ANALYSIS OF DESIGN PRINCIPLES FOR ENSURING USABILITY AND ACCESSIBILITY ON INTERFACE DESIGN

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Abstract: The people are interacting with the programs used in many devices like mobile phones, computers, ATM machines, kiosk…etc. The people interact with these devices in different manner[1]. The accessibility and usability[3] are important for the user to interact with the program. The accessibility is considered with the user’s ability, skills, knowledge. But the usability is considered with the user friendliness of the system. I did analysis about design principles which are significant for designing windows applications and web applications that ensures usability and accessibility in the interface in this journal.

Keywords: Design Principles[1], Interface Design[8], Accessibility[9], Usability[5].

Introduction on accessibility

The accessibility[9] is making systems adaptable to users based on the user’s skill and competences. The programs used in the devices must satisfy the user. The design and development of accessibility in the software applications are important for user to select the device for his own use. The developer creates many interactive applications[2] for computer, mobile, ipad…etc. Some interactive programs are designed to use in many devices for the interaction.

Introduction on usability

Usability[7] is a field that is considered with generally making computer interfaces with user friendly. Usability is tested by the right users for effective interaction of interfaces. It is an evaluating the following goals in the interface.

Usability goals[7]: Effective, Efficient, Engaging, Easy to learn, Easy to remember and Safety.

The products which are used by human have the potential for usability problems[6] and the products are improved by finding the solution to the problems. The problems are identified by the usability experts by evaluating the products by users using usability evaluation methods[5].

Considerations for designing windows applications

Windows[8] is a WIMP interface which is familiar combination of windows, icons, menus and pointer. Some of the environment supports for designing windows applications such as visual basic, visual C++. Designing for windows applications is based on many issues of usability. The consistency[8] is the main issue. The following are some of the considerations when we make designing for windows applications.

- Menu Layout
- Ordering
- Dialogue Boxes
- Use of widgets
- Association of GUI

The following are some of the design principles which ensures usability and accessibility in designing windows applications.
Design Principles required interacting with windows applications[2]

a) Navigation
b) Visibility
c) Affordances
d) Control
e) Feedback
f) Flexibility
g) Error Recovery
h) Association of GUI

a) Design Principle: Navigation

Navigation[2] gives direction to user in the software system. Menus are the main form of navigation in windows applications. People move around the application by selecting items from menus.

Menus are placed in the screen. The user uses menu to select an item from a list of items. Most probably the items are placed in menu in some particular order. The menu bar uses horizontal and vertical order to display items and allows the user to select an item from the list of items. The user interacts with the menu by using the devices keyboard or mouse or pen. Sometimes he uses shortcut key or function key for efficient interaction.

Some of the items in the menu are graying out which are not relevant at a particular context depends on the usability of the functions. Some applications of windows uses iconic menu.

The different colors are used to different functions in the menu.

Many windows applications use wizards. The instructions are in the wizard step by step. The wizard uses back, forward, finish buttons to undertake operations.

Some windows application uses refresh button, stop button, back button, tree view control and popup menu for navigation.

Example for Refresh, Stop, Back, Previous Buttons

Example for Popup Menu

Example for Tree view Control
b) **Design Principle : Visibility**

The following are some other objects which provide visibility in the windows applications.

- Progress bar

![Progress bar image]

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State Bar
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c) **Design Principle : Affordances**

The user wants to see a menu at the top of the screen or bottom of the screen. He uses mouse move operation or click operation to display the items in the menu.

- Menu at Top

- Menu at Down

![Menu at Top and Down]

d) **Design Principle : Control**

This design principle is very important in all the windows applications. The application should be controlled by user. The users do many actions like open, close, exit, save, minimize and maximize.

Many windows applications save work automatically by recovery action if mistakes are made by people. Some windows applications need emergency exit action. Example

e) **Design Principle : Feedback**

The user has to understand the system feedback after his action. Feedback indicates the user to wait for a moment and the current status of the system. The windows applications use the following symbol for busy status. Some time it plays sound when the user clicks any button if the system is busy.
Egg timer

Circle

f) Design Principle: Flexibility

Flexibility[2] helps to the user for efficient interaction with the system. It is provided by allowing short-cut keys or function keys to initiate actions in the menu. The user can easily navigate in the system. Some people use their right hand more and some people use their left hand more for interaction with the system. Many windows applications allow the user to set their own environment to communicate with the system. The application provides tool bar and navigational bar. Some objects have auto-hide feature. For example the visual studio environments for the users who are using their right hand more.

g) Design Principle: Error Recovery[2]

System must have error recovery operations if the user does mistakes unknowingly. Some windows applications have the following error recovery operations.

- Undo
- Redo

Windows applications display error messages in the dialogue box. The error message has to be understandable by the user and the user has to know what to do next and how to give feedback to the error and what mistakes he done.

h) Design Principle : Association of GUI

The system must have consistency and standard throughout the application. The look and feel of buttons, textbox, label box and image should be different. The non-clashing of colors should be applied. Windows applications maintain consistency and standard for button, text box, label box. Some attention needs to be paid to the use of tables, graphs, text and image in the application.

Ensuring Accessibility on Windows applications

It generally means making systems as adaptable as possible by users for their own use. Accessibility is different for users.
(i) Designing an interface for older age people

The older age people have many problems on their focus in vision, cognition and co-ordination with interface. Some of the design principles\(^8\) are considered in the interface design for them.

The following are some of the design principles which supports for older age people vision.

- Left-justify printed text, using 12-14 point and Sans-Serif fonts (e.g. Arial) with short line lengths
- Avoid moving text (jumping around)
- Avoid glare and sudden changes in brightness
- Avoid the need for rapid shifts in focal distance
- Consider alternatives to using depth (via shaded buttons) for providing information

The following are some of the design principles which supports for older age people cognition.

- Avoid distracting extra detail or background noise
- Allow more time for learning & avoid making ‘unnecessary’ changes
- Reduce demands on STM by using recognition (menus, labels etc.) instead of recall (function keys)
- Use Lists instead of paragraphs

The following are some of the design principles which supports for older age people co-ordination with the interface.

- Avoid the need for fine control of mouse e.g. scrolling, drag and drop etc.
- Enable single clicking rather than forcing double-click, target tracking etc.

(j) Designing an Interface for children

Designing for children requires distinct usability\(^7\) approaches, including targeting content narrowly for different ages of kids. More attention needs to the specifics of how to design for children. Children use interfaces for education or entertainment. The interface must have some specific features which satisfies the children. Children are impatient and they expect feedback quickly otherwise they repeat the same action. Interfaces should provide guidance and help to children remember how to accomplish task. The activities in the interface must allow expanding the complexity from one level to another level which support for children. The interface must use large icons. Icons should me visually meaningful to children. The audio, animation and highlighting should be used to find the task. The interface must provide clear feedback and specify the current status of the system. Proper navigation should be given to track the children’s exploration in the interface.

(K) Designing an Interface for Web

Designing of web application\(^8\) is different than windows application. The web application uses different presentation style to display the information to the user. Web application runs on browser and the standard for browser is to be considered. There is a need of more security on web applications for the abstraction of information. The information to be displayed to user on web is controlled by web server. The user interacts with web applications using web client (browser). If there is any error on web page, the user needs to be redirected. Most design principles are common for windows applications and web applications. But web application uses some special objects which supports for effective interaction with user. It uses hyper links, image links, link buttons, validators and many different methods like get, post, postback. Latest web applications use the features of silver light and AJAX. The web application uses globalized icons which are understandable by the all the people in the world.

Accessibility on Web applications

The web applications\(^8\) are designed for lot of people in the world. There are a lot of considerations available in the web design. There are more standards used to test the accessibility of the web site. Different kinds of users such as blind people, children, older age people and disability people are interacting with web applications. Some web applications are specially designed for blind people. Web
developers and designers give more importance for accessibility during web designing.

Accessibility\[^9\] is important for the web for the following reasons.

- **Accessibility is right thing to do**
- **Accessibility leads to good practice**
- **Accessibility helps to avoid legal concerns**

There are some web standards\[^9\] that provide guidelines for accessibility. The world wide web consortium (w3c) set the standards for html, dhtml, css, xml and all markup languages. It provides web accessibility guidelines\[^9\] for web sites. This standard defines the guidelines for the web contents. The following are some of the activities which evaluate web sites for accessibility.

- UW-Madison Policy Governing World Wilde Web Accessibility
- W3C WAI Web Accessibility Evaluation and Testing Activities
- Website Accessibility Conformance Evaluation Methodology
- Web Content Accessibility Guidelines

**Future Work**

In future, this paper will be updated with design principles used in mobile applications and ipad applications and kiosk applications.

**REFERENCES**

1. Alan Dix, Janet Finlay, Gregory Abowd & Russel Belle. “Human-Computer Interaction”.

**Conclusion**

Some design principles are important to achieve the usability and accessibility in the interface. Usability is different than accessibility. Usability goals\[^5\] are effective, efficient, engaging, easy to learn and easy to remember. Accessibility generally means making systems as adaptable as possible by users for their own use, taking into account user skills & competences. Usability is making the interface user friendly whereas accessibility satisfies the user. Accessibility is different for different users. The goal of interaction design is the designing for maximum usability.

The design principles in the interface are related with user’s goal, user’s tasks, mental models, affordances, abilities, skill set. High level design principles are to be considered first whereas other principles are considered next. Visibility, Consistency and Affordances are the design principles for ease of learning and remembering. Navigation and Control are design principles to be concerned with ease of use. Some design principles are different for one people to another such as recovery and flexibility. The usability and accessibility are important factors which affect effective interface design and user satisfaction.
8. Alan Cooper. “About Face: The Essentials of User Interface Design”.