

Strategies and Quality Guidelines for Effective User Interface Design



Jogannagari Malla Reddy, Kothuri Parashu Ramulu, B.V. Ramana Murthy

Abstract: Graphical user interface plays the vital in the human computer interaction. It exchanges the information and improves the communication. The user interface development represents an initial step towards the integration among the software developer and Human Computer interaction. Upcoming complexity Systems needs the developer to make User interface design is more flexible, understandable, adaptable and accessible to the end user. Software development identifies the importance of user interface design but don't form concise guidelines for its construction and its quality with in the life cycle. The intent of the research paper is to describe the guidelines for user interface design quality, customization and construction. It highlights the various benefits, quality guidelines, construction and supporting tools in perspective of user interface design. The information is useful for researchers, developers and professional of the user interface design for forth coming generations.

Key words : User interface design, Design benefits, Golden Rules, User interface construction, Supporting tools.

I. INTRODUCTION

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the journal, rectification is not possible.

II. RELATED WORK

Information Gathering is a way of discovering, assessing and inferring all available subject relevant to problem area. Over the years many theorists and researchers identified the importance of user interface design in software development. They carried out the valid amount of work in the area of user interface design. The related taxonomy can be useful in extending the knowledge of user interface for benefit of user community.

Bhaskar N.U et. al [1] presented the user interface Design general principles relevance with recent web interfaces with full pledge analysis. The value properties are statistically analysed. Modern web user benefited with the results.

Debasmita et.al [2] identified the various users based on their usage perception of physical and conceptual view. The author highlighted different issues in designing the effective user interface design with examples.

Florian Lachner, et.al [3] presented a case study on user interface design on perspective of various user community belongs to the Germany and Vietnam. They presented the analysis on cultural dimensions and comparison of country websites. It provides initial insights for the applicability of cultural theory in User interface design and for further research.

Hanumat G. Sastry [4], presented a novel user interface design framework for the digital libraries. This framework focuses the various factors and limitations in designing effective interface system

Jan L. Plass[5], proposed the hybrid model that includes the approaches of cognitive and software engineering. The author discussed the design and evaluation of multimedia software with a cognitive approach.

Leigh Clark. et.al [6], targeted the recent trends of speech interfaces with through review of 68 research papers. He analysed and find out insights and gaps and challenges in speech interface then expanded the innovation from single to multiple user interaction. He highlighted the importance of reliability, consistency, and validity and reduce the barriers functional speech interfaces.

Lumpapun Punchoojit et. al [7] presented a recent systematic recent literature on mobile user interface design patterns. The literature provide sufficient information for innovation of new trends in mobile application development. The authors analysed the topics in usability perspective and most of HCI benefitted with their literature survey

Maha Anwar,et.al [8] , expressed that, the usability of interface depends on design of the product. He proposed the structure is easier to understand than the board based user interface.

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Manish Godse et. al [9] viewed in detail the web services of security of service, quality of service and business agreement and prioritised the features using the AHP mathematical decision making approach.

Nur Atikah Shamat et.al[10] presented a paper on a Systematic literature Review on User Interface Design for Web Application. They discussed various issues based on the research questions and proposed a suitable solution. The proposed solution and its tools should guide the software engineers in elicitation of user interface design.

III. OVERVIEW SPECTRUM OF THE USER INTERFACE DESIGN & ITS QUALITY GUIDELINES

The user interface provides communication between user and the system. User interface design plays crucial role in creating an impact on the entire to the user interaction it guide the user community to perform certain function. It consists series of screens, layouts, push buttons and forms in the form of multimedia format that provide interaction to the user community. The user interface design is an art creation in clear, concise manner and enhances the power of presentation.

The challenge for information technology is to develop the rapid applications with certain functionality for end user satisfaction. These applications can be tradable and sustain in market place and get the competitive edge. The good human computer interface design considers the capabilities and limitations. The objective of interface design is to simple, easy to interact, productive nature and delight.

User Interface design has much to do with the study of people with technology issues i.e identify the user, how the user interact with computer based system, how the user interpret information produced by the system, and what user expect from the system. Based the above the designer can design the user interface.

A. Recognize the Diversity

The diversity of user community based on the wide range of situations, task, frequencies of use, then the set design possibilities become enormous. No single design could satisfy all these users and situations. The design should make according the user specific and situations as concise and complete. The designer should understand the various user needs and their performed tasks. Designer aware of the user profiles such as age, gender, education, physical abilities, ethnic background, cultural, motivation, goal and personality. The user community classified into following based on the usage perception.

Novice or first-time users : The novice users know little about the task or concepts of the interface. These users lack of syntactic and semantic knowledge of application in general. First-time users know the task but little depth of knowledge interface concepts. Both group of users with anxiety in using the system that inhibits learning. The designer should provide instructions, dialog boxes and online help to overcoming these limitations. It reduces anxiety, gain positive reinforcement and build the confidence of users. The user manuals and online help may be effective for the novice and fist-time users.

Knowledgeable intermittent users: These users knowledgeable but they use the system in irregular intervals. They have reasonable semantic knowledge of task concepts but low recall of syntactic information to use the interface. Consistent series of actions, meaningful messages and

regular patterns of usage will help these users how to perform their task properly. These users take the help from reference manuals and online screens to fill the missing pieces of task or interface knowledge.

Expert frequent users : These user are experts and know perfect semantic and syntactic knowledge about the task interface. They demand rapid response time, non distracting feedback from the system. These uses just a few key strokes, macros or abbreviated form to reduce the number of steps to perform the certain task. Each designed interface used by the different users. Designing for one class is easy than several which is more difficult. The designer should identify the users and their intended tasks.

The user interface design gives most importance for depicting the accurate information for the intended users with visibility. It is in the form of colors, pictures, sounds and textual which communicates with user on behalf of the system. The design should be more flexible according the user expectations, objectives of the website or software intended to develop. Otherwise, the intended web page will not be satisfy the user and the other side the results can deviated with the expected one.

The understanding and keeping mind of software quality factors is very important for the success of the software product before delivered into the market place then it can be appreciated and used widely used around the world. Failure to develop user interface in precise and concise manner, that the results leads to loss of company image and profits consequently to the product. The various following factors plays vital role and improves user interface design quality.

Reliability : The reliability is a degree of consistency of a measure. The software is to be reliable when it gives the same repeated results under the same conditions. The program can be expected to perform its intended function with required precision.

Efficiency : The amount of computing resources utilized by the program to perform its function . The degree of optimal utilization of the system resources such as time, resource etc..

Conciseness: The software program designed to provides necessary information.

Portability : Portable software can able execute on different platforms without any problem indicated by the attributes such as adaptability, insatiability and replaceability.

Consistency : Consistency is the measure of how the software maintains a similar code for notations, abbreviations and naming conventions throughout

Maintainability : The effort needed to find and eliminate the error in a program indicated by the attributes such as changeability, stability and testability

Supportability : The supportability combines the ability to extend , adaptability and serviceability, these three attributes represent a more common term, maintainability.

In the above every software quality attributes is weighted equally as in the development of user interface design.

B. Benefits of the Good Design

- Proper design can improves the productivity of software.
- Attractive screen clarity can enhance the readability and understandability.
- Employees satisfaction increased with reduced frustration and aggravation.

- Reformatting and good design principles reduce the decision making time.
- Training costs are reduced because of training time is reduced.
- Support service costs are reduced with help desks.
- Customers benefited with improved service they receive.
- Finding and rectification of problems during the development process also has significant economic benefits.

C. Golden Rules of Interface Design

The people prefer the more flexible user interface than, they have less interest in using bad user interface. It must be good and excellent to use. So that, the designer must follow some specific rules for user interface design irrespective of domain, website or an application.

Achievement of Consistency : The similar taxonomy should be used in menus, prompts and help screens. Consistent sequence of actions should be needed in similar situation. The consistency of usage such as capitalization, color, font, layout etc. The visual information must be consistent design rules in common to all types of screens and implementing mechanism for navigation from task to task.

Seek universal usability: Identify the requirement of diverse users in facilitating the transformation of content. The designer consider the needs such as expert differences, age gaps, disabilities, global variations, and technological diversity and enrich the spectrum of needs. Adding features such as explanations, shortcuts enhance the interface design quality.

Informative feedback : There should be an interface feedback for every user action. The frequent minor actions can be moderate and infrequent major actions the response should be substantial. The graphical objects provides a convenient environment.

Sequence of dialogs to yield closure : Series of actions should be organized into groups with beginning, middle, and end. The informative feedback depends of user satisfaction of work completion and, a sense of relief of their mindset. In the e-commerce website, the customers select the products to checkout, end with payment conformation page that transaction.

Prevent errors: With well designed system, the user cannot do the serious errors; if the user enters the alphabetic characters in the place of numeric fields, the system should find the error and offer simple, and construction and specific suggestion for recover. The user should entry the faulty part instead of full command.

Permit easy reversal of actions: The good feature is to providing the actions should be reversible. It relieves anxiety that the errors can be undone and motives the exploration of unfamiliar options.

Keep users in control: Skilled users strongly confident about the system, it should not generate surprising system actions, tedious sequences of data entries, inability to give necessary information which leads to anxiety and dissatisfaction.

Reduce short-term memory load: The limitation of human information processing in short-term memory requires the display should be simple, reduced and consolidated. The sufficient training time is to be needed for codes, mnemonics and series of actions. Suitable online access to command-syntax forms, abbreviations, codes and other

information should be provided. The knowledge users prefers the abbreviations, special key, hidden commands and macro facilities.

These principles must be refined, interpreted and extended for each environment. Ensuring principles can increases the user productivity and rapid informative feedback is to increase feelings of competence and control over the system.

IV. METHODOLOGY

The User interface is a front-end application for user interacts with computer. The user interface design is more attractive, simple to use, fast response time, clear to understand and consistent in entire software. The user interfaces are classified into following categories.

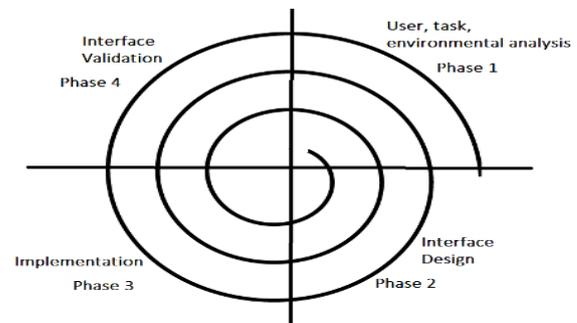
Command Line Interface: This interface provides the facility to enter the user commands in the form of text. User can remember the command syntax and meaning.

Graphical User Interface: It most simple interactive user interface which in the form of graphical icons. The user can easily interact with system.

The user interface analysis and design is a set of framework activities similar as software development life cycle. These framework activities in evolutionary in spiral fashion and represented in diagram 1.0. . It consists four set of framework activities of the following.

- User, task, environmental Analysis
- Interface design activities
- User Construction and implementation
- Interface validation

The following spiral starts with user and task analysis at origin progressively moves in clock wise direction towards interface design , construction & implementation and ended with interface validation. The spiral will continue upto the user satisfaction with respect to user interface.



User Interface Design Life Cycle

A. User, task, environmental analysis & modeling

The interface analysis is used to understand the task before user interface design. Initially, the designer targeted on the on user profiles of the system with domain understanding, knowledge skill levels and type of user. The requirements are collected to prior to detailed analysis. The user interface designer identifies and functional and non-functional requirements of the user interface. The designer plan for interface design based on these requirements..

As part of the analysis, the user intended tasks, goals of system are identified, described and elaborated. The analysis focuses on the physical work environment of the domain.

The designer identifies the user and the level of knowledge with competency.

Advanced and complex graphical user interface can be created for technical skilled user. Detailed information about how to use software for the novice users.

The designer can identify and analyze the user intended tasks. Graphical user interface doesn't matter how it will be performed. The tasks are organized in hierarchical structure one after another. The tasks can be decomposed into subtask by the method of "divide and conquer". Tasks provides user goals for graphical user interface.

B. Interface Design

The main aim interface design is to define the control mechanism of user performed tasks. It indicates the control mechanism of objects and its actions to be affected by the system. The scenario of interface design specifies the action sequence of tasks and subtasks and follows the golden rules of user interface design. The design issues must be considered such as response time, command structure, error handling and helpline facilities for refined design. The outcome of the phase is input to the implementation phase.

C. Interface construction and implementation

The activity of implementation starts with the creation of prototype model. Prototype helps in guiding the evolution of the interface design. Repetitive user interface design process that allows the creation of device interaction, windows, menus, error handling messages and many other elements can be refined for complete construction.

D. Interface Validation

Interface validation targeted on testing of the interfaces. Graphical user interface testing can be performed in many ways. The interface should be able to perform tasks correctly and it should be capable to handle the user intended needs. It should be easy to use and learn. Organization can perform validation at in-house, direct involvement of user community and release the beta version for refining the software. Testing may consist with various attributes such as compatibility, usability and user satisfaction etc.

V. RESULTS

The users examine the prototype after creation of design model then it can be modified based on their comments. Design and prototype tools can support for the user interface design process to develop the user interface as more robust. The user-interface toolkits or user-interface development systems (UIDS) provides the features such as creation of windows, device interaction, menus, commands, errors messages, and many other elements of interactive environment.

The user interfaces created with prepackaged UIDS software components. These components provides the following built-in mechanism for effective building of user interface design.

- Managing the input devices.
- Error handling and display error messages
- Validation of user inputs
- Providing automatic feedback
- Providing the help and service support
- Handling & scrolling of windows and fields.
- Establish the connection between application and interface

- Combining the application of interface management functions.
 - Permit the user to customize the interface as needed
- These functions can be implemented using either a language or graphical based approach.

VI. CONCLUSION

In this paper most prevalent strategies and quality guidelines discussed for diversity of users community. It is necessary to obtain adaptability and dynamism to user diversity and context. The user interface design process embodies with software life cycle, which benefits the integration of the areas of Software Engineering and Human Computer Interaction. The extensive research in user interface design is obviously important, Still lot of research work to be needed in area which leads to deliver the quality product offered by the user community.

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