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Cognitive Analysis of Software Interfaces

B.Venkata Raju, Ph.D Scholar , Reg.No.2004199506

Sathyabama University, Chennai, India.

Abstract: Understanding how users process he information available to them through the computer interface can greatly enhance our abilities to design usable systems. Usability evaluation has long been recognized as an indispensable part of the development of interactive software. Evaluation can still be a difficult and labor intensive task with conventional tools and user studies. It is aimed to present a theoretical framework for integrating cognitive modeling concepts into the development of software interface design process. The suggested model and equation is entirely based on the complete analysis of the user behavior and requirements that show the mental approach of specific user. It is going to present the suitable software interface recommendation according to the user psychology which is the actual demand of about every category of the user. Complete analysis of the user interaction with famous working software's was done before taking any step towards model and equation suggestion and then after suggesting the new model and equation, again user interaction is analyzed. Results showed that if these features that are presented in the model are provided to the users, enhanced User satisfaction was shown.

Keywords: Cognitive Science, Software Interface, User Satisfaction, Behavior.

1. Introduction:

Designing Software Interface is an important part of the Human Computer Interaction concepts. Software Interface is an effective source for Users to conduct information communication with computers and successfully complete their task. The personification of "Human-centered" design concepts is actually done by the software interface design; that highlights the perfect relation of "people" and "thing". In the Software design process activity, the designer focuses to launch the concept that is during the process of software design, the designer depends on establish concept, users' behavior, the sequence of interface design and based on the users' point of view, paying full attention to the user's needs. This can be achieved by combining the basic needs of cognitive psychology (Zhou, 2008). HCI concerns itself with social, cognitive and interactive phenomena. The basic goal of Software Engineering is the designing of software, the process of software construction, structural design, reliable functioning and design for convenience. The latter concern is shared with Human Computer Interaction, where fit-for-purpose is also seen as fit-for-use and ease of learning. The explanation of these layers in more detail is as: the social layer concerns with the interaction of people with each other as well as with technology based or other environment, with the formulization of groups working together, social traditions & attitudes, etc. The main concepts in this layer are sociology and social psychology, and HCI draws several theories from these areas, e.g. Distributed Cognition, Activity Theory and Small Groups as Complex Systems to name but a few. Although HCI has embraced the concerns of these theories, it has not led to much influence on HCI methods or models. The social layer may be acknowledged in Software Engineering but the processes are not investigated, so this is one area where the two disciplines could have a synergetic relationship, especially as Computer Supported Collaborative Work, Internet, etc. The cognitive layer draws on the parent discipline of psychology and represents one of HCI's central missions, what is the criterion to map the knowledge of the users to the software design process. This layer presents the models that focus on the cognition of problem solving, observations and memory work, and how these relate to interacting with computers. The main bridge is an interaction layer that is user interface where HCI & SE meet; the only difference is of their point of views.

When both communities, try to separate the user interface from underlying functionality for software planning reasons, acknowledge that the user interface and system functionality are linked. HCI basic focus is on the design properties of the user interface for ease of use and increasing creativity, affective reaction and attractiveness, while SE focuses on how functional requirements of the software will be delivered to the user.

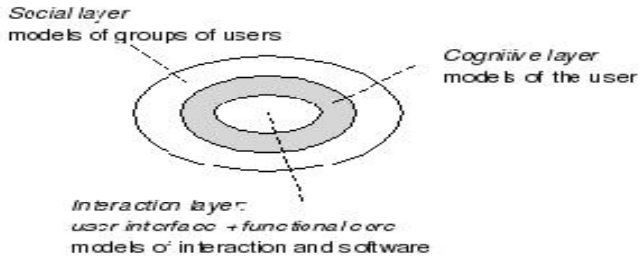


Figure 1: Relation of Cognitive models with Interface

This difference is reflected in model and development approaches. Interaction involves understanding not only what the user needs (functional requirements) but also how those requirements are delivered by interaction (HCI design). The interaction involves many functions, i.e. the partitioning between people and machine is split; integrated modeling interaction from both an SE and HCI perspective could improve the design of decision support systems. Decision support systems are often considered to be a sub-set of information systems, yet nearly any interactive system involves helping the user decide. A further challenge for both communities is the integration of the cognitive and social layers (Sutcliffe, 2005).Simulation of human performance is actually the Cognitive models. These cognitive models have been useful to HCI (Human Computer Interaction) by calculating task times, by helping users, and by acting as substitute of users. It will be easy to develop and apply cognitive models, if they could interact with the same interfaces that users do (Ritter, 2000). Cognitive analysis for human-computer interaction (HCI) presents two related explanations: the analysis of cognition-intensive interactions with computers, such as learning, problem-solving, or reading; and the analysis of cognitive content, structures, and processes involved in any interaction with a computer. The author addresses both explanations by providing methods for cognitive analysis with a focus on interactions that involve a high degree of cognition. When the analysis of users' is concerned, cognitions should not be restricted to an early design phase (as task analysis typically is), but should be involved as an important activity throughout the entire design process (Gillan, 1995).

2. Methodology:

For making successful cognitive analysis 10 famous software's were used and they were from different workbenches, communication, composing, entertainment, presentation and spreadsheet. 45 user responses were observed and these were beginners, intermediate and expert level users, i-e, and 15 users from each category.

2.1. Software Interface Evaluation Form for Cognitive Analysis:

Software Interface Evaluation form, i.e., used for my research is composed of total four major sections:

Part I: User Information

Part II: Summarized Software Interface Side View

Part III: Detailed software Evaluation

Part IV: Final Evaluation

2.1.1. Selection of Users:

This section is taking the information about user name, age group and user level of expertise in particular software. Summarized Software Interface Side View include evaluation of Screen that screen presentation of that software interface through good use of graphics, color & animation, text, layout information etc. Use of Widgets is obtaining the information about menus, buttons, dialog boxes, texts and graphics used in that software. Use of WIMP is obtaining the complete information about windows, icons, menus and pointers

used in that software. Remaining sections are taking the information in depth about core and supporting features of the software. I have taken three types of User to perform evaluation of software:

1. Beginner (Novice level Users, i.e. Using Software first time) These users were new to the field of computer science and working in the sample software for the about first time.

2. Intermediate (worked a little in that software)

These users were not very new to the field of computer science or very expert level users.

3. Expert (Worked a lot in this software)

These users were the expert users in the field of Computer Science and worked very much in the sample software.

Age Group:

User ages are in between the followings:

1. First category is from 17 – 22

2. Second category is from 23 – 27

3. Third category is from 28 – 32

That the majority of the users from the first age group means from 17 – 22 that shows it is not necessary that the expertise level matters the age but it matters the ratio of work done in a field. Before presenting the final formula for user satisfaction on the basis of cognitive analysis, the results were observed on the existing popular software to analyze the user mental approach. The observations were made from the questionnaires that are divided into five sections having salient features. The User satisfaction options are scaled as: 1) Poor 2) Fair 3) Average 4) Good 5) Excellent

2.2. Suggested Model for User Satisfaction

On the basis of above mentioned results, I have come to the point to suggest that cognitive interaction of a particular user towards software needs the following:

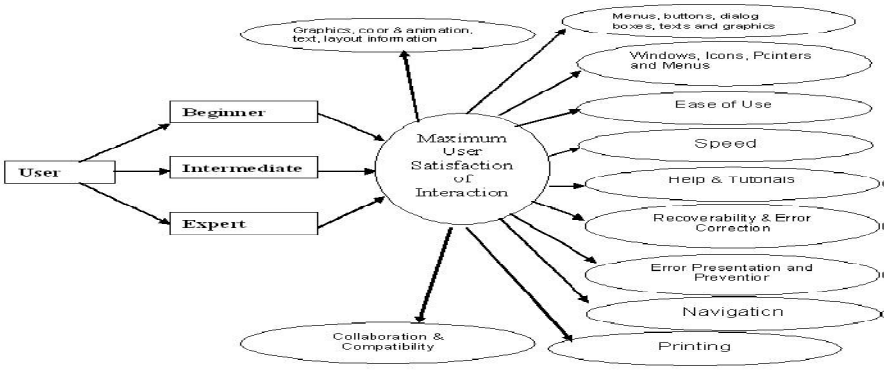


Figure 2: Suggested Model for User Satisfaction

The computer brought a powerful idea to psychology: understanding the mind as an information processing device. (Massaro and Cowan, 1993) described the defining properties of the information processing approach as follows:

(a) The description of the environment and cognition can be in terms of input, process, and output;

(b) Stages of processing can be broken down into sub stages;

(c) Information is transmitted forward in time and all inputs necessary to complete one operation are available from the outputs that flow into it;

(d) Each stage or operation takes some time; and

(e) Information processing occurs in a physical system; representations are information embedded in states of the system, and Processes are operations used to transform the representations(Massaro, 1993).

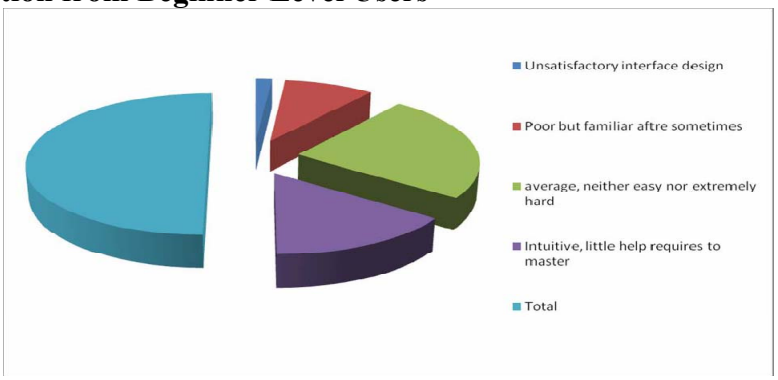
2.3. Suggested User-Software Interaction Equation

The suggested maximum user-software Interaction equation that is formulated on the basis of obtained results is as follows:

Maximum user-software Interaction = Use of Graphics * Use of Widgets * Use of WIMPS * Ease of Use * speed * Help & Tutorial * Recoverability & Error Correction * Error Prevention &Presentation * Navigation * Printing * Collaboration & Compatibility this proposed equation defines the relation of all those parameters that are inter-related to the maximum interaction of a user to a software interface. User is infecting in need of maximum efficiency in minimum effort done by the user. So with respect to the psychological point of view of a user is tried to be maximum met in this equation. My objective in this article is to improve the quality of interaction of each type of user who is going to interact the software whether the user is beginner or intermediate level or expert user. This paper proposes a model and equation to facilitate a relationship of user satisfaction towards software and merging the facilities al-together to enhance the software usability and accommodate user demand.

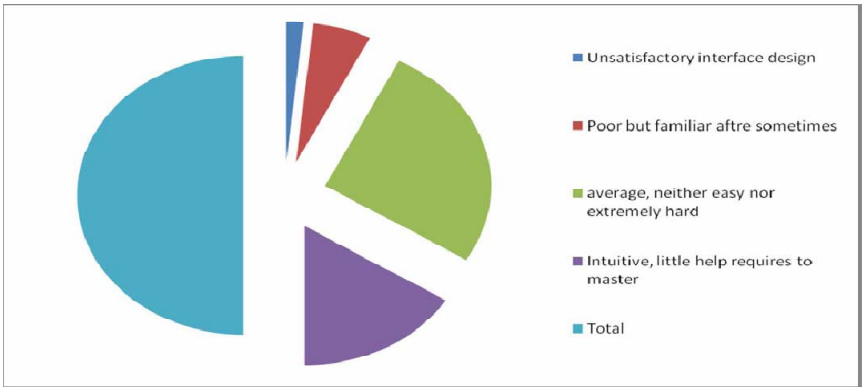
3. Results and discussion

3.1. Final Evaluation from Beginner Level Users



3.2. Final Evaluation of All Types of Users

Its core functionalities, a perfect software success with respect to user satisfaction point of view is that user must be mentally free from all supporting tasks and if software is provided with the set core functionalities that is presented in the model and equation, it can meet maximum needs of all users. It is not the last point that Final evaluation of the results shown in tables and charts clearly depicting the actual user behavior for any software interface belongs to any workbench. User satisfaction is utmost when they are facilitated with maximum facilities regarding interfaces and other supporting features treat software in different manner.



It is the first usage of the software that makes the user opinion about its future scope. When Users are of intermediate level, if they feel good to work this is because of 2 reasons, one is that user is feeling good and second is that user is bound to work with out interest. So on the basis of above mentioned results, it can be said that maximum user behavior is same whether they belong to any category of the users, they mental approach is round about same and they behave in the same way. Every aspect relevant to the use of software whether it is relevant to interface, functionality, working speed or can meet the maximum user satisfaction

according to their specific behavioral needs. Further wide ideas must be there to enhance the human interaction with computers. Cognitive Analysis of Software Interfaces 108 So, as the final point of view, designing the proper interfaces and is directly proportional to **Use of graphics * Use of Widgets * Use of WIMPS * Ease of Use * speed * Help & Tutorial * Recoverability & Error Correction * Error Prevention & Presentation * Navigation * Printing *Collaboration & Compatibility**. Providing all these core features make the user happy. Infect it is not very easy to measure the expectation of every category of users about software and it is also very difficult to judge their exact attitude for a pre-determined task sets but this approach Will be a positive step on the way to maximize the user interaction with the system. It will also be a Helpful method in customizing most of the user technical needs.

4. Conclusion:

Over all this research is providing a methodology that will serve as key element for software developers to decide that how they can customize their different product versions and how they can meet the maximum user interaction to their software product. The proposed model will be a challenging entity to the beginners when they will be provide with the thing they desire. Successful implementation of the proposed framework will contribute to establish the user satisfaction in true manner. It is not the last point that can meet the maximum user satisfaction according to their specific behavioral needs. Further wide ideas must be there to enhance the human interaction with computers.

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