

Scientific Paper Entitled: The Impact of the use of Information Technology on the Performance of Health Cadres in the Government Health Sector in the Kingdom of Saudi Arabia

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Abstract:

Background: Adopting information and communication technology (ICT) widely is a crucial tactic to address the issues that global health systems face, including rising costs, shrinking resources, and a shortage of workers. ICT investment has increased quickly, but adoption and acceptability have lagged, and the benefits have not been as great as anticipated. A multi-site assessment of how ICT might promote and drive creative work practices has been missing from the research literature. The global healthcare system has been significantly impacted by the digital revolution. The efficiency of care, health outcomes, workflow, and diagnosis and treatment accuracy could all be significantly enhanced by digital technology. The outcomes for patients will significantly improve with the use of health information technology. **Purpose:** This study aims to measure the readiness for digital health transformation in the government health sector in the Kingdom of Saudi Arabia, Saudi Arabia in relation to Saudi Vision 2030 based on the four dimensions adopted by the Healthcare Information and Management Systems Society: person-enabled health, predictive analytics, governance and workforce, and interoperability.

Keywords

- information technology, Digital technology, Electronic medical records.

Introduction

Organizations believe that the only way to beat the competition is to increase productivity, profitability, and operational quality—all of which can be attained by investing in information technology and high-quality data. With time, the health care industry changes in many ways. Thanks to connectivity, it has become more efficient and enhanced the patient experience. According to a number of researchers, adopting health information technology (HIT) could save billions of dollars, lower drug events, improve patient-doctor relationships, and reduce medical errors. It can also lower operational costs and improve the quality of health care processes. Effective HIT is seen by healthcare officials as a solution to the problems of rising costs, medical errors, and poor service quality. There is a wealth of research on the benefits of HIT in the healthcare process, but it ignores how

real IT use affects organizational performance (Alolayyan et al., 2020).

By altering the way health services are delivered and bringing in new patient care modalities, health information technology has been instrumental in bringing about significant changes in the healthcare industry. In actuality, the health care business, as a specialized area, cannot thrive in such a dynamic and quickly evolving environment without investing in the continued development of digital health infrastructure and adopting new and innovative technologies at a faster rate. The use of information technology and electronic communication services, tools, and procedures to provide healthcare services and promote improved health is the focus of the newly developing field of "digital health." (Al-Kahtani et al., 2022).

The global healthcare system has been significantly impacted by the technological revolution. Furthermore, the global healthcare industry now has higher expectations for delivering high-quality services due to advancements in information and communication technology across all domains (Wiederhold et al., 2018).

In order to enhance healthcare through the development and adoption of digital health for appropriate, accessible, and affordable healthcare for everyone, the World Health Organization (WHO) released a worldwide strategy on digital health in 2013. The plan asks for building the infrastructure necessary for nations to facilitate the use of digital health technology in the delivery of healthcare (Dhingra & Dabas, 2020).

The medical industry is no exception to the rule that information technology has been imposing on company everywhere. Because of the benefits of electronic health records, public and private sectors are becoming digital in many nations. The COVID-19 pandemic, which brought attention to the significance of digitization and electronic data, demonstrated the great utility and value of this transition. The goal of employing information technology in healthcare is to give patients and the general public easily available, reasonably priced services that help them lead fulfilling lives. Healthcare organizations can improve care and treatment routes, uncover better ways to diagnose problems, and boost service delivery by implementing informatics. There are many advantages to this integration, but there are also a good number of disadvantages (Chinnakali & Kumar, 2024).

Numerous facets of society and life have already been altered by technology, including the health care industry, giving rise to

what is known as "digital health." The definition of digital health is "the cultural transformation of how disruptive technologies lead to an equal-level doctor-patient relationship with shared decision-making and the democratization of care by providing digital and objective data accessible to both caregivers and patients." "The cost-effective and secure use of information and communication technologies and the associated cultural change it induces, to help people manage their health and wellbeing and transform the nature of health care delivery," is how the Saudi Arabian Ministry of Health (MOH) defines digital health (Justinia, 2022).

Adopting evidence-based digital health innovations has the potential to transform healthcare by lowering medical mistake rates, raising patient autonomy in understanding their needs, lowering costs, and promoting public health programs. With the hope that digital implementations will yield advantages, providers and governments have adopted, and will continue to implement, a broad range of clinical and administrative applications. The overwhelming body of research indicates that digital health apps offer significant benefits, even though the precise benefits may differ. These benefits can improve patient safety, improve health care delivery, and ultimately save costs (Justinia, 2022).

Information technology must now be included into the healthcare system. As a result, there have been numerous modifications to medical systems, one of which is the switch from paper-based to electronic medical records (EMRs). EMRs are electronic medical records that hold patient data, including medical history, treatment plans, and patient evaluations. Moreover, clinical trials, epidemiological studies, disease registries, and drug safety surveillance depend on this EMR data (AlSadrah, 2020).

Healthcare professionals and patients alike gain from the adoption of electronic medical records (EMRs) in a number of ways, including increased information sharing among professionals, time and cost savings, and a stronger safety culture among primary care physicians. Quality of healthcare systems is also improved with fewer errors, better diagnosis and treatments, and quicker healthcare decisions. Saudi Arabia continues to have a poor rate of electronic health record (EMR) adoption, mostly in small and rural hospitals, despite widespread knowledge of the benefits of EMRs and related health care industry technologies (AlSadrah, 2020).

Significance

The performance of health cadres in the government health sector in the Kingdom of Saudi Arabia has been significantly impacted by the use of information technology (IT). Technology has completely changed the work that healthcare practitioners do, increasing productivity, efficacy, and the general standard of care that the public receives. Improved Information Access: Thanks to information technology, medical data, patient records, and industry best practices are now easier to find and access. Health cadres are now able to give evidence-based care and make well-informed decisions by having instant access to pertinent medical literature, study findings, and treatment guidelines. It has made information more easily accessible, expedited administrative procedures, promoted teamwork and communication, permitted remote care and sophisticated diagnostics, assisted professional development and training, and supported data analysis and research. All of these developments have improved healthcare outcomes and delivery for Saudi Arabia's populace.

Literature review

Researchers are under a lot of pressure to look at different ways to understand how information technology (IT) affects organizational performance because of the business importance of IT. The effect of a certain resource that a business holds to give a competitive advantage was studied by researchers using the resource-based view theory. Businesses trust IT with gaining a competitive edge, overriding leadership as their top priority. Through process simplification and patient access to care, IT can facilitate the exchange and assessment of patient data as part of health information. Leaders in the healthcare industry are beginning to see the value of IT in lowering costs and enhancing services (Alolayyan et al., 2020).

Utilizing HIT improved quality, competitiveness, and productivity. HIT is viewed by many healthcare professionals as a remedy for medical errors. Human errors are decreased in the banking and aviation industries by employing IT effectively, and medical errors are decreased by using HIT. Electronic access to a patient's full medical record will help prevent medical errors caused by incomplete information regarding conditions such as allergies, pertinent test and drug information, prior medical history, and inadequate provider communication (Alolayyan et al., 2020).

By providing electronic patient information (health information) that medical professionals can use effectively,

health information technology (HIT) systems—such as automated decision-making and knowledge acquisition support tools—can reduce errors of omission caused by knowledge gaps in providers and their failure to apply that knowledge in clinical practice. Additionally, HIT lowers barriers, saves a significant amount of money on stationary expenses, enhances queue management, and relieves staff of numerous paper-related tasks (Alolayyan et al., 2020).

The World Health Organization is now creating a set of guidelines for the use of digital technology across all nations, having recently documented at least 12 uses for it in the field of health. These responsibilities include, in short, giving everyone access to clearer and more precise information about health and illness; providing accurate and searchable records of births, deaths, and medical encounters; helping medical professionals and managers directly with patient diagnosis and treatment; and providing operational and strategic data about drug availability, budgets, and human resource management to health managers at all levels. The delivery of healthcare will be profoundly altered by impacts on these processes in ways that we do not completely comprehend, but disruption is undoubtedly coming (Mitchell & Kan, 2019).

Digital technology

Digital technology has revolutionized research, industry, education, and most lately, healthcare. Aspects of technology including information and communication, mobile health, data recording, and telemedicine are all included in the field of digital health. In the past few years, there has been an exponential and uncontrolled growth in the availability of digital health services, raising questions about data privacy, ethical norms, and service quality. The worldwide plan on digital health, which the World Health Organization has unveiled, is a groundbreaking document that offers nations a framework for implementing and growing digital health services. Digital technology is a relatively new and creative addition to the medical field (Dhingra & Dabas, 2020).

High rates of infections and non-communicable diseases, a lack of human resources, unequal access to healthcare, a lack of individualized treatment, and a lack of emergency readiness are issues facing the delivery of healthcare in both developed and developing nations. Technology developments have enhanced patient outreach programs, communication, and access to medical information. With the emergence of patients as service providers and doctors as customers, patients are now more involved in healthcare decision-making. Patient-

centered healthcare led to technological research and development, which cleared the path for the digitalization of healthcare (Dhingra & Dabas, 2020).

There are numerous aspects of digital health, such as telemedicine, medical informatics, e-health, and mobile health (m-health). Its function has expanded beyond electronic data collection to include real-time data reporting, teleradiology for better image interpretation, telemedicine, which provides clinicians with affordable, accessible virtual access, and the use of mobile applications for healthcare and therapy (Dhingra & Dabas, 2020).

Health information technology (HIT) holds the potential to improve healthcare systems' efficacy, efficiency, and safety. Healthcare information technology (HIT), which includes electronic health records (EHRs), has the potential to enhance patient care by decreasing avoidable errors, supporting clinicians in making clinical decisions, and facilitating quick communication between team members. In actuality, there are a plethora of obstacles associated with implementing HIT. Certain of these difficulties are expected (keeping clinical operations safe and efficient while switching record systems, for example) (Sittig & Singh, 2015).

Electronic medical records

Because these organizations have a wide range of responsibilities as well as different expectations and aims, the delivery and improvement of healthcare at the societal level greatly depend on the technology and processes that enable Health Information Technology (HIT). To counteract these inclinations, there is a lot of interest in using electronic health records. For observational research, embedded pragmatic or post-marketing registry-based randomized studies, or comparative effectiveness studies in their early applications, electronic health records are meant to serve as the primary source of data (Cowie et al., 2016).

Electronic medical records may be used to speed up baseline and follow-up data collection, help with patient recruitment, and evaluate the viability of studies. Using electronic health records in clinical research presents a number of obstacles, including protecting patient privacy and security, resolving issues with integrating disparate systems, and sustaining infrastructure for high-quality data reuse (Cowie et al., 2016).

EMR integration can expedite the delivery of healthcare at several sites of care. For instance, they might expedite requests for pharmacy items, radiological investigations, and lab testing. Additionally, with EMRs, the nurse or physician can receive,

examine, and save lab and radiological results; they can also scan documents, review progress notes and communications, and assist with record review. Additionally, they can compile the patient's medical history, which allows for the quick identification of comorbidities and previous and current drug regimens. Additionally, electronic medical records (EMRs) can enhance the clinical performance of working healthcare providers by supporting clinical decision-making through computerized clinical decision support (CCDS) (AlSadrah, 2020).

Improved exposure to current clinical guidelines, alerts sent upon receiving bad test results, and alerts sent regarding drug allergies and interactions are some of the advantages in this regard. Documentation is another beneficial goal of implementation. A list of common medications, a list of the patient's specific allergies, a record of the patient's medical problems, and directions for patient discharge can all be found in an EMR. Another significant benefit of health care providers having phone, fax, and email communication with patients is the convenience of communication (AlSadrah, 2020).

Additional benefits associated with accessibility and management encompass patient referral management and records, enabling health care providers to access patient health records even when they are not in the hospital, enabling patients to access portions of their records, and offering disaster recovery and data backup (AlSadrah, 2020).

Artificial intelligence

Artificial intelligence (AI) has the power to completely change the way that healthcare is provided. In collaboration with EIT Health of the European Union, a joint report examines how it might help enhance patient experience, care results, and access to healthcare services. It can increase productivity and the effectiveness of care delivery, allowing healthcare organizations to treat more patients with higher-quality treatment. AI can improve the experience of healthcare providers by reducing burnout and enabling them to spend more time directly caring for patients. It can also improve the lives of medical personnel by enabling them to spend more time caring for patients, which will raise morale and promote retention. It may potentially hasten the delivery of life-saving medications (Spatharou et al., 2020).

Role of Internet

The Internet of Things (IoT) develops into a highly dispersed, heterogeneous structure that can adapt to the demands of many organizations and individuals on a regular basis. Public

health monitoring, effective oversight of centralized management, and low-cost health services and their support are all made possible by the rapid growth of IT-based technologies like cloud computing and the Internet of Things. As a result, the integration of IoT with health care has drawn more interest from academic and corporate circles (Usak et al., 2019).

Objective:.. the function of new technology in providing healthcare services that enhance patient outcomes, increase healthcare provider productivity, and lower patient costs.

Aim of the study:

This study aims to measure the readiness for digital health transformation in the government health sector in the Kingdom of Saudi Arabia, Saudi Arabia in relation to Saudi Vision 2030 based on the four dimensions adopted by the Healthcare Information and Management Systems Society: person-enabled health, predictive analytics, governance and workforce, and interoperability.

Objectives:

- 1) Evaluating how information technology affects the effectiveness of medical care.
- 2) The effect of new technology in providing healthcare services.
- 3) The effect of new technology on patient outcomes.
- 4) Effect of new technology on healthcare provider productivity.
- 5) Effect of new technology on patient costs.

Research Questions:

The current study will answer the following question:

1. Does information technology affects the effectiveness of medical care?
2. What is the effect of new technology in providing healthcare services?
3. What is the effect of new technology on patient outcomes?
4. What is the effect of new technology on healthcare provider productivity?
5. What is the effect of new technology on patient costs?

Methods

Research design:

Descriptive analytic cross sectional study design to discuss how information technology affects the effectiveness of medical care. This design is a systematic and structured technique to

collecting data from a sample of persons or entities within a broader population, with the primary purpose of producing a thorough and accurate description of the features, behaviors, views, or attitudes that exist within the target group.

Research Setting:

The study will be conducted in King Faisal Specialist Hospital in Madinah in Saudi Arabia.

Subject:

Purposive sample of 80 of health cadres, The sample will be selected according to certain inclusion criteria health cadres who working in King Faisal Specialist Hospital in Madinah, male and female.

Sample size:

Study sample was selected via the systematic random sampling method.

The sample size is an important feature of any empirical study in which the goal is to make inferences about a population from a sample. In practice, the sample size used in a study is determined based on the expense of data collection and the need to have sufficient statistical power.

Inclusion Criteria:

The inclusion criteria were set as follows:

- (1) health cadres who working in King Faisal Specialist Hospital in Madinah.
- (2) female and male.
- (3) from Saudi Arabia.

Sampling Technique:

Participants submitted data through a survey. Data will be collected by questionnaire.

Tools for data collection:

It will concern with Participants demographic data as age, gender, marital status and educational level. And four questions about the use of information technology in health sector in Saudi Arabia. Also five questions about the impact of the use of information technology on the performance of health cadres.

Validity:

The revision of the tools were ascertained by a panel of experts to measure the content validity of the tools and the necessary modification was done accordingly.

Administrative design:

An official permission was obtained from the directors of the hospital. The official permission included the aim of the study, the tools of data collection and the characteristics of the study.

Ethical considerations

Data was provided by participants via surveys. Participants were advised that participation in the study would be optional and that their privacy would be maintained. Data will be gathered by a self-reported questionnaire. The ethics committee will provide approval for this project. Before the questionnaire was administered, each participant provided written informed permission.

Results

Table [1] demographic characteristics:

Demographic data		Study participants (n =80)	
	Category	Frequency (No.)	Percentage %
Sex	Male	47	58.75
	Female	33	41.25
Marital status	Single	21	26.25
	Married	50	62.5
	Divorced	9	11.25
Occupation	Doctor	11	13.75
	Pharmacist	5	6.25
	Specialist	15	18.75
	Technician	13	16.25
	Nurse	29	36.25
	Administrative	7	8.75
Educational level	craftsman	20	25
	Bachelor	34	42.5
	Master's degree	26	32.5
Number of years of experience	1-5 years	19	23.75
	6-10 years	36	45
	11-15 years	14	17.5
	16-25 years	11	13.75

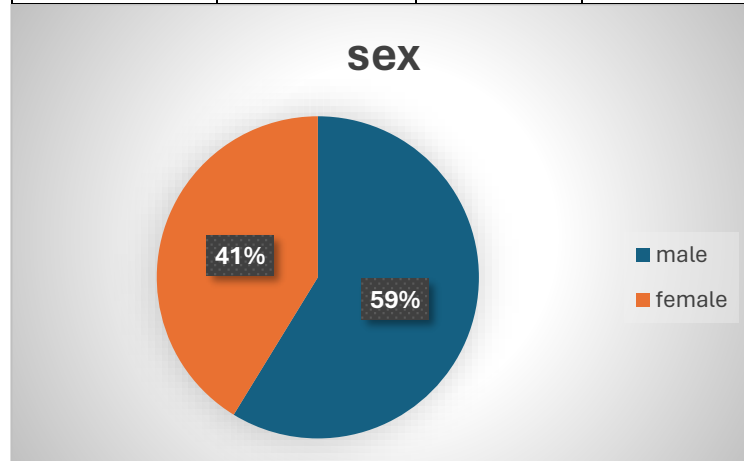


Figure [1] according to sex distribution:

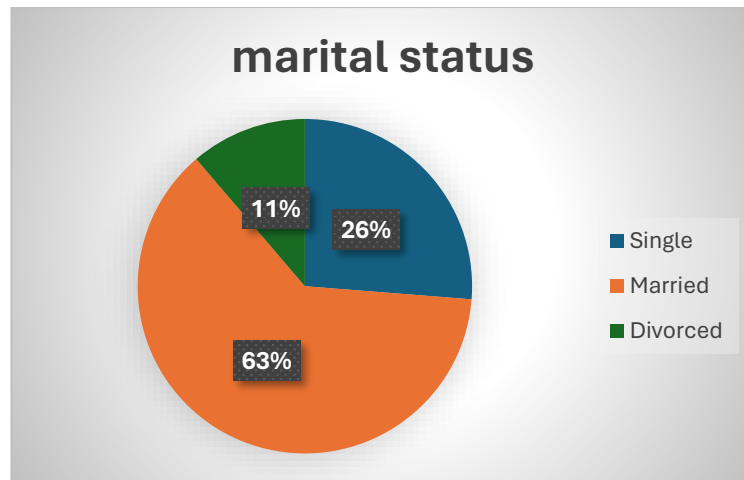


Figure [2], according to marital status:

Figure 1 showed that 59% and 41% of study sample were male and female respectively. Figure 2. Showed that the highest percentage of the sample was married.

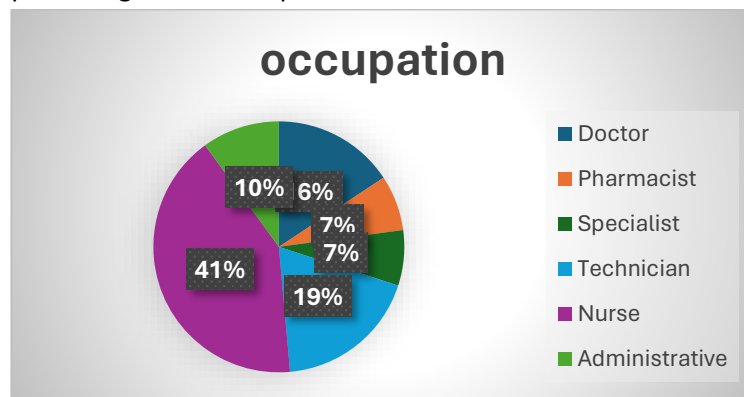


Figure [3] according to occupation:

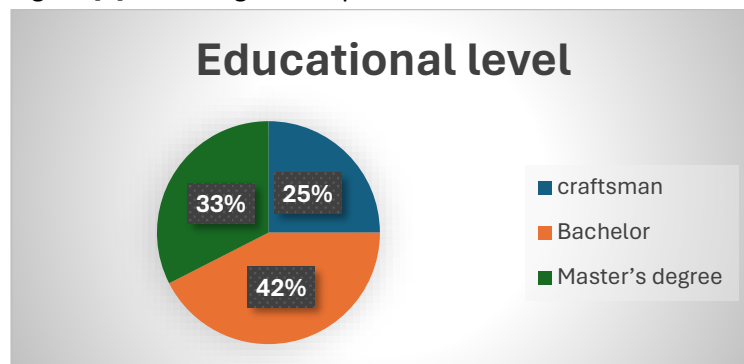


Figure [4] according to educational level:

Figure 3, showed that the highest number of participants was nurses with percentage 41% and the lowest occupation in number was pharmacists and specialists with equal percentage 7%.

Figure 4, showed that the highest educational level was bachelor with 42% percentage.

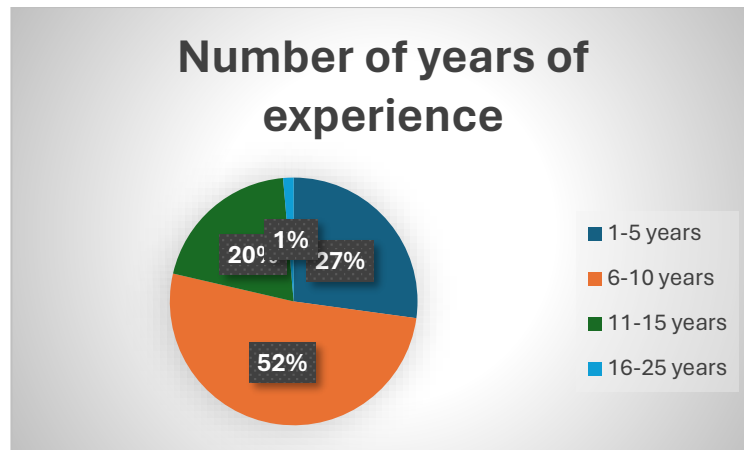


Figure [5] according to number of years of experience:

Figure 5, results showed that 52% of participants were worked for 6-10 years as number of years of experience and the least percentage were 1% which was 16-25 years of experience.

The use of information technology in health sector in Saudi Arabia:

The use of information technology			
	Category	Frequency (NO.)	Percentage %
[1] How would you rate the quality of IT infrastructure (hardware and software) provided in your workplace?	Excellent	12	15
	Good	36	45
	Average	19	23.75
	Poor	8	10
	Very poor	5	6.25
[2] Do you have access to reliable internet connectivity in your workplace?	Yes	67	83.75
	No	13	16.25
[3] Have you received adequate training on using the IT systems in your workplace?	Yes	48	60
	No	14	17.5
	Partially	18	22.5
[4] How satisfied are you with the level of technical	Very satisfied	12	15
	Satisfied	37	46.25
	Neutral	20	25
	Dissatisfied	8	10

support provided for IT issues?	Very dissatisfied	3	3.75
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[1] How would you rate the quality of IT infrastructure (hardware and software) provided in your workplace?

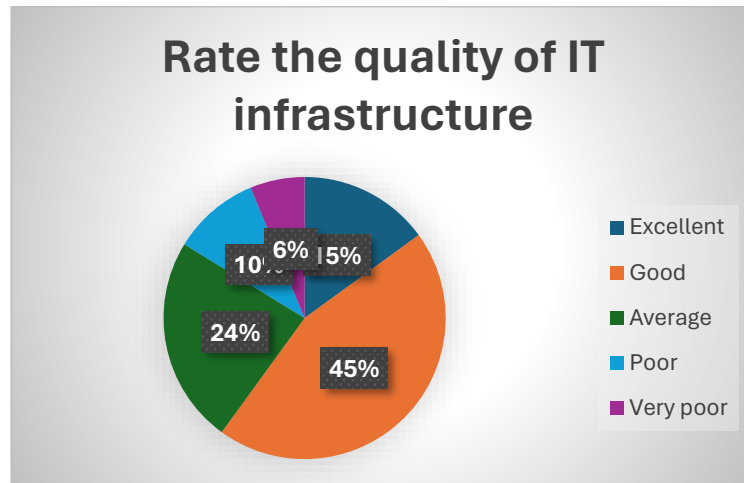


Figure [6] showed that most of participants rated the quality of IT infrastructure good rate with percent 48% and 25% , 16% and 11% of participants rated average, excellent and poor respectively.

[2] Do you have access to reliable internet connectivity in your workplace?

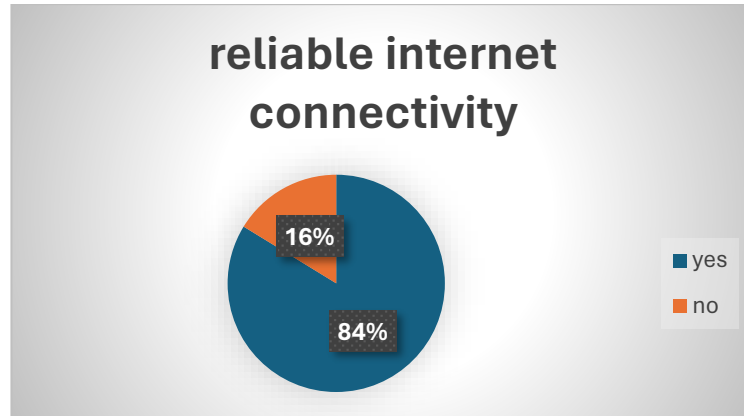


Figure [7] showed that 84% of sample had access to reliable internet connectivity and 16% of participants said they didn't have access to reliable internet connectivity.

[3] Have you received adequate training on using the IT systems in your workplace?

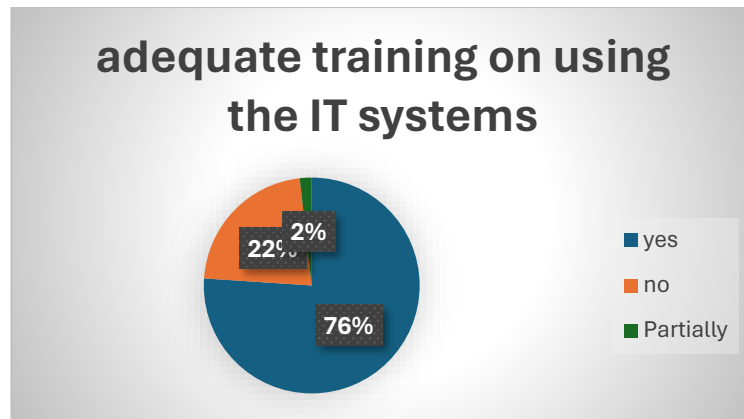


Figure [8] showed that 76% of the sample received adequate training on using the IT systems but 22% did not receive adequate training on using the IT systems.

[4] How satisfied are you with the level of technical support provided for IT issues?

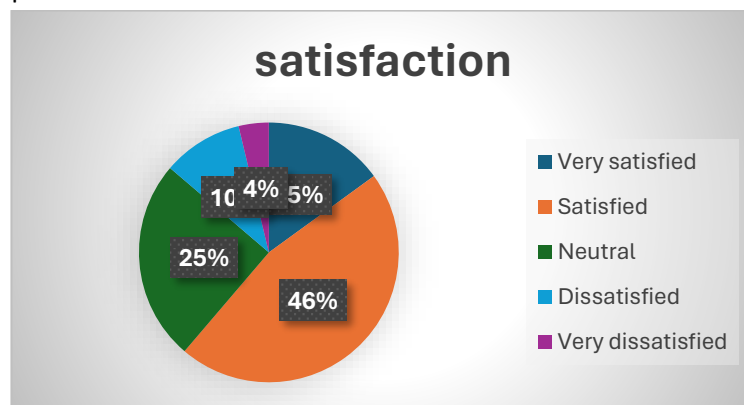


Figure [9] showed that 48% of the participants were satisfied with the level of technical support provided for IT issues but 10% and 4% were dissatisfied and very dissatisfied respectively with the level of technical support provided for IT issues.

The impact of the use of information technology on the performance of health cadres:

	Category	Frequency (N=80)	Percentage %
[1] How has the use of IT improved your efficiency in performing your job duties?	Significantly improved	33	41.25
	Improved	29	36.25
	No significant change	11	13.75
	Declined	7	8.75
[2] Have IT systems helped in reducing paperwork and streamlining processes?	Yes, to a great extent	39	48.75
	Yes, to some extent	35	43.75
	No, not really	6	7.5

[3] Do you use IT systems for patient record management?	Yes, regularly	48	60
	Occasionally	26	32.5
	No	6	7.5
[4] How has IT impacted communication between healthcare providers and patients?	Improved significantly	28	35
	Improved	33	41.25
	No significant change	10	12.5
	Declined	9	11.25
[5] how satisfied are you with the integration of IT into your work environment?	Very satisfied	52	65
	Satisfied	15	18.75
	Neutral	6	7.5
	Dissatisfied	4	5
	Very dissatisfied	3	3.75

[1] How has the use of IT improved your efficiency in performing your job duties?

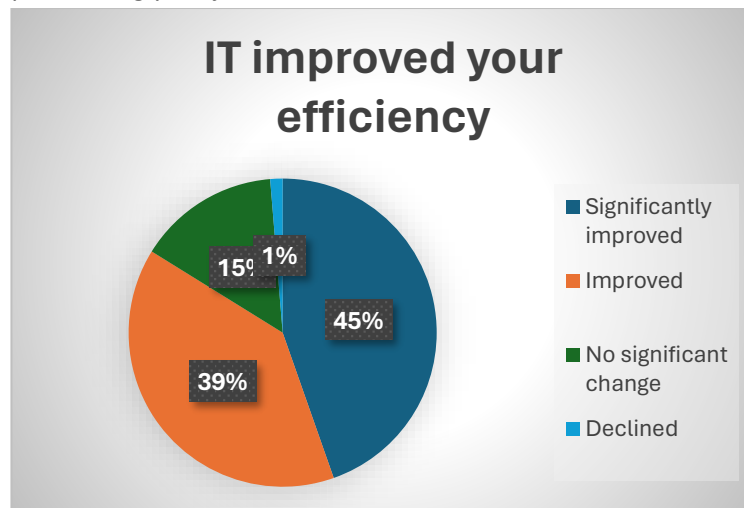


Figure [10] showed that most of the sample agreed that IT improved their efficiency in performing job duties.

But 1% of the sample said that IT declined their efficiency in performing job duties.

[2] Have IT systems helped in reducing paperwork and streamlining processes?

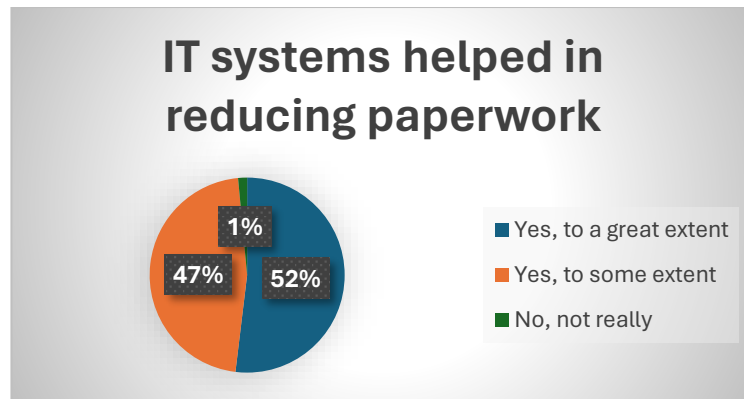


Figure [11] showed that 52% of study sample said that IT systems helped to a great extent in reducing paperwork and streamlining processes but 1% said that not really.

[3] Do you use IT systems for patient record management?

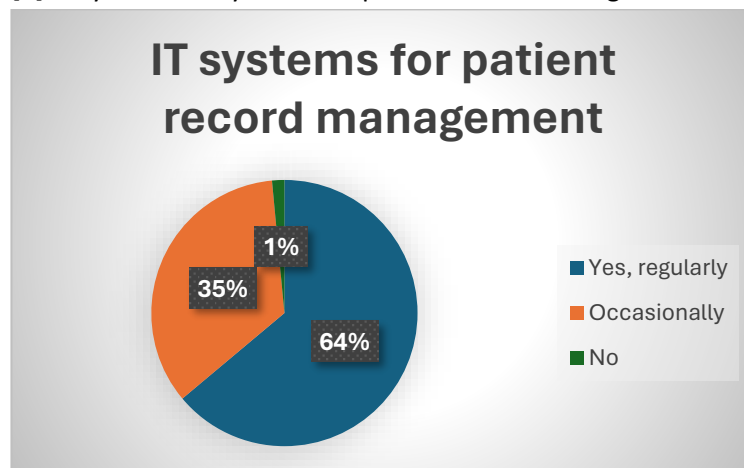


Figure [12] showed that 64% of sample used IT systems for patient record management regularly, 35% of sample used IT systems for patient record management occasionally and 1% of sample didn't use IT systems for patient record management.

[4] How has IT impacted communication between healthcare providers and patients?

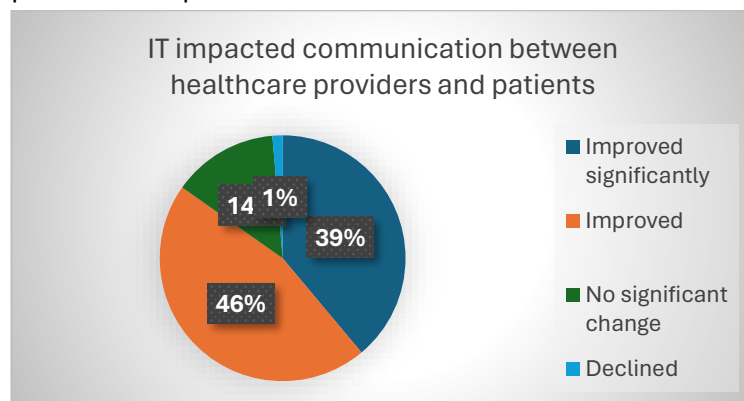


Figure [13] showed that 46% of the sample said that IT improved communication between healthcare providers and

patients, 39% of the sample said that IT improved significantly communication between healthcare providers and patients.
[5] How satisfied are you with the integration of IT into your work environment?

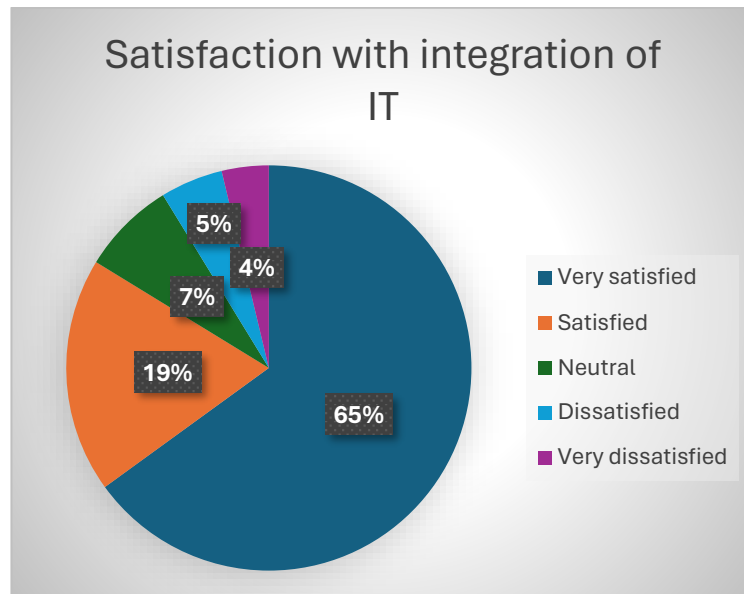


Figure [14] showed that 68% of sample were very satisfied with the integration of IT into work environment, 19% of sample were satisfied with the integration of IT into work environment, 5% and 4% of sample were dissatisfied and very dissatisfied respectively with the integration of IT into work environment.

Discussion

An important study subject that may help explain, at least in part, the success or failure of any HIT application is the reaction of health professionals to the use of health information technology (HIT). The researchers demonstrated that the likelihood of healthcare workers accepting HIT systems increases in proportion to the degree to which they are aware of the ways in which these systems might be used to their day-to-day work routines. When it comes to the deployment of health information technology (HIT) systems in the healthcare context, it is recommended to educate prospective end-users about the ways in which the systems might be used to their job, as has been shown by studies. This may include information about how the tasks can be made simpler, for instance, by automating processes; how the workload can be reduced, for instance, by reducing the amount of data entry that is duplicated; or how the workload can become more manageable, for instance, by improving patient booking systems; and how information technology can improve safety

and outcomes, for instance, by reducing the number of medication errors (Ketikidis et al., 2012).

The notion that health information and communication technology (HICT) has the potential to significantly boost productivity has been acknowledged for a considerable amount of time, according to the findings of the researchers. It has been around ten years since there was a significant increase in the use of information and communications technology (ICT) in the United States, particularly in the adoption of electronic health records (EHRs), which are now widely used (Bronsoler et al., 2022).

Atinga et al., 2020 found that The use of digital technology to enhance the delivery of health services is fast expanding in countries that fall under the category of low- and middle-income countries (LMICs). The use of digital technologies, such as electronic health (e-health), has been shown to enhance the quality of healthcare, as well as the efficiency and satisfaction of patients (Atinga et al., 2020).

Conclusion

We can conclude that improvements in healthcare organizations are mostly dependent on having a functional HIT infrastructure. Enhancements to the day-to-day operations of healthcare are dependent upon advancements in the technical infrastructure of healthcare. A very narrow concept of HIT is revealed when one looks at the stark differences between the goals and recommended procedures of Saudi hospitals and their actual technological practices. The usefulness of employing sophisticated technical methods has actually been called into question due to the inadequate HIT infrastructure. The conclusion of this paper will address the general commentary on staff and technology readiness for recent initiatives to improve HIM, such as the implementation of clinical coding. However, a discussion of leadership reluctance is necessary at this point. It is possible to overcome resistance from non-professional human resource sectors with motivated, committed leadership, support, and training opportunities that can result in career advancement. But when hospital directors, doctors, and other health decision-makers show a lack of openness to innovation because of a rigidity that keeps them mired in practices that are archaic and from when they first started their careers, there's a leadership void. The "vicious circle" that causes all significant development to stagnate may be partially caused by this lack of devoted leadership, albeit this is not conclusively demonstrated.

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