, dynamics and expression), inherent information and enhanced information can be used as "bridge" indirect information to help the coupling between basic functional information and actions, Wensveen noticed that the forms in classical aesthetics are highly predictive in the process of interaction(Overbeeke & Wensveen, 2003). Show as Figure 3.3

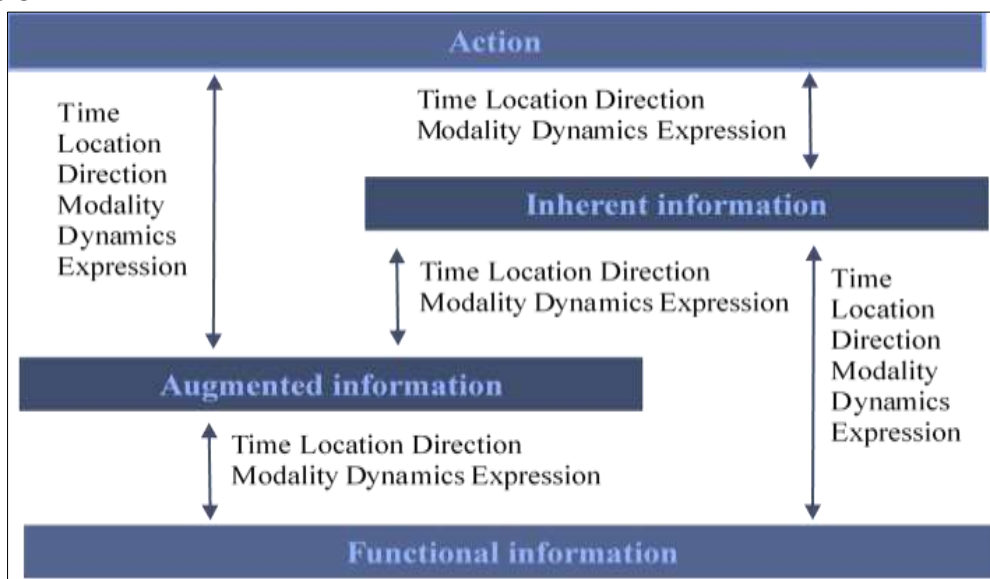


Figure 3.3: The different coupling possibilities between the user's action and functional information.

From the three different focuses of UX research, the advantages of product-centric research are: a good experience is based on the experience of past experience, and the development of new products around the functions and characteristics of the product itself will lead the fashion trend of goods. In other words, unexpected gains that users did not expect. Based on user-centered research UX, products suitable for specific user groups are designed from the user's cognition, emotions, needs, expectations, aesthetics and other aspects. Its characteristics are that the design is targeted and accurate, and can capture this user group, it can also form a fan economy. However, interaction-centric UX research is the whole process of dynamic interaction created by users and products. Not only focus on the fluency of the interaction process, but also pay attention to the emotions and the front and back feedback during the interaction. No matter what kind of perspective it is, it better complements that UX is a multidisciplinary and complex dynamic concept.

UX Measurement Methods

From three different perspectives of focusing on UX, the measurement methods used for UX and the development and design of measurement scales also have corresponding characteristics. Although UX has received widespread attention in two decades, there is still controversy about how to better measure user experience in UX (Gross & Bongartz, 2012). The research disciplines of UX are relatively broad, and the methods used in different research fields and even different research cases are also quite different.

In the selected article samples (Zarour & Alharbi, 2017b), it is found that the UX measurement methods used are different according to the application of UX in different research fields, but the UX measurement methods that are used more frequently include the following types. Show as Table 3.1

Table 3.1

UX general measurements methods

UX General measurement methods	UX Dimension NX (User Needs Experience); BX (Brand Experience); TX (Technology Experience);
Questionnaire	NX; BX
Interview	NX; BX
Expert Review	NX; TX
Persona	NX; BX
Survey	NX; BX
User profile	NX; BX
Observation	NX; BX
Prototype	NX; TX
Specification document	TX
Focus Group	NX; TX
Think-Aloud	NX
Experience report	NX; BX
Users' feedback	NX; BX
Diary	BX

Even though this research describes the three value-centric dimensions of UX, the article describes the three value-centred dimensions of UX, and summarizes the UX application fields related to these three dimensions and the research methods adopted through the SLR method, three related frameworks are constructed on the dimensions, aspects and measurement methods of UX. The article only provides a systematic review of a few representative articles. But the resulting UX framework has its limitations. For example, depending on the author's research field and academic background, the research measurement methods used are also different.

Conclusion

This section focuses on the definition, dimensions, approaches and methods of UX, and summarizes the following points: First of all, UX involves a wide range of research disciplines, which is a complex and dynamic concept. Researchers give different definitions from different fields of UX. But most of what is agreed is around the essence of UX: the relationship between the user and the product. Second, different from the applied disciplines of UX, the dimension of UX is explored from multiple perspectives. For example: from the UX-related brand experience, user demand experience, and technical experience; from the perspective of product interaction, it is also proposed that UX exists in the interaction process of products, systems, services, and objects; in addition, there are researchers focuses on other aspects beyond function, such as emotional, positive, and experiential aspects at the same time, and an integral part of UX is an emotional response that combines usability and aesthetics, and many more. These ideas and theories have contributed to a better understanding of UX. Finally, with regard to the research methods of UX, through a review, it is found that the methods adopted in different disciplines are also inconsistent; the methods adopted are different according to the different research focuses. For example, some research focuses on

product development, some tends to the user experience process, and some focuses on interaction or process feedback, etc. These research methods are qualitative (such as expert interviews, diaries, etc.) and quantitative research (such as: questionnaire survey, scale tools, mathematical modelling, etc.). Combined with the problems that need to be solved in this research topic, the research is more inclined to use UX to investigate the emotional needs, satisfaction, and aesthetic expectations of elderly users; use UX to design graphical expressions that are usable and aesthetically attractive the way. From this subject area and perspective, the UX approach is more inclusive and accurate.

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