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Study of Standard Assumptions of Graphical User Interface (GUI) Based on Usability, Adaptability and Security Factors

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***Abstract*—**

Today's computer system mostly used graphical user interface (GUI) allows users to interact with electronic device using graphical images. The most important aspects of this study is due to increase the motivation comes from developers office, home, entertainment applications, creative and collaborative interfaces, socio- technical systems, and industrial and commercial systems. In this research we follow the goals are (1) to find out how to achieve ultimate graphical user interface usability (2) Are the graphical user interfaces fully adaptable? (3) Risk factors for users behind graphical user interface and (4) Difficulties while preserving graphical user interface

***Keywords*— GUI, user interface, security factor, usability and operating systems.**

I. INTRODUCTION

In computing, a graphical user interface (GUI), commonly pronounced gooey [1] is a type of user interface that allows users to interact with electronic devices using images rather than text commands. GUIs can be used in computers, hand-held devices such as MP3 players, portable media players or gaming devices, household appliances and office equipment. A GUI represents the information and actions available to a user through graphical icons and visual indicators such as secondary notation, as opposed to text-based interfaces, typed command labels or text navigation. The actions are usually performed through direct manipulation of the graphical elements. [2]

GUI allows users to click and drag objects with a mouse instead of entering text at a command line. Two of the most popular operating systems, Windows and the Mac OS, are GUI-based. Apple with the Macintosh first introduced the graphical user interface to the public in 1984. However, the idea was actually taken from an earlier user interface developed by Xerox [3], [4]. Xerox's Star workstation was the first commercial implementation of the graphical user interface. The Star was introduced in 1981 and was the inspiration for the Mac and all the other GUIs that followed. (Image Courtesy of Xerox Corporation) [5], [6]. User Interface of first GUI system LISA personal computer developed MAC in 1984[7].

A major advantage of GUIs is that they make computer operation more intuitive, and thus easier to learn and use. For example, it is much easier for a new user to move a file from one directory to another by dragging its icon with the mouse than by having to remember and type seemingly arcane commands to accomplish the same task [8], [9], [10].

The history of the graphical user interface, understood as the use of graphic icons and a pointing device to control a computer, covers a five-decade span of incremental refinements, built on some constant core principles. Several vendors have created their own windowing systems based on independent code, but with basic elements in common that define the WIMP "window, icon, menu, pointing device" paradigm [8], [9], [10], [11].

There have been important technological achievements and enhancements to the general interaction in small steps over previous systems. There have been a few significant breakthroughs in terms of use, but the same organizational metaphors and interaction idioms are still in use. Although many GUI operating systems are controlled by using a mouse, the keyboard can also be used with keyboard shortcuts or arrow keys. The interface developments described, below, have been summarized and omit many details in the interest of brevity. The influence of game computers and joystick operation has been omitted. [8][9][10][11].

An important aspect of the empirical study of user experience is the process by which users form aesthetic and other judgments of interactive products. The current study extends previous research by presenting test users with a context (mode of use) in which to make their judgments, using sets of GUI or web pages from specific domains rather than unrelated pages, studying the congruence of perceptions of aesthetic value over time, including judgments after use of a GUI, manipulating the aesthetic design of web pages and studying the relationship between usability and aesthetic value [12]. The user interface is the most important part of any computer system. Why? It is the system to most users. It can be seen, it can be heard, and it can be touched. The piles of software code are invisible, hidden behind phosphor, keyboards, and the mouse. The goals of interface design are simple, to make working with a computer easy, productive, and enjoyable [12]. A fundamental reality of application development is that the user interface is the system to the users. What users want is for developers to build applications that meet their needs and that are easy to use. Too many developers think that they are artistic geniuses they do not bother to follow user interface design standards or invest the effort to make their applications usable; instead they mistakenly believe that the important thing is to make the code

clever or to use a really interesting color scheme. Constantine points out that the reality is that a good user interface allows people who understand the problem domain to work with the application without having to read the manuals or receive training [13]. The development of user interface systems has languished with the stability of desktop computing. Future systems, however, that are off the desktop, nomadic or physical in nature will involve new devices and new software systems for creating interactive applications [13]. Simple usability testing is not adequate for evaluating complex systems. The problems with evaluating systems work are explored and a set of criteria for evaluating new User Interface (UI) systems work is presented [13]. The enormous interest in interface usability arises from the growing recognition of how poorly designed many current interfaces are and of the benefits elegant interfaces bring to users [14].

This increased motivation emanates from developers of life-critical systems, industrial and commercial systems, office, home, entertainment applications, exploratory, creative, and collaborative interfaces, and socio-technical systems [14].

II. REVIEW OF LITERATURE

A. User interface guidelines

UI guidelines are collections of recommendations that designers and developers follow when creating the user interface for applications. Guidelines can include:

1. General design principles derived through research. These principles can include the expression of a fundamental design philosophy, assumptions about human behavior, a design methodology, and concepts embodied in the interface. [15], [16], [17], [18].
2. Standards. Most, if not all, major software platforms have published guidelines for user interface design. One example is the Microsoft® Windows® User Experience, which is subtitled the Official Guidelines for User Interface Developers and Designers [15], [16], [17], [18].
3. Local rules or style guide. Many individual companies and organizations have their own set of documented UI rules or styles for interface design that developers in that company use. This is common in large companies especially, where a suite of applications is created internally [15], [16], [17], [18].

B. Usability Testing

Usability testing is the gold standard by which you can determine if the design of an application meets the needs of its intended users and allows them to work productively. Only by gathering empirical data can you find out how well the user interface for a product fits your users' needs and expectations. There are two scenarios for usability testing [15], [16], [17], [18].

1. If you are a software product vendor, testing real users of your product means you are evaluating for design. Based on how you have designed the application, can users complete the tasks they need to do? Testing real users doing real tasks can also point out if the UI guidelines you are following are working within the context of your product, and when consistency helps or hinders the users' ability to do their work [15], [16], [17], [18].
2. If you are a software product purchaser, you can do usability testing to evaluate a product for purchase. For example, your company might consider buying a product for their twenty thousand employees. Before the company spends its money, it wants to make sure that the product in question will really help employees do their jobs better. Usability testing can also be useful to see if the proposed application follows published UI style guidelines (internal or external). It's best to use UI guidelines as an auxiliary, rather than primary, source of information for making purchase decisions [15], [16], [17], [18].

In some usability studies graphical systems were found superior, in other studies other interaction techniques were found superior, and in some cases no differences were found. Perhaps the best conclusion was drawn by Whiteside, Jones, Levy, and Wixon (1985) who compared the usability characteristics of seven systems, including the direct-manipulation, menu, and command language styles of interaction. They found that user performance did not depend on the type of system. There were large differences in learn ability and usability among all. How well the system was designed was the best indicator of success, not the style of interaction [19].

1) Usability in ISO 9241-11:

This standard explains how to identify the information that is necessary to take into account when specifying or evaluating usability in terms of measures of user performance and satisfaction. In this standard the three components of usability are defined as:

- Effectiveness - the accuracy and completeness with which users achieve their goals,
- Efficiency - the resources expended in relation to the accuracy and completeness with which users achieve goals,
- Satisfaction - the comfort and acceptability of use [20], [21].

2) Problems with UI guidelines and Consistency:

As an application designer, following UI guidelines might help ensure that the product you give your users allows them to apply skills they've already learned to common tasks and learn new tasks more easily. However, you cannot rely solely on guidelines to ensure the usability of your product. UI guidelines are often too general. On the one hand, to be guidelines they must be somewhat general. Yet it's that very generality that makes them difficult to apply. When you are

trying to make specific decisions within the context of your product, a general set of guidelines might not give you enough information for you to make a decision. An example is when you're trying to decide between method A and method B of presenting information in a dialog box [15], [16], [17], [18].

On the other hand, guidelines can be too specific. For example, a guideline might specify having no more than seven items on a menu. However, adding additional menus might be more confusing to users than having more than seven choices on any one menu. Additionally, guidelines may conflict with one another. For example, one guideline might specify having no more than seven items on a menu, and another might specify keeping similar items grouped together on menus. Which guideline takes precedence? How would you know? [15], [16], [17], [18].

Nevertheless, when designing an application, visual consistency can be helpful. Consider the consistency you find in Microsoft Word and Microsoft Excel. The user interfaces in these software products are very similar in the basic elements such as menus, toolbars, and placement of buttons in dialog boxes-the surface-level interface. In addition, they are consistent in how they handle many common tasks: formatting text, saving files, and so on. Consistency in these and other elements can make it easier for users to transfer skills when learning different applications. Specific UI guidelines help maintain consistency across different products, but consistency by itself is not the ultimate goal [15], [16], [17], [18].

Moreover, consistency in itself doesn't ensure usability. It is a mistake to think that consistency in the surface properties of the interface will lead to good design.

These problems really boil down to context: You need to be able to design the user interface for your specific users, goals, and tasks. Guidelines may be a reasonable starting point, but they are only a starting point. The value in UI consistency lies in effective learning, by making it easy to transfer knowledge from another product. However, sometimes ease of learning can get in the way of ease of use [15], [16].

You must test your product with users to make sure that your initial design decisions are the best for your users and the work for which they are using your product [15], [16], [17], [18].

C. User Interface Friction between MAC & MS-Windows

From purely function perspective, both operating systems have become increasingly similar, and even in terms of user interface, the basic concepts and user interface paradigm used by Windows and Macintosh are almost identical. This discrepancy between user perception and technical features led us to have a closure look at user interface differences, usability, and productivity [22], [23], [24].

D. Adaptable User interface

User interfaces are becoming more and more complex. Adaptable and adaptive interfaces have been proposed to address this issue and previous studies have shown that users prefer interfaces that they can adapt to self-adjusting ones. However, most existing systems provide users with little support for adapting their interfaces. Interface customization techniques are still very primitive and usually constricted to particular applications. In this paper, we present User Interface Facades, a system that provides users with simple ways to adapt re-configure and re-combine existing graphical interfaces, through the use of direct manipulation techniques. The paper describes the user's view of the system, provides some technical details, and presents several examples to illustrate its potential [25], [26].

III. METHODOLOGIES

A. *Approaches for Research*

For the underlying research I have chosen quantitative approach for achieving the purpose of the study.

B. *Quantitative and Qualitative Research Methods*

The research strategy should be chosen according to the research questions in the particular situation [27]. Each strategy has its own advantages and disadvantages, because of its specific approach to collect and analyze experimental data. According to Yin (1994) the type of question posed; the degree of focus on historical or contemporary events and the control over actual behavioral elements should be the main grounds on which the appropriate research method is chosen.

Qualitative research requires strong contact with real situation, which is usually reflecting the everyday life of individuals, societies, groups or organizations. According to Amaratunga, [28] this type of research has few favorable features: this type of studies allows revealing of what the "real life" is by studying events occurring in natural settings; the information gathered through qualitative research is complete and rich and has potential to reveal complexity and finally this type of studies are quite flexible in nature. Furthermore, qualitative approach is found appropriate for discovery, exploring a new area, developing hypotheses and qualitative data are useful when "one needs to supplement, validate, explain, illuminate or reinterpret quantitative data gathered from the same setting," [29], [35], [36].

Quantitative research approach is based on the development of testable hypotheses and theory, which can be generalized across settings. Quantitative investigations tend to measure "how often" or "how much". This approach allows generalization of conclusions and flexibility in the treatment of data, in terms of comparative analysis, statistical analyses and repeatability of data collection in order to verify reliability [29], [35], [36].

Taking into consideration the description of the quantitative research approach stated above, which is used to measure "how much" across settings and allows for statistical analysis on the collected data, this is the chosen method for the

purpose of this thesis. First of all, through the use of quantitative research method, I would like to measure "how much" users of web applications or desktop applications are satisfied with the provided GUI and its usability, adaptability, security. Furthermore, this method will allow statistical analysis of the collected data, on the basis of which an instrument for measuring quality of online banking services will be developed. To collect the quantitative data the survey method has been used and eventually the data has been analyzed by using statistical techniques. The combination of the quantitative method with the survey method is found appropriate as a large population has been studied and general conclusions have been drawn for the entire population [29], [35], [36].

In this research (synopsis), I am going to focus on different factors of different Graphical user interfaces (GUI), different reasons for poor user interfaces and how to overcome from it.

- To achieve this I am will use the qualitative research method, which based on the consideration of quality of Graphical user interfaces.
- Also I will use quantitative research method to obtain the number of users who uses Graphical user interface to interact with machines.
- And to obtain number of users who changed their application due to bad user interface.
- To obtain the number of users who are hunted by phishing or loosed their money due to GUI.

C. *Observation Method*

The observation method is the most commonly used method especially in studies relating to behavioral sciences. In a way we all observe things around us, but this sort of observation is not scientific observation. Observation becomes a scientific tool and the method of data collection for the researcher, when it serves a formulated research purpose, is systematically planned and recorded and is subjected to checks and controls on validity and reliability. Under the observation method, the information is sought by way of investigator's own direct observation without asking from the respondent. For instance, in a study relating to consumer behavior, the investigator instead of asking the brand of wrist watch used by the respondent, may himself look at the watch [30], [35], [36].

The main advantage of this method is that subjective bias is eliminated, if observation is done accurately. Secondly, the information obtained under this method relates to what is currently happening; it is not complicated by either the past behavior or future intentions or attitudes. Thirdly, this method is independent of respondents' willingness to respond and as such is relatively less demanding of active cooperation on the part of respondents as happens to be the case in the interview or the questionnaire method. This method is particularly suitable in studies, which deal with subjects (i.e., respondents) who are not capable of giving verbal reports of their feelings for one reason or the other. However, observation method has various limitations. Firstly, it is an expensive method. Secondly, the information provided by this method is very limited. Thirdly, sometimes-unforeseen factors may interfere with the observational task. At times, the fact that some people are rarely accessible to direct observation creates obstacle for this method to collect data effectively [30], [35], [36].

- We are using this method to observe the several Graphical user interfaces.
- The observed GUI will be recorded based on its quality.
- The number of units is to be observed is depends upon the common graphical components of the GUI [30].

D. *Documents:*

Documents can be divided into two types:

1) Found Documents:

Found document already exist prior to the research, such as documents found in most organizations: production schedules, profit and loss accounts, internal telephone directories, job descriptions, procedure manuals and so on [31], [36], [37].

2) Researcher generated document:

Researcher generated documents are put together solely for the purpose of the research task, and would not otherwise exised. For example a researcher undertaking ethnography would probably take photographs and make field notes about what they observed and thought. These images and notes become an important source of data when the researcher analyses, interprets and write up their study. Similarly, a Researcher who is designing and creating new IT artifacts would produce any model and diagrams [31], [36], [37].

Organizations produce a large number of documents that might be useful sources of data, such as [32], [33], [34], [35], [36].

- Guidelines provided by different Operating systems developers like Microsoft, Mac, Linux etc.
- Informal communications like notes memos and emails.
- Historical records about Graphical user interfaces.
- Publications are also a form of document-based data. Such as Academic literatures like books, journals articles and conference papers.
- Popular literatures such as newspaper articles, magazine pieces and brochures;
- Guides like programmer manual and software guides.

- Previous research can also provide a form of documentary data that you might reuse in your own research. Such data is called secondary data.
- Research data and field notes from studies, which have been intentionally achieved for the benefit of future scholars.
- Internal organizational research such as phishing surveys and suggestion schemes [32], [33], [34].

'The meaning of documents' has now been extended to encompass more than just written materials. A document is taken to mean any symbolic representation that can record and retrieved for analysis. We therefore sometimes refer to multimedia documents such as photographs, sounds and music, screen shots, websites etc. [31], [36].

IV. CONCLUSION

The goals of the research are as follow.

1 To find out how to achieve ultimate Graphical user interface usability (effectiveness).
2 Are the Graphical user interfaces fully adaptable?
3 Risk factors for users behind Graphical user interface.
4 Difficulties while preserving Graphical user interface.

I am planning to achieve above research goals using following stages:

- Understanding of poor and great esthetics of Graphical user interface.
- Understanding of barriers in between Human and Graphical User interface.
- Understanding of Metrics of User interface usability.
- Study of guidelines and principles of designing user interface for different platforms.
- Study of different Graphical user interfaces of several applications.
- Study of Graphical User Interface friction between different platforms.
- Study of Graphical User Interface friction over the decades.
- Study of phishing scams using fake Graphical user interface.
- Study of poor understanding of user against Graphical user interface
- Study of commonly used Graphical user interfaces.
- Study of difficulties while using cross platform Graphical user interface.

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