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Research paper

Human-Computer Interaction Based on the Function of Management Information Systems in Business

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Abstract

The discipline of management information systems (MIS) is new and distinct, undergoing ongoing upheaval and rapid evolution. As a result, MIS research must contend with two shifts: relevance and rigor. Numerous research approaches offer different combinations of relevance and rigor. The economic analysis of information as a commodity in business management is the basis for the linkages that determine the value of the information research stream. The focus of the human-computer systems design research stream is on the cognitive underpinnings of successful systems configuration. The locus of the value of the IS investment is the emphasis of the IS organization and strategy research stream, rather than the opinions of a system or its user. Since management information systems are used to examine organizational operations, they differ from other information systems. In academia, the phrase is frequently used to describe data management techniques related to the automation or assistance of human decision-making, such as executive information systems, talented systems, and decision-making systems. Organizations require different MIS types to support a range of organizational levels, roles, and company processes. In this article, an attempt has been made to examine the function of MIS as a business opportunity and a challenge.

Keywords: *Business; Management Information Systems (MIS); Human-Computer Systems; Data Mining.*

1. Introduction

The analysis of human-computer interaction (HCI), sometimes known as human factors, in management information systems (MIS), focuses on how people use technology, information, and activities, particularly in organizational, managerial, cultural, and business contexts [1]. HCI studies in MIS are unique even if they have interests and problems in common with HCI research in other fields like computer science, psychology, and ergonomics. By concentrating on the examination of activities and outcomes at a level pertinent to organizational performance and effectiveness, a MIS researcher's viewpoint gives managerial and organizational contexts significance and particular importance. MIS differs from other "homes" of HCI primarily in two ways: management emphasis and business applicability. Since the first research in the MIS field, MIS-focused HCI problems have been studied. Three of these nine have to do with problems that arise when people use computers. One of the five areas of research that make up the MIS discipline, according to a second analysis of MIS publications from a later era, is individual (or micro) strategies to MIS design and use, which has a tight relationship with HCI. After an evaluation of 50 decades of MIS papers published in the Management Research publication, it was anticipated that interest in HCI, one of the five main research streams in MIS, would rise.

However, with the advent of internet access and the spread of smartphones and diversified innovations like voice-based and Internet of Things (IoT), computers have become all-pervasive and all-powerful. Technological competence also had an impact on how user interactions evolved. This led to a growing interest in developing a tool that would humanize these man-machine communications [2]. Therefore, Figure 1.1 brought languages, knowledge, computational technology, and other fields under the umbrella of HCI as a technology. A few cumulative technological developments regarding software availability and hardware requirements have spurred an increase in interest in AI research and development. Large language models, pre-trained transformers, open-source neural network models, and the ability to fine-tune these models have made it possible for end users to create AI-driven apps.

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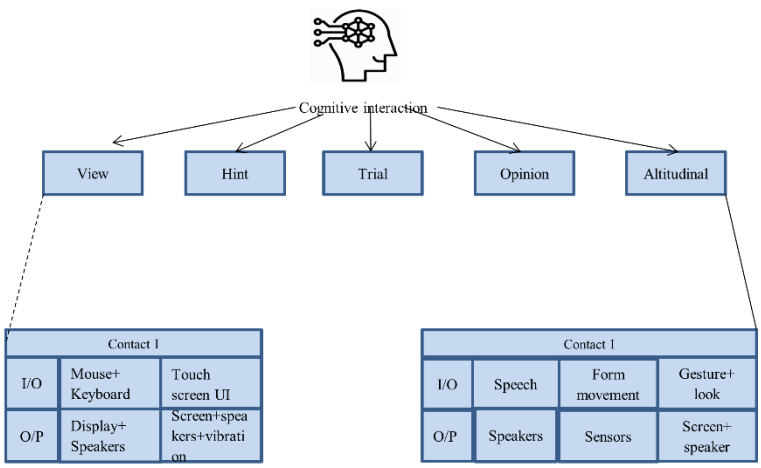


Fig. 1.1: Human-Computer Interactions.

HCI considerations are much more important and essential in the ever evolving and deploying technological world of today. Providing efficient support for user interactions, guaranteeing system functionality and usability, and improving a positive user experience are all objectives of HCI. Achieving corporate and individual user efficacy and productivity is the main objective. Managers and developers must understand how users, responsibilities, task situations technical (IT) [3], and system environments interact in order to accomplish these goals. It is our responsibility as educators to provide the upcoming generation of information system bosses, creators, and implementers with the HCI knowledge and abilities necessary to combine them with numerous other MIS components.

1.1. Management information system concepts

There are several approaches to understand and characterize MIS. Other common names for it are the Computer-based Information System, the Computerized Information System, and the Information and Decision System. There are multiple definitions of the MIS, some of which are included below:

- A system that supports organizational decision-making with information is known as a management information system (MIS).
- MIS is a human-machine integrated system that provides information to assist the organization's operations, leadership, and decision-making processes.
- A system built on an organization's database and designed to give information to its members is known as a management information system (MIS).
- A computer-based information system is known as a MIS.

1.2. MIS's goals

The MIS aims to achieve the following goals.

- To give a summary of the information those organizations need.
- To examine the function of leadership and how it relies on data.
- To talk about how data plays a part in decision-making.
- To determine the necessity of facts in an organization's daily activities.

This is how the remainder of the paper is structured. Section 2 lists the related works, including HCI. Section 3 introduces the suggested approach. The experiment's analysis and findings are shown in Section 4, and the conclusion is given in Section 5.

2. Related works

IT/information systems (IS) adoption and use are emphasized in many HCI research in MIS, yet it is well established that IS use is required but insufficient to increase personal output. The relationship between IS use and IS-enabled productivity may be mediated by the type of IS use [4]. The core idea of "Beyond Perceptions and Usage" is this. A model for personal IS-enabled productivity that takes into accounts both the type of IS usage and its prevalence was put out and validated by the researchers. The present research adds to the body of knowledge in MIS by elucidating the tenuous connection between individual productivity and IS acceptance. IT may have both beneficial and detrimental effects on potential users' health and well-being, which organizations and development companies should be mindful of.

These roadblocks raise the main query: are the frameworks and instruments already in use for assessing general information systems (IS) appropriate for CIS assessment? There is no proof in the literature that the measurements are appropriate for the cross-context [5]. Additionally, this question was answered negatively by a few studies. By adding missing elements to pre-existing frameworks and tools, some researchers attempted to address this issue. It has been demonstrated that this strategy is ineffectual, nevertheless, due to the lack of enough agreement and contrasts between various claims.

The phrases "human-computer conversation" and "human-computer interface" should ideally be used independently to refer to the dialogue between an electronic system and a human user and the medium used for that interaction, respectively. Therefore, an interface is the hardware and auxiliary software that facilitates the apparent two-way communication of activities and messages between an algorithm and a human, whereas a conversation is the action itself. However, because of their close relationship in the growth process, we will use the two terms interchangeably here, as we do in most writings [6]. There are gray areas between conversation and calculation in computer-based systems, making it occasionally challenging to distinguish between them even with an acceptable definition. Task analysis and other end-user-oriented simulation, for instance, consider the behavior of the complete system, including computing and conversation.

In this paper, we specifically offer a series of high-level research issues that can be broken down into more specific or lower-level inquiries. We next use a categorization approach to look at a group of HCI articles published over the last 13 years in seven prestigious MIS journals in order to answer these concerns. Our method employs a comprehensive perspective to highlight the specific features of the dynamics and depth of the HCI subfield. The scientific literature is evaluated using seven criteria: contributing subject areas, study contexts, degrees of analysis [7], themes, methodologies, human traits, and technology or company. These kinds of cross-facet and co-occurrence analysis are unique since they haven't been used in any comparable literature evaluation research in the field of information systems. Lastly, we look at the finest writers and colleges as well as publication trends in the seven journals to show the aspects of the sub-discipline that are scientific and cultural.

Innovations in many facets of life have been adopted because of ICT advancements. To expand the scope of learning and instruction for learners who would not otherwise be able to access it, the educational industry has witnessed a steady uptake of the internet and educational management systems [8]. These student groups include employees and distant learners who, for a variety of reasons, are unable to attend in-person classes. Most of the research on learning management systems (LMS) has been technical, focusing on assessing how well users engage with the LMS through HCI. Users attempt to comprehend the data provided by the LMS in a hypothetical environment using data interaction procedures that go beyond the user interface. This is mostly since the consumers are not given data that possesses both pragmatic and semantic qualities.

For enterprise management, HRM systems are essential tools. Numerous researchers have investigated cutting-edge HRM systems [9]. HR departments in small and medium-sized businesses employ this knowledge management system. Their emphasis on the connection between knowledge control practice and tools opened the door for executives and legislators to delve further into both theoretical and practical repercussions. As a major guide for the future growth of human resources management systems, the findings indicated that HRM processes in businesses concentrated on the twin skills of inspiring and training smart city managers (SCM). The green conception with HRM systems polled top executives and HR managers at 206 hotels in Southeast Asia, and PLS-SEM was used to analyze the results.

The first analysis was using reasoning to specify the context of use and the needs of the users while considering the PDA's small-screen interface design [10]. Five ward nurses participated in two semi-structured interviews as part of the research process. The first interview focused on investigating the current situation to create the usage context specification, and it employed workflow analysis, job analysis, and interview techniques to gain a clear understanding of nurses' everyday work. Accurate and essential medical data might be incorporated into the MNIS on PDA after a thorough understanding of the system's functioning, functionalities, happy, and surroundings. The daily work routine and surroundings, the incidence of prescription errors, the desktop health information system's practicality, and user expectations are the four primary questions that need to be considered.

3. Methods and materials

3.1. Types of information management systems

There are numerous kinds of systems for managing data available on the marketplace that provide businesses with a variety of advantages in Figure 3.1.

- Transaction processing system (TPS) documents and compiles an organization's daily activities. Most users of this system are at lower management levels. The company's basic transaction processing systems (TPS) offer data for management information systems (MIS), which generate fixed, regularly scheduled reports. MIS assists middle and operations managers in providing answers to structured and semi-structured decision problems.
- Decision-support systems (DSS) are primarily the middle level, utilizing computer tools to collect information from many sources to resolve problems and improve decisions. Executives at the highest levels of management make these choices.
- Executive support system (ESS) is an instrument for reporting that offers easy access to condensed information from departments and levels of the company, including operations, human resources, and accounting. This technology gives managers and executives access to vital data gathered from numerous both internal and external resources intuitively.
- Knowledge management system (KMS) is a knowledge-based information system designed to help managers and staff across the firm create, organize 11, and share business knowledge.
- Strategic information system (SIS) integrates information technology (them) into a company's business processes, services, and products to provide them a competitive edge.

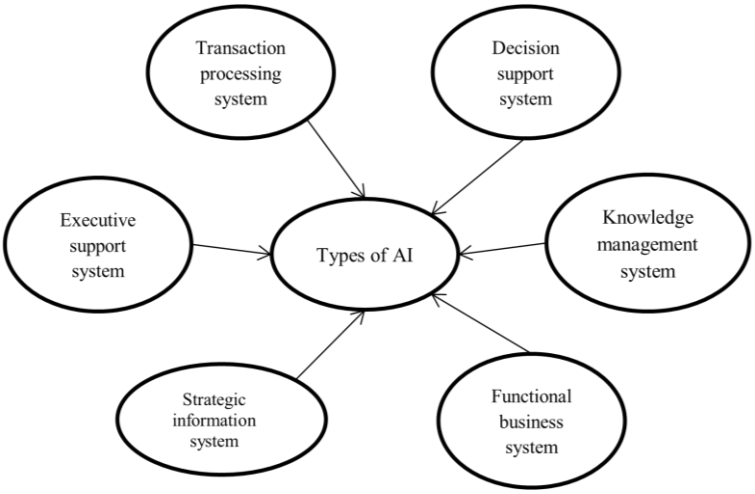


Fig. 3.1: Types of Information Management Systems.

- A Functional business system (FBS) emphasizes management and operational application to support company functions like marketing and accountancy, among others.

3.2. Human-computer communication

The training of human-computer interaction is known as HCI in Figure 3.2. It is important to note that the consumer interface serves as a dialogue and transfer channel for information between humans and computers. Ideally, machine language is not necessary for human-computer interaction. Human-computer communication is possible anywhere, at any time, without needing a keyboard and mouse—the connection between human behavior and computer-human interaction. The author explained the history of applied research (AR) [12]. The principles and ideas of human-computer interaction are analyzed, and two conceptual frameworks are presented.

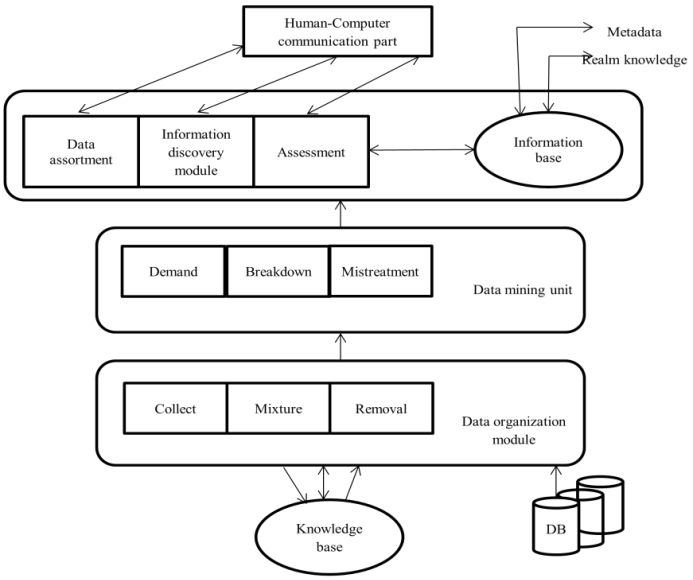


Fig. 3.2: The Main Structure of Decision Support System's Fundamental Design.

Modern intelligent systems, such as those that recognize hand gestures and human actions, frequently use human-computer interaction. Generally speaking, a computer with a camera can record human activity. Additionally, in response to certain human directions, the computer will perform the appropriate tasks. Human-computer communication can be facilitated by hand gestures and body movements, as explained in the human gaze. Because the Hidden Markov Model (HMM) has a great ability to analyze time-related tasks, it is commonly utilized for hand gesture identification. Furthermore, hand gesture recognition uses recurrent neural network methods. Human gesture recognition is important for HCI applications.

Finding the optimal answer is the goal of the decision-making system [13]. The choice the components of the DSS is the system, support, and modular elements. Along with structural decision-making, DSS should support semi-structural and non-structural judgments. The author outlines the broad framework of DSS and emphasizes that it is unable to specify decisions; it can only offer decision-makers relevant information. Numerous quantitative models, which are crucial to quantitative analysis and processing, are used in traditional DSS. Both unstructured and semi-structured decision-making problems are supported. DSS does have certain restrictions, though. The system's role in supporting decisions is passive; it is unable to offer active assistance in response to changes in the decision environment or to assist with common unstructured decision-making issues. According to the model of numerical mathematics, it does not address the typical qualitative, fuzzy, and uncertain issues in decision-making tools.

3.3. Usability of computer-based organizations

According to business analysis (BA), usability is a system's non-functional need. Indirect measurements or system properties (such as security access levels and delay before failure) are used to quantify non-functional requirements. BA researchers can handle certain aspects of system evaluation, including a better understanding of system users, by combining usability methodologies with process analysis techniques [14]. This would comprise the users' overall history, degree of information processing expertise, learning requirements, tasks they need or desire to complete, and tasks that, in the context of employment, must be entrusted to the machine. By establishing performance metrics and conducting assessment and evaluation, usability concepts and methods can also be applied to organizational process analysis to enhance business activity efficiency.

To find or evaluate areas for improvement, it is crucial to characterize performance measurements in both process analysis and usability evaluation. When assessing an application's design and usability, for instance, it should be obtainable and help fulfill the unique needs of individuals with disabilities, among other specified criteria. Consequently, the justifications for the importance of usability stem from the necessity to

- Understanding and empowering users;
- Designing objects with similar appearances to behave similarly and those without to behave differently;
- Presenting the data required for decision-making;
- Create user-friendly message conversations that guide how to correct errors;
- Make sure that every action has a response so that the user is always aware of what is occurring;
- Correct all user errors, if at all possible, as all users make mistakes;
- Reduce memory usage by retaining designs simple.
- Simplify and expedite tasks and procedures because the best journey involves the fewest measures.

3.4. MIS's part in improved decision-making

A vital component of any business is decision-making. This is since managerial decisions are at the center of the majority of organizational functions. Having a robust information system for management is essential to making decisions because they are based on the available data decisions more successfully. The time and substance of business information presentations, as well as executive decisions, determine how effective each piece of documentation is. It is when managers must make good business judgments that an information system for management becomes necessary. Although they must use their judgment, they also need facts to support their judgments. An organization may easily make decisions based on the information at hand if it has a sizable management information system. Just as poor MIS leads to poor decision-making, effective MIS guarantees sound decision-making. With its organized tools, relevant data, and suitable managerial norms and guidelines, MIS plays a critical role in making decisions.
Managers should create an environment that fosters the development of high-quality information since it is essential to the quality of managerial decision-making. Supervisors get quick access to information thanks to management data systems. It covers information analysis, cross-referencing of outside data, interaction with other decision support structures, and potential data removal methods. These systems offer data and strategic methods along with useful choices. Lastly, management information systems are essential because they offer a variety of choices available for decision-makers to choose from the one they want. This is crucial for businesses in the current generation since even a small error in judgment can result in enormous losses.

3.5. Experiments of using management information systems

Businesses still need a range of databases to accommodate different divisions, functions, and company procedures, and they are becoming more and more in need of systems that offer an enterprise-wide mix. Both opportunities and difficulties are brought about by these needs. Following the deployment of the essential information system, the company encounters numerous problems, including

- The creation of a modern computer database presents challenges for the company because of the expense and because the data system must be updated as time goes on. Workers ought to be informed of any modifications made to the business's website.
- It will be challenging for the company to remain in the market if employees cannot master their data systems, considering the shifting business and competitive environments.
- Server and website crashes can occasionally cause issues. Sometimes it results in information loss, and another issue is employee opposition to implementing the information system. Employees oppose novel innovations since they're unwilling to adopt the new system and prefer to continue using the same old pattern that they have mastered over the decades.
- The cost of implementing and preserving the data system of the company throughout all departments. Another challenge that arises during a software system's existence is figuring out what requirements it would best fulfill its needs, as every system has new technology and a restricted scope, and advancements constantly emerge. They must use the most recent innovations, which will increase the data management system's cost.

4. Implementation and experimental results

A thorough experiment is carried out in this section to confirm the efficacy of data mining applications in decision support systems (DSS). The parameter analysis and data mining evaluation are provided.

4.1. Assessment of data mining

A range of data mining algorithms, including grouping, decision tree (DT), Bayes network, association rules (AR), and concept lattice (CL), are used in this study to first evaluate the effectiveness of the proposed method. The phrase "decision buddy system evaluation" refers to a user's positive or negative feelings on DSS. If visitors like DSS, they can provide a small positive review.
Users who don't like DSS can also give a critical evaluation of the reasons why. We gather user input on the DSS to gauge its precision rate. The following is the definition of the accuracy rate:

$$\text{Accuracy} = \frac{\text{Positive Evaluation}}{\text{Total number of positive Evaluation}} \quad (1)$$

The DSS's performance under various data mining strategies is shown in Table 1. After ten iterations of the experiment, we compute the average value as the result, as Table 1 illustrates. The concept lattice-based approach performs the best. In addition to being a novel approach to decision support systems [15], idea lattices are also useful for accurately representing concept levels. The issue of concept validity following knowledge updating in a case-based reasoning system can be resolved by using a concept lattice in DSS.

Table 1: The DSS's Accuracy Rate Using Various DM Techniques

	DT	Bayes	AR	CL	Clustering
1	0.6272	0.7250	0.7273	0.8272	0.7104
2	0.6452	0.7265	0.7852	0.8457	0.7521
3	0.6412	0.7313	0.8414	0.8121	0.6313
4	0.6195	0.7426	0.6145	0.8175	0.6195
5	0.5982	0.7085	0.5982	0.8692	0.7821
6	0.6392	0.7945	0.6392	0.8392	0.7012
7	0.5623	0.7126	0.5623	0.8623	0.7854
8	0.6987	0.7654	0.8975	0.8947	0.6987
9	0.5123	0.7224	0.8623	0.8123	0.7845
10	0.6313	0.7154	0.7513	0.8313	0.7124
Ave	0.6313	0.7189	0.7814	0.8545	0.7393

4.2. Analyzing parameters

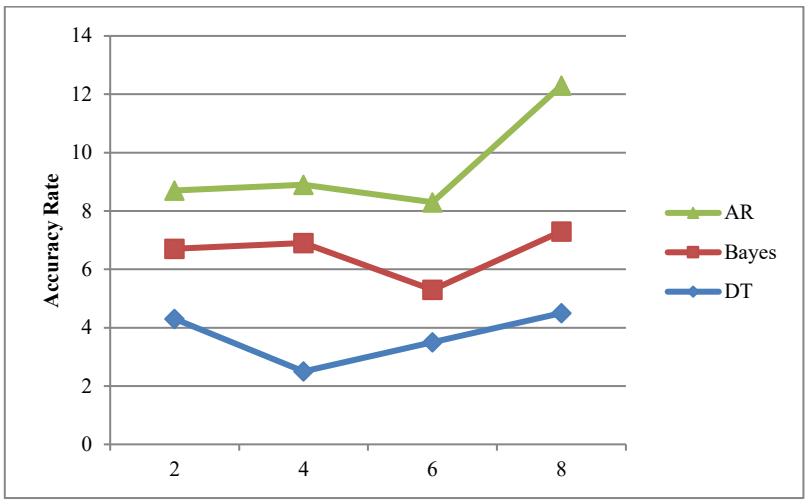


Fig. 4.1: (A) the Accuracy Rate for Different Amounts of P.

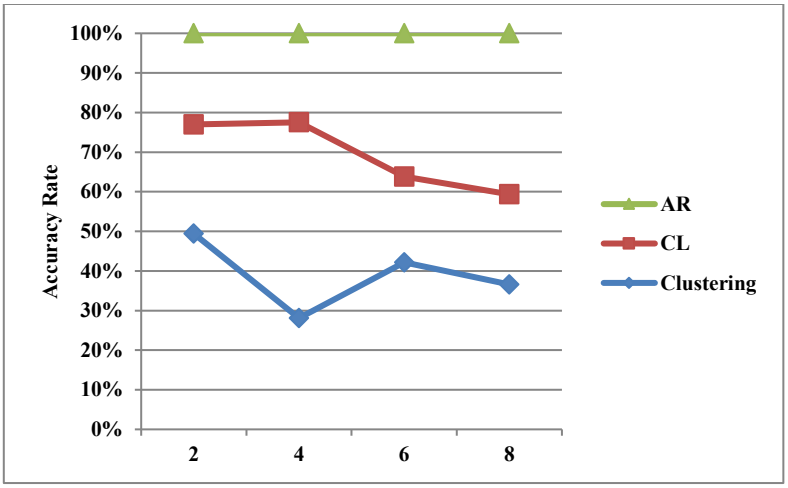


Fig. 4.1: The Comparison of the Results Under Various Parameters. (B) the Reliability Rate for Various Values of A.

Our method involves two crucial parameters: p, which represents the fund's probability, and α, which balances two components in formula (1). We do trials with varying values of α and p. The comparative outcome is displayed in Figure 4.1 (a) (b). The clustering approach can perform at its best when the probability value p is set to 0.7. The optimal performance of the concept lattice approach is attained when $\alpha = 0.6$.

5. Conclusion

The purpose of the research was to determine whether HCI interventions were still applicable when assessing the value of computer-based systems and the advantages that companies could obtain from implementing HCI practices. The travel services industry was the one that was utilized to get this knowledge. As demonstrated by the study's conclusion, HCI interventions continue to play a significant role in the design and development of modern computer-based systems, just as they did many years ago. Thus, the researcher maintains that HCI actions can be used to analyze business processes, including how tasks can be designed, how users interact and communicate in their work environments, how well users learn systems, how users' tasks are structured, and how users' social interactions and communication are influenced.

Data mining provides a practical and effective method for designing a decision support system. Data mining-based DSS may accurately forecast and analyze business decisions. In this study, we created a visual decision-making engine with the aid of data mining. We looked at the design of the decision help system using data mining. Furthermore, a comprehensive experiment has shown that our proposed method works.

Human-centered care has gradually given way to user experience in recent years because of new technologies like "virtualization, new smart home control systems, knowledge-based systems, gamification systems, IoT-based information systems for healthcare," which force people to ask for more visual care, unseen gestures, and corporal feedback. The study also revealed that some interface design issues are not being addressed by the user-centered approach, which HCI experts believe can help. Mobile substrate apps are heavily emphasized in HCI user interface design methods for information systems development. Therefore, to further explore HCI strategies in connection with other organizational information systems, with a particular focus on cloud-based systems, future studies should use a statistical or qualitative analysis methodology.

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