

STUDY ON USER INTERFACE DESIGN TO INCREASE SOFTWARE USABILITY

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Abstract— This article reviews how the user interface of a software can increase the usability of the software by helping all kind of users without consideration of age. Users can be divided into several categories. This article focuses how to design an interface that is suitable for all these users. The problems faced by the different set of users are concentrated here and the solution for those problems have been tried to be figured out on the basis of several previous researches. Then the common issues of all the users is discussed and based on that principles to satisfy all the needs is concluded. The difficulties faced by the users with physical impairments is also taken into consideration and the a study on the previous researches to overcome their issues is made.

Index Terms—User Interface, Usability, User Group, Users With Physical Limitations, Common Issues.

I. INTRODUCTION

Quality of any software is basically judged by the users with its User Interface (UI). If an user feels difficult to understand an Interface then the software not useable for him. Nowadays software usage is increasing a lot with the increase in computer users. It is not easy to satisfy goals of all the users. There will be different generation of people using the computer. Each generation has its own set of negative and positive. There may be several users for a software who don't even have any computer background. An Interface should reduce the difficulty of any software usage for any kind of users and provide an useful environment making software easy Nielsen (2003). There will be several expectations on the Interface few would want in to be funky and few as a professional looking software. The usage of the software is strongly depending on the Interface of that software. According to Wagner (2002) if the Software Interface is designed without concentrating on the user ability then it will make user confused and creates many problems and makes the software not useable. This study consists of 5 parts The first part reviews the difficulties faced by the elderly users and the solutions based on researches. Second part deals with issues faced by children and the solutions proposed. Third part is on the Teen and Adult users. Fourth part focuses on those who have physical limitations. Finally a comparison on the issues and solutions is made to propose a solution to design an interface which will be suitable for all types of users considering their mental and physical disorders.

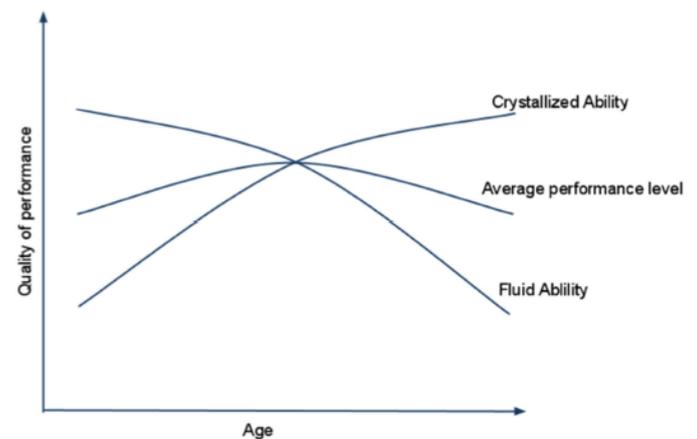
A. User Group

The computer users are increasing in numbers day by day. According to Ali Darejeh and Dalbir Singh(2013)

age of the user has a straight relationship with the software interface and usage. They can be easily differentiated on the basis of their age group into 3 types.

- (i). Child Users
- (ii). Teen User
- (iii). Adult Users
- (iv). Elderly Users (Old aged)

The following graph points out how the performance varies with the age. (Horn, 1982)



Due to the experience gained the crystallized ability is increasing with age. But the logical thinking and other related Fluid abilities decreases with age. Small children are not considered in this graph.

II. DESIGNING FOR CHILD USERS

Nowadays Children are growing up as a very important group of users of computer and software. The major goal of this group when using any software is only education and entertainment not for any productive purpose. The normal user interface which are adult tools are not suitable the needs of this group.

A. Issues

The primary problem of children is their understanding capacity and literacy. Some interface assumes that user is strong in vocabularies but in this case that assumption fails. Younger children are not even with little skill in vocabulary. There are several interfaces using text inputs for several purposes like searching but as we know children are *creative spellers* and with this the text inputs are considered as a very big difficulty. According to [Druin et al] text based query interfaces are insufficient for child users. It is not easy for them to understand all the things displayed as text even the guidance in text format seems to be difficult to understand. They have a very big difficulty with query based searching, they are not even able to guess what key is used to search. Memory power of children is also very low with this if the

interface is using several steps to complete any process then they are not able remember all the steps to be taken. Even if the guidance is given in several steps remembering all those is not easy for them. Due to their physical size the motor usage is difficult [Hann L, Inkpen K], controlling mouse is not easy for them. Double clicking is also sometimes a difficulty for them it is that they may click the wrong option second time. Drag and drop is not easier for them, they drop at incorrect positions. They are really impatient they just need the reaction for their work as soon as they complete it otherwise they will repeat it for several times. They are with very low level of interest and the text or formal interface frustrates them a lot. They get bored soon with the normal interfaces.

B. Solutions

- When an User Interface is designed for children then it should be with very simple and easily understandable design and contents as their intelligence is not yet grown up to elders level.
- Avoid using text more to make them understand as they are weak in vocabularies and [Steiner and Moher] discovered that using graphical metaphor is very useful for children.
- Using graphic based search is very useful for child users to find what they want [Druin et al].
- As they need their action to be reflected very soon the quicker reaction is necessary [Resnick et. al. (1998)].
- Do not use any reading manuals or reading contents more.
- To overcome their memory problem [Danesh et al] points the need for instance guidance which supports children through necessary steps to reach their need.
- Avoid using drag and drop and give same function for both the mouse buttons.
- In order to attract the children to use the software use the animations and sounds which may attract them.
- To avoid the wrong selection by them add animations and sounds to the proper option which attracts them to use that option.

The main advantage of the children over the elderly persons is that their imagination power is very high. [Strommer's "woodvisit"] discovered that children are getting more involved to the environment of the software they using and they feel themselves inside that environment. According to [Rader, Brand, Clayton] children expect the objects in the software environment to reflect the same properties of that object in their real world. The usage of smaller objects and objects separated by short distance should be avoided. Colorful animations and attractive sounds in the interface will surely attract the children using the software.

III. DESIGNING FOR ELDERLY USERS

Unlike the children the older people are very patient and slower. According to Weile et al (1991) when people grew older some cognitive changes occur and not in a positive

manner. According to Wirtz et al (2009) elder people require more textual guidance in the interface which is helpful in performing the task required. They are not bored with texts they prefer reading textual guidance or manual more to avoid the mistakes in prior. It is not easy for the young designers to understand the needs of the elderly users. They are very patient and they need all the guidance that might be provided for them before starting a task.

A. Issues

The major issue that is faced in developing an interface for the elderly users is that the ageing reduces some attributes such as vision, memory, muscle strength. As their memory power is low they are not able to remember all the things that they have to remember while performing any task. There are few cases in which the user's muscle may not even let him/her to use the mouse or touch pads efficiently. Some of them have very poor visual power and so they might have difficulty in differentiating the objects and understanding them properly. Most of the elderly people are very much afraid to take risk with the error messages. They think that they may create any problems so they tend to perform their task very carefully. According to Xie (2003) elderly users are not able to adapt themselves to every interface design due to their low computer background. They are not ready to take any risk with their imagination. According to Smith (2001) the elderly users do not interact much with the interactive interfaces, their age restricts them from providing spontaneous reactions. Czaja (2007) says that elders faces difficulty in using the new products and it is as that they are not able to understand the changes or the new features in the interface of that software. They do not have a great attention to the software and any spontaneous change in the interface will confuse them. They should be clear with what is happening and according to Reddy (2009) they take more time to recover from their failures and get anxious on complex tasks.

B. Solutions

- Their memory is low so help with the manuals and guidance to perform their tasks.
- Using mouse might be difficult sometimes so use touch panel interface even in that a problem persists which is that they feel difficult with closer objects to be selected so use objects separated with some space.
- Their visual capability may be a trouble in designing a suitable interface for them, so it is better to use large icons with space between each.
- Sometime they are afraid to take decisions with error messages so help them clearly understand the problem and the solution for it in an easy manner.
- The design is preferred to be simple and clear in order to make them understand it clearly.
- They are feeling difficult to deal with the new products due to change in interface but for that interface design can not be kept constant for all the products so it is better help them with the clear guidance and tips.
- They get anxious on complex tasks so the design must be in a way giving a feel that the task is not so complex.

According to Demiris et al (2004) there is no evidence that the elders are avoiding the new technologies or not interested with new products. It is just that they face some problems with those software. They will be very much interested to use them if the interface is developed more clearly by the software designers.

IV. DESIGNING FOR TEEN AND ADULT USERS

Teen and adults are similar in several attributes the main thing is that both are goal oriented and they will not be using any product aimlessly. Adult users uses computer mostly for productive purpose, most of them would prefer a professional interface design. Teens have more kinds of goals than adults.

A. Issues

The major problem faced when designing an interface for Teens or adults is that both of them has lots of complex goals and needs more options which helps to have a short way to accomplish their tasks. Teens expect the overall interface design to be as he/she requires. Both teen and adults sometimes think that they know everything about how it works but it can not be true all the times sometimes the software may prove not to be as they assumed or guessed it will be or it is. They get bored with textual contents and they will be frustrated to do same process repeatedly. Many researches have showed that the teen users differ from others in the fact that they are more socially focused. They are over confident on their knowledge which often results in small unexpected mistakes. According to Hoa Loranger and Jakob Nielsen (2013) teens are confident in their web abilities, but they perform worse than adults. They need more options available in the interface and are frustrated by childish animations and sounds. Most often they need their works to be done very sooner and so they might even use several shortcuts, it means that they are likely to have shortcuts for their works especially keyboard shortcuts.

B. Solutions

- The interface design should be in such a manner that it avoids wastage of time and provides a simplified usage.
- Interface should be configurable by the user.
- Putting customization ability for font, color and size.
- Interface should provide the guidance but not in a textual explaining type it just has to guide in a simple way.
- Usage of Animations and sounds should be minimized.
- They don't like to repeat a same task often so providing them with shortcuts will be useful.

V. INTERFACE FOR USERS OF ALL AGE GROUP

Considering the above stated previous researches we can conclude that all that users might have some similarities in the interface required. With the help of those similarities the designer can create an interface which will be suitable

for all the users. The principles for designing such interface can be as follows,

- Reducing the complexity of the interface by eliminating the unnecessary things.
- Using very small icons and objects should be avoided and larger icons should be preferred.
- Putting customization ability for font, color and size.
- Using textual guidance to help the elders by providing guidance more in come operations, but the textual contents should be optional as it may frustrate teen and children.
- Using animations and images will attract children but may irritate some users especially teen users so try to reduce the usage of childish animations and use attractive avatars.
- Reduce the complexity by using only the easily understandable words.

There will be several users with no computer background they can not understand any technical terms so the usage of technical terms have to be avoided and instead clearly understandable words providing same meaning can be used. Table 5.1 (Hoa Loranger and Jakob Nielsen) shows how the users of different age group differ from each other.

Table 5.1

	Hunting for things to click	Scrolling	Search	Patience	Animation and sound effects
Kids (3-12)					
Teens (13-17)					
College students (18-24)					
Adults (25-64)					

Key:

Enjoyable, interesting, and appealing, or users can easily adjust to it.

Users might appreciate it to some extent, but over use can be problematic.

Users dislike it, don't do it, or find it difficult to operate.

With the help of this table the designer can understand the interface design needed for all age group users. There are few features in this table which has to be considered even when designing the interface for computer software. Patience is the key factor to be considered when designing the interface and the customization of font, size and color is required. It is very important that the interface should avoid

the searching for tools available. When an interface is acceptable by the users of all age group then surely the usability of that software is very high.

VI. DESIGNING FOR PHYSICALLY LIMITED USERS

Normally software is designed for all user groups. But there is also another user group which needs some additional interface due to their physical limitations. Many research activities have focused on design that aims to produce universally accessible system that can be used by every one regardless of physical and cognitive skills. (Obrenovic et al., 2007).

A. Hands Free Interface

Of all communication channels through which information travels the vision provides a lot of information as it may make us understand human actions and gestures which is analyzed and implemented (Turk, Kolsch, 2004). According to Bradsky and Tegama (1998) face recognition using webcam is really a helpful method to transfer the information. The major difficulty faced by those physically disabled persons is handling the mouse or any such physical components to select things. Many research works have been done to find solution for this kind of problems. Then the researchers started using head location through webcam. Morris and Chauhan (2006) presented a system for cursor control using webcam but it faced several problems with low quality images in webcam. Kjeldsen (2006) made a study and as a conclusion he presented an accurate cursor point control that takes human motion in consideration dynamically and gives a smoother motion estimation. There are several other works carried out dealing with the facial gestures to provide some important interface.

B. Overcoming Visual Impairments

Interface designers has a lot to do with the visual impairments. In this case the guidance provided by Stephanidis et al. (1998) and Chiang et al. (2005) helps a lot, they are as follows,

- (i) Creating software in the way that could be read easily by screen reader software,
- (ii) Putting the ability of zoom in our software,
- (iii) Putting speech recognition for interacting with software and
- (iv) Putting customization abilities in software for tailoring font size and color.

Madih and Hisham (2010) carried out a research on children with partially sighted vision and concluded that they have their own preferred font-type, font size, background color, font color. An interface to overcome this partial visual impairments need to focus on this preferred type and make it useable. People with slight visual impairment can be helped by providing zoom in supported interface but the blind users can not use this so they should be provided with voice interface, speech output is used. Colorblindness problem can be solved by using only the distinguishable colors and should not use the identical colors.

VII. CONCLUSION

Previous researches helps to conclude that if an interface is to be useable for all kind of users then it should satisfy the essential need of all the user groups and especially it should also focus on the physically limited users. An interface suitable for all age grouped users is also suitable for users with physical limitations by providing some more technologies to provide the path for them to interact. According to Demiris et al. (2004) there is no evidence that elder people resist new technologies. However, they would be more willing to use them if software designers try to design more appropriate interface (Goodman and Lundell, 2005). The important principles to be remembered when designing an interface is that (a) Interface should be of reduced complexity with understandable texts, (b) Using limited required animations to help the users and attract them but more funky animations may sometimes not be appreciated by users, (c) Customization of font size, color and type are required to help the user have their own style to interface, (d) Scrolling should be used only if required, (e) Try to avoid textual searching use only when required, (f) Larger components and fonts may help many users. An interface that is designed with consideration of the principles observed stated can help all kinds of users. We could solve the problems of the users when using the interface by designing the interfaces based on the principles stated and the interface should provide less time to complete the required work. It is not sure that all the user will use all the facilities or options provided by the software but the interface should make the user understand all those options available easily. A good interface leads the user to use the software more and efficiently.

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