HUMAN COMPUTER INTERACTION- UNDERSTANDING USER CONTEXTS

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Abstract— With technology advancing at an unforeseen rate, technology products are finding their way into every aspect of human lives and have taken up a large variety of forms. However, along with technology, the user base has also become varied. Different users come from different backgrounds, have different experiences and perceive a product in different ways. They have different requirements and expectations from a product. Hence, their acceptance of a product varies. In order to improve the acceptance rate, an innate understanding of the user is necessary. Since it is impossible to personalize a product for each customer, users are grouped into broad categories such as on the basis of age, previous experience with computers, or even on literacy level. Studies are done to understand the context of each category and products are designed to suit those contexts.

Keywords—Human Computer Interaction, User Context, User Interface, User Experience

I. INTRODUCTION

The relationship between a human and computer has been a tumultuous one. It started when computers were first invented, with the ENIAC (Electronic Numerical Integrator and Computer) which occupied 1800 square feet and weighed 50 tons, to the modern- day Apple Watch which weighs a mere 50 grams. Computers are now used for a wide variety of uses, from scientific computing to basic daily chores. Humans interact with these computers by means of an interface. The human puts some input at the interface, the computer performs calculations internally and conveys the output to the human by means of another interface. This interaction between Human beings and Computers is now being termed as "Human Computer Interaction". This interface marks a sharp boundary between human and computer and hence as technology develops and human psychology undergoes shifts, this interface has become the focus of design challenges.

II. ORIGIN AND CONCEPTUALIZATION

In earlier times, the only people interacting with computers were technology professionals and technology hobbyists. Computers were complex to understand for the common man. They were also extremely expensive, making them unaffordable for daily use. However, the introduction of the personal computer in late 1970s disrupted the entire scene and computers started making an appearance in households for the first time, hereby making everyone in the world a potential computer user. This brought into light, the deficiency of these computers in aspects of usability, for the people wanting to use it in their daily lives. Hence began the study of Human Computer Interactions.

Cognitive science as a subject which incorporated Cognitive psychology, linguistics, cognitive anthropology, artificial intelligence and mind philosophy was gathering momentum around late 1970s. (John M. Carroll, 1995) Just around the same time there was an explosion of personal computers in the market and a dire need was felt for greater knowledge and research on human computer interactions. The cognitive science studies presented answers to the engineering teams studying usability. These diverse forces of need and opportunity converged around 1980 and amalgamated science and engineering aspects to create an interdisciplinary project called "Cognitive Engineering". This was further fueled by analogous developments in technology and design areas adjacent to or overlapping HCI (Human Computer Interaction).

HCI has been expanding steadily for three decades now. It is a means for professionals from varied disciplines and semi-autonomous fields of research (such as information technology, psychology, communication studies, cognitive science, information science, design, science and technology studies, geographical sciences, management of information systems, industrial engineering, manufacturing engineering and systems engineering) to come together and incorporate diverse concepts, approaches and paradigms into vibrant and productive intellectual research.

III. IMPORTANCE OF STUDYING USER CONTEXTS

User Experience is the overall experience of the customer when he uses the product. The product can be anything, from a computer application or website, to a phone app, to even an interface of a treadmill machine. It is a study of the easiness, intuitiveness and pleasing aspect of using a computer. Users come from a wide variety of backgrounds and have different levels of knowledge when it comes to the product. Using a product is an experience and each user perceives and uses the product in different ways. It is impossible to take into account all these differences; hence users are classified into broad categories or contexts to help ease study and research. It is very important to understand the audience that the product is catering to, and what are the core characteristics of the intended audience, along with their idiosyncrasies. It is of utmost importance that the user does not feel any discomfort or confusion while using the product. If a product interface is poor or degrades the experience of the user, the user will tend to stay away from it. This will impact the acceptance of the product and hence affect its business value. Therefore, it is necessary to understand users and their contexts.

IV. USABILITY OF A SYSTEM

When designing a user interface, the needs of the user and the purpose of the interface should be considered (Shneiderman & Plaisant, 2010) and the interface should empower the user to achieve the goal of the software (Nielsen, 2005). Schneiderman (1987) mentions eight "Golden Rules" of interface design: Interfaces should be consistent, suit different types of users, provide informative feedback, indicate completion of actions, prevent user errors, permit actions to be reversed, minimize cognitive load and allow the user to feel in control.

The following factors can be considered while designing an interface to ensure that the product scores high when it comes to usability.

1. **Effectiveness:** The completeness and accuracy with which the user can achieve his intended goal or purpose.
2. **Efficiency**: The resources required to achieve the required goal in terms of cost or time.
3. **Simplicity:** The less confusing and distractive the site is, the simpler it is.
4. **Customizable:** The extent to which a user can customize the interface to suit his needs or ease of use.
5. **Stable:** The design stays the same or similar. Hence user does not have to get used to a new view of the product.
6. **Consistency:** The design stays consistent throughout the product.
7. **User Satisfaction:** The satisfaction of the user after using the product.

V. TYPES OF CLASSIFICATION OF USERS

Users can be classified in numerous ways on the basis of various factors. This classification is required to do a more streamlined and directed study of the users in a particular group to understand them better. This study explains three types of classifications on the basis of Age, on the basis of Literacy Levels and on the basis of prior-experience with computers.

1. Age-Based Classification

The users can be classified on the basis of the age group they fall into. They can be the "Teens or Young Adults" (0-30 years of age), or the "Middle Age Adults" (30-60 years of age) or the "Senior Citizens" (60+ years of age). The young adults have been born and grown up in the age of technology. They are more knowledgeable and fluent with the use of computers. They find it easier to use computers and are able to find their way about the most poorest of interfaces due to previous knowledge and general know-how of the use of computers. The Middle-Age Adults are have seen the start of the technology age and the advent of the use of computers. They may/may not have learnt and kept up with the technological advancements, hence they have a lesser level of fluency when it comes to computers. Senior Citizens have seen the first computer and the growth of the computer to the present life. They are usually the poorest users of computer and the least fluent. There is also a high level of doubt and suspicion amongst these users when it comes to software and computers which further impacts their acceptance of the product.

2. Literacy-level based Classification

With the advent of technology and the common man adopting the use of computers, a wide variety of machines and products have come up catering to a wide variety of users. However they must keep in mind that some users are well educated and will be able to find their way around a product or application. However a portion of the users are also people without education or experience in using a similar product. People with low literacy generally make sense of text by reading word by word, which might hamper their understanding of the system. In this situation including more pictures or audio clips might help them understand the product better. With the movement of Government and Social Service information to online distribution, digital inclusion will require designers to consider the problems faced by low literacy users (k.Neesha, 2009). As information technologies move beyond the realms of the personal computer, the designers will have to take Literacy-Level of the audience as a major aspect in their user-research (K.Neesha, 2008).

3. Experience-with-Technology based Classification

The previous experience a user has had with a computer also dictates how easily he will be able to navigate through a new product, since he is already familiar with the common signs and terminologies used. For example a new user with minimal previous experience of using a computer might find it hard to use the mouse or keyboard, or he might not understand the meaning of various icons on the screen, or how to navigate through the application. The experience-level does not necessarily go hand in hand with the age or literacy level, as we can have a young user with far greater experience than an older user, or a less literate user, like an office peon, who uses the computer more in his day to day life than a more educated person such as a biology professor. If handed a new application to use, chances are that the peon will be able to navigate his way around much easily than the professor. The previous experience a user has had with a computer also dictates how easily he will be able to navigate through a new product, since he is already familiar with the common signs and terminologies used. For example, a new user with minimal previous experience of using a computer might find it hard to use the mouse or keyboard, or he might not understand the meaning of various icons on the screen, or how to navigate through the application. The experience-level does not necessarily go hand in hand with the age or literacy level, as we can have a young user with far greater experience than an older user, or a less literate user, like an office peon, who uses the computer more in his day to day life than a more educated person such as a biology professor. If handed a new application to use, chances are that the peon will be able to navigate his way around much easily than the professor.

VI. CREATING A PERSONALIZED DESIGN

After ascertaining the context of the users, the following factors can be used to design an application or product to suit their needs (Oon Thiam Thek):

1. Memory of User

Aging brings with it certain levels of memory loss. This makes it difficult for the elderly to carry out relatively complicated tasks or trace back their previous action. According to a study, elderly people had the most problems with tasks requiring more than three clicks (Mead, S.E., Spalding, R.A., Sit, B.M. and Walker, N., 1997). Hence they found it difficult to form a conceptual model while learning to use the computer (Zajicek, 2001) or to remember the steps to execute to achieve an end result. On the other hand, the younger users are quicker in learning and are able to retain the knowledge for a longer time. Therefore the cognitive load on the user should be adjusted appropriately according to user context. For an older user base, cognitive load should be minimum by keeping only relevant and required elements on the main screen and putting additional information on other screens.

2. Visual Input

Some people have vision problems. For others, vision degradation occurs with age such as difficulty in focusing on smaller text or images, issues in resolving images, inability in distinguishing colors and a reduction in the ability of the eye to adapt to light change (Christopher.P.). This causes issues when using applications on the computer requiring them to focus on tiny figures or text, or color based choices where the colors are similar.

3. Auditory Input

Similar to the visual sense degradation, many human also face an issue of reduction in sensitivity of their ears. Hence an auditory response to user input might be missed by such users. For such users, it is preferable to have visual feedback or haptic feedback to their inputs.

4. Motor Coordination of User

Motor senses degrade with time. Elderly users have trouble with small movement, precision clicking, quick responses or mouse movements etc. Hence in such scenarios, a fair amount of time should be given to the user to respond, response should not require the user to perform complicated actions, and the options to click on should be sufficiently large and have sufficient space between them, to avoid the need for precision clicking.

5. Psychology of the User

The younger generation have grown up around computer and are more familiar with them. They are more willing to explore computers which is very important when it comes to learning computer technology. The older generation however are very cautious in their approach. They are often discouraged by the cyber-crime incidents in the media. Also most media advertising feature the younger generation using computers which leads to a further feeling of disconnect. (Zajicek,M., 2001).

VII. OUTCOMES AND CONCLUSION

Each user is unique, comes from a different background, has had different experiences and perceives a product in different ways. To make such a varied base of users accept a new product is a difficult and daunting task. However, categorizing these users, understanding the context of each category of user and designing the product to suit that context, gives us a better chance at having the product accepted without much problem. Hence this paper explains the broad customer categorizations we can do, and how we can build tools for that particular user category.

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