Importance of Mobile Human-Computer Interaction in Education

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Abstract–

In recent decades, smart phones have become an inseparable part of people's daily lives, particularly among younger generations. Education, business, and marketing are some of the fields that now widely utilize smart phone platforms and applications. In the past several years, education has also been significantly influenced by the smart phone. Mobile learning mainly concerns mobility and high-quality education, regardless of location or time. Human computer interaction comprises the concepts and methods in which humans interact with computers, including designing, implementing, and evaluating computer systems that are accessible and provide an intuitive user interface. Some studies showed that mobile learning could help overcome multiple limitations and improve learning in educational systems. The study investigates the Human computer interaction design challenges, including the guidelines and methods in mobile Human computer interaction for education. An existing mobile learning tool was discussed on the current and future design enhancements of Udemy. Next is the further discussion on future mobile learning to provide the possible improvements for learners based on the challenges of mobile Human computer interaction in education.

Keywords—Smart phone, Human computer interaction; education technology

Introduction–

In the rapidly evolving field of mobile learning, education has served as the key emphasis. Various initiatives have shown that mobile learning helps overcome numerous limitations that affect educational systems and make learning more convenient. This has led to a distinct sub-community of experts with extensive experience and skills in developing and delivering mobile learning. Mobile learning is also a kind of elearning that uses the number of specific features available on computers, devices, and bandwidth and the characteristics of the networks. E-learning is described as applying digital electronic tools and media to support learning.

In contrast, mobile learning refers to the same concept but in the context of mobile devices and wireless transmission. In short, mobile learning is a word to describe the usage of a mobile device to help facilitate learning. Furthermore, mobile learning has been recommended to be applied in any educational system using portable devices as the prominent technology. Moreover, research on mobile learning has been performed in the last decade on many occasions. Each research played an essential role in providing researchers with knowledge on effectively using mobile devices in education. However, some of these studies were non-educational studies whose findings could not identify the research design. According to the researchers, their results were published without making any reference to the educational levels of the learners.

The mobile learning interaction is supported by pedagogical requirements and technological characteristics to provide and support user needs. There is a strong consensus that mobile learning is mutually dependent on the technology that facilitates learning, as shown in many studies. Mobile learning mainly concerns mobility and high-quality education, regardless of location or time. Academic disciplines related to human-computer interaction (HCI) are interested in researching all forms of human-technology interaction, along with its design processes, software, and technology tools. The primary goal of mobile HCI is to investigate various motivations and approaches used by mobile device users to engage with the devices and data accessibility. Historically, the main priority of HCI has been humans and how technology must fulfill their needs to guarantee that it does so effectively.

This viewpoint, it is argued, also describes the objective of the new intelligent technological world. As a result, HCI has developed tremendously, broadened the scope of inquiry, and made significant breakthroughs. However, the use of new technologies continues to grow and demand higher levels of complexity. Moreover, humans' counterpart to technology is changing; as a result, individuals are more conscious and concerned but also less optimistic and demanding. There are several challenges to implementing HCI in education based on how students prepared for their class, how they interacted with users during the class, and what the students thought of the interactions. Educators have been encouraged to innovate by these challenges, which has led them to explore other methods of interacting with the target users in educational contexts. The context can be viewed as an interactional issue instead of a representation issue. In addition, the mobile context can be denoted as data linked to the interaction between the user of the application, the application itself, and the users' surroundings.

Despite advocating creating learning environments that enable students to have hands-on experiences dealing with real users, educators highlight several limitations that prevent students from interacting with others. Establishing relationships between students and prospective users requires time and effort. According to Kumar S (2015), the most prevalent thing related to mobile HCI is the user's mobility. There is a great distinction in the literature regarding mobility and interaction between extremely mobile, somewhat mobile, and stationary interactions. Mobile HCI researchers claimed that the user's movement influences the physical environment of the interaction in a significant way that they identify mobility as one of the most significant challenges. In addition, connections to remote information and mobile device interactions can develop social relationships and communication. According to an interactive activities viewpoint, the study results are not mutually exclusive, as both are integrated. Thus, the user accomplishes the objective by utilizing and interacting with the technology. Students vary in their abilities and development speed regarding design thinking. Many of those were found to have difficulty analyzing their results and problems out with fresh ideas.

Significance of Mobile HCI in Education–

HCI comprises the concepts and methods humans interact with computers, including designing, implementing, and evaluating computer systems. The main focus of the HCI is on the usability of software applications in which software technology is accessible and provides an intuitive user interface. One of the factors affecting technology adoption is the usability of the technology. When people choose to adopt a new system, they desire to utilize it. Mobile devices usage provides an incentive for informal learning in which learners are free to pick up other tasks depending on the situation. The additional benefit of mobile HCI is that outdoor learning more exciting and enriching. Research shows that learning outdoors benefits the development of learners' knowledge and hands-on learning as long as the activity is conceived, organized, and followed up properly. The integration of mobile HCI will benefit students and enhance their learning experience by providing contextual learning. The mobile HCI aims to offer contextual information to students to enhance their learning environment and location.

Smart phones have been considered tools or devices for gaining access to information and services. Besides that, smart phones are provided a significant way of getting information, but it also promotes interactions between people involved in various activities. Generally, educators encourage students to use search engines and other apps that provide news feed and language learning and use social media to communicate with others. Mobile devices are particularly beneficial for learners looking to search and access documents and perform various other tasks, such as survey-taking, summarizing material, reading books, taking pictures, and sharing information. Researchers discovered that mobile website usability is influenced by many factors, including the lighting, the number of people around, movement, and the environment's sounds. According to Korn and Zandar, the experiment sparked intriguing discussions and reflections among the 64 participants.

Apart from the contextual information, video creation can create a new way for the student to develop creative ideas for communication while ensuring effective presentation of knowledge and abilities. Some researchers have found that students engaged in collaborative video creation demonstrated and improved strong media literacy and digital skills. Moreover, creating a video presentation can help create a fair, competitive environment for various

materials, including paper prototypes and software prototypes. In response to these sentiments, students will obtain a better experience in video creation than written reports and presentation slides for sharing information. The effectiveness and accessibility of video are growing with the ubiquity and efficiency of smart phone cameras, and thus, it is recommended that instructors utilize video in the assessments. However, the most reliable human memory can be prone to error. The importance of mobile HCI in education can show the difference between how designers recall the interaction and what occurred during the interaction. Students who utilize mobile HCI in the learning process will remember their interactions and user-centered design process completely different from the recorded videos. The mobile HCI approach in education seems to be a kind of organized learning in which students can extract information from the interaction sessions.

HCI Design Challenges–

New challenges for human-computer interaction experts examine how HCI helps solve significant social problems, emphasize the necessity for multidisciplinary approaches, and identify sixteen main challenges for society-oriented and technology-oriented problems. The aim is to probe into the significant problems in modern-day fast technological advancement, leading to smarter interactive technologies and increased social demands, with individual and community expectations. The challenges of HCI design consist of six challenges: an integration of human technology, an interaction between humans and the environment, privacy and security, health and well-being, universal accessibility, and creative learning. Live and working peacefully with technology is defined as part of human technology integration. This technological feature will include language comprehension, learning, thinking, and creative thinking. It has become necessary due to the emergence of smart ecosystems, composed of smart devices, services, materials, and environmental conditions that collaborate seamlessly and transparently. Smart ecosystems have an intricate web of symbiotic relationships with humans, extending well beyond technological limits and involving many diverse disciplines to resolve complicated ethical, social, and philosophical matters. There are many ways involved, such as combining human values into design elements and exchange. For instance, automation comes second to human control or strategizing around increasing our focus on humanistic problems instead of solely being driven by deterministic ones. Many practical aspects must be integrated with the criteria mentioned to form a comprehensive design strategy that addresses meaningful human control, system accountability and transparency, and intelligent system transparency and volatility. Interaction between humans and the environment describes how humans interact with many technological systems that have become more intelligent and interactive, not only with a single object. Interactions in technologically enhanced, autonomous, and smart settings are likely to be more implicit and unspoken. Additionally, issues dealing with the challenges and opportunities surrounding human interaction in these settings result in new implications and applications. Digital content will combine with and support the physical structure, and information will naturally flow from one entity to another. The difficulties laid out before us will guide us to evolve our current design and assessment methods and approaches to keep pace with the continually evolving technology environment—understanding how the increased interaction possibilities impact humans.

The capability of users to maintain control over data collection and distribution and what that data may be used for is at the core of privacy. While computing security relates to protecting the computer systems' hardware, software, electronic information, and services. Intelligent systems must benefit people beyond just being functional to empower individuals and protect their privacy and security. The introduction of new dimensions concerning technologically enhanced and intelligent settings implies privacy, trust, and security all take on more importance in the digital realm. To understand this concept, the key aspects to consider are privacy and the difficulties it creates in the new digital world, and the problems it presents on a societal level as they emerge in various environments. Privacy should be protected even further because the new technology landscape features advanced information processing and artificial intelligence to gather a large amount of data about the user and a substantial amount of information about user behavior that may result in developing conclusions. Hence, the findings of HCI research

should contribute to regulating government policies on privacy, security, and safety in the context of the new intelligence period.

Health includes both the absence of illness or disability and a condition of full physical, mental, and social well-being. An abundance of well-being also involves a feeling of purpose and pleasure and comfortable living standards. Opportunities for medical advancements with new technological developments make it possible to live healthier and cheaper methods of helping people have a long and healthy life. Technology may also help people reach their personal and emotional well-being objectives, encompassing both health elements and a chance to become happier. Healthcare technology is now extensively used, yet unsolved research questions remain. However, the larger problem is that since technology is ubiquitous, the question becomes how it can be maximized to enhance wellbeing, particularly when it comes to questions of how to improve interaction difficulties and remain human-centered. With the development of devices, services, products, or environments more accessible, designers have to think about accessibility. The idea of universal access to information society technologies means that everyone may use information society technologies wherever and at any time. Innovative environments present new difficulties related to accessibility and universal access, especially due to the rising technical complexity, which significantly affects daily life. As technology-augmented settings have historically focused on human beings, HCI initiatives will be expanded to the wellbeing of other groups, including those with disabilities. The idea of accessibility and universal access has been around for some time, but now, concerning demographics and growing technical complexity, these concepts are necessary and critical for future civilizations. While certainly, it introduces universal access concerns, the introduction of intelligent environments presents new possibilities that should be taken advantage of. Methods that seek to address accessibility only based on reactivity will lack design complexity and scalability needs. Therefore, HCI research demands more comprehensive solutions, demanding a significant place in the foreseeable future. The concept of learning suggests any of these: taking in new information, learning a skill, or experiencing something new. The act of being creative has to do with the capacity to generate unique and original ideas or to create something entirely new or innovative. This will allow individuals from different backgrounds, abilities, and interests to work together to discover, understand, and develop new knowledge to tackle difficult issues. Innovative and developing technologies may aid with emerging and distinct learning styles since they have developed due to new and emerging technologies permeating into daily life for the new generations. To address the question, 'What is the proper role of technology in the learning context?'. In this age of evolving technology, the debate is more relevant than ever, touching on such themes as privacy and ethics, learning concepts, and pedagogical factors. Regardless, problems concerning Human-Computer Interaction have a huge impact on the performance of the technology in education. While creativity has a prominent responsibility for future society, cultivating and exploring ways to be supported are essential. The revolution will influence various learning styles and how educational technologies are used.

Guidelines and Methods–

1) Mobile Human-Computer Interaction: There are various ways humans engage with computers, and it is thus necessary to provide the proper interface between humans and computers, as shown in Fig.-1. Since people first started interacting with computers, the development in the HCI area has occurred in terms of interaction quality and various points of history. Several research centers have instead focused on ideas like multimodality, intelligent adaptive interfaces, and active interfaces despite using conventional interfaces. Humancomputer interaction is defined as a field dedicated to developing, testing, and implementing interactive computing for human use and studying the key human-computer interaction aspects. It utilizes the information on both machines and humans in its field of study. Applying the methods of computer graphics, operating systems, programming languages, and application frameworks in the design and construction of new technology is of primary concern. While the human aspects such as computer user satisfaction are an important consideration, communication theory, graphic design, industrial design, languages, social sciences, cognitive psychology, and social psychology are essential when interacting with humans. HCI is multidisciplinary, resulting in individuals from many backgrounds being involved

in its progress. The interface between humans and computers is known as human-machine interaction (HMI), machine-machine interaction (MMI), or computer-human interaction (CHI).
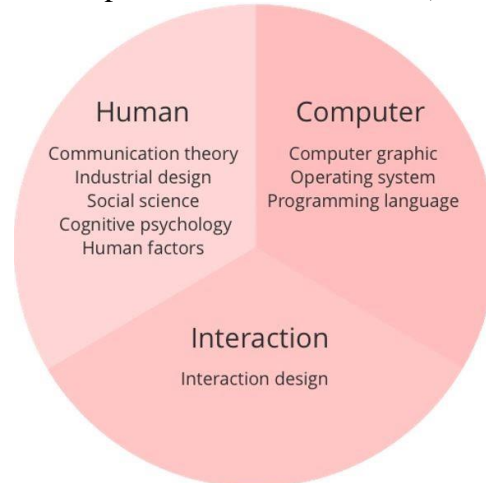
Fig-1 : Overview of Human, Computer and Interaction.

Various methods for human-computer interaction design had appeared since the 1980s when human-computer interaction design (HCI) as a discipline began to gain popularity. The concept of interaction between users, designers, and technical systems serves as the foundation for most design methods. Early methods regarded user cognitive processes as predictable and measurable, which enabled design practitioners to draw inspiration from cognitive science findings in domains including memory and cognitive when creating user interfaces. The activity theory, a tool employed in HCI, describes and analyzes the physical, social, and technical environment in which human-computer interactions occur. Activity theory establishes a framework and defines a process for analyzing and designing activities.

Besides that, user-centered design (UCD) is a contemporary and widely implemented design philosophy based on the concept that people should be spotlighted in any computer system. There are several roles inside a project, including the roles of the user, the designer, and the technical experts. These roles need to work together to comprehend the user's needs, requirements, and constraints. The participatory design does include methods of facilitating the participation of endusers in designing new products and services. However, it does not quite mirror the approach used in participatory design, which stresses collaboration between design partners, customers, and end-users. The user interface design has seven principles: tolerance, simplicity, visibility, affordance, consistency, structure, and feedback. In addition, it encompasses many concepts that can be conceived of at any point throughout the development of user interfaces VSD, known as the value-sensitive design, is a method for developing technologies that reflect the values of individuals who use the technology and those whose well-being is affected by the technology. A three-tiered method for developing VSD includes conducting conceptual, empirical, and technical studies. Conceptual studies seek to grasp and elucidate all users who will be using the technology along with the various values and the possible values conflicts that could emerge due to its usage. Empirical studies focus on understanding the target users' values, needs, and behaviors based on qualitative and quantitative research studies that aid in this process. Finally, technical studies should include research into how users utilize technology with systems development to serve the best values established in both the research and development process.
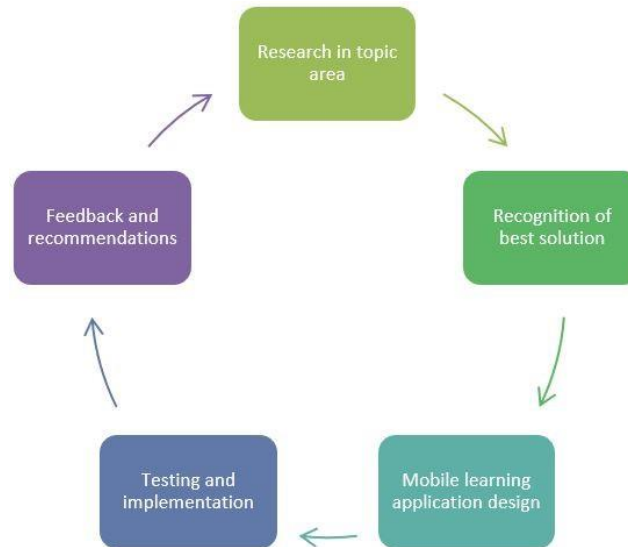
Fig-2. : HCI Guideline Concepts in Mobile Learning.

The challenge of accessibility guidelines for mobile applications has not been extensively researched, although it is almost as essential as websites. Mobile applications are sophisticated and have to work in many different form factors and interaction methods, making it impossible to make them completely accessible. As a consequence of comparing the mobile HCI guidelines, a richer set of recommendations for mobile design will be produced, such as removing cluttering, producing good navigation, creating a user-friendly touch screen, readable text, and elements visible on the interface, and many more. In addition, a valuable asset called user attention must be allocated appropriately.

2) Mobile Learning: Implementing a systematic approach to the design process for mobile learning sources and materials will be highly effective once we use the concepts of HCI, as illustrated in Fig. 2. Learners must be able to gather data, regardless of any ambiguous circumstances. Also, learners need to be provided with opportunities to reduce risks in the user interfaces and limit the dangers of mistakes and other unexpected moves. The design must comply with the specifications such as subject content should have a pleasing visual appearance, easy-to-use navigation structure, animated and graphical presentations can potentially transform learning into an enjoyable experience to achieve everyone's expectations.

Research is performed to discover which issues need help from mobile learning. An interactive approach can be used for effective learning where the topic is fully recognized. A broad range of solutions is available to solve the problem depending on what has to be solved. The development team must consider if the topic can be delivered in a video or other instructional medium. A certain kind of learning material to be used is selected during the solution recognition. The actual design process begins at the mobile learning application design phase. HCI concepts control this to ensure that the solution conforms to industry-standard recommendations and guidelines. Furthermore, some design strategies are adapted to meet the situation depending on the learner. This consists of all options, such as design, layout, font, and color.

After the design process, the learning resource is evaluated for different technical and non-technical aspects. Then, the testing phase is HCI-controlled, which follows the requirements' rules and standards. Once it is shown that the solution works by the conclusion of the testing process, it is deployed to end-users which are the learners. Finally, a customer survey helps assess the product's strengths. The feedback resulted in recommendations on what to improve, making the process again.

Conclusion–

Human-computer interaction studies all aspects of HCI, including design processes, software, and tools. The mobile device promotes informal learning, in which learners are allowed to take on extra activities as necessary. The importance of mobile HCI in education can show the difference between how designers recall the interaction and what occurred during the interaction. New challenges for human-computer interaction experts examine how HCI helps solve significant social problems and emphasize the necessity for multidisciplinary approaches. The challenges in HCI design include human technology, interactions between humans and computers, privacy and security, well-being, universal accessibility, and creative learning. Additionally, this study discussed current mobile learning resources, such as online courses, memorizing tools, assessment preparation tools, and supporting tools. Udemy was selected as one of the learning platforms to explore the design and possible improvements. Some students mentioned issues with the user interface or other aspects of the device, while others highlighted drawbacks, such as shorter battery life caused by accessories. Thus, future-proofing devices and networks to support mobile learning needs will likely entail resolving these issues, and parents are then required to supply an appropriate device for mobile learning.

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