Aspect-Based Model Of User Experience

Dhaval Vyas
Department of Computer Science
Vrije Universiteit Amsterdam
The Netherlands
dvyas@few.vu.nl

Introduction

Traditional HCI design and evaluation methods merely focus on functional and usability aspects of a product. Although these aspects are important, they do not guarantee product's success, especially the consumer product. Many consumer products are now part of user's everyday activities – that support fun, pleasure, entertainment, etc. Secondly, in today's consumer market many of the products have become similar in terms of their technology, functionality, price and quality. In response, many companies have started designing products with added emotional and experiential values. This has challenged designer's to explore and visualize directions in product design field that could evoke intended and desired experiences amongst its users. Subjective product qualities such as fun, pleasure, entertainment, etc. are not the part of a product, but they are better thought of as the outcome of user's interaction with the product [Wright et al. 2003].

We believe that it is very important that interaction designers have some way to understand a specific experience and different aspects that contribute towards it. In this position paper we introduce a conceptual model of user experience that differentiates different user aspects that contribute towards an experience. In the following part we first introduce this model called "aspect-based model of user experience", and in the second part we will analyze an experience of Apple's iPod using this model.

1. Aspect Based Model of User Experience

In the process of interacting with the system a user merely uses three capabilities: Cognitive, Affective and Perceptual-motor [Overbeeke et al. 2002]. In this process of interaction the user first perceives the information about the systems through his sensory system (vision, hearing, touch, smell, taste). Some information received by the user would need very little processing depending on the user's knowledge and/or the context of the system. However, it is more likely that (based on the complexity of the today's everyday used systems as discussed in the introduction) some of the information would require higher levels of processing, which could involve interpretation, learning or use of memory. In either case, based on the given information, the user then tries to perform an action towards the system using his motor skills and receives system's response based on that action. A judgment is made on this particular iteration of action and feedback. The cycle of user action and system feedback goes on until the system and the user reach a mutual state (this may include aborting the whole activity). To the user this is an experience of using the system.

The above mentioned is just a simplistic view of user experience. Based on each individual action, the user actively constructs the experience using his sense making and information processing skills. In an experience there are many sub-experiences and each sub-experience may have different levels of user appreciations. E.g. a commercial movie is likely to have different plots and sequences (e.g. comedy, action, drama, erotic, etc.) and a user may like some plots and sequences and may not like others. There could be a chance that some highly appreciated movie-parts make the viewer neglect or even forget about the less appreciated movie-parts or vise versa. So, even though there could be different sub-experiences in an experience, for the designers the question remains is – how a user amalgams these different sub-experiences and comes up with an overall evaluation about the experience. Also a different user could experience the same system in a different way and have a different view on that experience.

For designers it has been difficult to understand the underpinnings of user experience and hence impossible to apply them into the design process. Although given this inherent complexity of user-experience, we believe that there are some specific aspects that contribute towards the unfolding nature of an experience and this could help designers understand this phenomenon to some extent. Dewey [1934] has identified three major forms of an experience that contribute to its overall quality: Intellectual, Emotional and Practical. To Dewey, intellectual experiences are sensory and they involve drawing out intellectual conclusions from signs and symbols, which leads to an experience. Emotional experiences are subjective and internally driven evaluations of the objective situation at hand. Practical experiences involve physically interacting with an object, within a situation. Dewey also mentions that an experience is holistic and integrates these three forms in a coherent form with a specific experience-quality. In the new era of HCI it has become clear that

issues related to 'affect' could not be neglected in designing interactive systems. Norman [2004] identifies three levels of information processing namely: visceral, behavioral and reflective, where affect plays different intensity of roles. The visceral level is biologically determined and helps making immediate and reactive judgments. The behavioral level is concerned with executing well-leaned actions based on expectations. The reflective level is concerned with making sophisticated judgments based on full-fledged emotion and higher-level cognitive process.

In the context of interactive systems, we believe that there are four major aspects that contribute to the overall experience. They are aesthetic, cognitive, emotional and practical. Based on Dewey's and Norman's work, we develop an aspect-based model of user experience. The mere focus of this model is to identify the flow between these aspects, their intensities and their correlations within an experience. Figure-1 shows this model.

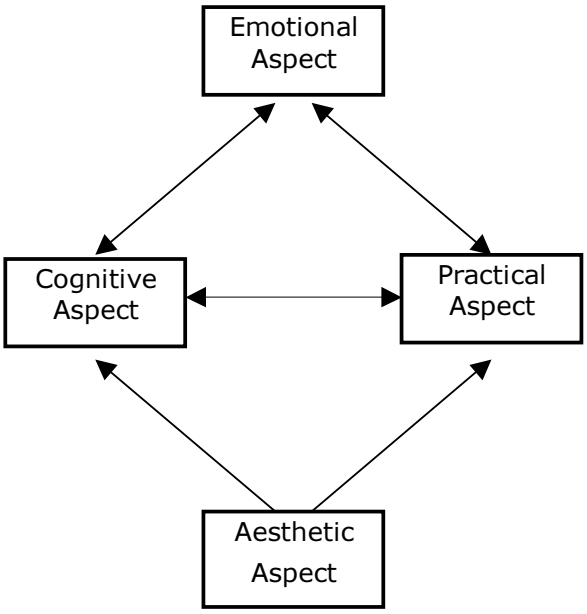

Figure-1 Aspect-based model of user-experience

Aesthetic Aspect

In day-to-day lives, people constantly receive information about the environment through their sensory system. Without being consciously aware of the objects, people make judgments about them based on their attractiveness (or otherwise). Aesthetics have their roots in philosophy, which defined aesthetic as the (perceived) sense of beauty [Hekkert 1995]. Its concept has evolved since then. According to the Merriam-Webster Online Dictionary, aesthetic means *"a particular taste for or approach to what is pleasing to the senses and especially sight"* [MWOD 2005]. Different fields use the concept of aesthetics differently. Our model focuses aesthetics as user's immediate appreciation about the system based on only its sensory information relevant to the user. This also means that although aesthetic is related to the attractiveness and beauty of the system, both the observer (here the user) and the system play a combined part in aesthetic preferences.

These aspects are concerned with the immediate reactions initiated by the look and feel of the product. These are only the 'skin deep' beauty and do not involve any cognitive support [Norman 2004]. As mentioned earlier that these aspects are perception-based and only related to the sensory information about the system and it's context, if the sensory information is sufficient for the user to make judgments then the practical aspects are triggered where action upon the system will be carried out. E.g. in jewelry shops, people sometimes buy very expensive jewelries based on their look and feel, only. But, if the system does not provide sufficient information to the user and he is not able not make a precise judgments about it then the cognitive aspects are triggered. E.g. a work of art could be very complex for its viewers to understand. In this case, viewers need to use their past experiences or memory to make judgments about the art-work.

Even though attractive things are subjective, their aesthetic appreciation is naturally determined and consistent within similar cultures [Norman 2004]. Hence, aesthetic aspects create a sort of platform for an experience whole. They help designers analyze the flow of an experience and also provide a sort of control over user experience. E.g. there are universal rules in visual perception regarding perceiving the size, color, and brightness (and contrast) of the object [Dix et al. 1998]. Designers could make use of these 'sensuality' in their product design. There is also a close relationship between attractiveness and usability. Tractinsky et al. [2000] argue that aesthetic perceptions about a user interface are highly correlated to the interface's usability. They evaluated different ATM layouts amongst a group of (Israeli) subjects and found out that pre-experimental measures had a strong correlation between system's perceived aesthetics and perceived usability. And their post-experimental results showed that the strong correlation remained intact. They concluded that physical attractiveness of a product improves its ease-of-use.

Cognitive Aspect

These aspects are related to involving human cognition (i.e. cognitive processing skills). Because of the lack of user knowledge and/or less accurate sensory information, some of the products don't immediately make absolute sense in terms of their use when the user starts interacting with them. They require some information processing and problem solving skills. These aspects help the user comprehend a product's narrative structure, action possibility, explanation of actions and expected results. They also help the user reflect on his previous situations (or

events) and evaluate the current situation. The 'actual beauty' could be judged from these aspects since people analyze the system from cultural, social, political and historical perspectives.

Cognitive aspects involve learning, interpreting and understanding the events and thus inform users what actions are required. These aspects have reflective and recursive relationship with practical and emotional aspects. Cognitive aspects help the user understand the context of system use and trigger what actions are required to be performed by the user on that particular situation. E.g. before buying the expensive jewelry a user might think about his social image on wearing this jewelry in the society. The jewelry could also be a fashion statement for him. Cognitive aspects also trigger emotional aspects. (Even though there is an ongoing debate on the primacy about cognition and emotion.) When the user's information processing is aided with cognitive supports he is better able to make emotional judgments about the situation. E.g. an expensive surprise gift (of jewelry) becomes more appreciative and valuable after knowing that it is from our loved ones. Here, emotions related to a pleasant surprise are evoked.

Practical Aspect

These aspects are related to the actual use of the system, i.e. the physical activities the user is capable of with respect to the system. The user uses the system in order to access its functions (these can be pragmatic or hedonistic) and if the system doesn't fulfill them, it means nothing to the user even if the system is beautiful and attractive. These aspects make the user realize the usability and functionality of the given system. If supported positively, these aspects could provide the most engaging and satisfying experience, according to Hummels [2000]. System ergonomics are closely related to these aspects. Tangible, Embodied & Haptic interactions ([Dorish 2001], [Ullmer et al. 2000], etc.) merely focus on the issues related to practical aspects. Keeping the concept of design in mind these aspects could be utilized to augment fun, enjoyment and playfulness. The reason being that a physical action is more easily perceivable then a cognitive and an emotional (re) action and as supported by Hummels physical action and feedback are more engaging. They can be achieved in different ways, with a physical product like a mobile phone involving button press and speech and in an Internet application involving mouse handling.

Practical aspects could trigger back to both cognitive and emotional aspects. After physically using the system the user would have more knowledge and comprehension about the system. E.g. a tourist would become more familiar with how to use the ticket-vending machine, after using the machine a couple of times. The experience generated on these occasions would be added to the tourist's knowledge, which would help him on future uses. Ease of use or the usability also has a relationship with emotions. If a user is able to finish his tasks fairly easily he would be more satisfied with the experience and would evoke positive emotions. E.g. an old mobile phone might still be emotionally close to its user because it's very simple to use or has a very strong body that doesn't break down when dropped.

Emotional Aspects

These aspects are related to different emotions (e.g. joy, anger, disappointment, disgust, etc.) elicited by an interactive product. The emotion is a part of affect, which helps users make judgments. These aspects are separated from those affective aspects related to only sensory information, i.e. the aesthetic aspects. Emotions evaluate and judge the user state based on each events of user's interaction with the system. Current theories of emotions fail to explain the relationship between experience and emotions [Mutlu 2004]. The intimate nature of emotion is manifested in an experience. In an experience, emotions are attached to each events and objects in user's interactions. Evoked emotions belong to the user only but these emotions are concerned with the events and interactions the user is going through. Emotion is the moving and cementing force in an experience [Dewey 1934]. Carlson argues that emotions are instrumental to an overall experience [Carlson 1997]. He provides three reasons on how emotions could help designers understand experience. First, emotions elicited in an event of a system use shape the user's plans and intentions. Second, emotions also help the user organize these plans into basic procedures on how to go about them. Third, emotions help the user evaluate and judge the outcomes of the system use. Negative emotions evoked during the system use could well turn the experience into unpleasant one.

These aspects could trigger both the practical and/or cognitive aspects in an experience. Picard [1997] suggests that emotions are cognitive and physical, i.e. our brain and body both interact with each other to generate emotional experiences. Cognitive aspects focus on understanding the situations that elicit emotions and practical aspects emphasize on the physiological responses that elicit emotions, which occur during a system use. Practical aspects sometimes become carriers of expressing emotions. In critical interactive systems (e.g. a Nuclear reactor control panel), when a user finds himself in a hazardous situation; he generates panicking emotions. These emotions could be interpreted through user's bodily actions. E.g. higher heart-rate, slow motion, facial expressions, etc. Picard [1997]. When negative emotions are evoked during a system use it affects both the cognitive and practical aspects in a negative manner. E.g. After sensing the hazardous situation its user generates some panicking reactions that could affect the user's cognitive and physical skills.

2. Applying the Model

Figure-1 shows a high-level model of user-experience but does provide some information on how these aspects in co-ordination and combination play a part in shaping the overall quality of an experience. It is our intention to clarify that even though aesthetic, cognitive, practical and emotional aspects help forming an experience, the amount of their involvement may vary depending on the knowledge of the user and the context of use. For example, using a familiar and everyday used product might not involve much thinking; hence the cognitive aspects would have less impact in the experience. According to Carlson [1997], a user's goal-seeking behavior helps him cognitively construct a plan – a set of actions and tasks, which is aided by the emotions. Each user action and task would contribute to these four aspects of an experience. And at the end of these activities a judgment is be made based on these four aspects.

Let's consider a brief example walkthrough on Apple's iPod and see how these above mentioned aspects help designers understand the experience phenomenon. Experience, being subjective, may differ in other cases; we are providing an instance of an experience.

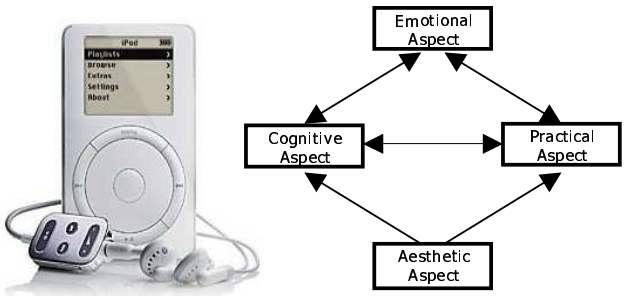

Figure 2: Analyzing an iPod experience

A novice user comes across the iPod (shown in figure 2) and sees its interface. An initial judgment is made based on its attractive shape and pleasing silver/while color. Here the aesthetics aspects played their role. He then sees the main display of iPod and circular click-wheel. The cognitive aspects are triggered, when he tries to understand the structure of iPod, different action possibilities and their outcomes. He tries to relate iPod with other well known PDA and mobile phones that he is familiar with but is not able to make a precise judgment about it. He is curious to know more about it and also believes that it is safe to touch and use it. Here emotional aspects were triggered. He decides to use one of his hands to check iPod's functionality. He touches the click-wheel and rotates it with his single thumb and immediately receives the feedback by recognizing the change in the top display. The practical aspects were triggered here. He finds the click-wheel very smooth and pleasing in touch and it also gives him control over getting to a menu he wants. This provides him with a new emotion of playfulness. He's now excited and happy about the iPod. He also gains some skills and knowledge about how to set the precise menu & song after practically using the iPod (cognitive aspects are triggered).

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