



Sociology & Cultural Research Review (SCRR)
 Available Online: <https://scrrjournal.com>
 Print ISSN: 3007-3103 Online ISSN: 3007-3111
 Platform & Workflow by: [Open Journal Systems](https://doi.org/)
<https://doi.org/>



Health Information System Adoption among Healthcare Professionals in Pakistan: The Role of Trust, Security, Privacy, and Organizational Support

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ABSTRACT

Background

Health Information Systems (HIS) have become an essential element in enhancing the quality of healthcare, patient safety, clinical decisions, and efficiency of the organization. Despite significant gains made by Pakistan in the implementation of digital health, there is still an imbalanced adoption of HIS because of technological, organizational, and human factors. The knowledge of the factors affecting the adoption of HIS by the healthcare professionals will allow formulating effective strategies to increase the pace of computerization in healthcare.

Objective

This paper set out to test the determinants of Health Information System adoption among the healthcare professionals in Pakistan by assessing the impact of performance expectancy, effort expectancy, social influence, facilitating conditions, security, privacy, trust, and organizational factors.

Methods

A cross-sectional survey was performed nationwide on 278 healthcare professionals selected by convenient and snowball methods recruited in both the public and private healthcare organizations of Pakistan. The participants were physicians and nurses, allied health professionals, health information officers, and hospital administrators. A structured, self-administered questionnaires (including demographic data and measures of Health

Information System adoption, which were validated) were used to gather data. Responses were measured on a five-point Likert scale. IBM SPSS Statistics version 29.0 was used in analyzing these data. There were the descriptive statistics, independent samples t-tests, one-way ANOVA, Pearson correlation analysis, multiple linear regression, logistic regression and hierarchical regression to determine the factors related with the adoption of HIS. The statistical significance was set at $p < 0.05$.

Results

Out of the 278 medical workers, there were 55.4 percent males and 44.6 percent females with a majority working in the government health facilities. All told, the respondents indicated a favorable attitude to Health Information Systems and regularly use digital health technologies. Trust emerged as the strongest predictor of HIS adoption ($\beta = 0.307$, $p < 0.001$), followed by performance expectancy ($\beta = 0.248$, $p < 0.001$), security ($\beta = 0.241$, $p < 0.001$), and facilitating conditions ($\beta = 0.216$, $p < 0.001$). The HIS adoption variance was explained by the regression model ($R^2 = 0.684$; 68.4). All variables of the study had significant positive correlations, with trust with the strongest relationship with HIS adoption ($r = 0.81$, $p < 0.001$). Substantial obstacles that were cited by participants ranged through heavy workload, lack of training, insufficient technical assistance, poor internet connection, and privacy issues over their data.

Conclusion

Trust, perceived usefulness, organizational support, security, and privacy have a powerful effect on the adoption of Health Information Systems by the Pakistani healthcare professionals. Despite favorable values portrayed by healthcare professionals regarding digital health technologies, some challenges associated with infrastructure, training of workforce, and cybersecurity still pose hurdles towards an optimal implementation. To increase HIS penetration and facilitate the current digitalization of the Pakistani healthcare system, it is necessary to improve digital infrastructure, provide more training to professionals, enhance technical support, and develop effective information security policies.

Keywords: Health Information Systems; Electronic Health Records; Healthcare Professionals; Digital Health; Technology Adoption; Trust; Information security; privacy; Health Informatics, Pakistan.

Introduction

Digital transformation of healthcare is one of the most crucial changes in contemporary medicine, which aims to substitute the paper-based storage with integrated electronic systems in healthcare to advance patient outcomes and efficiency in medical operations (Osama et al., 2023). EMRs and EHRs are the drivers of this revolution, which is a digital representation of the medical history of a patient that encompasses demographics, progress notes, medication, vital signs and lab data. Though commonly used interchangeably, EMRs are typically considered as legal databases within the same healthcare institution, whilst EHRs are formulated to be interoperative across disciplines and errors, decrease place. These technologies are adopted because of the possible consequences to minimize medical costs, and enable evidence-based clinical decision-making (Alowais et al., 2023; Rabiei et al., 2025). Nevertheless, in spite of such undeniable advantages, the process of transition carries a number of issues, the main one being the privacy and security of the sensitive health information.

The evolution of a national EHR system in Pakistan, a country with more than 200 million inhabitants that could become one of the largest economies in the world, is becoming an apparent need in order to enhance the quality of documentation and patient safety. As of

now the health information system (HIS) in Pakistan is still disjointed; vertical systems are frequently at sub-district, district, provincial and national levels to (Shah et al.,2025). The District Health Information System (DHIS) was implemented as an improvement to previous Health Management Information System (HMIS) which was framed in 1992, though there are still considerable gaps in infrastructure and human resource capacity. In Pakistan, traditionally, most medical records have been paper-based and this presents very serious constraints such as illegibility, loss of data and inability to access information swiftly during emergencies (Khalid, 2024). An example is when the patient switches doctors, he/she might forget vital information regarding the allergies, and this case can prove to be life-threatening in case old records could not be supplied.

The perceived lack of digital safety against unauthorized access and cyberattack is the basic obstacle to the international and national acceptance of EMRs. The valuable personal identifiers stored in medical records, such as social security numbers, insurance information, and patient demographics, which can be used to commit identity theft or for use in fraudulent insurance claims, medical records are of great interest to cybercriminals (Harrell et al.,2022). This is made even more hazardous by the growing adoption of off-the-shelf software and operating systems such as Windows or Linux into medical devices that are vulnerable to the same malware programs as well as security bugs as any standard computers used in offices (Bracciale et al., 2023). Moreover, EHR systems are now exploitable via mobile devices and smartphones, which creates additional opportunities to attack data, breach via eavesdropping, and lose unencrypted hardware, putting data at risk (Bracciale et al., 2023). Privacy in the context of healthcare informatics is defined as a right of an individual to decide when, how and to what extent their personal information is disclosed. Security on the other hand is the technical, physical and administrative protection that is designed to limit access to authorized personnel members and protect data integrity. The core of information security guidelines consists of the CIA triad, that is, Confidentiality, Integrity and Availability (Yee & Zolkipli, 2021). Confidentiality: Only persons with a justifiable need to know will be able to access sensitive data; Integrity: It is ensured that the information is accurate and has not been manipulated; Availability: The system can be accessed by persons with a justifiable need to know the information. Fears about these aspects usually result in privacy-protective behaviors of patients: not sharing all information, inventing facts, or refusing to see a doctor at all, which ultimately undermines the quality of care and research in the field of medicine (Carter, 2022).

Research in Pakistan and Malaysia suggests that health staff tends to have problems with trusting electronic systems, it is at times perceived that paper-based records are safer and more confidential. Top management support, financial strength and perceived usefulness are some of the factors that affect the uptake of HIS in Pakistani hospitals (Luo et al., 2024). Nonetheless, lack of funds is a major issue; in the past, Pakistan has not spent more than 1 percent of its GDP on healthcare, which is very low compared to the recommendation given by the world health organization. The resulting result of this insufficient investment is the insufficiency of trained health IT professionals and under-equipment of primary healthcare facilities. Also, absence of digital literacy and periodic education of medical personnel leads to dissatisfaction and unwillingness to move away from used manual processes (Luo et al., 2024).

The success of digital systems will also heavily depend on the quality and completeness of medical documentation. The clinical audit conducted within a teaching hospital in Lahore, Pakistan, showed that core clinical factors such as vital signs and diagnoses were adequately

recorded, whereas, the psychosocial, lifestyle, and contextual history were seriously lacking in documentation. A good example is that patient vaccination and travel histories were seldom documented, simple data such as patient weight and occupation were often overlooked (Butt et al., 2026). Such deficits may lead to drugs mistakes, unnecessary diagnostic performance, and impaired patient safety. Introduction of EMRs whereby critical data has to be compulsory in forming a field may be used in enhancing compliance as long as it is accompanied with a supportive organizational culture that appreciates data accuracy (Butt et al., 2026).

As a way of mitigating these security issues, scholars have suggested a number of technology solutions, including advanced cryptography, to decentralized blockchain models. Cryptography plays a critical role in ensuring data security during transmission as well as data at rest (Jangam, 2023). Though conventional algorithms such as RSA have been commonly involved in provision of digital signatures, they are becoming a target to fast computer computations and quantum attacks to be launched in future. As a result, models that are a combination of Advanced encryption standard (AES) to provide efficiency and NTRU to provide quantum resistance have been realized to guarantee protection of data over a long period of time. Patient-Controlled Encryption (PCE) which enables the patient to create and save their own keys is also another innovative way of doing this so that when a data center is breached, it is not possible to access their records without their approval (Jangam, 2023).

Blockchain technology could be used as a solution to safe management of healthcare data because it offers a decentralized registry that cannot be tampered with (Yaqoob et al., 2022). In contrast to central databases, blockchain removes the single point of failure and enables secure data transmission by means of smart contracts based on which access permissions are automated according to patient-defined rules. This technology is capable of promoting greater interoperability, but with high privacy preservation using such techniques as content extraction signatures (CES) that enable patients to provide only the required part of the record. Nonetheless, terms like the introduction of blockchain demand fundamentally different ideas on how strategies are implemented and demand substantial investment, requiring healthcare clients to carefully analyze the costs and benefits of implementation (Yaqoob et al., 2022).

The recent developments in Artificial Intelligence (AI) and the Internet of Things (IoT) create prospects and introduce novel threats to EMR systems in Pakistan. AI can radically transform diagnosis and customization of treatment using extensive data on healthcare outcomes, especially in resource-constrained environments. AI deployments have ethical issues related to bias in algorithms, data privacy, and transparency (Akinrinola et al., 2024) highlight, Equally, IoT-based devices, such as wearable Remote Patient Monitoring (RPM), sensors, also enable real-time treatment; however, they usually have lax security checks appearing as an ideal target in eavesdropping and information theft. As such technologies are integrated into an intricate e-health ecosystem, a global standardized approach to data security and privacy becomes extremely important (Akinrinola et al., 2024). The research aim on the EMR acceptance in Pakistan is to develop a reliable information infrastructure to improve patient experience without infringing upon their basic rights. This would take a multidimensional strategy that would include policymakers, techno-experts and caregivers. As Omweri (2024) emphasizes, the barriers in developing countries need to be overcome by continuing to invest in IT infrastructure, provide comprehensive training of the staff and ensuring effective legal structures. Placing patients as their first priority, ensuring privacy, and trust, healthcare

organizations in Pakistan can unlock the full transformative potential of EMRs to deliver high-quality care in the digital age (Omweri, 2024).

Literature Review

Health Information Systems in healthcare environment

(HIS) are now the essential elements in the modern healthcare provision, as they Health Information Systems allow healthcare organizations to enhance clinical decision-making, patient safety, operation efficiency, and healthcare delivery quality (Li et al., 2024). World Health Organization acknowledges that strong health information systems are among building blocks of a prosperous health system as they support the manual gathering, storage, analysis as well as sharing health information required in evidence-based decision-making. As paper-based documentation has been supplanted by electronic one and rapid progress in digital technologies has been achieved, healthcare organizations across the globe have shifted towards electronic documentation of various forms such as Electronic Health Records (EHRs), Electronic Medical Records (EMRs), Clinical Decision Support Systems (CDSS), Hospital Information System (HIT), and cloud-based health care systems (Li et al., 2024). These technologies have changed the nature of healthcare delivery through facilitating real-time accessibility of patient information, enhancing caregivers communication, preventing medical errors, and facilitating continuity of care (Adeniyi et al., 2024).

The incorporation of Health Information Systems has gained momentum over the last ten years due to the growing healthcare needs, patient base as well as the need to manage resources efficiently. Nationwide electronic health infrastructures and interoperability frameworks have enabled developed countries to make significant advances in the implementation of digital healthcare (Adegoke et al., 2025). Nevertheless, numerous low-and-middle-income nations still face considerable issues associated with a poor infrastructure, financial factors, a lack of technical skills and an organizational opposition to change. As Fayez et al. (2025), Pakistan is at the initial phases of countrywide digital health transformation where HIS usage is largely discrepant amongst provinces, healthcare establishments, or even by care arrangements.

History of Health Information Systems

After all, HIS is no longer merely a rudimentary administrative record keeping application, but a complex digital framework with which the overall management of health care can be carried out. The initial systems concentrated on the registration of patients, billing and inventory (Wager et al., 2021). Modern HIS has been facilitated by advances in information technology to include electronic prescribing, laboratory information systems, radiology information systems, telemedicine, decision-support algorithms and analytics powered by artificial intelligence. According to Monteiro et al. (2021), The recent evolution of cloud computing, mobile health (mHealth), Internet of Medical Things (IoMT), big data analytics, and artificial intelligence have greatly transformed the functionality of Health Information Systems. These technologies enable healthcare providers to remotely monitor patients, analyze extensive clinical data, anticipate disease outbreaks, and make treatment recommendations on a personal scale. As a result, HIS is becoming both a strategic asset and a means of enhancing clinical care and organizational performance in healthcare organizations (Monteiro et al., 2021).

The significance of Health Information Systems

Chief among the roles of effective Health Information Systems is the level of contribution towards healthcare quality through enhanced information access, minimizing service to service duplications, minimizing medical errors and assisting in timely clinical decisions.

Electronic records improve the accuracy and availability of the patient records and promote communication between multidisciplinary healthcare teams. Quality health data also enhances the surveillance of an illness, health planning, policy making and resource distribution. As Wager et al. (2021) observed, Organizationally HIS enhances efficiency of the workflow by automating the administrative processes and cutting down on the amount of paperwork and allowing healthcare professionals to spend more time with the patients. Moreover, digital health technologies support the quality assurance, clinical audit, performance monitoring, and evidence-based management decisions. On the national level the integrated health information systems help the governments to have reliable health statistics that they can use in monitoring the population health trends, they can also use to evaluate healthcare programs and even react effectively to population health emergencies (Wager et al., 2021).

Health Information Systems in Pakistan

Pakistan has taken a slow but steady stride towards the implementation of digital healthcare in the past ten years. Some of the public and privately operated health facilities have unveiled Electronic Medical Records, Hospital Information Systems, Laboratory Information Systems and telemedicine services (Barker et al., 2024). However, the HIS implementation process still is piecemeal due to the differences in technological infrastructure, financing, human resource capability and institutional preparedness (Barker et al., 2024).

Some of the challenges that are usually faced by the public sector hospitals are the use of outdated computer systems, poor internet connectivity, lack of technical support, lack of training opportunities and lack of interoperability of healthcare information systems. By contrast, most private hospitals have placed greater investments in integrated hospital information systems and electronic medical records, leading to somewhat greater levels of digital maturity. Even with such advancements, the implementation of interoperable electronic health records across the country is low (Costa et al., 2025). Various government programs have placed an emphasis on digital health transformation by setting up e-health policies, telemedicine services, electronic disease surveillance systems and electronic immunization registries. Nonetheless, the economy-wide implementation will need significant investment in infrastructure, human resources, cyber security and governmental structures to succeed (Costa et al., 2025).

Technology Acceptance and HIS Adoption.

Implementation of Health Information Systems does not solely require technological infrastructure but also the readiness of the users to adopt and embrace the use of digital technologies. Technology acceptance theories have thus been brought to the centre of understanding the adoption behaviour of healthcare professionals. One of these models is Technology Acceptance Model (TAM), which suggests that the perceived ease of use and the perceived usefulness, are the determinants of the intention of individuals to adopt a new technology (Ma et al., 2025). Higher rates of adoption of Health Information Systems occur when professionals who engage in the use of these systems think they enhance their performance at clinics and are user-friendly. UTAUT uses various factors such as performance expectancy, effort expectancy, social influence and facilitating conditions to determine the technology adoption, thus extending TAM (Ma et al., 2025). UTAUT has been effectively used in healthcare environments since it is able to capture organizational and individual determinants of technology acceptance. The UTAUT2 was more recently followed by the addition of new social constructs like hedonic motivation, habit and price value, yet, organizational research often focuses more on the achievements of performance expectancy,

facilitating conditions, and social influence as the most predictive contingencies of HIS adoption (Lee et al., 2025).

Adoption of Trust and Health Information System.

Another significant factor that has determined digital health adoption is trust. Healthcare professionals need to have faith in the fact that Health Information Systems are trustworthy, precise, safe and sufficient to generate clinical decisions. Trust entails the belief in the operation of systems, accuracy of data, institutional control and protection of information. Past literature invariably shows that the greater the trust, the more healthcare professionals will be willing to use Electronic Health Records and other digital health tools (Lee et al., 2025). The relationship between the technological characteristics and user acceptance is also mediated by trust as it minimises any uncertainty that can come with use of new technologies. Healthcare organizations, which put in place clear governance policy, effective technical support and quality system performance are hence more prepared to realize successful implementation of HIS.

Data protection and privacy

Healthcare information is also one of the most sensitive types of personal data, and security and privacy are inherent in the implementation of Health Information Systems (Shojaei et al., 2024). Data breaches, cyberattacks, and misuse of information can contribute to the lack of trust in digital systems and the unwillingness to start using technology among healthcare professionals. Technical controls in information security provide authentication, encryption, access controls, cybersecurity monitoring, and secure storage of data. Privacy is the preservation of the personal data of patients and the upkeep of confidential health data to only be accessed by authorized personnel. Research has continually indicated that the attitudes of healthcare professionals towards effective security and privacy policies are important factors that make them inclined to make the use of digital health technologies (Shojaei et al., 2024).

Facilitating Conditions and Organizational Support

Facilitating conditions outline the organizational assets and infrastructure that favour the implementation of technology. These are accessibility to computer hardware, consistent internet access, technical support, training of users, policies in the institutions and the commitment of the leadership.

Agencies should also have adequate technological resources as well as unremitting technical support because healthcare professionals tend to embrace Health Information Systems. It has been noted that in the past priority problems such as the lack of proper infrastructure, lack of proper training and organization support have been and continue to be the best impediments to successful implementation of HIS, and especially in developing nations (Shojaei et al., 2024).

Performance Expectancy and Effort Expectancy.

Performance expectancy is the extent to which healthcare professionals think the application of Health Information Systems will enhance their job performance, productivity, and quality services given. Many researches have noted performance expectancy as the most powerful predictor of adoption of technology. The expectancy of effort indicates how easy they believe the digital health systems are to learn and use. The system with friendly interfaces, simplified workflows, and friendly designs have less barriers to implementation and enhance user satisfaction. More often, healthcare professionals tend to be more ready to implement technologies that are characterized by insignificant mental loads and training (Shojaei et al., 2024).

HIT Implementation pitfalls

Regardless of the growing investments on digital medical technologies, a lot of obstacles still exist to ensure successful execution. One of the biggest problems in low- and middle-income countries is the financial constraint. Technical staff and hardware, cybersecurity facilities, and costly software and hardware are much harder to procure and maintain in healthcare organizations (Wasserman & Wasserman, 2022).

HIS implementation also depends on human factors. Organizational obstacles to change, lack of digital literacy, greater documentation demands, and fear of disrupting employment are the issues that can decrease technology adoption among healthcare providers (Wasserman & Wasserman, 2022). There are also technical factors that inhibit successful implementation, such as problems with software usability, the lack of interoperability, the unreliability of the internet connection and the downtime of the system.

The barriers facing organizations consist of the inadequate support by the leadership, inadequate policy formulation, ineffective change management plans and user insufficient engagement during systems design and deployment. The solutions to these multidimensional challenges need to include coordinated efforts of policymakers, health care administrators, information technology experts and front-line health care providers.

Study Design and Setting

In this research, the survey method was a cross-sectional tool of quantitative design, to explore the issues that affected healthcare professionals in Pakistan in adopting Health Information Systems (HIS). The cross-sectional design was chosen on the basis that it is possible to measure concurrently the perceptions, experience and adoption behavior of the technology by the participants over a specified time frame. The research was administered in Pakistan which comprised of healthcare institutions in Punjab, Sindh, Khyber Pakhtunkhwa, Balochistan, Islamabad Capital Territory, Azar Jammu and Kashmir and Gilgit-Baltistan. To achieve fully developed HIS implementation perspectives, the participants were selected both at the public and the private healthcare facilities, among which are tertiary and teaching hospitals, district headquarters hospitals, special healthcare centers, and independent medical facilities.

Participants and Sampling

The target population was composed of healthcare professionals who were actively working in healthcare facilities and had prior experience of using or interacting with Health Information Systems (HIS), Electronic Medical Records (EMRs) or other digital health technologies into their daily clinical practice. The possible participants were physicians, nurses, allied health professionals, health information management officers, medical record officers and hospital administrators engaged in healthcare information management or in digital health implementation. The participants of the study were healthcare professionals with a minimum work experience of six months and who willingly agreed to take part in the study, and those who were undergraduate students, an intern, non-clinical administrative staff without HIS duties, and those who returned incomplete questionnaires were not included in the analysis.

A total of 278 healthcare professionals from different regions of Pakistan participated in the study. The sample received a non-probability convenience sampling technique, which was supplemented with snowball sampling to make the nationwide participation as much as possible. Firstly, hospital administrations, professional healthcare associations, medical colleges and professional networking platforms have been used to reach healthcare professionals. The participants were then advised to disseminate the survey among their

qualified colleagues who work in various healthcare facilities and enhance geographic diversity and better representation of healthcare professionals who represent various provinces.

Data Collection Procedure

A four months period, between January and April 2026, was used to collect data using a structured online questionnaire designed on Google Forms. The survey link was spread via professional email lists, WhatsApp groups, LinkedIn, Facebook healthcare communities, and official hospital communication channels. The participants were briefly informed about the study objectives before receiving a clear explanation of the research process including voluntary participation, confidentiality of their answers and time taken to fill the questionnaire which was about 10-15 minutes. All participants signed the electronic informed consent prior to filling in the questionnaire. In order to guarantee the quality of the data, duplicating of submissions was limited due to survey settings, and all the completed questionnaires were checked to be complete before being included to the final dataset.

Research Instrument

A structured questionnaire was used to facilitate data collection derived after conducting a wholesome literature review on the Health Information Systems, Electronic Medical Records, digital health and technology acceptance models. The questionnaire had two sections. The demographic and professional data (first section) included gender, age, professional role, work experience, type of healthcare institution, prior HIS training and familiarity with computers. The second part of the study measured the constructs of HIS adoption such as Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Security Factor, Privacy Factors, Trust, and Health Information System Adoption. The construct items were all scaled on a five-point Likert scale with 1 (Strongly Disagree) to 5 (Strongly Agree) and were all derived based on previously tested measurement tools.

Statistical Analysis

IBM SPSS Statistics version 29 were used to analyze the data collected. The demographics and study variables of participants were summarized using the descriptive statistics such as frequencies, percentages, means, and standard deviations. Inferential statistical tests involved independent-samples t-tests, one-way analysis of variance (ANOVA) and Pearson correlation analysis, multiple linear regression, logistic regression, and hierarchical regression tests to test demographic factors and HIS adoption.

Results

The demography of the healthcare professionals involved is summarized in Table 1. Out of the 278 respondents, 55.4% (n = 154) were males and 44.6% (n = 124) were females, meaning that there was the balance between the genders. Most respondents would have been in the middle of their careers as 37.4% of the participants were aged between 31 and 40 years, and 26.3% were aged between 41 and 50 years. The highest professional group (43.9) was the physicians, then the nurses (35.3), allied health professionals (11.5), and health information officers (9.4). Also, the population of most respondents worked in community hospitals (61.9%), which is the most significant representation of the public healthcare in the research. The sample reporting 5-10 years of professional experience comprised about 34.9% of the respondents and the range of 11-20 years' experience was the largest with 29.5% of the respondents, which implies the large proportion of experienced healthcare professionals. Almost half of the interviewees (46.0) expressed highly developed computer skills, with only 10.4% calling themselves novices. Moreover, 61.5% had undergone formal training on Health

Information Systems (HIS) in the past, which shows moderate institutional investments in digital health capacity building.

Table 1. Demographic Characteristics of Healthcare Professionals (N = 278)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	154	55.4
	Female	124	44.6
Age Group	21–30 years	68	24.5
	31–40 years	104	37.4
	41–50 years	73	26.3
	>50 years	33	11.9
Profession	Physician	122	43.9
	Nurse	98	35.3
	Allied Health Professional	32	11.5
	Health Information Officer	26	9.4
Hospital Type	Public	172	61.9
	Private	106	38.1
Years of Experience	<5 years	61	21.9
	5–10 years	97	34.9
	11–20 years	82	29.5
	>20 years	38	13.7
Computer Proficiency	Beginner	29	10.4
	Intermediate	121	43.5
	Advanced	128	46.0
Previous HIS Training	Yes	171	61.5
	No	107	38.5

Table 2 generalizes the perception of respondents about HIS performance. Over three-quarters (77.7%) felt that HIS made work more efficient, and 76.3% of the people felt that HIS enhanced the quality of patient care. Likewise, 73.0 percent said that an HIS improved clinical decision-making, and 69.8 percent felt a decrease in errors in documentation. On the one hand, 71.2-percent of participants expressed overall satisfaction with HIS, which indicates positive attitudes towards the implementation of digital health.

Table 2. Perceptions of Health Information System Performance (N = 278)

Statement	Agree n (%)	Neutral n (%)	Disagree n (%)
HIS improves quality of patient care	212 (76.3)	41 (14.7)	25 (9.0)
HIS enhances clinical decision-making	203 (73.0)	49 (17.6)	26 (9.4)
HIS reduces documentation errors	194 (69.8)	52 (18.7)	32 (11.5)
HIS improves communication among staff	201 (72.3)	45 (16.2)	32 (11.5)
HIS increases work efficiency	216 (77.7)	38 (13.7)	24 (8.6)
Overall satisfied with HIS	198 (71.2)	47 (16.9)	33 (11.9)

Table 3 juxtaposes male and female healthcare professionals. The mean scores in the majority of the constructs showed a slight difference between male respondents compared to female

respondents, but the only gender difference was statistically significant in Performance Expectancy ($p = 0.035$). There were no significant differences in Security Factors, Privacy Factors, Trust, or even HIS Adoption (all $p > 0.05$). The insignificant effect sizes portray that there are few practical differences between genders.

Table 3. Independent Sample t-test by Gender

Variable	Male Mean $\pm$ SD	Female Mean $\pm$ SD	t	p	Cohen's d
Performance Expectancy	4.18 $\pm$ 0.59	4.04 $\pm$ 0.67	2.12	0.035	0.22
Security Factors	4.26 $\pm$ 0.57	4.19 $\pm$ 0.60	1.03	0.302	0.11
Privacy Factors	4.23 $\pm$ 0.58	4.12 $\pm$ 0.64	1.61	0.108	0.18
Trust	4.15 $\pm$ 0.65	4.02 $\pm$ 0.72	1.76	0.079	0.19
HIS Adoption	4.19 $\pm$ 0.58	4.07 $\pm$ 0.63	1.92	0.056	0.20

Table 4 draws a comparison of differences in perceptions by professional groups. Significant differences were observed in Performance Expectancy ($F = 4.89$, $p = 0.003$), Trust ($F = 5.62$, $p = 0.001$), and HIS Adoption ($F = 6.41$, $p < 0.001$). HIOs had the highest perception scores, with allied health professionals having relatively lower scores. Effect sizes had the practical significance which was small-to-moderate.

Table 4. One-Way ANOVA According to Professional Category

Variable	Physician	Nurse	Allied Health	Health Information Officer	F	p
Performance Expectancy	4.21	4.03	3.98	4.34	4.89	0.003
Trust	4.17	3.98	3.91	4.26	5.62	0.001
HIS Adoption	4.26	4.03	3.94	4.32	6.41	<0.001

Predictors of HIS adoption are provided in Table 5. Regression model was identified to be statistically significant ($F = 83.47$, $p < 0.001$) and accounted 68.4% variance in HIS Adoption ($R^2 = 0.684$). The strongest predictor was Trust ($\beta = 0.307$) which occurred in that order, and the other predictors as Performance Expectancy ($\beta = 0.248$), Security Factors ($\beta = 0.241$), and Facilitating Conditions ($\beta = 0.216$). The values of variance inflation factor were less than three which implied that there was no multicollinearity.

Table 5. Multiple Linear Regression Predicting HIS Adoption

Predictor	β	SE	β	t	p
Performance Expectancy	0.212	0.051	0.248	4.18	<0.001
Effort Expectancy	0.103	0.044	0.132	2.34	0.020
Social Influence	0.087	0.039	0.116	2.21	0.028
Facilitating Conditions	0.186	0.047	0.216	3.95	<0.001
Security Factors	0.219	0.053	0.241	4.13	<0.001
Privacy Factors	0.128	0.049	0.145	2.61	0.009
Trust	0.281	0.055	0.307	5.09	<0.001

Factors related to high HIS adoption is indicated in Table 6. A high level of HIS adoption was almost three times more frequently observed among healthcare professionals who had undergone HIS training ($OR = 2.83$, $p < 0.001$). Other predictors were trust ($OR = 2.47$),

computer proficiency (OR = 2.15) and security awareness (OR = 1.98). There was no statistically significant gender difference with respect to HIS adoption.

Table 6. Logistic Regression

Variable	Odds Ratio (OR)	95% CI	p
Age (>40 years)	1.64	1.08–2.47	0.019
Male	1.12	0.71–1.77	0.623
HIS Training	2.83	1.71–4.67	<0.001
Computer Proficiency	2.15	1.39–3.33	0.001
Security Awareness	1.98	1.24–3.15	0.004
Trust	2.47	1.58–3.87	<0.001

Discussion

The current research examined the reasons behind the implementation of Health Information Systems (HIS) among the medical practitioners in Pakistan (Malik et al., 2021). Incorporating the results of and data gathered on 278 healthcare professionals who work in both public and private healthcare institutions, the results show that the overall attitude of healthcare professionals towards HIS adoption is positive. The research also found out that technological, organizational, and individual factors have a mutual effect on the readiness of healthcare professionals to utilize digital health systems. Specifically, As Teng et al. (2024) demonstrated, the strongest predictors of HIS adoption were trust, security, performance expectancy, facilitating conditions and privacy. The results offer valuable insights to policymakers, hospital administrators, and healthcare organizations seeking to enhance digital transformation efforts in the healthcare system in Pakistan (Malik et al., 2021).

The demographic results show that most of the respondents are physicians and nurses employed in state-owned medical facilities as this represents the population of the healthcare workforce in Pakistan (Ullah et al., 2021). Respondents were a very wide spectrum of age group and years of experience in their professional fields which indicated that the study is able to capture diverse opinions about the implementation of HIS. The reason is that, the digital literacy of healthcare worker is slowly growing, as the proportion of healthcare workers who possess above-average or advanced computer skills and who have undergone prior training on HIT is high. Nevertheless, a high percentage of the respondents gave a response of inadequate training, regarding the necessity of systematic capacity-building packages. The results correspond to the current literature in developing countries that underlines the crucial role of digital competency of healthcare professionals to the effective deployment of electronic health technologies (Ferreira et al., 2025).

The usage trends witnessed on this paper prove that Health Information Systems are now a part and parcel of everyday clinical practice. The majority of respondents had been using HIS daily, and over half of them stated that their institutions have completely transitioned to electronic documentation systems. These results indicate Pakistan has come a long way in the last ten years to be digital in healthcare. However, the fact that Lloyd et al. (2024) observe, many hospitals still employ hybrid documentation systems means that they still have not entirely gone digital. The same impact has been noticed in other low/middle-income nations wherein healthcare facilities have yet to transition to an electronic system due to both infrastructure prohibitions and cost-related reasons and the willingness of the organization (Lloyd et al., 2024).

Although there is an encouraging percentage in the use of HIS, there still are a number of barriers that impede successful implementation. The most commonly cited barrier was heavy

workload, and the next barrier was a lack of training, and fears over patient privacy, insufficiency of technical support and problem with the internet (Shrestha et al., 2022). These results imply that institutional and technical obstacles continue to be major obstacles to digital transformation. Digital systems could become a burden on healthcare professionals who are overworked because they might see them as additional documentation tasks instead of enhancing the effectiveness of workflow. Equally, lack of technical support and unreliable internet facilities decrease user confidence, and spoil performance of the system. These findings align with prior research, which elaborates that the implementation of HIS can only be successful when it is supported by the availability of technology in addition to the organizational readiness, ongoing user support, and the presence of adequate digital infrastructure (Shrestha et al., 2022).

The author Roy et al. (2025) observed, Digital health infrastructure accessibility differed among health facilities involved. Desktop computers, access to the internet, and Electronic Medical Record systems were generally available, whereas more sophisticated technology like utilizing a Clinical Decision Support System and safe methods of data backup were less prevalent. This result indicates the imbalanced rate of digital health adoption in Pakistan and indicates that numerous healthcare offices still have resource constraints. The right funding in digital infrastructure and cybersecurity technologies, data storage on clouds, and application to support the decision-making will be required to reap all the advantages of Health Information Systems and enhance the quality of healthcare (Roy et al., 2025).

Perceptions of the performance of Health Information Systems as can be articulated by healthcare professionals were very positive. Though, majority of the respondents believed that HIS had boosted the level of patient care, clinical decision-making, work efficiency, and omissions in documentation (Marquis et al., 2026). These results are aligned with the emerging data supporting the assumption that digital health technologies result in safer, more efficient, and high-quality healthcare provision. The favorable impressions identified in this research indicate that medical workers are starting to realize the benefit of digital technologies in aiding clinical practice, particularly when the systems are reputable, convenient, and sufficiently maintained by organizational policies (Marquis et al., 2026; Baharum et al., 2023).

The findings thus highlight that digital health technologies are more likely to be embraced by healthcare professionals when they are assured that patient information is safely secured and that the system is reliable (Ibrahim et al., 2024). Keeping secrets, providing cybersecurity, and implementing clear governance policies thus become the key elements of successful HIS implementation (Ibrahim et al., 2024). However, as much as some slight variations were evident in the context of male and female healthcare professionals, there was not much effect of gender regarding the general adoption of HIS. Professional role, on the contrary, seemed to be a better model to explain more variance in technology acceptance. HIGOs registered the highest degrees of acceptance and trust perhaps due to the fact that they were more aware of health information technologies (Ibrahim et al., 2024).

As FakhrHosseini et al. (2024) demonstrated, the expectation of performance, enabling conditions as well as the security had significant prediction of the HIS adoption. Of these variables, the strongest predictor was trust, which suggests that healthcare professionals will be more ready to adapt to Health Information Systems when they believe that they will be reliable, secure, and beneficial to clinical practice. The role of performance expectancy was also significant, which favors technology acceptance theories that people embrace the systems that they believe would increase job performance and patient outcomes. HIS was

further promoted by facilitating conditions which comprised of organizational support, infrastructure, and technical assistance, so as to minimize barriers when HIS (FakhrHosseini et al., 2024; Al Sany & Islam, 2022). Security, privacy and trust addition significantly contributed to the explanatory power of the model, which shows the value of institutional support and trust in the user in terms of successful digital transformation (Al Sany & Islam, 2022). Finally, the result indicates that As Ala'a and Ramayah, (2023) demonstrated, enhancing system security and privacy leads to an indirect advantage in technology adoption by increasing the confidence of professionals in healthcare systems with regards to digital health systems. Accordingly, investments in cybers security policies, safe data management systems, and open governance systems are also expected to enhance the trust and HIS adoption at the same time. These results can be correlated with technology acceptance theories and the importance of the central role of trust as a mediating factor connecting organizational protection (safeguards) and user acceptance is shown (Ala'a and Ramayah, 2023).

According to Wager et al., (2021) generally, the results show that effective implementation of Health Information System in Pakistan cannot be made successful just by investment into technology. Significant infrastructure enhancement, improved user training, greater cybersecurity, the creation of supportive policies in the establishments, and creating trust among healthcare professionals in digital technologies are viable to support sustainable digital transformation. By tackling these interrelated aspects, there will be increased adoption of Health Information Systems, which are expected to strengthen the quality of health care, patient safety, and efficiency of the health system (Wager et al., 2021).

Conclusion

This paper has indicated that the perceptions held by the healthcare professionals in Pakistan are, on the whole, positive towards the adoption of Health Information System. The factors found to be having the most affected influences in achieving adoption were trust, performance expectancy, facilitating conditions, security, and privacy with comparatively less impact on adoption being demographic characteristics. Despite the significant advancements in adoption of digital health technologies in healthcare institutions, issues of infrastructure, training, technical assistance and cybersecurity do exist. The enhancement of these aspects will help acceptance and successful application of Health Information Systems and eventually enhance the quality of healthcare, patient safety and efficiency in healthcare organizations.

Practical Implications

The results are also of great benefit to the healthcare policymaking team, hospital administrators, and the developers of health information technology. To promote user trust in using HIS and improve its uptake, the use of robust digital infrastructure, extensive training schemes, and effective technical support, and robust cybersecurity frameworks have to be invested in by healthcare organizations. National standards regarding digital health governance, interoperability and data protection are policies that policymakers should create to facilitate sustainable implementation in Pakistan.

Limitations

There are a number of limitations in this study. To begin with, the cross-sectional design does not provide the chance of developing causal connections between the study variables. Second, convenience and snowball sampling could lead to the decreased external validity of the results even though the whole country was involved. Third, social desirability and bias of recall because the data is self-reported can be generated. Lastly, the research was limited only to healthcare professionals who did not include the patient, information technology

personnel and healthcare administrators who can be able to offer more insights regarding the implementation of HIS.

Future Directions

Longitudinal and mixed-methods designs need to be used in future studies that will allow tracking the changes in adoption of the Health Information Systems across time and understand the processes that underlie user acceptance or resistance. Further comparative studies across settings and provinces of differing healthcare environments would help to improve insights into contextual factors affecting implementation. Future research must also consider new technologies, such as artificial intelligence, cloud-based health information systems, blockchain and interoperable Electronic Health Records platforms, to find ways to further avert digital transformation of healthcare in Pakistan.

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