Critical Analysis of the Human Computer Interactions

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Abstract*: In this study, the human-computer interaction literature is evaluated, and the technological element of HCI in relation to digital technologies is also examined. In light of all these issues, suggestions for creating effective human-computer interfaces for digital devices are examined and put forth. The efficiency and processing power of digital devices have continuously increased as a result of advancements in both hardware and software. But many of these systems are also growing bigger and more intricate. Although many users often have no problems with such intricacy, it frequently presents obstacles for users when utilizing digital gadgets. Typically, the human-computer connection is neglected when creating those digital products. In order to create reliable, usable, and well-engineered interactive digital devices, it is necessary to apply research on human computer interaction and have an understanding thereof its's issues.*

Keywords: Human Computer Interaction, Non-Cognitive Properties, Natural Language Processing, Digital Devices

I. INTRODUCTION

Study of how people interact with computers to develop human-centered design concepts and techniques for top-notch technology interfaces.

These days, computers play a big part in both healthcare and education. Digital devices like laptops, tablets, and hand-held mobile phones are becoming practically standard pieces of equipment. Electronic gadget usage in the field of healthcare and educational environments are important because they provide beautiful, more practical, and intriguing facilities. Using digital gadgets in the classroom is also meant to improve the overall learning experience for all pupils. It was also clear that using digital devices in the classroom improved student motivation, application of course-based knowledge, and overall academic accomplishment.

The interaction design for a class of forthcoming computer technologies for human use is the focus of this thesis Being distinct from conventional desktop computers in terms of both their outward appearance and the situations in which they are employed. Such technologies, which are frequently referred to as emergent technologies, include, for instance, wearable computers, context-aware computers, immersive virtual spaces, and pervasive computerized environments. Emerging technologies frequently suggest engagement that differs from the way computers are typically used. Location-aware auto navigation systems are one example of this. Such systems do not use WIMP-based interaction as we are accustomed to from conventional desktop computers; instead, they are operated by moving across physical space, listening to spoken directions, and pushing a few dedicated buttons near to the steering wheel. As a result, these systems cast doubt on the applicability of known techniques and tools for human-computer interaction as well as their breadth for their design.

The research described in this thesis contributes to the body of knowledge regarding workable design approaches and procedures for HCI.

The concept of human-computer interaction design is established in the following parts to describe the thesis' primary subject matter, and a distinction between interaction design and designing interaction is introduced and covered.

II. READING REVIEWS

It is possible to think of human-computer interaction as the endeavor of two highly capable information processors—the computer and the human—to communicate with one another via a confined interface with a narrow bandwidth. According to the definition given by ACM SIGCHI in 1996, human-computer interaction (HCI) is "a discipline concerned with the design, development, and implementation of computing systems for human use as well as with the research of key

phenomena surrounding them." According to its definition, HCI is the fusion of various academic fields, including computer science, behavioral science, and others. As a result, there is much confusion regarding whether HCI is an engineering, a design science, or a science discipline.

According to Newell & Card (1985), HCI is a discipline that offers engineering-style theories and tools for designers. HCI is restrained by approximation. Carroll and Campbell (1989) described HCI as a design science, creating a craft-based methodology and new research techniques to assess current systems in the context of their intended and task-related uses, then using the findings to guide designers for the development of future systems. Engineering discipline that focuses on the planning and implementation of good human-computer interaction (Long & Dowell, 1989).

Human-computer interaction (HCI), according to Preece (1994), is the study of the key phenomena that surround the design, testing, and implementation of interactive computer systems for human use (Preece, 1994). As a whole, the field of human-computer interaction research focuses on how humans and machines interact, drawing on supporting data from both the human and the machine side. According to Dix (1998), HCI entails designing, implementing, and assessing interactive systems in the context of the task and work of the user. The main focus of human-computer interaction is the interfaces between humans and machines. In several ways, HCI is different from human factors (or ergonomics). HCI places a strong emphasis on the user's perspective when using computers in particular. HCI also focuses on the hardware and software implementation processes production to support effective human computer interaction.

The cognitive processes through which users interact with computers should be taken into consideration when creating devices because typical user characteristics do not match the capabilities of such gadgets. The user's response to virtual worlds is one example of a non-cognitive influence that such technologies may have. But most of the time, people highly endorse the typical cognitive consequences. Humans have a strong propensity to respond to computers in ways that are comparable to how they respond to other people, as demonstrated by Reeves & Nass (1996). When examining human communication, deciphering the fusion of aural and visual impulses is essential to comprehending communication.

Improving user-computer interactions is the main objective of human computer interaction. It improves computer performance and user-responsiveness. Certain device design objectives are developed or improved by human computer interaction. These top objectives are:

- **Models -** A model depicts how a user interacts with a computer.
- **Norman's interactional model -** Norman focuses on user perception. Norman uses psychology to explain how people' interactions with technology in daily life affect their cognitive processes. The two stages of Norman's paradigm are execution and evaluation. Each phase is broken down into a number of phases. Overall, there are seven different steps in it. The listed actions are: defining the aim Creating the purpose Defining an activity and carrying it out observing how the world is doing interpreting the global situation assessing the result
- **The Relationship Model -** This framework of interaction was described by Abowd and Beale as language translation. Both a general framework for interactions and a translation inside the framework are stated. The four components of the Abowd and Beale framework each have their own distinct language. which are;System Output User Input
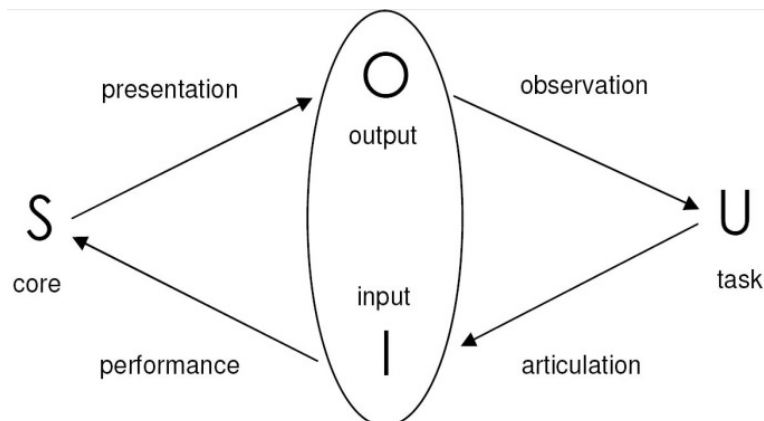
Figure 1: Interaction Model: Abowd and Beale Framework

Structure of HCI - The user, the computer, and the interaction, which describes how they cooperate to accomplish objectives, are the three main components of the HCI framework, as the name would imply. Three key elements of human computer interaction are depicted in Figure 2.
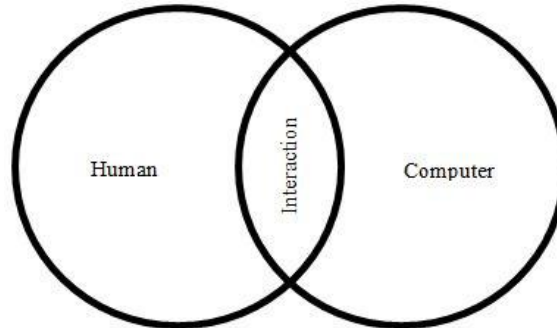

Figure 2: Three components of HCI

The person - An essential component of designing user-centered systems is the user analysis. The general public or HCI users may be regarded as system users. Depending on the functions and duties they perform within the system, they may change. The above goal and objective, along with their expertise with it, determine the distinct characteristics of users. According to Danino (2001), an HCI user is anyone who tries to complete a task using technology.

The computer - According to Danino (2001), the term "computer" in human-computer interaction (HCI) refers to a wide range of technologies, including generic computer systems and embedded systems. A computer is a general-purpose device that performs a number of mathematical and logical operations with the assistance of humans. Because of the great advancement in technology, using computers does not require using them in their conventional form. However, human computer the interfaces between man and machine are the main focus of interaction. Each and every gadget has a user interface that is used to operate it. It typically entails a great deal of interaction.

The relationship - Interaction between people and machines is a key aspect of human-computer interaction. Humans typically communicate with one another through speech. They simultaneously support their expression with a variety of body gestures, feelings, and expressions. Because humans always have a strong non-cognitive foundation, the non-cognitive effects of a computer system on the user must be carefully considered tendency to respond on a computer in the same ways as they react to the practical world (Reeves & Nass, 1996).

III. RESEARCH ON INTERACTION BETWEEN HUMANS & DEVICES

Research on technology that aids in learning

Input effectiveness has a significant role in learning assistive technologies. The majority of the time, real-time lecture notes are collected or acquired using learning support tools. The different methods that humans and computers communicate are mentioned in interaction styles. Different systems employ various forms of interaction. However, there are some general interactional patterns that are assessed on an individual basis.

Command line languages

This is one common way that people and computers interact. Here, the computer will accept some sensible commands that are typed. Typically, a user can only enter one command at a time, which makes data entry exceedingly slow. A specific application processes or executes the user's subsequent inputs and provides feedback.

Although it has many benefits, interactions become limited to discourse since people are more active and have heavier workloads than computers. Table 1 lists two significant advantages and disadvantages of command line languages in relation to academic support equipment.

Pros and Cons of Command Line Languages, Table 1.

Pros	Cons
Cheap	Limited visibility
Flexible	Error handling

Command line languages are challenging to utilize in real-time contexts due to their poor visibility. Because it is used in real time, error correcting mechanisms are particularly significant. But these command-line languages severely lack this feature.

Menus

As the name implies, the menu interface takes its name directly from the selection of dishes or food items available in a restaurant or food stand. In a similar approach, a menu interface provides the user with an onscreen static list of pre-defined options. On the screen, a number of options are provided for selection and execution the state of the interface is altered by changing one or more of the selections (Preece, 1994). There are four courageous menu categories:

- Slid-out menus
- Modal menus
- Ladder-style menus
- Contextual menus

Table 2 lists the two main benefits and one drawback of menus.

Pros	Cons
No need to recall	Limited
Logical group	Limited

Table 2: Menus' Benefits and Drawbacks

Manipulating directly and graphically - Data or information is directly manipulated by using a graphical representation. The advantages and disadvantages of direct device handling are listed in Table 3.

Table 3: Pros and Cons of direct manipulation

Pros	Cons
User sensitive	Limited
Flexible	Limited

Filling out forms, answering questions, and using function keys- Function keys, question and answer fields, and form filling are not appropriate for use in academic assistance technology. These three interactional modalities are entirely focused on a predetermined flow. However, it now needs a dynamic input flow and collects input data in a real-time setting.

Natural language - Human languages, including regional languages, are the focus of natural language processing (NLP). It belongs to the branch of computer science known as Human Computer Interaction.When compared to other forms of contact, the use of natural language processing is crucial. Here, we focused on natural language interfaces, a category of interface that enables users to enter data using their native tongue. In this kind of interface, interaction is made simpler.

Supportive devices are given:

Parallel inputs - Devices can receive multiple inputs at once, and each input has been filtered by filters. Finally, various input data were combined by a combiner, where noise was eliminated. Device prompts the user with feedback before storing the data. The processes of gathering parallel inputs are shown in Figure 3.
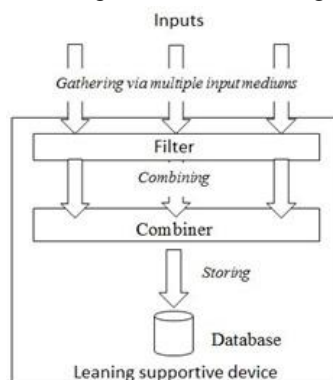

Figure 3: Stages: Accepting parallel inputs

Sound recording - Voice is a common kind of engagement in settings. It's challenging to collect or achieve continuous voice output, though. Much of the argument is covered by voice as input even though it is simple to capture the voice through interfaces in devices with a low error rate without interruption.

It is also important to conduct research to determine the best method for gathering voice input and incorporating it into multimode interface. While using a microphone in this situation is a straightforward way to collect speech input, difficulties could arise in a noisy area. In these situations, it's crucial to provide a parallel input system to prevent data loss or lecture inputs.

Recognition of handwriting - Additionally, it is a more organic form of communication than vocal input. By adopting handwriting recognition interfaces, users can avoid this uncomfortable interaction.

The need of additional input devices, such as the mouse and keyboard, can be reduced with the use of interfaces that recognize handwriting, which in turn minimizes the time required for entry. It can be used to write or solve math problems or depict inputs.

IV. REVIEW

In the study of human-computer interaction, we discovered certain important review elements (HCI). According to Shnider man (1986), researchers have discovered that changing the human computer interface can significantly impact learning times, performance, speed, error rates, and user happiness.

V. CONCLUSION

In the research mentioned above, interaction styles and other technological issues are examined along with the benefits and downsides of each. Human computer interaction literature is also analyzed. We also looked among the already existing interaction styles for more effective ones. In terms of interaction, we discovered that dome "fit" in best between a human and a machine.

Several disputes need to be taken into account when building moral, effective, and user-friendly interfaces. This study points to some theoretical underpinnings for human computer interfaces. In this essay, we have discussed the promising application of human-computer interaction to achieve the highest levels of user-device interaction.

We come to the conclusion that in order to create a quality human-computer interface, it is important to choose an acceptable interaction style and interface type for the target user group while also taking into account any potential human problems. Therefore, we advise using several crucial interactional techniques including parallel input, speech recognition, device compatibility, and handwriting recognition. We advise designing linked human-computer interactions.

Clearly, in order to improve the effectiveness of gadgets, we have now examined all currently used human-computer interface strategies. However, putting the suggested interaction models and styles into practice provides a strong foundation for further study.

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