CHARACTERIZING THE ROLE OF USER EXPERIENCE IN PRODUCT DESIGN

User-Product Interaction and Beneficial Aspect of User Experience in Product Design

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Abstract: User experience, known as the users’ cognition responses to the look and feel of a product, has been evolved and recognized as one of the prominent aspects in product design and development. Theoretically, the studies of user experience have been expanding, adapting from psychological research to design research. user experience, a concept which places users as a central focus, has been used for creating products that are provide aesthetically pleasing and pleasurable to use as it focuses beyond usability and traditional design strategies. However, since the concept of user experience is still broad and arguably unclear in definition, there are a few numbers of practical researches of user experience that stress the benefit of this emphasizes in different directions, such as creation of product differentiation by user experience, brand building and longevity of a product. This study provides an understanding of user experience concept and its relationship with product design by product specific example and how roles of user experience are generated. In addition, framework and model to explain the stages of user experience in product interaction is proposed. This study identifies three main roles and contributions of user experience in product design: user experience as product differentiator, decoding of complex technology and product longevity. Finally, a framework to explain the mechanism of user experience stages during an interaction with a product is proposed. This research expects to elicit the design researchers to further explore and investigate this topic in order to compels and expand the benefit of user experience in another direction. Particular design research effort is needed for developing tools and methods applicable in design practice that would enable designers to create differentiations of their products based on user experience approach.

Keywords: User experience design, User Experience Role, Product Interaction, Product Experience

1. Introduction

User experience (UX) is considered as an important factor in determining product success today [1-4]. It deals with all aspects of user’s interactions with a product such as the look and feel of the product [5]. The interaction itself covers from how user is perceived both aesthetic and usability. It also includes an ease of use and the needs that the product fulfills [6]. It also involves users’ internal state such as emotion and how users feel by recognizing and interacting with aesthetic and usability attributes of the product, system or service [1].

Many researchers have previously conceptualized user experience in many contexts, such as: design for pleasurable product [2], quality of experience [7], user experience in social context [8] and framework for product experience [9].

As the experiential qualities of a product becoming more important to implement in order to achieve market success, designers and companies become more interested to stress the beneficial aspects of user experience concept. However, since the concept of user experience is still broad and arguably unclear in definition [10], there are a few numbers of practical researches of user experience that stress the benefit of this emphasize into different directions such as product differentiation by experience, brand building, and product longevity. Furthermore, the amount of researches that clarify user experience in different stages of interaction are still insufficient.

Research on interaction, usability and user experience has become an important issue for a long time. However,
design, technology and trends has changed very rapidly and products, services and systems blend into a new phenomenon in our lives. Started from physical products that are transformed into digital products, and products that have both aspects, of which resulting context in product usage drastically changed which is necessary for further research on user experience.

Research on user experience is still extremely broad and lack of practical examples, especially from product design standpoint. To that end, exploratory research on the benefits of user experience in the design field is important, in order to improve the quality and delight of interaction between products and users.

For understanding the potential of user experience in product design domain and how it can be constructed from the interaction, we need to understand the concept of the user experience and the way it works through product-specific examples.

2. Objectives

This paper is focused on exploring the concept of User Experience and explores the roles and beneficial aspects of user experience concept. This exploratory study used a product-specific examples and proposes a framework to explain the mechanism of user experience on different stages of interactions that can evoke the beneficial aspect of user experience. Finally, a new research direction is suggested for future research.

In order to achieve the objectives, a number of multidisciplinary literatures from psychology, marketing, management, and design point of view were analyzed. The literatures are predominantly focused on user experience in design context from 1997-2013.

In the beginning this paper describes the concept of user experience in general by providing multidiscipline literatures and proposes an overview of how user experience concept can be utilized. And then, the paper explores the role of the beneficial aspects of User Experience and to describe how these roles are specifically generated in details. Finally, the framework to clarify User Experience concept on different stages of interaction is discussed and concluded into three parts; study results, shortcomings and future research direction in order to research more further on this emphasis.

3. The Concept of User Experience Design

To explore the role of user experience in product design, an understanding of the concept of user experience is needed.

Traditionally, companies tend to concentrate on usability and see usability as an area where they can gain advantages by creating better and differentiated products over their competitors. As products have become more complex, the issues of usability become more pertinent. Users also become more aware with usability issues and begin to see the high quality of usability as a ‘standard’ on every product. However, since usability has become ubiquitous on every product, companies need to find alternatives to add values on their products.

User experience is a concept that focuses on the quality of interaction between users and products. The interactions will evoke certain feelings and emotional reactions that depend on the quality of both hedonic and utilitarian benefits of the product on a specific context of use. E.g. user experience of a snowboard depends upon the weight and material qualities of the board, the bindings and your boots, the snow conditions, the weather, the terrain, the temperature of air in your hair, your skill level, your current state of mind, the mood and expression of your companions [11]. In another words, user experience depends on the user, product attributes, and context, and those aspects are interconnected during the interaction.

Interaction with the products clearly does not only concern about effectiveness and efficiency (usability) that makes the products feel good during usage, it also needs to consider that interaction with the product that evokes users’ positive and negative emotional responses to the products such as satisfaction, pleasurable to use, joy, frustration, boredom, excitement, etc. [1-5]. These responds can make user engage and respond with loyal attitudes to certain products [12].

As an example, on earlier days, experience in using products such as a film camera depends on the quality of the film itself, the operational of camera, and the quality of the lens. If the experience of a camera is not satisfying enough for the users, they can change the film or lenses because most of the camera has similar affordances. However, since the digitalization era for most electronic products, user experience on the camera has become more complex and is different to its predecessor. Users will focus to not only operational, but also to digital interface of the camera and for most part it is relatively difficult to operate for average users, especially for the first encounter with the product. Hence, if the camera failed to offer good experience that makes the users feel comfortable and pleasant during usage by offering users an appealing visual of the product, simple operational, and good result that are expected by the users, the experience that appears will likely to be negative, such as frustration, anger,
sad, and lead to discontinuation use of the the product.

Figure 1. Utilitarian Benefit of the Camera That Affect User Experience. Top: Canon F-1 Film Camera, Simple Operational and Utilization. Bottom: Canon 5D MkII, Modern Professional DSLR with Plentiful Features And Complex Operational.

User experience focuses on human perceptions and responses that result from the use (or the anticipation of use) of a product, system or service [13]. User experience includes all emotions, beliefs, preferences, perceptions, physical and psychological responses, behaviors and achievements that occur before, during and after the use of a product. Often, user experience is associated with usability concept, due to the similarity on how the concepts are evoked. The difference between user experience and Usability is not exactly the measurements or methods used, but on the emphasis and focus established during the development of a product [14].

User experience points to a more global projective goal, not just attaining effectiveness, efficiency and satisfaction. It aims to enhance the entire experience of the users, from the expectation, through interaction, and finally the reflection about the experience. In other words, one of the most important aspects of user experience design is providing both satisfaction and enjoyment while users interact with the product.

3.1 User Experience in Product Design Context

Forlizzi and Ford developed a framework for understanding the experience interactions [15]. This framework aims to show what kind of experience products evoke. The framework includes four components, called “dimensions of experience”. These dimensions are subconsciousness, cognition, narrative, and storytelling. Knowing the shifts between each of dimensions are useful for designers to think about what kinds of specific experience they are creating. However, this concept is predominantly concentrated on what kind of experience is evoked from the interaction and illustrated the shift between experience components.

Desmet and Hekkert coined the term of product experience that specifically aimed for possible affective responses created from interactions between users and products. They mentioned that the product can be experienced differently, which depends on perceptual properties. Those experiences can be divided into aesthetic experience, experience of meaning, and emotional experience [9].

Aesthetic Experience is an experience that evokes before and during interaction by delighting user by the products’ aesthetic attributes. Aesthetic experience involves one or multiple sensory modalities in order to delight during interaction. Aesthetic aspect of an experience includes not only visual of a product, but also other attributes such as sound and tactual [16]. This aesthetic approaches may transform a product into an object of desire by creating impression s in the first contact [17]. Users will perceive ease of use from the product if the product has an aesthetically beautiful appearance [18]. These aesthetic aspects also have high probability of being used, whether or not the products are actually easier to use. In contrast, more usable but less-aesthetic products may suffer a lack of acceptance that renders issue of arguable usability [18]. Aesthetic aspect might be one of the principles that connect the concept of usability to user experience [19].

Experience of Meaning is an experience when user cognition takes a role during interaction with the product. Users assess the personal or symbolic significance of product by using recognized of metaphors, assigning personality or other expressive characteristics [9]. We suggest that experience of meaning is generated by specific design properties that makes users see a value of the product. E.g. experience of meaning on luxury product has the meaning of “luxury” generated by the use of material, product processing, design of the packaging (appearance), distribution system, and branding that are well-arranged and exceeding the level of standard products to allow for pleasure [20] and by interacting with the product, experience create attachment, which have some profound and sustain the meaning to the users by its product attributes [21].

Emotional Experience is the experience that is typically considered in emotional psychology and in everyday language about emotions, such as calm and happy, which are elicited by the appraised relational meaning of products. It is an interpretation of a product rather that product itself which create a user’s emotional response due to certain condition from the product. This condition may come from aesthetic or...
usability [16]. For example, feeling frustrated from using complex product or disappointed with a small battery capacity of a smartphone. These three kinds of experience that evoked before, during and after interaction with product are indeed interrelated and, actually, interact with each other [9].

User experience is also closely related to users’ expectation with the product. If the users have low initial expectation to the product, e.g. the product has less attractive appearance, but when the user interact with the product and the product has greater function, then the product can easily surprise the users positively [22].

Recently, as the trends, technology has evolved and users’ paradigms of a product and service have also been shifting, companies that provide only what users want and need are no longer sufficient to create distinct products that can compete in the market. Hence, user experience has become the economics’ research target for several years to explore the new kinds of new methods that they can offer to customers [3]. As the results, many companies shift from selling products to selling experience. To achieve that, most companies are studying the characteristics of experience. The study enables companies to develop products that give user pleasure and will create better experience during the interaction with the product or service [22]. E.g. Starbucks coffee that offer experience of having good coffee in good environment and good service that disrupts the café business.

4. Roles of User Experience in Product Design

Based on the understanding description of a user experience concept in the previous chapter, user experience is considered as an important concept for both designer and company in order to develop distinct product to the competitor as part of design strategy. However, user experience with its complexity can be characterized into different kind of role that can benefit companies and designers for specific purposes in designing the product. Diagram in Figure 2 explained that user is the starting point to create experience through two different interactions. Both physical and perceptual interaction with the product can generate roles and benefit to the company such as product differentiation, product longevity and technology decoder. It may helps designers to explain how user and product characteristics can generate some beneficial aspects of user experience created from interaction.

4.1. User Experience as Product Differentiator

Nowadays people are faced with commodities that are indistinguishable. Products, user, technology and pricing are in the same level of each other. The differences that can be recognized are in the brand, the user perception and the feel of a company. These differences are delivered through the user experience in their product and will also differentiate the company [3, 24].

User experience is a distinct economic offering, as distinct from a service and a service from a product. Because service delivers benefits to the customers, user experiences delivers emotional feeling that designed to be memorable, personal and sensorial [3]. In the saturated market when all the products have similar appearance, technology, and pricing, consumer no longer select products for their functional roles, but they look for superior usability characteristics or engaging experiences [25].

As a result, successful products depend on whether the product is able to elicit a distinctive and appropriate experience to the users. The new competitive landscape in the product design domain has shifted from extracting commodities and producing goods, to delivering services and ultimately offers the experience that allow pleasure [3].

In the business point of view, differentiation is considered as main foundation in building the brand [3, 26]. If the brand fails to develop or maintain the differentiation, customers have no basis for choosing it over others. Designers need to create engaging features implemented in the product in order to create differentiation by engaging users with certain experience.

Experiencing a design involves multisensory aspects as it evokes from different kinds of perceptual properties of the product: aesthetic (color, shape, texture), usability (interactivity, efficiency, effectiveness), auditory (audio) and
olfactory (smell), attributed with certain qualities (e.g. comfortable, reliable, adaptable) and they can elicit different feelings (e.g. curiosity, satisfaction, irritation). This perceived experiences are created by one or multiple design attributes of the product [9, 12, 17]. From that statement, we suggest that to create product differentiation by user experience, both aesthetic and usability aspects need to be simultaneously active to elicit the users’ emotional response during interaction. Since aesthetic aspects (shape, color, texture) may create impression when the user encounter the product for the first time [27]. In addition, usability may help to immerse the user during interaction that can help user to engage with the product and lead to loyalty to certain brand [22].

In the design domain, differentiation is necessary to make product not only distinguishable by the users, but in fact can create remarkably different from other similar products, as it resembles company identity. There are types of product differentiation such as differentiation by the technology (the way it uses, complexity of features) and differentiation by the aesthetic (shape, form, size, color, material, auditory and olfactory). Differentiation by experience is more focused on creating great satisfaction and enjoyment from beginning to end of interaction through multiple touch points of design elements embedded in the product.

As an example, the first generation of iPhone was considerably different in all aspects, from the design package, user interface and the ecosystem that were created by other smartphone brands at the time. The design package of the iPhone (color, shape & material) gave the impression of premium and well-built product compared with other smartphones at that time [28]. The impression feeling from the user not only evoked from the combination of shape, color and material itself, but created a new aesthetic form that is far different from its competitor.

During interaction with the product, Apple created a simple, logic and natural interaction through multi-touch technology that gives users immersive and comfortable feeling during interaction. The design elements on iPhone’s user interface such as icon design, layouts and animations that are well arranged can elicit emotional response from the users. Those multiple affective responses from different kinds of elements, and ultimately can make users engaged to the product and gave a loyal attitude to the brand and product.

4.2. User Experience as Decoder of Technology

Technology as one of the main user experience components has a strong impact on the quality of user experience. An advanced technology could be hard to understand by its users when the company fails to create appropriate way for user to interact with. A product may fail if it is easy to use and easy to understand but has deficient technology that has limited ability and obsolescent, or the product has tremendous technology but is too difficult to use [6]. Study conducted by Dianne Cyr et al. demonstrated that aesthetic elements of the product do in fact have a significant impact on perceived usefulness, ease of use and enjoyment [16, 29].

Apple Company has clearly not invented the touch screen-based smartphone to navigate the entire interface of the phone. However, Apple was the first to make it with a good user experience for both physical (device) and virtual (software). What made users switch from traditional keypad-based mobile phones to touch screen-based operated smartphones was not due to the technology itself, since the technology was available on devices more than ten years before Apple introduced it for the iPhone product. The problem with previous touchscreen phone before iPhone was users have to interact in a complicated way to do a simple task and gives users unpleasant feeling due to inefficient usability and insufficient user experience. Hence, most of the touchscreen phone failed to engage users before and after interaction. In contrast, Apple managed to create user experience for touch screen technology that the transition is not difficult for the user by providing familiar interaction and delighted by how the phone’s user interface has been design to move, animate and transform like real world objects. Hence, users saw a real value and relevance need of the technology [22, 28].

From then the first iPhone changed the perception of a smartphone being complicated to use. Apple changed the expectations of millions of users by allowing them to solve desired core tasks of the mobile phone operation in an elegant and easy way of user experience.

New technology will continuously appear and mature. However, technology innovation alone does not make successful products. The user experience and design ideas that bridge the technology are what gives users value, and this value is what will make successful product [4, 22, 30].

User experience is one concept that can solve the gap between technology and user by creating seamless aesthetic, usability and usefulness of interaction between product and user [24]. Figure 3 is one of the examples that simplify the complex technology into a more aesthetically appealing, intuitive user interface interaction and desirable. So most users could create great impression and positive user experience compared to the less simple aesthetic attributes
Many companies failed to create innovation and it often happens when a company launches a new technology, that users may have positive expectation from it, but the companies forget to provide any valuable methods to use this new technology, such as providing a good user experience. It also happens that companies are actually designing the way of use, or product affordance for its new technology, but the users see no need for the functionality, or a company may fail to design the functionality with an adequate user experience that makes users realize a need for the technology [22].

In addition, when the level of technology in a product is enough for users and is saturated within competitive products, customers seeks for another reasons to buy the product such as efficiency, reliability, reasonable price and convenience. The experience becomes the differentiator and continues to add value [3, 30].

4.3. User Experience contribute to Product longevity

User experience contributes to product lifetime optimization by product attachment through aesthetic, usability and product interaction. Creating attachment through User experience is one of the design strategies to extend product longevity. It may extent the product lifetime as the user feels attached to product due to the perceptual attributes of the product and meaning that are created by the user itself [31, 32]. Longevity of products entails not only the extension of their physical lifetime, but also the optimization of their psychological lifetime that can be achieved through user experience. [12]. Long-term user experience resembles a personal relationship with the product though multiple interaction. Long-term user experience is hence just as important as the creation of first impression of the product. First impression itself can be described into aesthetic impression and interaction impression. Aesthetic impression that Norman defined as visceral, can lead into product engagement [27]. Interaction that is created from first impression can get users interested or engaged and lead to continuous usage of the product [22]. E.g. electronic devices such as smartphone, notebook or tablet PC work with Operating System (OS) that act simply as a bridge to mediate the users with the device. Although the users physically interact with the device, they mostly spend their interactions with the system itself (operating system of the devices). By changing or updating the operating system of the device, partial or whole interaction of the device will be new to the users.

5. Three Stages of User Experience on Product Interaction

User experience in product interaction is clearly not only about the physical usage of the product. The experience itself can be divided according to its sequential tasks during interaction. Hassenzahl described user experience as a momentary interaction which accumulates over time, depending on how many times the user interacts with the product [33]. The interaction process starts from perceiving, exploring, learning and comparing as it has structure of layer from the beginning to an end stage [33].

User experience is shaped by the characteristics of users (e.g. personality, background, skills, cultural values and motives) and the product itself (e.g. color, shape, texture, smell, sound). All actions that are involved such as physical and perceptual interaction with the product (e.g. perceiving, using, exploring, learning, comparing etc.) will contribute to the user experience [15, 34, 35]. Practically, designing and integrating user experience design on development process is considerably difficult, since companies have their own strategies and standards to develop their products. However, by examining how experience is evoked from the interaction, we can divide the stage of experiences by its characteristics and different elements that involved: Impression, immersion and attachment.

In the impression stage, every product needs to create impression through its physical and emotional properties such as aesthetic elements and how user perceived the aesthetic of the product (color, shape, texture, sound and smell) and
creates meaningful perceptual interaction to the product [17]. It can be a determinant on whether user will accept or reject and perceived the quality of the product [36]. Aesthetic impression that Norman defines as visceral can also create immersive interaction between user and product as user interested to use the product due to attractive attributes of the product [27]. In addition, product that could provide continuous impression through its physical or emotional properties will create positive emotional response and create attachment.

As an example, Leica is known as an exclusive camera brand with strong consistency in design since many years ago. Different from Digital Single Lens Reflex (DSLR) camera which is relatively large in size, and predominantly made from plastic or painted magnesium alloy or aluminum, Leica offers a rangefinder type camera that is made of painted brass material and anodized brass similar with the original Leica M series camera from the past. Leica users will naturally erase the paint and reveals the original material of the camera by using it over times. Despite of receiving negative feedback from its users, this aesthetic changed in Leica camera will appeal to most its users. From those combined paint and material, Leica M series camera has created camera that will continuously appeals and impressed its users.

For example, when a person uses large sized DSLR camera and advanced features, that person is more likely to have a feeling like a professional photographer and more confident while using the product. This immersive feeling of a professional photographer which the person experiences is generated from the camera’s properties and its usability. Since DSLR camera has a profound aesthetic appearance and more complex features than digital pocket camera, the user feels more in control and immersive to operate the camera.

The impression that the colors give may change completely by combining certain colors from its material and paint [37].

In the Immersion stage, product creates predominantly physical interaction by its usability embedded in product’s physical properties (e.g. using, comparing, learning, understanding, etc.). However, usability alone does not guarantee that the product will be a success; it also need to cover enjoyment and immersive experience during interaction [1-5]. Designer can focus on improving the immersive aspect of the product in order to create a greater usage experience of the product. The word “immersion” is borrowed from game and entertainment terminology that can be defined as the level of engaging experience between users and product. The more products could provide pleasurable mechanism during interaction, the higher level of immersion will be.

The attachment stage, however, holds the key to successful overall user experience that can create bonding between user and product by multiples interaction which we called “engagement experience” As a product can achieve engagement level, users can be satisfied and loyal to the product due to the emotional attachment and how user valued the product [12]. That satisfaction that makes the user wanted to continue using the product, at some point to an addictive level. This sensation has been known in the gaming industry, web and mobile app interfaces and recently it is adapted to most industrial product. People become attached to products since product can give pleasure; product can express one’s unique identity; product articulates one’s belonging to a group; and product evokes memories of the past [12]. Attachment with the product can be enhanced by emotional significance, personalization, social desirability, and pleasures and memories with the product over time [38]. This indicates that designers can contribute to stimulate the attachment to the product. Consequently, strong user-product relationships may result in more protective behaviors towards this product and consequently enhance product longevity [39].
As an example, Android smartphone is a smartphone operating system that has a high level of personalization that could give freedom to the user to set a theme in accordance with their respective styles, such as icons, animated movement and transition, ringtones and so on. If the users have more control and options to personalize their products, then the user will be easier to attached easily and will use the product continuously [39].

Figure 6. Proposed Framework to Describes the Three Stage of User Experience on Product Interaction.

The three stages of user experience are summarized in Figure 6. These stages of user experience during interaction involves different user experience’s elements that are embedded on the product properties. If the product can create good impressions to the user by its aesthetic attributes and how the product performs, it could lead user to physically interact with it and creates immersive and meaningful interaction that predominantly generated from its usability attributes. Both impression and immersion interaction that are repeated overtime will lead to the attachment stage which involved the user’s emotional feeling with the product as shown with dotted line no. 1 in Figure 6. After the attachment stage, there are two possible outcomes. Positive outcome is that user will continue to use the product due to the positive experience during use as it shown with dotted line no. 2 in Figure 6. While the negative outcome is the user will stop using the product as it gave the user an unpleasant experience, such as broken product, boredom or obsolescent.

6. Conclusion

Concept of user experience, in fact, involves subjective and objective issues, as it generates from what user feels and what product properties are affecting those responds. User experience concept has evolved and become more important as technology matures and becomes a commonplace, a high level of usability is taken for granted and something more is needed to make people engaged and attached with a product. To an increasing extent, also immature technology needs to fulfill not only utilitarian but also hedonic user needs.

Nevertheless, companies who produce a product for consumer still need a foundation of functionality and usability, however, the pleasure factor to delight users from user experience aspects helps product to rise above the competition.

This research concludes that user experience has three main roles in product design, which can benefit company and lead to market success. The first role is that user experience could be a product differentiator, user experience can create impression, unique perceptual and physical interaction that can give user certain emotional response as it focused on beyond usability. It will make the product distinct to other competitors and also create brand manifestation. The second role is that user experience can be a tool for decoding new and complex technology. Since user experience is more focused on how one product could create a pleasant way to operate the product and make the complex technology accessible, easy and pleasurable to use. User experience has also contributed to product longevity by creating attachment between user and product. Attachment aspect of the product can be associated with the relationship between user and the product itself, the properties of the product or the context of use.

From the explanation of the concept of user experience through multi-discipline literatures, we can understand that the user experience is the emphasis that has significant role in the success of the product.

The proposed model in the Chapter 5 may help designer to demystify how we can design for user experience and how the products we design can achieve specific user experience goals by providing the different stage of user experience during interaction with the product and identify what product’s and design elements are involved on that particular stage.

However, the proposed models to understand and explain such phenomena are based on literatures and need further field study to prove the hypothesis. By exploring the roles of user experience and the framework of user experience stages that was proposed in this paper, it is indicated that it is possible to distinguish elements, both in the types of affective product
experiences and in the processes that underline these experiences. These findings can be of value for designers, because they can be used to facilitate the designers’ structured attempts to ‘design for experience,’ that is, attempts to deliberately influence the experiential impact of new designs.

References


