

Perceived usability: How Computer Interaction Design is Informing Product Design

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Abstract

Computing is providing a great deal of information in regards to interaction design and in particular the connection between emotion and perceived usability.

In 1995, Masaaki Kurosu and Kaori Kashimura gave a short paper at the Conference on Human Factors in Computing Systems, documenting research that strongly indicated the positive effects of aesthetics on apparent usability, after studying different layout controls for ATMs. These findings were repeated, and with more profound results by a doubting Israeli scientist Noam Tractinsky (1997) who felt that the original research may have suffered from a cultural bias. Designer and psychologist Donald Norman in 2004 devoted a chapter, entitled 'Attractive Things Work Better' in his book 'Emotional Design: Why we love or hate everyday things' (2004) where he contends that positive emotions aid in the decision making process that are critical to learning, curiosity and creative thought.

This paper will provide a critical review of human factors research and practice into computer interaction design. In particular it will focus on the user's emotional state and perceived usability and how it can inform product design. The links between: pleasure and happiness; aesthetics (style, beauty, attractiveness); self confidence in the user and usability will be discussed.

Introduction

As a product designer I am forever on the lookout for the key to the understanding of how and why the user reacts to what we design. Our knowledge and the understanding of usability in product design is quite sophisticated, as it is in Human Computer Interaction design. A look through a well worn addition of the 'Human Factors Design Handbook', (Woodson, W. E., Tillman, B., Tillman, P., 1992,) the Bible (or the Koran) of ergonomics, will attest to this. However, the influence of emotion on usability, is not mentioned. It is only alluded to in the context something that might influence the potential buyer after the real decision has been made about its functionality.

Donald Norman (2004) and Patrick Jordan (1998 & 1999) provide the product design profession with the best information on the role of user emotion and its affect on usability but they seem to be the very few authors discussing this in the context of product design. The need to fill this void is highlighted by Norman's (2004) assertion that the emotional element of design may be more critical to a product's success than its practical elements, due to the part played by the brains visceral processing level, which he feels that is given little importance. He says,

Visceral design is about the initial impact of a product, about its appearance, touch and feel.

I have had many conversations with my fellow Multimedia colleges in our Design Department that alert me to the fact that usability is a major issue in the digital world as it is for product design. If you were to make a quick search on usability, results would support this notion, and in particular the connection between emotion & perceived usability by computer interaction designers. More research is

needed to evaluate the emotional dependent aspects of human nature that influence usability such as pleasure and happiness; the benefits of creating a challenge and having fun; aesthetics (style, beauty, attractiveness); and self confidence in the user. It is the intention of this paper to form an overview of the emotional issues that should be of interest to product designers in regards to their influence on usability. I am constantly impressed by the flow of research that emanates from the field of Human-Computer Interaction and I believe are worthy of further investigation by product designers.

Pleasure and happiness

Human Factors specialist, Patrick Jordan, (1999), has discussed form and aesthetics in terms of the component of a design that can provide pleasure¹ or produce a special bond with the user. Products such as the Volkswagen 'Beetle' and the Harley Davidson motorcycle are such examples that provide more than just their overt task of being a mode of transport. Is this due to their uniqueness? The pleasure component can be a powerful contributor to the bond that is created between the artefact and the user. Product designers captured this uniqueness in the new Mini, a sales success, a design that that Donald Norman (2004, p6) says, *It is fair to say that no other new vehicle in recent memory has provoked more smiles*, furthermore the new (2007) Mini barely looks any different from the previous 'new' Mini. It is a case of if you get the aesthetics right, it makes you smile and feel happy, don't change it!

Another psychologist Alice Isen (1993) has shown that happy people benefit from thought processes that foster creative thinking, curiosity and learning. The stimulus for this could also be relatively small, just a very small gift, a bag of sweets or even watching a few minutes of a comedy. Feeling good resulted in improved brainstorming and the ability to examine multiple alternatives as opposed to concentrating directly on a single option (narrowing the thought processes) which is generally useful for situations, such as escaping danger. The emotional component can be so strong that it might cause us to overlook an artefact's poor usability. To complicate the issues of usability even further you might want to consider the challenge of mastering a difficult instrument such as a violin or a guitar. Satisfaction results from producing entertaining music after persistent practice. Another example of this is computer games.

Appealing aesthetics helps provide confidence and creatively thinking which lead to a better interaction on the part of the user.

Aesthetics (style, beauty and attractiveness)

Product design has a habit of separating usability and aesthetics during the concept development process. Aesthetics being described as appearance, style, attractiveness or beauty and that which can attract the potential purchasers eye. The understanding of the emotional impact that aesthetics has on the interaction of the user with the artefact seems to be only a little better than complete ignorance. Perhaps this should be of no surprise when if you were to take a quick overview of product design courses, there is little evidence of curriculum that makes the connection between aesthetics and functionality. What there is only discusses it in terms of the balance rather than how it can positively influence usability and why. Other discussion is in terms of semiotics where no connection is made with usability or functionality. This at best provides an interpretation of the meaning conveyed by an artefacts visual elements, but it sidesteps the user interaction at a cognitive level (the understanding of

¹The four pleasures he describes are: physio-pleasure, socio-pleasure, psycho pleasure, and ideo-pleasure.

the stages that are required to affect a result). Furthermore it avoids any understanding of the complete interaction that includes perceptual motor and emotional skills (Overbeeke, et al, 2003, p8).

In 1995, Masaaki Kurosu and Kaori Kashimura gave a short paper at the Conference on Human Factors in Computing Systems, documenting research that strongly indicated the positive effects of aesthetics on apparent usability, after studying different layout controls for ATMs (electronic teller machine). Interestingly their motivation for their study, at the time, seemed more to do with increasing the market appeal of ATMs rather than attempting to improve usability of the interface. The rational being that if users weren't attracted to the ATMs GUI in the first place then it really didn't matter how good it was because no one would want to use it. The experiment used computers to emulate ATMs. Those who took part in the research were: three secretaries, nine GUI designers, eight engineers, and six industrial designers.

For product designers the results of this research has obvious application in the development of controls and feedback for products from DVDs, electric irons to mobile phones. They all require input from the user to set them up correctly for a particular task and the user needs to be periodically updated on the status of these actions.

Some of the results from this experiment documents cognitive efficiencies strategies, such as:

Glance sequence: the main display should be place at the upper left corner, because the user may start to look at the screed from there then may go down right. Because the main displays are showing information that is necessary for the subsequent operations, it should be seen by the user first in the total operation sequence.

For product designers this seems to fit with research that the power 'on' button for an electronic product should be optimally placed in the top left corner. This also relates to the best sequence of operations.

Familiarity (over efficiency): The layout of the numeric keys (referring in this case to those on the ATM), that were found to have the highest usability were those like a calculator, i.e. 1, 2, 3 top row line, as opposed to the standard calculator or computer keyboard, i.e. 7, 8, 9 top row.

This mirrors the product designer's experience of typewriter letter key layout (which carried through to computer keyboards) of the preference for the 'qwerty' layout as opposed to the 'Dvorak' key layout

Grouping: Keys should be grouped according to their functions.

To product designers and ergonomisists this is referred to as modularity.

In some respects, while the researchers have put the improvement of usability down to aesthetics they may also be due to good organisation and modularisation of the controls and feedback. More conclusions were made but the above illustrates the bodies of knowledge on usability that are key to both areas of design.

These findings were repeated, and with more profound results by a doubting Israeli scientist, Noam Tractinsky (1997) who felt that the original research may have suffered from a cultural bias, that being Japanese. His experiment was conducted to test the relationship between the users perception of a computer system's (as he called it) beauty and usability. Again the system used computers to emulate ATMs. The analysis showed that while the systems aesthetics affected perceptions of good usability, the degree of actual usability was not affected, pointing to the probability of an emotional component affecting usability. The finding once again points to the importance of aesthetics in the GUI and human-computer interface (HCI) design. The product design's equivalent is the human-machine interaction or controls and feedback.

Tractinsky (2004) says

For me, the inquiry into the role of aesthetics in HCI has been—how symbolic—a struggle between logic and intuition. The logic of the HCI field (with very few exceptions), has marginalized aesthetics, often viewing it as standing in usability's way. Intuition, however, based on my own experience and informal observations, had suggested otherwise.

Before this he had already coined the phrase 'beautiful is usable' (Tractinsky, et al, 2000), however he clarifies this on reflection saying that they were actually aiming to disprove such an equation. They found that the unavoidable conclusion was that something was going on between user's perceptions of the systems beauty and their perceptions of other system attributes. He came to the opinion that this is where logic and intuition have started to converge.

Designer and psychologist Donald Norman in 2004 devoted a chapter, entitled 'Attractive Things Work Better' in his book 'Emotional Design: Why we love or hate everyday things' (2004) where he contends that positive emotions aid in the decision making process and these are critical to learning, curiosity and creative thought. Supported by: Isen, (1993) 'Positive Affect and Decision'. Norman contends,

Emotions, we know change the way the human mind solves problems – the emotional system changes how the cognitive system operates. So, if aesthetics would change our emotional state, that would explain the mystery.

Other researchers such as Hassenzahl, (2004) however, claim that perceived usability should be regarded as a bundle of low-level product attributes (p. 323). He goes on to claim that ordinary users cannot integrate specific usability elements into holistic judgement

Self confidence

This brings in another interesting area of research conducted at the University of Zaragoza in Spain (Flavián, et al, 2006), that investigated the influence that perceived usability had on the users loyalty to the websites that they visit. This team found a further benefit, that is the addition of self confidence and with it, customer loyalty:

Usability is related to consumer ability to know where he or she is at any time and what can be done. Self-confidence may be defined as a consumer feeling of security and ability about his or her decisions and behaviours (Bearden, Hardesty and Rose, 2001) thus we may establish a clear relationship between usability and self-confidence. Greater usability offers more security to website users. In addition, greater self-confidence might improve consumer trust in the website.

Further insights on usability are emanation from web design. Author Steve Krug (2000), a usability consultant for companies such as Apple and Netscape dispense with the 'academic speak' and provided a strait to the point helpful hints on usability design born out of many years of personal experience. He provides a refreshing body of knowledge in the area of HCI that can be applied to product design.

When we're creating sites, we act as though people are going to pore over each page, reading our finely crafted text, figuring out how we've organised things, and weighing their options before deciding what to click.

What they actually do most of the time (if we're lucky) is glance at each page, scan some of the text, and click on the first link that catches their interest or vaguely resembles the thing they're looking for. There are usually large parts of the page that they don't even look at. (Krug, 2000)

This experience of user interaction mirrors that of product (appliance) design. Unfortunately product designers foolishly also gravitate towards a multitude of actions and distracts for the user to wade through, called 'featurism', by Donald Norman (2000), which was mentioned previously in reference to over-featurism. Product designers also believe that the user is prepared to methodically work their way through a user manual!

Steve Krug suggests three simple facts to take when designing web pages:

- Users scan & tend to use as little time as possible, looking for words or phrases that catch their eye.
- Users don't make optimal choices, they satisfice, that is they choose the first reasonable option.
- Users aren't necessarily intent on finding how things work, and again we are reminded that they don't read instructions, they will just muddle their way through.

I would like to conclude with a quote from Noam Tractinsky

The unavoidable conclusion was that at least something is going on between user's perception of the system's beauty and their perceptions of other system attributes. This where logic and intuition have started to converge.
(2004, p351)

Product design needs to take the point that something more is happening between logic and intuition if it is develop further the issues of improving the usability in their domain.

Computer interaction designers are already highlighting many issues that product design needs to follow up with specific research to find out what is really going on.

Conclusion

Product designers are creating an overwhelming diversity of appliances and electronics products that are supposed to save time and produce better outcome but wether they are designed to improve the experience of the interaction with the user is an issue of concern. At this point in time there does not seem to be a consistent acknowledgement in the literature reviewed for this paper that perceived useability can influence an interaction. There are many examples of research concerning this issues that emanate from Human -Computer Interaction design. Including issues that impact on the perception of usability such as: pleasure and happiness; the benefits of creating a challenge and having fun; aesthetics (style, beauty, attractiveness); and self confidence in the user. This research can be used to inform product designers in their pursuit of improving useability however more domain specific work needs to be done.

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Biographical Notes

Martin is an academic at the Department of Design, Curtin University of Technology where he has lectured predominantly in Product Design and been a past Course Coordinator. However he has also been a past Course Coordinator for the Human Environment Design, Fashion and Textile Design and co-written new teaching developments for these and the Jewellery Design programs. Martin was instrumental in introducing new curriculum and creating a focus for the Product Design program in the areas of computer modelling, human factors and user-centred design.

His current teaching and research interest is in the area of human factors and in particular how it relates to the design of products and optimising the user relationship.