Assessing the acceptability of an Automated Health Records Information System in the universities: a technology acceptance model approach

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ABSTRACT
This research assessed the acceptability of the Automated Health Records Information System in a state university clinic located in Cebu, Philippines, and aimed to enhance healthcare management in the digital era. Employing the Technology Acceptance Model, the study examined user perceptions and satisfaction with the software, providing insights into its effectiveness in improving workflow efficiency and patient care. The study employed a weighted mean utilizing a five-point Likert scale to evaluate the acceptability of the software and a four-point scale for expert validation. A descriptive correlational method was utilized, applying Pearson r to analyze the degree of correlation. The study revealed that the software was highly acceptable based on perceived usefulness, ease of use, intention to use, and actual use, as rated by the respondents. Moreover, the technical requirements of the software, including design, features, and program content, were also positively rated. The null hypotheses were not rejected as there were no significant interrelationships among the four acceptability variables, indicating that other factors, such as the type of institutional support, user's characteristics, experiences, and skills, may influence the inter-correlation acceptability of variables. Respondents highlighted challenges in software navigation and expressed the need for comprehensive training. Despite these challenges, the study strongly recommended the acceptability and adoption of the Automated Health Records Information System to enhance healthcare delivery within university clinics, emphasizing its role in seamlessly managing health records for all university personnel and students, in alignment with broader institutional objectives aimed at improving overall well-being and organizational efficiency.

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Introduction

The COVID-19 pandemic had pushed healthcare institutions worldwide to their breaking point, revealing significant challenges in the ability of current healthcare systems to effectively manage the crisis. This global health emergency tested the capacities of both public and private healthcare services, highlighting weaknesses in providing adequate care. The absence of standardized organizational and treatment protocols exacerbated the strain on healthcare systems, hindering effective responses[1]. In a study conducted in Africa, where many nations are low-income countries, the coronavirus had a devastating impact due to already weak healthcare systems[2]. The study underscored the incapacity of African healthcare systems to address the pandemic, leading to unprecedented deaths during its peak.

As computer technology and software continue to advance, the automation of the healthcare system with the Internet of Things (IoT) was ready to assume a pivotal role in mitigating such risks[3]. The integration of IoT into health-care systems had been successfully implemented, yielding precise outcomes. Amid the COVID-19 crisis, the automation of health monitoring systems had become crucial in the medical field. Researchers and medical professionals found the programme to be very helpful in expediting COVID-19 treatment and preventive efforts. The Internet of Things-based automated health monitoring programme complied with modern technological norms and offered a better method of providing healthcare[4]. In order to manage data and additional information at the quick speed required under these circumstances, information technology was essential.

A Health Information System (HIS) comprised interconnected elements that gathered, processed, stored, and disseminated data and information. This functionality aided in decision-making, facilitated the management of health organizations, and improved healthcare applications[5]. Health information technology had the capacity to revolutionize healthcare delivery by providing information where it was required and reshaping healthcare to prioritize the consumer. This transformation could occur without significant regulatory changes or disruptions in the industry. It enabled improved quality, safety, and responsiveness to consumer needs, as well as enhanced efficiency, reduced waste and increased accessibility to care[6].

According to the National Association of School Nurses (NASN), electronic health records (EHRs) were crucial for registered professional school nurses. EHR platforms that adhered to modern nursing standards empowered school nurses to enhance healthcare coordination, quality, equity, safety, efficiency, and effectiveness. These capabilities contributed to maximizing the educational potential of school-age youth[7].

The medical personnel were responsible for keeping track of the employees' and students' medical records to provide a healthy atmosphere. All registered nurses in private and public school institutions had to access EHRs software platform that complied with confidentiality, security, and privacy regulations. School nurses were required to maintain accurate and secured student health records, following standardized nursing practices[8,9]. EHRs were identified as the most effective and secure method for managing this information[10].

The number of software programs available to users increased due to the fast development of technology. However, not all software programs were embraced and utilized by users. The Technology Acceptance Model (TAM)[11] emerged as a suitable choice, given its established focus on user's perceptions of technology's usefulness, ease of use, intention to use, and actual usage[11].

The TAM outlined how individuals accepted information systems. TAM suggested that user's adoption of a technology was determined by their perception of its utility in task completion and ease of use,[12-14] asserting that the adoption of information technology benefitted individuals and organizations short- and long-term by improving

performance, saving time and money, and offering convenience, while innovations like wearables, virtual reality, and IoT transformed healthcare, giving patients more mindful, patient-centric choices.

According to the TAM, people undergo a three-step process when deciding whether to embrace new technology. Initially, individuals evaluated the design of the technology to gauge its usability and potential advantages. These assessments then shape their attitudes towards using it. Ultimately, their emotions played a pivotal role in deciding whether to embrace or decline the technology[11,15]. A study conducted by Davis FD[15] and further supported by Ajzen I[16] found that the attitude towards behavior, termed behavior intention, played a crucial role in technology acceptance. This emotional assessment of potential consequences is more influential in determining actual behavior than mere behavioral intention.

The study aimed to evaluate and adopt an Automated Health Records Information System (AHRIS) for digitizing medical records, updating them in real-time, validating the software's technical requirements, and contributing to the advancement of healthcare technology within university clinic. Its significance lay in its focus on addressing the urgent need to enhance healthcare management in educational settings, particularly in the digital age when efficient record-keeping was crucial for both patient care and operational efficiency.

Materials and methods

Participants and procedures

The study utilized a quantitative approach with a descriptive-correlational design involving two respondent groups. The first group comprised 101 employees, including two clinic nurses authorized to access the system, organic teaching personnel, organic non-teaching personnel, part-time teachers, and contract-based employees. The second group comprised 300 students from a range of programs, such as Industrial Technology, Hospitality Management, Elementary Education, Secondary Education, Marine Engineering, and Fisheries and Allied Sciences.

The study was conducted at one of the state universities in Cebu, Philippines, which was dedicated to the holistic development of all stakeholders through various educational programs and the integration of fundamental values for global competitiveness. Three computer experts, each with extensive experience in software development and system security, authenticated the technical aspects of the software. They ensured that the system met industry standards, including compliance with the Data Privacy Act of 2012 (Republic Act No. 10173), ISO/IEC 27001 for information security, TESDA's e-Governance Standards, and the National ICT Standards set by the DICT, verifying that the system was robust enough to handle the anticipated data load while maintaining data privacy and security.

Every participant in the study completed a standardized questionnaire with three components. The first section gathered data on demographics. Using the TAM, the automated health records information system's acceptability was evaluated in the second phase. The third section addressed challenges encountered by participants while navigating the system. The clinic personnel had been using the AHRIS for about two months prior to completing the survey, while the rest of the respondents were able to navigate the system after attending an orientation and demonstration. The orientation and demonstration sessions, which were limited to 20-25 respondents per day, were conducted over the course of a month. Respondents were only allowed to participate in the survey after attending these sessions. The questionnaire, which took approximately 5-10 minutes to complete, was distributed through both online platforms such as Facebook Messenger and in-person at the university clinic. Participants evaluated its acceptability using TAM, emphasizing usefulness, ease of use, intention, and actual usage. Additionally, users' encountered challenges

were documented. The output of the study was the developed AHRIS.

Sampling technique

To guarantee a thorough and representative sample selection procedure, stratified purposive sampling was used. With this approach, the population was categorized into discrete subgroups according to pertinent factors, such as departmental affiliation within each college. From each subgroup, participants were carefully selected to represent both employee and student populations. Specifically, a sample of 101 employees, which included two clinic nurses and 300 students was drawn, ensuring that key groups, such as teaching and non-teaching personnel, contract-based employees, and students from different programs, were adequately represented. This approach allowed the study to capture a diverse and balanced set of perspectives from across the university community.

Statistical analysis

Three statistical techniques were used in the study: Pearson r coefficients, simple percentages, and weighted averages. A five-point Likert scale, with five being the highest level of acceptance and one being the lowest, was used to produce weighted means in order to assess the acceptability of the TAM-based AHRIS. The survey questionnaire underwent content validation by computer technology experts, and reliability testing yielded a Cronbach alpha coefficient of 0.868. Since Cronbach's alpha exceeded the minimum threshold of 0.7, the study inferred that the technical specifications of AHRIS demonstrated strong internal consistency.

Data gathering procedure

The researchers obtained approval from the Campus Director's office at Cebu Technological University, Carmen campus, ensuring ethical compliance (Ref. number: 2024-001-LEC, a unique identifier assigned by the local Ethics Committee representative to confirm the study's adherence to ethical standards). All respondents provided informed consent electronically via Google Forms or in writing. The university administration permitted software demonstrations, ensuring privacy during sessions. The university clinic nurse assisted in data collection and ensured that the AHRIS software used for demonstration complied with all confidentiality and security protocols. Questionnaires were distributed via Google, Facebook Messenger, and face-to-face, depending on respondent availability. Protocols were established for data collection, confidentiality, debriefing, communications, and conflict of interest to ensure ethical standards were upheld throughout the study.

Results

The study involved two main groups of participants: 101 university employees, including clinic nurses, teaching and non-teaching staff, part-time teachers, and contract-based employees, along with 300 students from various programs such as Industrial Technology, Hospitality Management, Marine Engineering, Education, and Fisheries. These participants were selected using stratified purposive sampling to ensure a balanced representation of perspectives across the university community. The clinic personnel had direct access to the system for two months prior to the survey, while the rest of the employees and students interacted with the system following orientation sessions.

The results presented in each table were derived from specific participant groups. Data on the system's technical requirements were gathered from the three computer experts who assessed the AHRIS, while the results on acceptability, challenges, and system usability were obtained from the broader pool of employees and students, reflecting their experiences and interactions with the system.

Table 1 Data on the technical requirements of the Automated Health Records Information System post-exercise, and recovery period

Indicators	Weighted Mean	Description
1. AHRIS design	3.67	very well done
2. AHRIS features	3.50	very well done
3. AHRIS content	3.63	very well done
Overall average	3.60	very well done

A. Technical requirements of the Automated Health Records Information System

As shown in table 1, the result suggested that the technical requirements were considered critical in the development of the university clinic's AHRIS, as indicated by the overall average of 3.60, which was equivalent to a very well done.

Table 1 revealed that the technical requirements of the AHRIS indicated that the AHRIS design, features, and content were all rated very well done, with a mean of 3.67, 3.50, and 3.63, respectively. This result indicated that the system met the highest standards of quality and provided a comprehensive suite of tools and features to support the efficient management of health records.

B. Acceptability of the Automated Health Records Information System

The average score of 4.695, which was similar to a very highly acceptable one, indicated that the system's acceptability was regarded as important in building and implementing the automated health records information system for the university clinic, as shown in table 2.

As indicated by the data depicted in table 2, the TAM served as a beneficial framework for comprehending user acceptance of the AHRIS. The average scores for the acceptability variables were as follows: perceived usefulness (4.78), perceived ease of use (4.60), intention to use (4.71), and actual use (4.69), with an overall average of 4.695. These results suggest a strong level of acceptance of the AHRIS among users.

C. Relationship of the Automated Health Records Information System's acceptability

The findings presented in table 3 of the study indicated that there were no notable correlations observed between the pairs of variables examined. The computed correlation coefficients (r) were all extremely low, ranging from 0.023 to 0.083. Furthermore, every p-value was higher than the traditional cutoff point of 0.05, indicating that the null hypothesis—which put out the idea that there were no meaningful intercorrelations between the four variables—could not be ruled out.

D. Challenges encountered in navigating the Automated Health Records Information System

The respondents had varied experiences while navigating the AHRIS. Table 4 presents issues and concerns mentioned by the students, while table 5 mentions the challenges of the employees.

Table 2 Data on the acceptability of the Automated Health Records Information System

Indicators	Weighted Mean	Description
1. Perceived usefulness	4.78	very highly acceptable
2. Perceived ease of use	4.60	very highly acceptable
3. Intention to use	4.71	very highly acceptable
4. Actual use	4.69	very highly acceptable
Overall average	4.695	very highly acceptable

Table 3   Inter-correlation of the acceptability variables

Pair of Variables	Computed r	*p*-value	Decision	Significance
Usefulness and ease of use	0.082	0.101	fail to reject Ho	not significant
Usefulness and intention to use	0.083	0.097	fail to reject Ho	not significant
Usefulness and actual use	0.066	0.187	fail to reject Ho	not significant
Ease of use and intention to use	0.023	0.646	fail to reject Ho	not significant
Ease of use and actual use	0.041	0.413	fail to reject Ho	not significant
Intention to use and actual use	0.041	0.413	fail to reject Ho	not significant

Table 4   The challenges provided by the students

Students' challenges	f	%	Rank
The app is new that is why it takes time for me to fill out the form.	105	35	1
Need to consult the user manual often when using Automated Health Records Information System.	95	31.67	2
Difficult to access the Automated Health Records Information system using a smartphone.	68	22.67	3
Make errors frequently when using the Automated Health Records Information System.	19	6..33	4

Table 5   The challenges provided by the employees

Employee's challenges	f	%	Rank
Need to consult the user manual often when using Automated Health Records Information System.	53	52	1
Need more time to study the app.	34	33	2
Need more in-person training and demonstration about the app to fill in the information correctly.	25	24	3
Cannot view the app with my cell phone.	19	18	4

Discussion

In this section, the study highlighted several critical insights that were pivotal for understanding the adoption, implementation, and use of the AHRIS in a university clinic setting.

Firstly, the technical requirements of the AHRIS, including its system's design, features, and content, received high ratings from experts. These aspects were foundational to the system's functionality, usability, and compliance with regulatory standards. The emphasis on meticulous design ensured that the system met the specific needs of healthcare professionals and patients, contributing to its efficiency and security. The validation of these technical requirements through expert evaluation affirmed the system's capability to manage health information effectively, thereby improving patient care and operational efficiency.

The design was crucial for the AHRIS, demanding careful planning to prioritize security, meet technological standards, and ensure user-friendliness. The design process aligned with

nursing practice, incorporating elements such as quality, safety, security, efficiency, effectiveness, and privacy protocols, while considering the needs of all stakeholders, including administrators, patients, and healthcare professionals[7-10].

To ensure that the program met the requirements of both patients and university clinic staff and contributed to a secure and efficient system, design validation was crucial. Experts recognized potential implementation problems and affirmed that the design effectively addressed healthcare needs. Throughout the design process, important elements such as the user manual, database design, testing, user interface, system architecture, programming language, and interoperability were carefully considered. Detailed flowcharts for the admin and patient portals were developed to visualize the system's capabilities and ensure proper functionality. These flowcharts were crucial in illustrating the processes and interactions within the AHRIS, making the system's workflow clearer for users. The design process began by gathering user requirements from clinic staff and patients through interviews and surveys, which highlighted how each group interacted with the system and identified areas for improvement in terms of efficiency and user-friendliness.

Once these needs were identified, the flowcharts were used to map out the step-by-step processes for both portals. The admin portal's flowchart covered key functions such as patient record management, appointment scheduling, and report generation, ensuring a logical and efficient workflow. For the patient portal, the flowchart focused on user actions such as account creation, appointment requests, viewing medical records, and communication with the clinic. These visual representations played a vital role in reviewing the system's adherence to user requirements, helping experts identify potential bottlenecks, and ensuring the system was user-friendly and aligned with the intended goals.

Features of the program were meticulously crafted to prioritize user-friendliness, ensure clear access to patient health information, and facilitate medical documentation, decision-making, communication among healthcare workers, and data sharing. Expert validation confirmed the system met these technical requirements, enhancing healthcare management within the university clinic. The program streamlined processes for healthcare providers, administrators, and patients, offering functionalities such as generating patient reports, analyzing health data, ensuring secure access to records, and facilitating communication with healthcare professionals. Detailed consultation records provided a structured view of patient interactions and treatments, supporting informed decision-making and optimizing healthcare information management. For adolescents with complicated medical needs and long-term illnesses, the use of electronic health records in schools proved beneficial for managing cases and coordinating care, offering the most efficient, effective, safe, and secure approach to handling student health information[9,17-19].

Content played a crucial role in meeting the technical requirements of the AHRIS, ensuring accurate representation of the system's purpose, accessibility, and user-friendliness. It facilitated data processing and communication between healthcare providers and patients, which was integral to the system's functionality. School nurses effectively accessed student health data stored in EHRs for communication and exchange with other healthcare providers and organizations, enhancing student health outcomes through bidirectional interoperable EHRs[9].

The system was designed, developed, and tested to high standards, ensuring accurate and efficient capture, secure storage, and retrieval of necessary information. Functionalities included user registration and login, management of patient consultation and treatment records, patient history, student enrollment tracking, data management, appointment scheduling, inventory management, and medical report generation. The patient's records, depicted in the system's figures, were a key

component of the content, supporting comprehensive medical histories and treatment plans.

Validation by experts ensured the system met user needs and complied with relevant standards, improving accuracy, reliability, and usability in managing healthcare information within the university clinic environment. In order to assess the quality, usability, functionality, security, and interoperability of school health electronic health records—as well as the associated policy, procedures, and professional development requirements—school nurses needed to be represented on school district information technology committees[19].

Secondly, the study applied the TAM to assess how well users, including healthcare professionals and students, accepted the AHRIS. It found that users generally perceived the system as useful, easy to use, and expressed intention to use it, indicating they viewed it as valuable for enhancing healthcare delivery. The decision of whether to accept or reject the technology was largely influenced by emotions[11,15]. These findings were supported by the study by Davis FD[11], who pointed out that research in information system management had traditionally been motivated by the prospective benefits of technology, influencing people's willingness to adopt new technologies. Thus, easier-to-use technologies perceived as being beneficial were more likely to be adopted, as evidenced by empirical research in the field. In this model, technology that was easier to use was viewed as more advantageous, which encouraged more people to adopt it[11,15].

Despite the lack of significant correlations between the acceptance variables (usefulness, ease of use, intention to use, and actual use), additional contextual factors likely influenced the overall acceptability of the AHRIS. The data did not capture the full range of influences on system adoption. Factors such as institutional support, individual user characteristics, prior experiences, and varying levels of technological skills played significant roles in how users received the AHRIS.

For instance, the orientation sessions and technical support provided by the researchers may have helped less tech-savvy users overcome challenges, increasing actual usage despite initial difficulties. Users with prior experience in digital systems likely had a smoother adoption process. Feedback from tables 4 and 5, where users reported consulting the manual frequently or facing difficulties with mobile access, pointed to varying levels of comfort with technology, reinforcing the impact of these external factors on acceptability.

While the study indicated strong user acceptance of the AHRIS in university clinics, it underscored the importance of considering these external factors for effective system implementation. Understanding how these variables interacted provided insights into optimizing healthcare information systems in academic settings. Future research should further explore these dynamics to enhance system adoption and utilization.

Furthermore, the study underscored significant challenges faced by both students and employees when using the AHRIS in a university clinic. Students encountered issues with software usability, mobile device compatibility, and system reliability. Employees, on the other hand, experienced difficulties such as frequent reliance on user manuals, the time needed to learn the system, and accessing it via smartphones.

Similar difficulties were seen in the study conducted by Press A and colleagues[20], which found that although the electronic tool was first perceived as being time-consuming, difficult to use, and less user-friendly, these issues were resolved after the usability was assessed. Addressing these challenges was crucial for enhancing user acceptance and maximizing the system's effectiveness in supporting patient care and administrative tasks.

This study underscored the importance of ongoing support through comprehensive training sessions and continuous improvements in system usability and compatibility. Proactively addressing

these issues helped institutions improve the adoption and utilization of AHRIS, leading to enhanced healthcare delivery and operational efficiency in university clinics.

Conclusion

The study concluded that technical requirements and software acceptability were critical factors in developing and implementing an automated health records information system (AHRIS). The research emphasized the importance of these technical requirements and software acceptability in successfully deploying the system. Attention to detail in program design, features, and content was essential to meet healthcare professionals' needs and ensure regulatory compliance. Validation by experts confirmed the system's ability to manage health information effectively, leading to improved patient care and operational efficiency.

Although acceptability variables showed no significant interrelationships, other institutional and individual factors, such as institutional support and user characteristics, were important. Adequate training and support during implementation were crucial, as highlighted by respondents. Adoption of the system was essential for university clinics to improve healthcare delivery, patient outcomes, and operational efficiency.

Continuous monitoring and evaluation were vital for identifying and addressing emerging challenges, maintaining data accuracy and security, and achieving the system's intended goals. This iterative approach was essential for adapting to technological advancements and ensuring the system being relevant and effective over time.

The study's findings were particularly relevant for educational institutions seeking to streamline their health records management systems. By prioritizing technical robustness, user acceptance, and ongoing system improvement, stakeholders could optimize the benefits of AHRIS, ultimately improving patient care and organizational efficiency in university clinic environments.

Take home messages

The acceptability of Automated Health Record Information Systems in school settings was driven by their capability to streamline healthcare delivery, enhance data accuracy, and improve patient outcomes through efficient information management.

Conflicts of interest

The authors declare no conflict of interest.

Acknowledgements

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