Experience-Centered Web Design Model

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Abstract. This paper presents an experience-centered web design model. This model was constructed identifying a series of heuristics that characterize the quality of experience. This series was the start point to select a set of variables that could be used to design the user experience. Thus, user experience is designed using variables such as: challenge, focused attention and clear goals and feedback. These variables were analyzed in terms of the three dimensions of user experience which were established from the literature review: emotional, functional and aesthetics dimensions. This analysis was used to create a model for an experience-centered web design. In addition, this paper suggests that this model can be used in different applications of experience-centered design.

Keywords: web design, user experience, creativity.

1   Introduction

Many studies that investigate web design from the point of view of human-computer interaction focused on technology, such as tools, and interaction paradigms or functionality. Yet, technology has a limited impact in the design unless it is a product of an epistemological process. This paper goes beyond the question of 'how to create a web site' and explores how to create a web experience.

This paper proposes a shift in focus - from designing web technology to designing a web experience and explores the flow theory suggesting that challenge, focused attention and clear goals and feedback could lead to an optimal experience. Thus, this paper describes a series of heuristics about quality of experience in web design. Quality of experience is defined in this paper in three dimensions: functional, emotional and aesthetic dimensions. The functional dimension defines how well the interface supports the functionalities. The emotional dimension defines how well it achieves the user's expectations and how valuable the interface is to the user. Finally, the aesthetic dimension defines how agreeable the interface is to the user [1-4].

Many papers have suggested identifying the factors that add 'quality' to the experience. In this case, experience is defined as design attributes such as usability and aesthetic [5-6]. This paper aims to contribute to this line of research by studying the attributes such as challenge, focused attention and clear goals, combined with feedback that add 'quality' to the user experience.

2 Literature Review

This section reviews three main areas of literature which are the basis for this study: optimal experience, user experience (referred to as UX) and web design.

Optimal experience theory has its roots in the flow theory and is used to characterize the interface so that it promotes a most advantageous experience to the user. Thus, the next section defines optimal experience and lists the crucial characteristics to be used. Next, some of the user experience studies are reviewed and three UX's dimensions are selected to be the focus of the model. Finally, some considerations about web design are drawn. These considerations take account of the characteristics of an optimal experience and the UX dimension are used to create an experience-centered web design model.

2.1 Optimal Experience

In 1991 Mihaly Csikszentmihalyi wrote that people remember best the moments which were lived in flow. Flow means "the holistic experience that people feel when they act with total involvement" [1]. Furthermore, total involvement needs that mind and body are taken to the limit in order to complete a task. In this situation people reported some characteristics that can be found on a flow situation which are briefly summarized as follows:

- Challenges that can be overcome;
- Attention focused without distraction;
- Clear and well defined goals;
- Immediate feedback and reward;
- Actions and awareness are merged;
- Feeling of being in control over actions, activities and environment;
- Loss of self-consciousness;
- Differentiated sense of time.

2.2 User Experience

The term 'user experience' has been openly used by industry and researchers with vast different meanings. In an attempt to define user experience the researchers Law, Vermeeren, Hassenzahl and Blythe edited in 2007 the document 'Toward a UX Manifesto'. This document is the basis for a definition of UX used in this paper as the degree to which the user expectations are fulfilled. Before this manifesto other publications defined, although provisory, the term 'user experience'. These publications where analyzed by Hassenzahl and Tractinsky [7] and they concluded that UX could be studied in three different perspectives:

- To understand human needs beyond the instrumental;
- To understand the affective and emotional aspects;
- To understand the natures of experience.

Each perspective by itself could not define UX in its completeness. This is because UX recognizes the use as subjective, situated, complex and dynamic. In addition, UX is a consequence of the emotional state of the user (predisposition, expectations, needs, motivations, humor etc). UX is also a consequence of the system's characteristics (complexity, goals, usability, functionality etc) and its context (or environment) where the interactions occur (social space, organizational, etc). Clearly this creates a wide range of opportunities to design the experience and many challenges.

For Hassenzahl [8], for example, the product's attribute could be pragmatic or hedonic. Pragmatism refers to the ability of the product to support the 'to do' factor. For example, 'make a phone call' or 'find a reference', etc. The second dimension, hedonism, refers to the product's ability to support the 'to be' factor. This ability would support 'to be competent', for example, or 'to be special', etc. The pragmatic-hedonic model, although simplistic, shows that experience is unique to each user. In addition experience is situated and complex. These restrictions can be presented as challenges to web design.

Mahlke [9] understands UX as usability perception. In this case usability is not restricted to design for high performance but involves all that is relevant to the user. Thus, Mahlke and Thüring [10] defined UX components as: perception of the instrumental qualities, perception of the non instrumental qualities and emotional user reaction.

Usability is also a central point in Roto's model [11]. She states that usability is a product's attribute while UX is personal, i.e., UX is a feeling towards the product. Roto says that before people interact with a product they have expectations about it. Thus, people will assess how good the experience is, comparing to what they expect it would be. In user experience the success of the business depends on a long term relation with the user. In this case the observation of this experience and the understanding of what factors are creating an optimal experience may lead to product changes. The three components that affect UX in this moment are: system, user and context. To Roto the system component is the most important when considering changing to a better product.

This paper understands that users interact with the elements of the product which are designed to create a specific experience, and this experience changes over time. This is a similar approach adopted by Kort, Vermeeren and Fokker [12] in their UX model. Their model is composed of 2 circles (one inside the other). The outer circle represents the general phases of the process Sense-Making which results in the user experience. The Sense-Making strategy considers that humans have the capacity of mutually understanding although each one sees the world from different points of views. The inner circle contains the three UX's aspects which may drive the emotions. These aspects are compositional, aesthetics and meaning and can be designed to support a specific emotion. That's because the 'compositional' aspects are created by the designer using the user-product interaction. These aspects are related to usability, pragmatism and behavioral characteristics of the product. Thus, these compositional aspects may result in a feeling of having understood how the product works.

On the other hand the 'aesthetics' aspects of an experience are related to product's capacity to delight one or more sensorial capacities. These aspects are related to the appearance, textures, sound, color, forms, composition, etc.

The 'meaning' aspects are related to the designer's intention to reach the high order user' goals, like needs and desires. As posted by Desmet and Hekkert [13] these aspects are related to cognition and through cognitive processes the users are capable of recognizing metaphors, assigning personality and other expressive characteristics, plus also assess the personal or symbolic meaning of a product.

Table 1. Summary of the UX dimensions considered by different authors

Author	UX's Axes		
	Aesthetic	Emotional	Functional
Hassenzahl (2007)	Hedonic		Pragmatic
Hassenzahl and Tractinsky (2006)	Beyond Instrumental	Emotion and affection	Experimental
Mahlke and Thüring (2007)	Non instrumental qualities	Emotional reaction	Instrumental qualities
Roto (2007)		Expectation	
Kort, Vermeeren and Fokker (2008)	Aesthetic	Meaning	Composition
Wright, MacCarthy and Meekison (2004)	Sensorial	Emotional	Compositional Temporal-spatial
Desmet and Hekkert (2007)	Aesthetic	Emotional Meaning	

Table 1 summarizes the different axes that are treated by the authors reviewed in this session. The analysis of different UX points of view was carried out using a graphic design approach. This approach indicated three axes: aesthetic, emotional and functional. In addition, this paper adopts the conclusion of Roto and Kort, Vermeeren and Fokker about the system design effect over the UX perception. This is to say that the products' form impacts on the products perception which in turn characterizes the experience. Thus, the three axes, aesthetic, emotional and functional should be conceived by the interface graphic design.

Experience-centered design requires that the designer to have a means of view the experience, talk about it, analyze its relationship with its parts and understand how technology could participate to make experience more enjoyable [14].

2.3 Web Design

This section proposes an analogy between character and web design since both can be designed in accordance with user experience heuristics. Thus, the macro categories defined by Fadel [15] focusing on experience-centered character design are now

written for web design. The categories in Fadel were established analyzing the studies about character design. Thus, Figure 1 show the categories which are: project, psychology, physical and drawing. These categories are now adapted to web design using the dimensions of UX established in last section. But before adapting to web design, a briefly comment of each category follows.

The project category concerns the phase of planning and analysis of the market which are carried out before the start of designing the character or interface. This phase is crucial to understand the character/interface context and its objectives. In addition, this phase establishes the character/interface requirements. Some of these requirements can have a psychological aspect; others are physical, technological, marketing etc. To this extent, this category involves and affects all the other categories.

The category about psychological aspects embraces the character/interface behavior that defines its personality. The psychological aspects define the ability of the character in projecting itself emotionally. In designing interfaces, the psychological aspects involve interactivity.

The physical category describes the body and costume of the character. In the case of web design, physical category describes its functionality and usability. Finally, the drawing category groups all the drawing factors and the technology involved, as well as the format and adjectives of color, shape, texture, image and typography. This category involves the elements and graphical principles, in addition to organizing and monitoring the dynamics of the trace, style and color used to shape the other three dimensions: project, psychological and physical.

The areas of intersection in Fig. 1 determine the relationship among the categories.
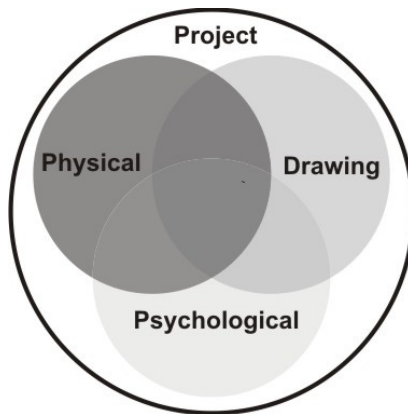

Fig. 1. Four categories in character design (Source: author)

Thus, the intersection between drawing and physical categories determines that some physical characteristics of the interface can be determined also by the drawing attributes. For example, areas of interaction on the interface are approached on drawing level with more or less degree of emphasis depending on hierarchy of these areas. The ideal on designing interfaces is to work on these intersections. This means

that interactive features are highlighted by the graphic and supported by the 'personality' of the interface and vice-versa.

These categories can now be associated to the dimensions of UX summarized in Table 1. The association was drawn by the similarities between categories and dimensions. The psychology category is associated to the emotional dimension, while drawing category is associated to aesthetic dimension. The physical category deals with interface characteristics that are established in the functional dimension as showed in Fig. 2. Finally the project category combines all the others categories and is interdependent on all of them at the same time.
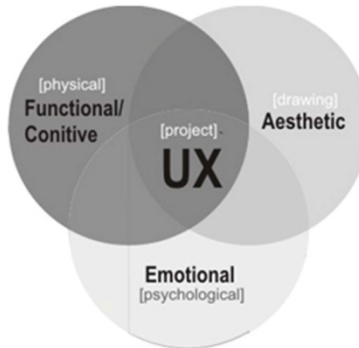
Fig. 2. User experience in web design (Source: author)

Next section describes the experience-centered web design model.

3   Experience-Centered Web Design Model

Assuming that an optimal experience can be determined as a moment when the individual applies all energy and attention to solve a problem, three variables of the optimal experience were selected to create an experience-centered design model. These variables were selected prioritizing those that are external to the user. The variables selected are:

- Challenges that can be overcome;
- Attention focused without distraction;
- Clear goals and feedback;

3.1   The Challenge

An optimal experience is more likely to occur when there is balance between skills and challenge. This means that the flow happens when someone's skills are all concentrated overcoming a challenge [1].

If the challenges are too high the person can feel anxious. However, if the challenge is too low compared to someone's skills this person can feel bored. Nevertheless, if both

challenge and skills are perceived as low the person can feel apathy. The flow occurs when challenge and skills are in a high level and balanced.

This idea is supported by the authors Overbeeke, Djajadiningrat, Hummels, and Frens [16] as they argued that users are not interested in products but in challenging experiences. To these authors, to have challenging experiences is necessary a 'context for the experience' and 'aesthetic for the interaction'.

Thus, the context would lead to fun while aesthetic of interaction would lead to beauty. The beauty in interaction is one of the most important parts of the interaction design. Following this idea Hummels establishes a strong argument to highlight fun and beauty. Hummels considers five aspects of the product that are essential to create beauty. These aspects involves the products functionalities, the intimacy it instigate, the senses it stimulate as well as the context and the users' desires needs and abilities.

Like Hummels, Djajadiningrat, Overbeeke and Wensveen [17] listed 10 guidelines to augment fun and beauty in products design. These guidelines invoke designing experience and designing interaction instead of designing products.

3.2   The Attention

One distinctive features of optimal experience is that people become so absorbed by the activity so that becomes spontaneous [1]. All the attention is concentrated on the stimuli. This is to say that the concentration must be focused on what is done. If attention is focused is more likely that the user is aware of what is relevant on that moment. Thus, this intense concentration on the present relieves the user of usual fear that causes anxiety. To promote an optimal experience area of attention should be clear to the user.

3.3   The Clear Goal and Feedback

The flow is more likely to happen when the user has a real notion of what he/she is looking for. Having clear goals reduces tension and allows the user to focus attention.

Next section describes briefly how these dimensions could be designed.

The model is constructed using the three dimensions of UX (aesthetic, emotional and functional) which are built focused on these three variables (challenges, attention and clear goals and feedback). Fig. 3 shows the aesthetic dimension and the three variables.

Fig. 3. The aesthetic dimension focused on challenges, attention and clear goals and feedback (Source: author)

The three variables are considered interconnected in each of the dimensions as shown in Fig. 4. To better understand the model, each dimension is described in the next section.
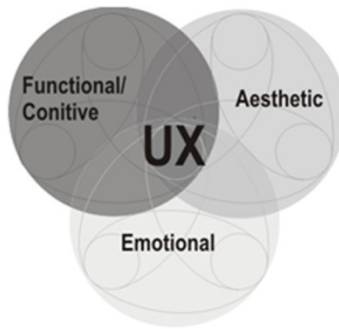
Fig. 4. The experience-centered web design model (Source: author)

3.4   The Emotional Dimension

The first dimension to be designed is the emotional dimension because the user experience will be conceived here. This paper suggests that the user experience is overall perception about the interaction with a web site and it can be designed by amplifying, modifying or re-creating the experience in the real world. In order to do that, the first step would be to understand what this real world experience is.   This involves having a clear ideia about the organization/client concept. This concept is the essence of the organization.

In addition, this dimension characterizes interactivity. Interactivity is defined here as all the elements of user-interface interaction, as well as the interface capacity of reacting to users' interventions.

3.5   The Functional Dimension

The functional dimension deals with the web site functionality and usability. In this dimension the interface is delineated by two different perspectives: the clients and the users. The clients' perspective describes their needs in relation to the interface. These needs are used to describe the interface role in the general context of the web site and the clients' expectations.

Likewise, users' needs in relation to the interface are collected by questioning them. Hence, techniques like user segmentation and personas can be used [18]). Understanding clients' and users' needs are resumed as the interface functionalities which concern all that the interface does and what the user can do.

3.6   The Aesthetic Dimension

The aesthetic dimension assumes all visual attributes of the interface like color, texture, images and graphic composition. The aesthetic dimension represents visually

the other two dimensions. This is to say that picturing the concept and functionality might enable the user to experience what was designed. The challenge in the aesthetic dimension can be based on applying the design principles and gestalt as discussed in Fadel and Dyson [19]. Some of these principles activate the limbic system promoting a feeling of well being, as argued by Ramachandran and Hirstein [20]. For these authors aesthetic is understood as a set of visual arrangements to which human respond willingly. These visual arrangements use rules or principles broadcasted by recent works and the classics [21,20].

Some of these principles were listed by Ramachandran and Hirstein [20]. The first principle is known as the peak shift effect and refers to the preference of choosing the objects that better represent a value. The authors explain that this effect is applied when drawing a caricature. In this case the artist subtracts the characteristics of the human face that are common to all humans and amplifies those characteristics that are exclusive to the person. At the end, the caricature resembles better the person than a photo.

In addition, the authors suggest that this effect could also be applied when using colors, depth and movement. Therefore, the aesthetic dimension can benefit from the peak shift effect.

The second principle is the process of discovering correlations and seeing the similar as a single object. This trend seems to be related to the fact that brain rewards the association made. Thus, once detected a form, the limbic system reacts with a feeling of pleasure and the form remains cohesive facilitating their understanding. An application of this could be representing an object using different objects with similar meaning that cause a different insight to the user.

The third principle dictates that on isolating a single visual modality prior to amplifying the sign of this modality. The isolation of a single element (shape, depth etc) allows the employment of resources of attention effectively allowing the emphasis given to the element that is appreciated by the observer. This appreciation in turn feeds the limbic system and further strengthens the emphasis. For that reason some portraits made only with contour are more representative than the colorful. In this case the form is isolated from the other elements that do not contribute both to characterize the character. This principle was also observed in another study on animation. People recognize a man or a woman walking even if they saw only the lights placed on the joints. This principle explains simplicity. As established by Fadel [15] the interface visual should be simple. Simplicity can be reached through extraction of the fundamental characteristics which express the actions and relationships and portray them using the design elements.

The fourth principle is concerned with the extraction of characteristic before of the group, which is the extraction of contrast. As placed in several studies, the information is on the border, in the region of change. Thus, these regions have the preference for attention. In this case the abstract representation which is in the extreme of the realistic representation causes an extra effort in understanding the interface. The abstraction allows that each user can have a different output from the interface.

The fifth principle refers to symmetry that also seems to be recognized very early by visual processing and is preferred by humans. This is possibly because both prey, such as hunter or companion are symmetrical forms.

The sixth principle establishes that the visual processing attempts to interpret a scene from the point of view of the most generic as possible. In this way the compositions which may refer to more than one interpretation are not as pleasant as the compositions which refer to only one interpretation.

Thus, this paper assumes that visibility, images, text and animation can promote interactivity as argued in a previous work [15]. Each of these four elements should be treated using the design and gestalt principles as briefly discussed below. Therefore, visibility of the interaction tools can be highlighted by using simplicity, emphasis, organization and modularity. Simplicity can highlight visibility because simple visual are better and quicker understood. Emphasis can help on focusing user attention in a specific point of the interface.

Organization improves readability because it groups information in subsets which can be processed individually or in parallel. Finally modularity reduces the quantity of visual information by repeating elements.

Furthermore, the use of images, especially abstract image, can inform rapidly because of its immediacy and generality. Abstract images are processed without conscious effort because it is read graphically. Some authors also argue that images are better remembered than words. Moreover, images can improve the interest, create emotion and stimulate curiosity. Otherwise, text can be integrated with images as text complements the images meanings.

Finally, animation is useful to drive user's attention. This happens because humans are very sensitive to movement.

Although the application of the design and gestalt principles is an initial indication of how the model could be used, more details should be driven in future work.

4   Conclusion

This paper discussed a change in the focus – from designing an interface to designing a web experience. Thus, this paper investigated the Flow theory which supports an optimal experience, suggesting that its characteristics should be presented while interacting with the interface. In addition, the user experience models were reviewed in order to establish where the web design could act on the experience. The web design was also briefly reviewed to list the elements and principles which could intensify challenge.

In this way the initial question of 'how to create an interface that supports an optimal experience' was answered using a model. This model was elaborated based on a series of visual quality heuristics. A number of variables that were related to optimal experience were selected from this series. These variables are: challenge, focused attention and clear goals and feedback. These three variables were interpreted under the three dimensions of web design. These dimensions are aesthetic, emotional and functional and were listed from reviewing the literature. The model for

experience-centered web design is then constructed by describing each variable applied to each dimension.

In addition, this paper discusses some of the preliminary applications of the model. In the emotional dimension the web design concept is delimited. It is suggested that this concept is the result of the analysis of the organization/client. Furthermore, the aesthetic dimension observed that application of the design principles and gestalt can intensify the interface challenge because these principles influence on interface visuals. Also, interactivity is designed at this dimension.

The model suggests that usability is treated by the functional dimension where the clients' and users' needs are specified.

Future works suggests that the model be tested outside an academic context.

Finally, this paper expects that the model can be applied in different experience-centered design. It seems that the creative process per se can benefit with the model, which opens a vast gamma of applications, from creating graphic design, promotional, editorial, and informational as well interaction design. But other studies are necessary.

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