 ISSN : 0976-8491 (Online) | ISSN : 2229-4333 (Print)

The Cognitive Ergonomics of Efficient User Interface Design for Widows OS

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Abstract
There has been radical shift in presentation layer for current Microsoft windows (desktop) applications. The traditional application centric user interface is dispensed with giving way to user centric interface design. This facilitates many advances into the psychological science of better work study. Its ready impact on human memory improving quality and hence efficiency of man hours at work can't be undervalued. Thus it can be emphatically generalized to say that the better interface of software designed for users aids better work for organizations.

Keywords
User Interface,Ergonomics, Efficiency, Cognitive Science, HCI

I. Introduction

The windows operating system is ubiquitous in present day computers. The interface provided for windows OS is issue of contention as market share of windows 7/8 is 90.66%[1].The need of more and more user centric OS for Microsoft is felt by present generation operating computers.

Name	OS	Free	Language
Bytecheleby	Windows	N	Delphi
Appetizer	Windows	Y	C++
Asuite	Windows	Y	Delphi
Classic Shell	Windows	Y	C++
JetToolBar	Windows	N	?
jPort	Windows	N	Java
Launchy	Windows	Y	C++
LiberKey	Windows	N	?
Platform	Windows	Y	Delphi
SliderDock	Windows	N	?
SyMenu	Windows	N	C#
WinLaunch	Windows	N	C#

Fig. 1: Program Launchers

The traditional user interface for applications has given rise to wide variety of program launchers as tabulated below [2].

II. User Interface Design

A. Human Computer Interaction Human

This deals with the methods by which computers and their users communicate [3]. It is process of designing interface software so that computers are pleasant, easy to use and do what people want them to so. Dealing with design of interfaces requires study of not only hardware of computer, but that of human side also. Therefore much of attention is paid to human psychology and physiology. Today, one can say that any attempt to facilitate the relationship between the machine and the user must consider not only the technological perspective (e.g., promote the us-ability) but also, for instance, the way the user is going to use the technology and his or her purpose as well as the social and cultural context of this use (the Human and the Computer).

Advances in HCI are seen with embedding of interfaces in other devices such as microwave oven containing microprocessor to manage computational aspects of microwave cooking.

B. User-System Interface [4]

It is concerned with all aspects of system design that affect system use. this concerns design features of user interface that are implemented via software(i.e the design of computer program logic).It deals less with hardware(the design of equipment).It is obvious that software is not the only significant factor influencing user performance. Other aspects of user interface design are clearly important, including workstation design, physical display characteristics, keyboard layout, environmental factors such as illumination and noise, design of paper forms and written documentation, user training courses etc. Hence, to achieve a good user interface design, all of above factors outlined must be taken into consideration while designing with care

C. User Interface Software [4]

The significant role of user interface software in system design poses a special challenge to human factors practitioners.the function of switch button,functional arrangement among buttons,the size and distribution of elements within a display are established not in design of equipment but in how computer is programmed. User interface software can represent sizable investment of programming effort during initial system development, and latter when system is upgraded.overall, the average estimate was that user interface design comprises 30 to 35 percent of operational software.Estimates for individual systems ranged from 3 to 100 percent reflecting the fact that some computer systems require a much higher investment in user interface design than others, depending upon their purpose.

The significance of user interface depends on many factors of design. The design of user interface software is not only expensive and time consuming but it is also critical for effective system performance. To be sure users can sometimes compensate for poor design with extra effort. Probably no single user interface design flaw in itself will cause system failure. But there is a limit to how well users can adopt to a poorly designed interface. As one deficiency is added to another the cumulative negative effects may eventually result in system failure, poor performance, and user complaints.

III. Cognitive Ergonomics

Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance [5]. It also refers to Design factors, as for the workplace, intended to maximize productivity by minimizing operator fatigue and discomfort [6]. Cognitive Ergonomics is a new interdisciplinary research field between computer science and psychology. The investigation of design-criteria for human computer interfaces under cognitive aspects, modeling of systems, users and interfaces and empirical

work characterize the research in cognitive ergonomics (sometimes also called cognitive engineering).

A. Definition

Cognitive engineering is the analysis, modeling, design and evaluation of effective human integration in complex systems[7]. Its researchers aim to provide better integration between human operators and the system so that human operators can act more effectively and preserve system safety and productivity if unanticipated situations arise

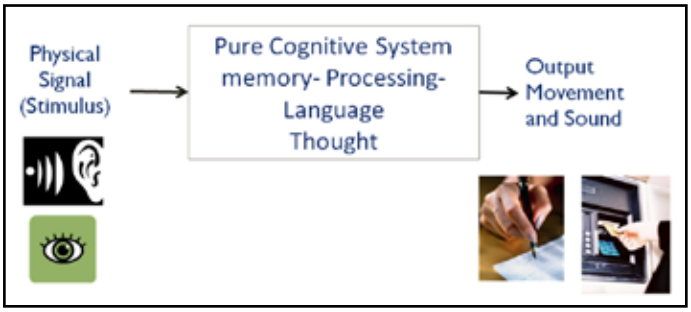

Fig. 2: Cognitive System

B. Subjective Study

The cognitive psychology is the branch of psychology that studies mental processes including how people think, perceive, remember and learn [8]. This deals primarily with understanding the user. It can't be less emphasized that user must understood the system before him. Additionally one needs to understand cognitive processes and cognitive limitations of users. Identifying and explaining the nature and causes of problems users encounter have to be accounted for. In effect theories have to be supplied, and methods have to be chalked that can lead to the design of better interactive products.

The cognitive processes can be listed as mentioned below:

A. Perception and recognition [9]

This primarily deals with how information is acquired from the world and transformed into experiences.Design implication says

1. Text should be legible
2. Icons should be easy to distinguish and read

B. Memory

This involves encoding and recalling knowledge and acting appropriately

1. We don't remember everything –(memory involves filtering and processing)
2. We recognize things much better than being able to recall things

- The rise of the GUI over command-based interfaces
- Better at remembering images than words
- The use of icons rather than names

How to make good usable design follows objective to design products having efficient and safe usage, easy learning curve for remembering, motivating and aesthetically pleasing factors. The application of Norman's principles [9] for design covers visibility, feedback, constraints, mapping, consistency, affordances. In conclusion it has to be said that there are no fixed methodologies to achieve cognitive design principles. It is always there that only different methodologies should be altered to suit different populations and specific systems.

3. Attention is an important cognitive process aiming at details regarding productivity of minor and major user systems
4. Problem-solving and decision making is a process that aims at overcoming hindrances. This step lets user accumulate experience by solving problems thus final decision making depends on gathered experience.

C. Application

A. user-centered design (UCD) or the usability engineering life cycle aims to improve the user-system. Ergonomic principles have been widely used in the design of both consumer and industrial products [10].

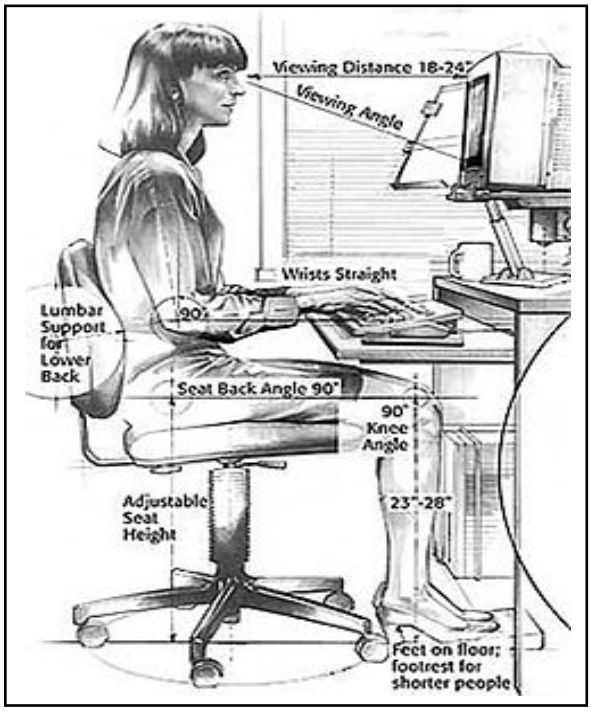

Fig. 3: Computer Ergonomics

IV. Contribution to Efficiency of Design With Ergonomics

A. Thought Experiment

Imagine there is small controlled system. Also let us call the system by familiar name 'family'.It is beneficial to pool 2 types of resources internal and external.internal resources are available within the system and external ones outside the system.internal resources for practical reason are time bound and external ones are not.internal resources may include personal faculties such as memory,health,power,status that dally with location of family in relation to surroundings of habitation.external resources are faculties that are driven by technology to augment internal faculties like if human memory fails it is supplemented with machine memory or if health fails it is augmented with medicine. Time goes by as experiment gets implemented and family system under study performs as expected.It is logical to capture and record activities of system over a span of measured time.observers outside the system have following questions to ask about cycle of study

- when did the system start?
- when did the system stop?
- what are routine actions of system?
- what is the learning curve of system?
- what is efficiency of system?

Algorithm:- to measure efficiency gain of interface(s) designed for a system

1. Consistent user interface is introduced into system during constant initial interval ti and throughput for a task is calculated as thpi
2. User(s) executes same ideal task on the system through interface during constant time interval tc where tc=ti
3. Cognitive faculties like perception, memory,retention,know ledge,understanding are utilized by user(s)while calculating throughput of system for interface(s)
4. After finite time intervals user is dislocated from the interface on the system.
5. Throughput for last interval of user(s)task thp is empharically calculated at last interval of time tp where tp=tc.
6. Efficiency gained by system with introduction of interface(s) is measured as thpi/thp

B. Projection of Result

It is unbiased projection of result when computer system performs tasks and gains desired output.The human computer interface may acknowledge that computer system goes beyond user interface in time.The sophistication of technology is major thread in this interaction.

VII. Conclusion

It has to be noted that Human Computer Interaction is future of computer industry. Also development of interaction tools and environment is need of hour to facilitate ease of use. When systematic principles of cognitive work study are followed in design of interfaces for applications centred around user, much of productivity in work is bound to be gained as a rule.

References

[1] [Online] Available: http://www.en.wikipedia.org/wiki/Usage_share_of_operating_systems
[2] [Online] Available: http://www.en.wikipedia.org/wiki/Comparison_of_desktop_application_launchers
[3] [Online]Available: http://www.seminarstopics.com/seminar/human-computer-interface
[4] [Online] Available: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.84.8930&rep=rep1&type=pdf
[5] [Online] Available: http://www.en.wikipedia.org/wiki/Ergonomics
[6] [Online] Available: http://www.thefreedictionary.com/ergonomics
[7] [Online] Available: http://www.techdigest.jhuapl.edu/TD/td2604/Gersh.pdf
[8] [Online] Available: http://www.psychology.about.com/od/cognitivepsychology/f/cogpsych.htm
[9] Reem Al-Kadeem, Alexandria University, 2007: Cognitive Ergonomics.
[10] [Online] Available: https://www.google.co.in/search?q=ergonomics&tbm=isch&tbo=u&source=univ&sa=X&ei=E4edUuvOB8i3rgfqloD4BQ&sqi=2&ved=0CDMQsAQ&biw=1348&bih=567

Madhu Ronda received his M. S degree in software technology from Robert Gordon University, Aberdeen, Scotland, in 2003. He has been working as Assoc. Software Engineer, with Department of Systems and Technology, K L University, since 2012. His current research interests include Human Computer Interface (HCI) the implementations of which are realized using advanced java technologies.