GENERAL CHARACTERISTICS OF ANTICIPATED USER EXPERIENCE (AUX) WITH INTERACTIVE PRODUCTS

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ABSTRACT

Providing a positive user experience (UX) has become the key for products to win a competition in mature markets. However, the early stages of product development have not been fully supported by current UX evaluation methods. We conducted a qualitative study investigating anticipated user experience (AUX) to address this issue. Twenty pairs of participants were asked to imagine an interactive product and anticipate their interactions and experiences with it. The data was analyzed to identify general characteristics of AUX. We found that while positive AUX was related to an imagined product overall, negative AUX was mainly associated with existing products. Furthermore, the hedonic quality of product received more focus in positive than negative AUX. The results also showed that context, user profile, experiential knowledge, and anticipated emotion could be reflected in AUX. The understanding of AUX will help designers to ensure pleasurable UX from the start of the design process.

Keywords: anticipated user experience, product design, human-centered design.

INTRODUCTION

Design for experience has received great interest over the last decade due to the paradigm shift in human-product interaction. An interactive product is no longer used solely as a tool, but more importantly for the pleasurable experiences it provides. Positive user experience (UX) has therefore become a key differentiator which helps products gain a competitive advantage in mature markets (Pine and Gilmore, 1999; Väänänen-Vainio-Mattila et al., 2008). To ensure that a product will support enjoyable experiences for its users, assessment of UX should be conducted early during the design and development process. However, most UX frameworks and evaluation techniques focus on understanding and assessing user's experience with functional prototypes or existing products (Law et al., 2009; Vermeeren et al., 2010). At the same time, working prototypes are commonly unavailable in the early stages of the design process. This situation delays UX assessment until the late phases of product development which may result in costly design modifications and less desirable products.

In relation to the above issue, there is a lack of research on users' anticipation of their interactions and experiences with a product. Filling this knowledge gap can be crucial for supporting UX assessment in the earliest phases of product design and development. This paper reports on the results of a study which aims to define the general characteristics of anticipated user experience with interactive products.

By anticipated user experience (AUX), we mean the experiences and feelings that the user *expects* to occur when *imagining* using an interactive product or system. We argue that a deeper understanding of AUX is necessary. UX researchers (Karapanos et al., 2009; Norman, 2009; Roto, 2007) have suggested that episodes beyond the actual usage of products, viz. anticipation or remembrance, play a central role in shaping the holistic experiences. They can even be more important than the actual experiences per se. Since AUX does not involve any actual interaction between user and product, it can support the design for experience from the start of designing a product. Specifically, it is envisaged that new knowledge about AUX will lay a foundation for developing UX evaluation methods useful for the early stages of product design and development.

This paper is structured as follows. Firstly, the related research on UX and user anticipation is presented. Next, the study process is delineated. Finally, the findings about general characteristics of AUX are described, including a discussion of their significance and limitations.

RELATED RESEARCH

In this section, we review relevant previous work on UX. We then discuss the concept and importance of user anticipation as well as how it relates to UX in using interactive products.

USER EXPERIENCE

There has been wide agreement that UX deals with more than functionality and usability (Alben, 1996; Hassenzahl and Tractinsky, 2006; Law et al., 2008). The UX viewpoint pushes the limit of a traditional usability framework, which is task-based, goal-oriented, and mainly focused on behavioral performances, to the non-instrumental or hedonic quality of user-product interaction. The focus of UX is on the user and the construction of positive experiences through emotions, sensations, attitudes, meanings, and values as the outcomes of the interaction with a product or system (Law, et al., 2009; Zimmermann, 2008).

According to ISO 9241-210 (2010), UX is defined as *"a person's perceptions and responses that result from the use and/or **anticipated use** of a product, system or service"*. Another definition has its roots in user-centered design, extending it to include all aspects relevant to UX: *"the value derived from interaction(s) [or **anticipated interaction(s)**] with a product or service and the supporting cast in the context of use"* (Sward and Macarthur, 2007, p. 36). The terms *anticipated use* and *anticipated interaction,* as used in the above definitions, indicate that UX should be investigated not only *during* or *after* interaction, but also *before* the user actually interacts with the product. This is principally important as UX is intrinsically dynamic, momentary, context-dependent, and subjective (Hassenzahl and Tractinsky, 2006; Law, et al., 2009) so that it tends to change over time and situation. Roto (2007) argues that from product creation perspective, it is important to consider UX outside the interaction stage to allow the understanding of long-term attitude and emotional attachment towards a product, instead of a fleeting emotion during interaction. Hence, she interprets UX as a series of phases consisting of *expected* UX, UX during interaction, and overall UX. It is the importance of this user's anticipated/expected experience and how it can facilitate designers in designing interactive products that motivates us to conduct this research.

A multitude of UX models have been developed. However, they largely concentrate on UX occurring *during* or *after* user-product interaction (e.g. Thuring and Mahlke, 2007). Perhaps, the most eminent model is the one proposed by Hassenzahl (2003). According to this model, when interacting with a product, the users perceive the product features into the apparent product character. Here, the product is judged along two different attributes: pragmatic and hedonic qualities. The perceived product character then generates consequences, consisting of product's appeal evaluation, emotional outcomes, and behavioral effects. These consequences are influenced by the usage situation.

Hassenzahl (2003, 2008) associates pragmatic quality with the product's ability to support the fulfillment of behavioral objectives/do-goals. It is therefore inextricably linked to a product's functionality and usability. In contrast, hedonic quality refers to the product's ability to facilitate the achievement of psychological well-being/be-goals. The hedonic quality can be further categorized into three attributes: *stimulation* (ability to enable personal growth and development of knowledge and skills), *identification* (ability to promote self-expression to relevant others), and *evocation* (ability to provoke memories) (ibid).

ANTICIPATION IN USER EXPERIENCE

From the anticipatory behavior perspective, Glasersfeld (in Butz et al., 2003, p. v) notes that *"on the conceptual level, to anticipate means to project into what lies ahead a mental representation abstracted from past experience"*. Researchers agree that people can learn to anticipate consequences including emotional outcomes of certain acts by reflecting on past and current experiences (Baumeister et al., 2007; Glasersfeld,

1998). Prior experiences, both positive and negative, accordingly play a key role in anticipating future experiences. In addition, study on affective forecasting has demonstrated that anticipated emotion is often more intense and enduring than actual, felt emotion (Wilson and Gilbert, 2005). Hence, anticipation of future experiences and emotions greatly affects current behavior and subjective well-being (Baumeister, et al., 2007; MacLeod and Conway, 2005; Norman, 2009).

In the design field, the importance of anticipation in user-product interaction has also been acknowledged. Mäkelä and Fulton Suri (2001) have suggested that expectations and previous experiences of the users influence their current experience; and the current experience induces modified expectations and more experiences. In product experience framework, Desmet and Hekkert (2007) include not only instrumental and non-instrumental interactions, but also non-physical interaction which refers to recalling, fantasizing about, or anticipating the use of a product. They point out that potential consequences of interaction can also be anticipated, imagined, or fantasized about, which in turn can engender emotional responses. Moreover, McCarthy and Wright (2004) incorporate anticipation as one element of the six sense-making processes in their framework of experience with technology. Here, anticipation refers to the possibilities, expectations, and ways of making sense that are related to pertinent past experiences. Karapanos et al. (2009) likewise place anticipation as an additional theme in their experience temporality framework. It represents a user's anticipation towards an experience that leads to the creation of expectations before any actual user-product interaction occurs.

Despite the present recognition of the role of user's anticipation in UX, research focusing on AUX is exiguous. Heikkinen et al. (2009) conducted focus group sessions with various types of users to study expectations for UX in haptic interaction with mobile devices. As the prototype of research subject was not available, they used several different scenarios of product usage which acted as stimuli to elicit group discussion and expectations related to users' experience with haptic communication technology. Although their experiment method is comparable to ours to some extent, Heikkinen et al. focused on identifying users' needs and important factors in designing haptic applications, and not on the characteristics of the expected experience itself.

Chattratichart and Jordan (2003) proposed a simplified technique called 'Virtual Immersion' to assist designers to acquire a deep understanding of users' experiences. This was done by pretending to be the user and living the user's experience in the designers' minds. It can be seen that the proposed method required imagination and pretense to understand the users' needs and experiences. Nevertheless, the act of imagining was not performed by the users themselves but purposely by the designers to empathize with the users. The authors' goal was to develop a discount method for setting user requirements in inclusive design.

In summary, UX research has touched on and recognized the subject of anticipated experience and the importance of user's anticipation in creating a holistic experience. However, there are hardly any studies that investigate in depth, the characteristics of AUX, and link them to UX assessment in the early stages of product design.

RESEARCH DESIGN

In this section, we explain the study process including research participant recruitment, product selection, and data collection method. In addition, the procedure of experiment and data analysis is elaborated.

The main research goal was to gain insight into anticipated user experience (AUX) to support the UX assessment in the early phases of product design. The study employed a qualitative approach as it was able to capture the felt experiences and emotions of a user as well as answer the 'how' and 'why' questions pertaining to user-product interactions.

PARTICIPANTS AND PRODUCT

Forty participants representing different categories of gender, age, cultural background, and expertise were recruited using a combination of purposeful (snowball) and volunteer (via mailing lists) sampling techniques. A screening questionnaire was utilized to gather demographic and product familiarity

information of the participants in order to assess their suitability to partake in this study. The participants were required to be at least 18 years old and familiar with the selected interactive product, i.e. digital camera.

A digital camera was deemed appropriate to be used in our experiment because it could represent an everyday, popular, and interactive artifact used by a broad range of users. Moreover, it had a reasonable degree of complexity that satisfied the requirements of this study.

Product familiarity data gathered by the screening questionnaire was transformed into scores based on a predetermined scoring system (Blackler, 2008), by which the suitability of a potential participant was judged. The participants consisted of 18 males and 22 females, with age groups ranging from 18 - 25 to 56+ years old (median and mode: 26 - 35 years old). All participants owned at least one digital camera with an average period of ownership (since they had their first digital camera) of 5.8 years. On average, they purchased approximately two digital cameras in the last five years. Forty percent of the participants used their camera at least once a week, 35% at least once a month, and the rest once every few months.

DATA COLLECTION METHOD

We selected a data collection method which would generate rich data about anticipated experiences from the users: *co-discovery* which included a *sketching* task.

The co-discovery method involves two participants working collaboratively to explore a product or concept, while the researcher observes and gives necessary input (Jordan, 2000). In this study, a pair of participants imagined and discussed their desired digital camera concept, followed by sharing with each other their anticipated experiences in using the imagined product.

The sketching task complemented by the participants' verbal explanation was employed to obtain further information (e.g. pictorial description of usage procedure of the product's features). In particular, it also functioned to make the imagined digital camera more tangible, thus facilitating the participants in anticipating their interactions and experiences with the product. It has been shown that there is a relationship between drawing and experience so that the use of visual technique can access and portray users' experience aspects (Chamorro-Koc et al., 2009). The complete procedure of data collection is detailed in the next section.

PROCEDURE

Our experiment was conducted at the People and Systems Laboratory of Queensland University of Technology, Australia, where data was collected for a period of five months in 2010. The recruited participants were randomly paired and then took part in the experiment session (Figure 1).

Figure 1. A pair of participants exchanging ideas in the co-discovery session

The session started with a brief introduction about the study objective and overview of the required tasks. The tasks were delivered through task cards, where a new card was given following the completion of task(s) specified in the previous card. Firstly, the participants were asked to imagine a digital camera they desired. They were free to conceive the product's models, features, functions, and characteristics. The participants then explored and discussed their views pertaining to the imaginary digital camera. The second task was to pretend and imagine that they used and interacted with the imaginary product, succeeded by exchanges of ideas between them. Immediately afterward, the participants were instructed to individually draw a sketch of their product concept and their perceived interactions or experiences with it. This was followed by explaining the sketches to each other to clarify their meaning. Next, they discussed what they would use the imagined digital camera for.

Finally, in the last stage of the experiment, the participants were prompted to reflect and then to talk to each other about feelings and experiences they would have regarding their anticipated interactions with the imagined digital camera. The experiment sessions lasted between 35 – 60 minutes and each of them was audio and video recorded.

DATA ANALYSIS

All verbal data was transcribed and analyzed using ATLAS.ti, a software package for qualitative analysis (Scientific Software Development GmbH, 2011). Through the analysis process, categories and sub-categories that emerged from the data were iteratively identified. They were translated into a coding scheme by which all textual data was coded. Data analysis involved creating commentary and theory memos while coding the data, which recorded insightful information with respect to the research question. In addition to theory memos, co-occurrence analysis was applied to understand and develop relationships between codes. These relationships were indispensable to engender an understanding about the construction and characteristics of AUX.

In this study, participants' drawings and video recordings were not specifically analyzed, but were used to support textual data analysis.

RESULTS AND DISCUSSION

This paper focuses on reporting the findings about general characteristics of AUX. This section briefly describes the coding scheme and occurrences of the emergent categories. Furthermore, general characteristics of AUX and how they relate to design for experience are delineated. Lastly, significance and limitations of the findings are discussed.

CATEGORIES AND SUBCATEGORIES

Classifying and abstracting the textual data resulted in 4 categories and 14 sub-categories. They served as a basis for developing a coding scheme shown in Table 1. The coding process on 20 sets of data produced a total of 2504 quotations from which the associated codes and their relationships were further analyzed to extract deeper meanings.

Categories	Sub-categories	Codes
Product Characteristic	Desired Product Characteristics	*DPC*
	Dislike(s)	*DL*
	Favorable Existing Characteristics	*FEC*
Experience	Positive Anticipated Experience	*PAX*
	Negative Anticipated Experience	*NAX*
	Positive Prior Experience	*PPX*
	Negative Prior Experience	*NPX*
	Experiential Knowledge	*XK*
Emotion	Positive Anticipated Emotion	*PAE*
	Negative Anticipated Emotion	*NAE*
	Positive Prior Emotion	*PPE*
	Negative Prior Emotion	*NPE*
Context	Intended Use	*IU*
	User Profile	*UP*

Table 1. Coding scheme comprising categories, sub-categories, and codes

Figure 2 presents the occurrence of each category. The most common category was *Product Characteristic* (38.5%), followed by *Experience* and *Context* which were proximate in scores (30.6% and 26.2% respectively). Although the *Emotion* category was expected to have a significant frequency, as emotions are considered closely intertwined with human experience, its occurrence was considerably low (4.8%).

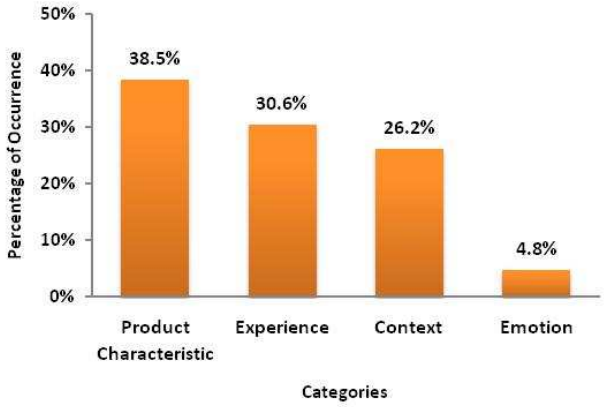

Figure 2. Occurrence of categories

GENERAL CHARACTERISTICS OF ANTICIPATED USER EXPERIENCE (AUX)

Functional prototypes are usually unavailable in the early phases of product development, making it unfeasible to assess UX through physical user-product interactions. To enable UX assessment before actual use of product, the users need to imagine the product concept and anticipate future experiences with it. Therefore, the understanding of AUX

characteristics is essential to support the design for pleasurable UX from the start of the design process.

It is highly advantageous for product manufacturers to offer a new product that meets the users' needs. For this reason, in investigating AUX, we asked the participants to imagine a product containing features they wanted. The *desired* product (*Desired Product Characteristics* in Table 1) was considered a principal stimulus with respect to anticipating experiences with an interactive artifact. However, in the process of imagining a desired product, the participants often brought to mind *existing* products (their own or those available on the market), which could also generate anticipated experiences, in addition to triggering memories of prior experiences with the products. We found that imagining or remembering interactive artifacts and their use engendered two types of anticipated experiences: positive and negative. Positive anticipated experience refers to pleasant situations, feelings, and values that a user expects to experience from using the imagined or remembered product (and the opposite for the negative one).

We discovered some characteristics of positive and negative anticipated experiences. Users' *positive* anticipated experiences were almost exclusively related to the *imagined* or *desired* product. It was somewhat natural that when imagining a future product, the users would conceive an ideal one that satisfied their needs. Hence, anticipating interactions with such a product would most likely elicit positive anticipated experiences and diminish the negative ones. The 'rosy view' proposed by Mitchell et al. (1997) suggests that people tend to anticipate events as more positive and enjoyable than the actual experience when it is happening. In that case, the users had a tendency to overlook disappointment, problems, and other less positive views regarding their future experiences with a dream product.

Conversely, *negative* anticipated experiences were overall associated with *existing* products. When thinking of products readily available, the participants had a propensity to recall and to focus on the products' weaknesses, problems, and other negative aspects leading to undesirable anticipated experiences. This was congruous with Schrammel et al.'s (2008) finding that relating to interaction with today's technology, the users reported much more negative than positive experiences; and the negative experiences were expressed using stronger emotional terms. This fact can be linked to the concept of 'negativity bias' as suggested by Cacioppo and Gardner (as cited in Schrammel, et al., 2008).

Both positive and negative AUX involved *pragmatic* and *hedonic* aspects of product quality. The users perceive the pragmatic quality of a product to be its ability in facilitating the accomplishment of behavioral goals; whereas the hedonic quality is built on perception of a product's capacity in supporting the achievement of non-utilitarian goals and pleasure (Hassenzahl, 2008). In this study, the pragmatic aspects in users' anticipated experiences (both positive and negative AUX) comprised ease of use, learnability, usefulness, portability, simplicity, performance, and durability of the imagined digital camera. In short, the pragmatic anticipated experiences pertained to how to capture high-quality photos without difficulties or hassles.

The three hedonic attributes proposed by Hassenzahl (2003) were reflected in the users' positive anticipated experiences:

- *Stimulation:* developing skills in photography; having fun and playful experiences through camera usage; experiencing incitement to use the camera more often and more artistically.
- *Identification:* getting socialized and connected by sharing photos with others; being proud of using a unique and stylish camera.
- *Evocation:* having nostalgia of good old times in doing photography; bringing back memories of beautiful moments and experiences through pictures.

The hedonic positive AUX also included other psychological wellbeing expected to occur if the users used their desired digital camera, i.e. being confident, empowered, satisfied, comfortable, secure, and stress-free, as well as having a sense of achievement and feelings of freedom. On the other hand, the hedonic aspects in negative AUX involved the feelings of diffidence, dissatisfaction, insecurity, and lack of spontaneity.

The first excerpt below exemplifies *pragmatic* negative AUX due to the product's *portability* issue; and the second one demonstrates *hedonic* positive AUX in relation to the *stimulation* attribute:

"I don't want it too heavy because it's so hard, especially when you are on travelling or tour, you have so many like baggage with you and you're holding this heavy camera and it's so awkward and so bulky." [Participant #5, female, 36 - 45 years]

"I guess I would feel more like taking pictures is less of a chore, and more fun. Like it'd just be more fun to have features that you could just really play with it." [Participant #38, female, 18 - 25 years]

Another interesting result is presented in Figure 3. By classifying the participants' comments, we found that positive AUX encompassed pragmatic experiences whose proportion (60.7%) was moderately higher than that of hedonic ones (39.3%). With regard to negative AUX, however, there was an extreme discrepancy between the ratios (pragmatic: 87.2% vs. hedonic: 12.8%).

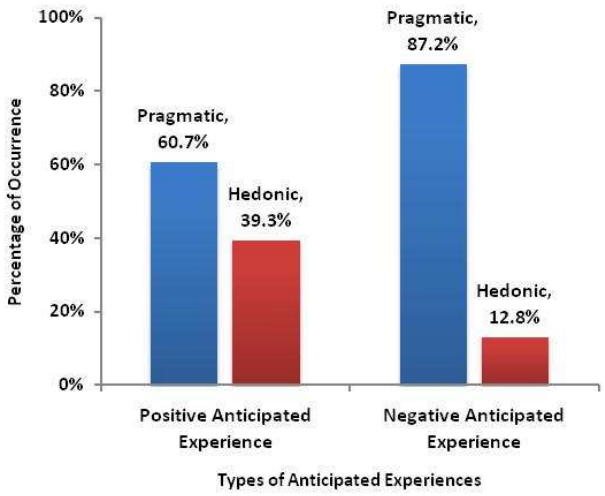

Figure 3. Occurrence of pragmatic and hedonic experiences in positive and negative anticipated experiences

Figure 3 suggests that the users paid less attention to the hedonic quality of product when it came to perceiving future negative experiences. In contrast, when anticipating positive experiences with a desired product, the hedonic aspects of the product received remarkably more focus from the users.

Further, based on the co-occurrence analysis, it was revealed that anticipated experience was influenced by several main factors. First, *Intended Use* (review Table 1) set the context and perceived interaction of product usage within the experience. *Intended Use* refers to purposes, procedures, situations, and environments of product use, as well as how users interact with the product. The following response illustrates the usage purpose and situation (in bold) that contextualize the experience:

"… in terms my experiences, it would be to not interrupt whatever you're doing. So if ***you're out to dinner … and you want to capture a moment, birthday party,*** *people don't have to stop and pose … I can pull it out, I can take it … Just go snap, snap, snap … And it just doesn't interrupt, it doesn't spoil the moment."* [Participant #34, female, 18 - 25 years]

Second, *User Profile* determined the intentions of use of a product and how it would be used, thus influencing the context and content of the anticipated experience. *User Profile* is the participants' perception of their characteristics as a product user based on a self-appraisal of their physical and mental attributes in using the product. For example, a participant who had poor eyesight anticipated a satisfying experience, that when he forgot to bring his glasses, he would still be able to take excellent pictures by using a special feature available in his desired digital camera.

Third, *Experiential Knowledge* helped the users to construct their anticipated experience by knowing in detail about product aspects and by comparing the experience to that in using analogous products. *Experiential Knowledge* refers to the users' understanding about a product and other product-relevant aspects, acquired mostly from learning and prior experiences. It also relates to familiarity with comparable artifacts. To illustrate, by referring to her knowledge and experience in using an iPhone's camera, a participant anticipated affective connectedness with her family by sending pictures directly via her imagined digital camera.

Finally, *Anticipated Emotion* was frequently embedded in the anticipated experience, which augmented its nuance and intensity. *Anticipated Emotion* indicates the emotions that are imagined to occur as a consequence of using a product. A comment below shows a positive anticipated emotion (in bold), embedded in positive AUX:

*"… I think that it gives some opportunities to take better photos about something that we have imagined to take … taking the photo of a tiger or lion that is running. And you can have this, you can experience this dream … eventually **your life will be happier** when you can capture what you like and then you get that and remember the memories."* [Participant #15, male, 26 - 35 years]

The diagram in Figure 4 recapitulates the findings explained in this section.

SIGNIFICANCE OF THE FINDINGS

The findings provide new knowledge about general characteristics of AUX pertaining to the fields of product design and design for experience. Specifically, it contributes to the early phases of the product creation process. Early UX assessment is crucial in product development, as the sooner the assessment can be conducted, the easier and cheaper it is to improve the product being designed. Nevertheless, UX assessment in the beginning of the design process is difficult not only because there are generally no working prototypes to interact with, but also because complex factors such as emotion, expectation, and context must be considered. This work offers new information for designers to understand more about UX through users' anticipation, supporting UX assessment prior to real usage of a functional prototype.

The understanding of positive and negative AUX by designers will allow them to foresee the underlying users' needs, both pragmatic and hedonic. This promotes the design of quality products that can deliver enjoyable experiences for their users. As previously discussed, positive AUX is mostly associated with a desired product. Therefore, by looking into users' positive anticipated experience, we can better predict what product characteristics are able to facilitate the users in achieving their behavioral and be-goals. Equally, examining negative AUX, which is mainly related to existing products, helps us identify undesirable product attributes that prevent the users from having pleasant experiences. Thus, AUX is beneficial for the early stages of product design in providing rich design ideas and an understanding of the users' concerns and expectations of their experiences, leading to ensuring positive UX. However, it should be kept in mind that people tend to anticipate their future experiences to be more fervent than the actual ones (Baumeister, et al., 2007; Wilson and Gilbert, 2005), so that the designers should strive to design for UX that positively exceeds the users' anticipation.

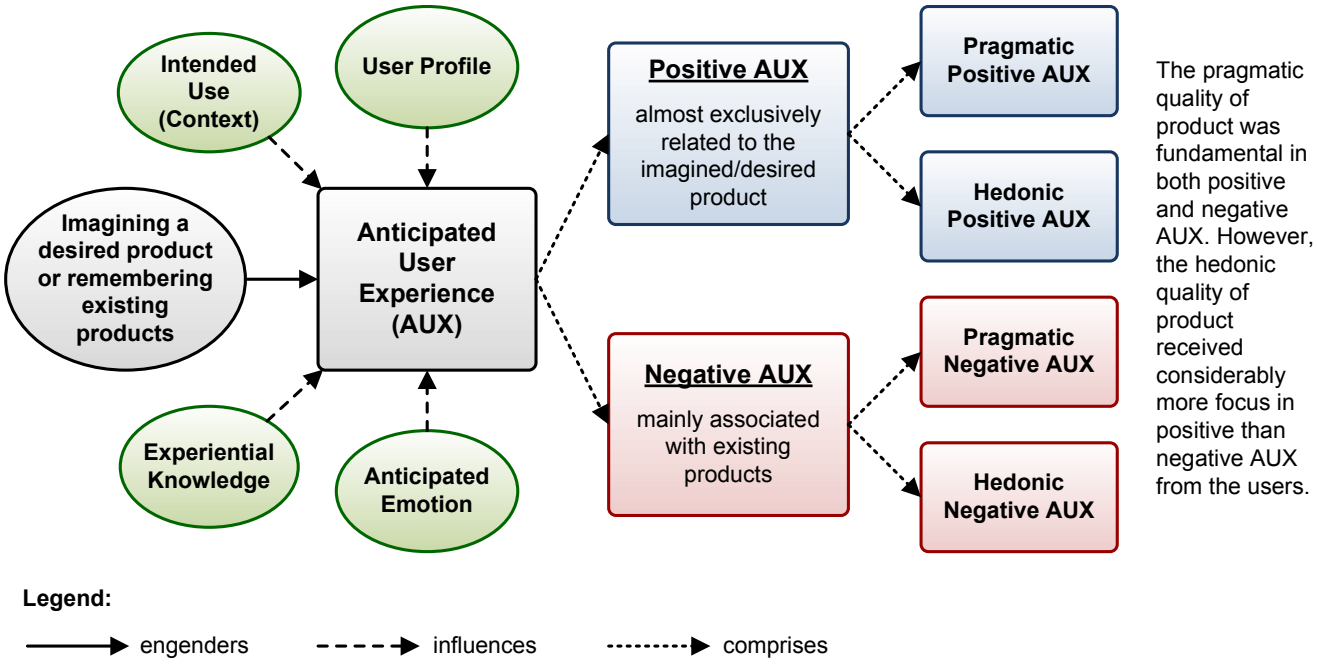

Figure 4. Summary of the findings on general characteristics of anticipated user experience (AUX)

The findings of this study also inform that the instrumental quality (e.g. usability) of an interactive product is paramount and significantly influences users' perception in anticipating future experiences with the product. This is especially true when imagining undesirable experiences. However, when envisaging future pleasurable experiences, the users noticeably pay more attention to the product's non-instrumental value that can fulfill their hedonic needs (e.g. being competent in using a digital camera).

From this point, it can be implied that relying heavily on UX evaluation based on interactions with an existing product may result in an overemphasis on negative and pragmatic aspects of the experience. This may mislead the designers during the creation of the new product. Alternatively, by exploiting users' anticipated experiences with a desired product, the designers are able to gain more insight into positive and hedonic aspects of the UX that are arguably more important for the experience-driven design. In other words, the findings suggest that information from AUX needs to be employed to usefully complement the data gathered from UX assessment on actual user-product interactions.

Lastly, through AUX, the designers are also enabled to get a picture of potential contexts of product usage according to particular user profiles. It is made possible by information about usage purposes, circumstances and environments of use, and characteristics of users that typically co-occurs with AUX data. This is valuable as the context and user characteristic are the core facets of UX besides the product itself (Hassenzahl and Tractinsky, 2006). Moreover, anticipated emotions were often reflected in AUX, aiding the designers to predict and evaluate the users' affective responses in using the product being designed. In light of this understanding, product developers/designers will be better equipped in pursuing the creation of pleasurable interactive artifacts.

LIMITATIONS AND FUTURE STUDIES

This study used only digital cameras to represent interactive products in evoking users' anticipated experiences. Hence, the characteristics of AUX derived from the data may be limited and cannot be entirely generalized. Very simple products such as staplers or stopwatches may result in different appreciations pragmatically and hedonically compared to the more complex ones such as smartphones or tablet PCs. Therefore, various levels of complexity and types of interactive products should be included in the future study to expand the scope of the products evaluated and to analyze their influences on AUX.

In terms of participants grouping for the co-discovery session, we observed that a large disparity of knowledge and experience in using digital cameras seemed to hamper the exploration and discussion of product concepts between the users. This may indirectly affect their anticipated experiences with the imagined product. Grouping the users based on specific criteria (e.g. age, experience level in using a product) can be considered in the future to overcome this issue and enable comparisons of AUX between different user-categories.

It should be noted that our research outcome serves to complement the UX evaluation on actual user-product interactions. Our aspiration is to support product developers/designers in designing for pleasurable UX from the outset of the design process. AUX offers a projection of potential experiences from the users and possibilities to assess UX before the actual use of a product. However, as asserted by Heikkinen et al. (2009), the users may not be able to accurately recognize their true and possible needs and expectations. Likewise, emotion, as an important part of experience, can be hard to cognitively imagine and verbally express so that they may be absent or untruthfully described in AUX. In view of that, assessment on UX during or after actual interactions with the product in a real context is still necessary.

In pursuing and realizing our study objective, we envisage the next steps in our continuing research. First, we will delve deeper into the AUX characteristics and develop a model defining how a user anticipates their future experiences with interactive products. Following this, we will conduct an experiment requiring participants to actually use a provided digital camera for several days and report their experiences. That is to identify the differences between anticipated and real UX. Last but not least,

based on the understanding about AUX characteristics and their distinctions compared to those of real UX, we will develop a tool for assisting designers in assessing UX in the early design phases.

CONCLUSION

Assessing UX in the very early phases of product development is difficult and challenging. During these stages, there are commonly no functional prototypes and therefore evaluating actual user-product interactions is practically impossible. There is a need for methods that will help evaluate future experiences with products, so that UX can be assessed before the actual interactions take place.

We conducted a qualitative study to investigate *anticipated user experience* (AUX) as the first step in addressing the above problem. Twenty groups of two participants participated in co-discovery sessions where they were asked to imagine an interactive product, to draw their product concept, and to anticipate their interactions and experiences with the imagined product. We discovered that while *positive* AUX was almost exclusively related to the *imagined/desired* product, *negative* AUX was largely associated with *existing* products. It was evident that the *pragmatic* quality of product was fundamental, and significantly influenced user's anticipated experiences. Moreover, the users showed less interest in the *hedonic* quality of product when anticipating negative experiences. In contrast, when it came to perceiving positive AUX with a desired product, the hedonic aspects of the product received remarkably more focus from them. We also found that information about *usage context*, *user profile*, *experiential knowledge*, and *anticipated emotion* could be educed from AUX.

The significance of this work lies in developing an understanding about general characteristics of AUX with interactive products. By harnessing this new knowledge, designers are able to better foresee the users' underlying needs and to focus on the most important aspects of their positive experiences. With the final target to ensure enjoyable UX from the start of the product design process, we envisage that our findings will contribute to user- and experience-centered design by providing a basis for developing new design guidelines and UX evaluation methods.

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REFERENCES

Alben, L. (1996). Quality of experience: defining the criteria for effective interaction design. *Interactions*, Vol. 3, No. 3, 11-15.

Baumeister, R. F., Vohs, K. D., DeWall, C. N., and Zhang, L. (2007). How emotion shapes behavior: feedback, anticipation, and reflection, rather than direct causation. *Personality and Social Psychology Review*, Vol. 11, No. 2, 167-203.

Blackler, A. (2008). *Intuitive interaction with complex artefacts: empirically-based research*. Saarbrucken, Germany: Verlag Dr. Müller.

Butz, M. V., Sigaud, O., and Gérard, P. (Eds.). (2003). *Anticipatory behavior in adaptive learning systems: foundations, theories, and systems*. Berlin; Heidelberg: Springer-Verlag.

Chamorro-Koc, M., Popovic, V., and Emmison, M. (2009). Human experience and product usability: principles to assist the design of user-product interactions. *Applied Ergonomics*, Vol. 40, No. 4, 648-656.

Chattratichart, J., and Jordan, P. W. (2003). Simulating 'lived' user experience - virtual immersion and inclusive design. In: M. Rauterberg, M. Menozzi and J. Wesson (Eds.), *Proceedings of the International Conference on Human-Computer Interaction - INTERACT'03: IFIP TC13*, Zurich, Switzerland, 721-724.

Desmet, P. M. A., and Hekkert, P. (2007). Framework of product experience. *International Journal of Design*, Vol. 1, No. 1, 57-66.

Glasersfeld, E. v. (1998). Anticipation in the constructivist theory of cognition. In: D. M. Dubois (Ed.), *Computing anticipatory systems*. Woodbury, NY: American Institute of Physics, 38-47.

Hassenzahl, M. (2003). The thing and I: understanding the relationship between user and product. In: M. A. Blythe, K. Overbeeke, A. F. Monk and P. C. Wright (Eds.), *Funology: from usability to enjoyment*. Dordrecht; Boston; London: Kluwer Academic Publishers, 31-42.

Hassenzahl, M. (2008). User experience (UX): towards an experiential perspective on product quality. In: *Proceedings of the 20th International Conference of the Association Francophone d'Interaction Homme-Machine*, Metz, France, 11-15.

Hassenzahl, M., and Tractinsky, N. (2006). User experience - a research agenda. *Behaviour and Information Technology*, Vol. 25, No. 2, 91-97.

Heikkinen, J., Olsson, T., and Väänänen-Vainio-Mattila, K. (2009). Expectations for user experience in haptic communication with mobile devices. In: *Proceedings of the 11th International Conference on Human-Computer Interaction with Mobile Devices and Services, MobileHCI'09*, Bonn, Germany.

ISO 9241-210. (2010). *Ergonomics of human system interaction - Part 210: human-centred design for interactive systems.* Switzerland: International Organization for Standardization (ISO).

Jordan, P. W. (2000). *Designing pleasurable products: an introduction to the new human factors*. London: Taylor & Francis.

Karapanos, E., Zimmerman, J., Forlizzi, J., and Martens, J.-B. (2009). User experience over time: an initial framework. In: *Proceedings of CHI'09: 27th International Conference on Human Factors in Computing Systems*, Boston, USA, 729-738.

Law, E., Roto, V., Hassenzahl, M., Vermeeren, A. P. O. S., and Kort, J. (2009). Understanding, scoping and defining user experience: a survey approach. In: *Proceedings of CHI'09: 27th International Conference on Human Factors in Computing Systems*, Boston, USA, 719-728.

Law, E., Roto, V., Vermeeren, A. P. O. S., Kort, J., and Hassenzahl, M. (2008). Towards a shared definition of user experience. In: *Proceedings of CHI'08 Extended Abstracts on Human Factors in Computing Systems*, Florence, Italy, 2395-2398.

MacLeod, A. K., and Conway, C. (2005). Well-being and the anticipation of future positive experiences: the role of income, social networks, and planning ability. *Cognition and Emotion*, Vol. 19, No. 3, 357-374.

Mäkelä, A., and Fulton Suri, J. (2001). Supporting users' creativity: design to induce pleasurable experiences. In: M. G. Helander, H. M. Khalid and M. P. Tham (Eds.), *Proceedings of the International Conference on Affective Human Factors Design*, Singapore, 387-394.

McCarthy, J., and Wright, P. C. (2004). *Technology as experience*. Cambridge, Massachusetts: MIT Press.

Mitchell, T. R., Thompson, L., Peterson, E., and Cronk, R. (1997). Temporal adjustments in the evaluation of events: the "rosy view". *Journal of Experimental Social Psychology*, Vol. 33, No. 4, 421-448.

Norman, D. A. (2009). The way I see it: memory is more important than actuality. *Interactions*, Vol. 16, No. 2, 24-26.

Pine, B. J., and Gilmore, J. H. (1999). *The experience economy: working is theatre and every business a stage*. Boston: Harvard Business School Press.

Roto, V. (2007). User experience from product creation perspective. In: E. Law, A. P. O. S. Vermeeren, M. Hassenzahl and M. Blythe (Eds.), *Proceedings of the COST294-MAUSE Affiliated Workshop: Towards a UX Manifesto*, Landcaster, UK, 31-34.

Schrammel, J., Geven, A., Leitner, M., and Tscheligi, M. (2008). Using narration to recall and analyse user experiences and emotions evoked by today's technology. In: P. M. A. Desmet, J. van Erp and M. Karlsson (Eds.), *Design & emotion moves.* Newcastle: Cambridge Scholars Publishing, 362-377.

Scientific Software Development GmbH. (2011). *ATLAS.ti: the qualitative data analysis software*. Retrieved 20 January, 2011, from http://www.atlasti.com/

Sward, D., and Macarthur, G. (2007). Making user experience a business strategy. In: E. Law, A. P. O. S. Vermeeren, M. Hassenzahl and M. Blythe (Eds.), *Proceedings of the COST294-MAUSE Affiliated Workshop: Towards a UX Manifesto*, Landcaster, UK, 35-42.

Thuring, M., and Mahlke, S. (2007). Usability, aesthetics and emotions in human-technology interaction. *International Journal of Psychology*, Vol. 42, No. 4, 253-264.

Väänänen-Vainio-Mattila, K., Roto, V., and Hassenzahl, M. (2008). Now let's do it in practice: user experience evaluation methods in product development. In: *Proceedings of CHI'08 Extended Abstracts on Human Factors in Computing Systems,* Florence, Italy, 3961-3964.

Vermeeren, A. P. O. S., Law, E., Roto, V., Obrist, M., Hoonhout, J., and Väänänen-Vainio-Mattila, K. (2010). User experience evaluation methods: current state and development needs. In: *Proceedings of the 6th Nordic Conference on Human-Computer Interaction: Extending Boundaries, NordiCHI'10*, Reykjavik, Iceland, 521-530.

Wilson, T. D., and Gilbert, D. T. (2005). Affective forecasting: knowing what to want. *Current Directions in Psychological Science*, Vol. 14, No. 3, 131-134.

Zimmermann, P. G. (2008). *Beyond usability - measuring aspects of user experience*. Unpublished Doctoral Dissertation, Swiss Federal Institute of Technology Zurich, Zurich.