
HUMAN COMPUTER INTERACTIONS. THE IMPORTANCE OF USABILITY

M kathirvel

Jawaharlal Nehru Rajkeeya Mahavidyalaya (JNRM)

Port Blair, Andaman

ABSTRACT

In order to improve and increase system capabilities and to meet users' demands and necessities, usability and human-computer interaction (HCI) are becoming essential parts of the process of developing systems. Usability will confirm if the system is efficient, effective, safe, utility, easy to learn, easy to remember, easy to use and to evaluate, practical visible, and provides job satisfaction to the users. HCI will assist designers, analysts, and users in identifying the system needs from text style, fonts, layout, graphics, and color. Adopting these factors in the system development process, including the sustainable design, will enable users to measure and complete the objectives and tasks they have set for themselves by utilizing a particular piece of technology. Finally, in order to improve the acceptability of technology, performance, and satisfy the requirements of people, designers should incorporate these issues into their agenda.

Keyword: Usability of HCL, Human computer interaction.

INTRODUCTION

This article explores the significance of Human Computing Interaction (HCI), as well as its meaning, and explains how it may be valuable when developing a user interface or website. According to Peerce et al.(1994), "Human Computer Interaction (HCI) is about designing a computer system that supports people so that they can carry out their activities productively and safely" (page 1). HCI plays an essential part in the creation of computer systems and websites because it helps to build "interactional techniques and to suggest where and in what situations these technologies and techniques might be put to best use" (Booth 1989, page 6). Therefore, commercial websites that utilize HCI successfully are more likely to be valuable to their users and lucrative for the business. HCI is a "very important concept in the process of system development because it is about understanding and creating software and other technology that people will want to use, will be able to use, and will find effective when they do use it," according to IBM. And the notion of usability, as well as the methods and tools used to encourage it, accomplish it, and assess it, are now touchstones in the culture of computing" (Carroll 2002, page xxvii). In addition, the issue of Usability Evaluation is covered in this chapter. According to Booth (1989) usability "is concerned with both obtaining user requirements in the early stages of design, and with evaluating systems that have been built" (p. 103). There are many different approaches to creating successful websites; these approaches handle specific concerns including page design, typography, graphics, sound, navigation, and multimedia. Effective websites can be created using any one of these

approaches. However, they do not offer a sufficient holistic approach to human-computer interaction (HCI) and usability. The field of computers has experienced rapid advancement during the course of recent history. We began in data centers and have since gone on to the cloud and are now at the edge of the network. We anticipate many more advancements in the near future. We were given access to life-altering technologies such as 3D printing, virtual reality, and augmented reality apps, some of which dramatically transformed our lives. Learn about the hottest trends in augmented reality while we talk about it.

Technology has broken through every barrier imaginable in recent years, from the artificial intelligence assistants on our mobile devices to the devices that resemble speakers and have the ability to turn off the lights in a room with just one order from the user. But in the midst of this technological revolution, we have to recognize that interacting and communicating with technology is not always simple. For example, do you recall how frustrating it was when the autocorrect feature on your phone would make mistakes? That is exactly what I am referring about.

A bad design for human-computer interface was to blame for the difficulty in communicating with the keyboard. Do you have any idea what this thing is? This entire blog is dedicated to discussing the aforementioned topic.

PRINCIPLES OF HCI

Numerous concepts have been developed by researchers and designers working in the subject of human-computer interaction (HCI). These restrictions can be broken down into more basic categories such as conventions and guidelines for design, or more specific categories such as abstract design concepts. Let's take a look at some of the most important rules for HCI.

- Make the components legible and approachable.
- Design for familiarity and learn ability.
- Make the components approachable.
- Tolerance for mistakes
- Flexibility

USER-CENTERED SYSTEM DESIGN

If one wishes to enhance the chance of general acceptance and productive deployment of computer-based systems, it is vital to take a "user-centered" approach to the design of such systems. This approach is referred to as "user experience" design. This does not imply that every system needs to be built in such a way that it can accommodate everyone; rather, it implies that computer-based systems should be created taking into consideration the requirements and capabilities of the people who will be using them. This does not mean that every system needs to be built in such a manner that it can accommodate everyone. Users shouldn't even have to give the difficulties involved in figuring out how to use a computer in the end a second consideration in order to successfully use the device. Because of this, computers and other connected devices need to be designed with the concept in mind that individuals will have certain duties in mind when they use them, and that these persons

will wish to utilize these devices in a way that is seamless in connection to their profession. In addition, it is of the utmost importance to "define the style, norms, roles, and even mores of the human and computer relationship that each side can live with, as computers become more complex, intelligent, and capable," and as we allow them to "take on autonomous or semi-autonomous control of more critical aspects of our lives and society." The people who design systems need to have the mental capacity to consider the activities that will be carried out by future users and the ability to translate that information into a system that is usable in practice. The user will be able to interact and deal with the computer without any issues if a robust interface design is built, and the user will also be provided with greater control over the system. This may be accomplished by developing an interface design. An great user interface design, according to Head (1999), "is a reliable and effective intermediary, sending us the right cues so that tasks get done—regardless of how trivial, incidental, or artful the design might seem to be. Recent events have brought to our attention the fact that "user-centered design" has recently arisen as an important "concept in the design of interactive systems. Its primary focus is on the design of socio technical systems that take into account not only the activities of the people who will be using the system, but also the role that technology plays in the users' day-to-day lives. In addition, "it can be thought of as the design of spaces for human communications and interaction," which is another definition of "it." It has been asserted that "human-computer interaction is acknowledged as an interdisciplinary subject." Contributions to HCI are required from a wide range of academic disciplines, including "computer science" (application design and engineering of human interfaces), "psychology" (the application of theories of cognitive processes and the empirical analysis of user behavior), "sociology and anthropology" (interactions between technology, work, and organization), and "industrial design" (interactive products). Because of this, "science, engineering, and design aspects" are included in human-computer interaction.

HUMAN COMPUTER INTERACTION (HCI)

Human–Computer Interaction (HCI) is the academic area that explores how work and activities are affected by the advent of computer technology. HCI is an abbreviation for "human–computer interaction."

The term "computer technology" can be used to refer to a wide range of different kinds of machines in the modern world. These machines can range from traditional computers that have screens and keyboards to contemporary smart phones, home appliances, in-car navigation systems, and even integrated sensors and actuators, such as automated lighting systems.

The field of Human-Computer Interaction (HCI) is strongly connected to another design discipline known as User-Centered Design, which is also known as Interaction Design. User-Centered Design studies ways to make the use of computer technology as simple and enjoyable as is humanly possible, and HCI is closely tied to both of these design subfields. The phrase "usability," which is often defined in terms of efficiency, effectiveness, and satisfaction, is accorded a great deal of significance in the design business.

Because it currently encompasses almost all subfields of information technology (IT), the idea of Human-Computer Interaction (HCI) has to maintain its breadth so that it can adequately account for this development. The term "human-computer interaction" (HCI) refers to the study of how computers and other forms of technology might be designed to be of the greatest service to the people who will be utilizing them. Human-

computer interaction (HCI) is intrinsically tied to user experience design (UX design), which is generally seen as the forerunner to this more contemporary method.

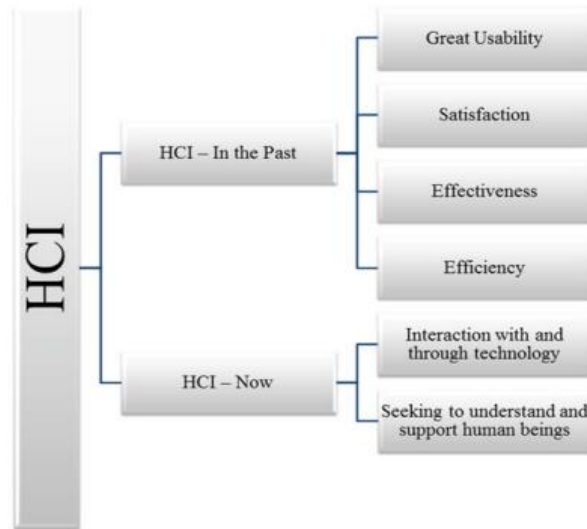


Fig. 1 HCI – past and now (Prepared by Tomayess Issa)

HCI AS PROCESS

The study of human-computer interaction, sometimes known as HCI, is a subfield of computer science that focuses on the conceptualization, creation, and use of interactive computer systems. It is expected that the incorporation of HCI principles and practices throughout the development process would result in a system that is straightforward for individuals to use within the context of their particular work settings. The objective of include HCI approaches in the whole development process is to serve the purpose of including excellent design "both in practice and in understanding." The Human Computer Interaction (HCI) field studies "what occurs on the human side of interaction as well as what happens on the machine side" in order to achieve this goal. This objective may be reached by the implementation of sound design "both in practice and in understanding." Human-Computer Interaction, also known as HCI, is primarily concerned with two issues: first, the study of the relationship and communication between humans and computers; and second, the discovery of methods for "mapping computing functions to human capabilities and effectively using input and output techniques so that computers and users have more seamless interactions". These are the primary foci of HCI's research and development efforts. One of the key goals of human-computer interaction is the "creation and application of user-centered design techniques as well as the use of iterative usability testing methods." As a consequence of this, the machine side, often known as the computer side, entails a number of significant issues, some of the most significant of which are "computer graphics, operating systems, programming languages, and development environments." **Communication** theory, graphic and industrial design disciplines, linguistics, social science, cognitive psychology, and human performance are all relevant" These are some of the areas that are important to consider when looking at the equation from a human perspective.

EVOLUTION OF HUMAN-COMPUTER INTERACTION

Since it was initially founded, the discipline of Human-Computer Interaction has seen a substantial expansion since it was originally introduced. Because using the early personal computers (PCs) needed a significant amount of training, it should not have come as a surprise that there were a large lot of problems related with the user experience. The most fundamental aspects of using a computer, such as pointing and clicking the mouse or removing text, presented users with challenges they had never faced before, which made it substantially more difficult for them to operate the computer.

Human Computer Interaction (HCI) emerged at the beginning of the 1980s as an attempt to grasp why and how computers may be made to be more user-friendly. This was done in the name of making computers more accessible. The investigation's purview swiftly expanded to encompass practically every area of computer and information technology once its initial confines were quickly outgrown.

RELATIONSHIP BETWEEN THE HCI AND HUMAN DIALOGUE

The study and theory of how humans and advanced technology interact is known as human-computer interaction or HCI for short. It is concerned with how existing input and output technologies affect interaction, as well as the circumstances in which these technologies and techniques may be utilized to their maximum advantage. In addition, it examines the scenarios in which these technologies and approaches may be utilized. The following is a synopsis of the relationship that exists between HCI and human speech as a direct result of this:

- Human having a conversation with a computer, much like having a conversation with another person, is a form of communication that enables one to achieve some level of comprehension. As long as the user is aware of the system's capabilities and how to issue commands, a well-designed computer system will comply with the demands placed upon it by the user. This is true even if the computer system was not developed by the user. Having said that, it is necessary to point out that this awareness can have certain limitations in certain respects.
- There must be agreement on the language that is being used during the conversation in order for there to be efficient communication. When two or more individuals are able to communicate with one another effectively, it is likely that they have a shared grasp of the words that are being exchanged as well as the concepts that are being referred to by those words. This holds true for the communication that takes place between humans and computers as well. It is necessary for a computer system to be able to grasp the user's instructions in order for the interaction between the user and the system to be successful when the user interacts with the system by giving the system orders.
- In order to communicate successfully, there must be agreement not just on the language and concepts that are used, but also on the entire context of the conversation. This agreement must be reached in order for there to be effective communication.

For instance, in order for a discussion between two people to continue, there needs to be an understanding on both sides of the issue that they are talking about. This ensures that there is no misunderstanding. In order to offer a further instance of this issue, let us take into account a scenario in which two persons do not agree on the context of their communication with one another. Two people have decided to share a single car in order to cut costs associated with attending a conference. They stop into a gas station in order to check the pressure in their tires and get some gasoline for their car. When Bill is in the middle of pumping air into the tires, Bill's

friend Fred walks up to him and asks, "How's the pressure?" Bill's reaction is "Not too good," and he continues by saying, "the boss keeps getting on to me." In answer to the inquiry, Fred offers the following remark: "Sorry, I meant the car tyre pressure, but how's work anyway?" As a result of the above example, it is possible for us to draw the conclusion that Fred and Bill do not have the same background information for their brief talk. There is a possibility that some of the concepts, such as "Pressure," might have different meanings depending on the context in which they are used; as a result, communication between the two individuals may become impaired as a result of this. The "necessary link of work" and "the context of car maintenance" are two instances of different contexts.

RECENT DEVELOPMENT IN HUMAN-COMPUTER INTERACTION

As a closing note, I would like to point out that if we take a look into the future of human-computer interaction (HCI), we will see that the things that are going to occur in the years to come are going to be extremely fascinating.

When you think about all of the different ways that HCI may lead us in the future, you could get the sensation that you're in the middle of a science fiction novel. This is as a result of the fact that HCI aspires for technology to become as normal and easily accessible in our day-to-day lives as is humanly practical, offering us with a view into a seemingly futuristic future as a result.

The following are some examples of some of the most cutting-edge prototypes that have been constructed by firms all over the world that make use of HCI theories:

1. Dexter hepatic gloves

Dexter created a unique pair of gloves for use with virtual reality that he named "chaotic gloves." These gloves are designed to simulate a wide range of touch sensations, including hardness, softness, springiness, and many more. When the user participates in different activities inside the virtual reality experience, the gloves will simulate these feelings by locking and unlocking the user's finger joints to variable degrees. This will allow the user to feel as though they are actually moving their fingers. As this article explains, there are a variety of applications for virtual reality technology in the armed forces. You should familiarize yourself with these applications.

2. Pre-touch sensing

It essentially gives your Smartphone the power to read your mind and know what you are thinking. When they initially hit the market, pre-touch phones should be able to recognize how the user holds the device as well as which fingers are getting closer to the screen in order to anticipate what the user intends to do with the device. It gives the impression that your phone can read your mind since it starts doing things before you give it a clear instruction.

3. Paper ID

The process of digitizing paper will continue with the next step of changing it into a touch screen. Paper will, as the new technology is described, be able to "detect its surroundings and respond to gesture instructions, as well as link to the Internet of Things." The physical world and the digital world need to be linked together in order to accomplish the goal of this project.

In the not-too-distant future, these are only some of the potential applications of human-computer interaction (HCI), which stands for "human-computer interaction." When we take into account the fact that this is only a porthole into the future, we can be absolutely certain that this will only be the beginning of much, much more than what will be made available to us.

OBJECTIVE

- One of the essential skills involves possessing a complete grasp of user interfaces for computing systems.
- Come up with strategies, protocols, and resources that will allow users to access systems in a manner that is in accordance with the requirements that they have outlined.
- Ensure that users are able to communicate or engage with the systems in an efficient manner by adapting, testing, improving, and verifying the system. This will allow for the best possible user experience.
- The end users' needs should always come first, and a solid basis for human-computer interaction should be built.

USABILITY

The word "usability" refers to the "quality of the interaction in terms of parameters such as the time it takes to perform tasks, the number of errors made, and the amount of time it takes for a user to become competent." Alternately, "usability" is a quality attribute that evaluates how straightforward it is for users to interact with user interfaces. The term "usability" can also apply to techniques for enhancing a product's level of accessibility during the design phase. The usability assessment stage is an efficient way that a software development team may use to determine the good and bad features of its prototype releases and make the necessary modifications before the system is released to the people who are intended to make use of it. The process of usability evaluation involves studying people to "see what can be improved, what new products can be developed" The phrase "based on human psychology and user research" describes its foundation. HCI experts "observe and talk with participants as they try to accomplish true-to-life tasks on a site (or system), and this allows them to form a detailed picture of the site as experienced by the user" (Human Computer Interaction: Observing and Talking with Participants While They Perform Real-Life Tasks on a Website or System).

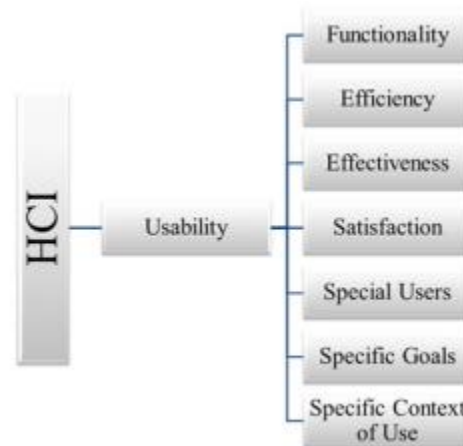


Fig. 2 Usability (Prepared by Tomayess Issa)

CONCEPTS OF USABILITY

Usability is not "determined by just one or two constituents, but is influenced by a number of factors" that interact with "one another in sometimes complex ways" (Booth 1989, p. 106), and this is something that we need to recognize in order to have a complete comprehension of the ideas that lie behind the term "usability." Eason (1984) proposed a series of models, which can be seen in Figure 3, that shed light on what some of these variables may be. Figure 3 illustrates the link between independent variables, such as task, user, and system features, and dependent variables, such as user reaction, with each variable having its own unique requirements and demands.

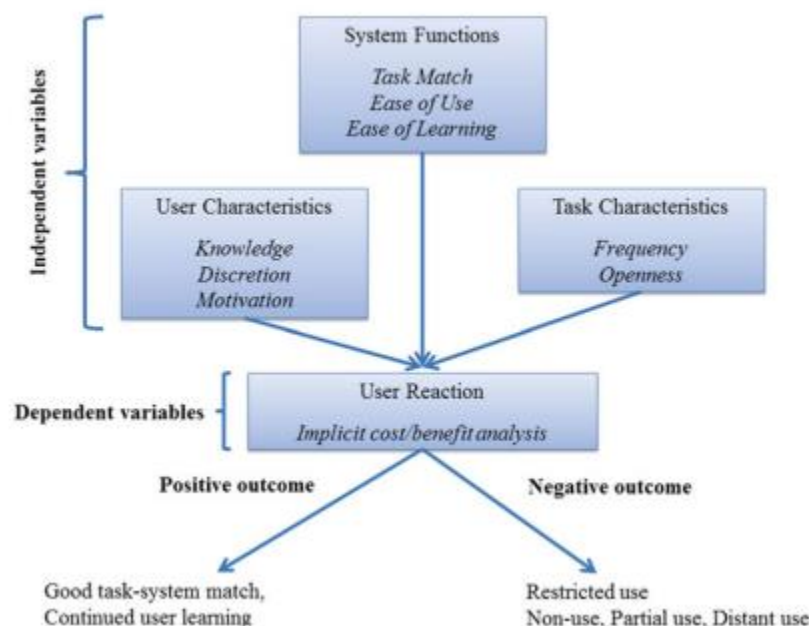


Fig. 3 Eason's causal framework of usability (Adopted from Eason (1984). Prepared by Tomayess Issa)

According to Eason (see Fig. 3), usability is not just concerned with the qualities of the user, but the 'task' and 'system' categories are the most significant ones that need to be added to the usability chart. As a result, the variables of the job, the system, and the user all collaborate in order to develop the usability aspect of the system.

The response of the user is the dependent variable in Fig. 4, and Eason explains that this response is the result of a sort of cost-benefit analysis being performed on the user. As a result, the focus of this variable is on the consequences, both good and bad, of implementing the new system. If the outcomes are positive, it will lead to the success of the system, but if the outcomes are poor, it will lead to the suspension and eventual termination of the system. To put it another way, as the user continues to make use of the system in a series of task episodes, they will gradually build up a knowledge base consisting of task-system links. The evolving strategy for usage may reflect a good result in which the user gradually masters the system by locating and utilizing relevant system functionalities for each new activity as they proceed through their use of the system. When unfavorable outcomes predominate and users stop utilizing the system, we get the opposite of what we want to happen. According to the findings of Eason's field research, "under realistic conditions, the user seems to approach a state of equilibrium where further learning about the system is minimized."

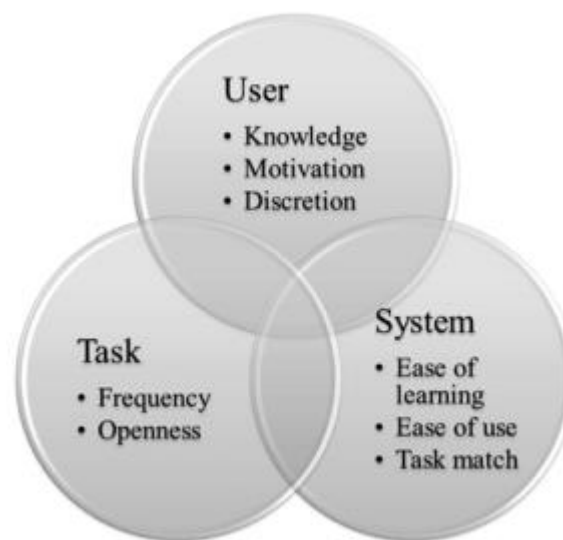


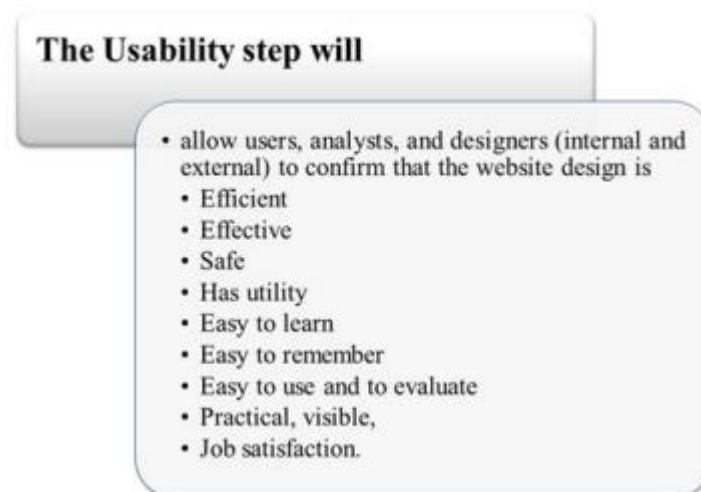
Fig. 4 A re-iteration of Eason's (1984) interacting task, system and user variables (Adopted from Booth 1989 , p. 109) (Prepared by Tomayess Issa)

USABILITY SPECIFICATIONS

The following phase is to answer the question: How will we know if the interface is usable? Once the designer has acquired and evaluated information on the tasks, challenges, and processes to work with the proposed system, the next step is to answer the question. A usability specification outlines all of this information. The usability specification is the first stage of the development process and is monitored "at each iteration" to determine whether or not the "interface, is, indeed, converging toward an improved, more usable design" (Hix

and Hartson 1993, p. 222). A usability specification defines the measure of success of a computer system or website and serves as an indicator about whether or not the development of the website is on the right track. Specifications for usability should state out exactly how usability will be assessed, and they may be separated into two components, which are as follows:

- Performance Measures are possible to be directly observed by observing a person do a job within a predetermined amount of time. This involves keeping track of the number of mistakes made and the amount of time required to complete the assignment. These sorts are referred to as "quantifiable measures" since they are capable of being expressed using numerical values. For instance, "you can count the number of minutes it takes a user to complete a task or the number of negative comments that occur" (McCracken and Wolfe 2004, page 53). Additionally, "you can count the number of positive comments that occur" (McCracken and Wolfe 2004, page 53).
- Preference Measures: These measurements provide an indicator of a "user's opinion about the interface that is not directly observable." Utilizing questionnaires or conducting interviews are both viable options for determining preference measures. Specifications for usability are required in order to ascertain when an iteration of prototypes has resulted in a system that possesses an acceptable level of usefulness. Therefore, in the absence of usability criteria, the primary reasons that "generally determine an end to the iterative refinement process are when developers run out of time, patience, and/or money" will come into play. Usability specifications are very important to the development process because they define "a quantifiable end to the seemingly endless iterative refinement process" and confirm that usability is a core step in the system development process. Usability will allow users, analysts, and designers (internal and external) to confirm that the website design is efficient, effective, safe, utility, easy to learn, easy to remember, easy to use and to evaluate, practical, visible, and pliable. Usability will also allow users to confirm that the website design is efficient, effective, safe, utility, easy to learn, easy to remember, easy to use and to evaluate, practical, visible and provide job satisfaction (see Fig. 5).



**Fig. 5HCI step in the New Participative Methodology for Marketing Websites (NPMMW) – Issa 2008
(Prepared by Tomayess Issa)**

CONCLUSION

This chapter has provided an introduction to the fundamental ideas behind Human Computer Interaction (HCI) as well as usability in the context of the system development process. These factors are extremely helpful to the business community in terms of increasing the productivity of their employees and, as a consequence, their earnings. At this time, human-computer interaction (HCI) and usability are required in any design, including sustainable design, in order to acknowledge the requirements of emerging smart technology and portable device demands from both the perspective of designers and users. Therefore, designers should integrate and combine HCI and usability in their agenda design, including sustainable design, to improve the performance and facilities of new smart technology and portable devices and to fulfill the demands of users.

REFERENCES

- Benyan D, Turner P, Turner S (2005) Designing interactive systems: a comprehensive guide to HCI and interaction design, 2nd edn. Pearson Education Limited, Edinburgh
- Booth P (1989) An introduction to human-computer interaction. Lawrence Erlbaum Associates Publishers, Hove/East Sussex
- Carroll JM (2002) Human-computer interaction in the new millennium. Addison-Wesley, New York
Carroll M (2004) Usability testing leads to better ROI. http://www.theusabilitycompany.com/news/media_coverage/pdfs/2003/NewMediaAge_270303.pdf. Accessed 1 Sept 2014
- DePaula RA (2003) New era in human computer interaction: the challenges of technology as a social proxy. In: Latin American conference on HCI, ACM international conference proceeding series, Rio de Janeiro, Brazil, pp 219–222
- Dix A, Finlay J, Abowd G, Beale R (1998) Human-computer interaction, 2nd edn. Pearson Education Limited, Harlow
- Dix A, Finlay J, Abowd G, Beale R (2004) Human-computer interaction, 3rd edn. Pearson Education Limited, Harlow
- Eason KD (1984) Towards the experimental study of usability. Behav Inform Technol 3(2):133–143
- Ghose S, Dou W (1998) Interactive functions and their impacts on the appeal of internet presence sites. J Advert Res 38(2):29
- Head AJ (1999) Design wise. Thomas H Hogan Sr, Medford Hewett T, Baecker R, Card C, Carey T, Gasen J, Mantei M, Perlman G, Strong G, Verplank W (1992) Human-computer interaction. ACM SIGCHI curricula for human-computer interaction. <http://old.sigchi.org/cdg/>. Accessed 1 Mar 201