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Analysis of the Role of Information Technology in Knowledge Management in Hospitals

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Abstract – This case study aims to analyse the role of information technology in knowledge management within hospital settings. As healthcare is a complex and challenging field, the use of information technology has shown the potential to enhance the efficiency and quality of healthcare delivery.

This study reviews current literature on the use of information technology in knowledge management within the healthcare sector. It examines the benefits of integrating electronic records systems, the impact of artificial intelligence, and data analytics in optimizing healthcare processes.

By identifying current issues in knowledge management within hospitals, this study proposes a methodology to evaluate the effectiveness of information technology in this context. Through surveys and interviews with healthcare professionals, the benefits and challenges of using information technology are analysed.

In the presentation and analysis of results, the study focuses on the tangible achievements of implementing information technology, emphasizing improvements in access to and sharing of health information and the reduction of medical errors.

In conclusion, recommendations are offered for healthcare organizations to improve the use and integration of information technology in knowledge management within hospitals. This study aims to contribute to the understanding of the importance of information technology in enhancing the efficiency and quality of healthcare in hospital environments.

Keywords – information technology, knowledge management, healthcare, electronic records, artificial intelligence, data analytics, hospitals.

INTRODUCTION

The rapid changes in hospital services over the past two decades have necessitated an increased research interest in the importance of various forms of knowledge, with the goal of leveraging best practices to manage knowledge assets and improve hospital performance. For organizations, continuous learning, both internally and externally, is key to organizational survival and serves as the foundation of a firm's knowledge architecture. Improving the flow of knowledge and communications across the organization through collaboration, knowledge sharing, and idea generation has been observed to have a strong positive effect on organizational effectiveness and innovation (Opele, Adepoju, & Adegbite, 2020).

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Organizations believe they can combat competition by improving productivity, profitability, and operational quality only if they invest in information technology and the quality of information. The healthcare sector undergoes various changes over time and has achieved greater efficiency and enhanced customer experience through the power of connectivity. Various researchers agree that increased investment in Health Information Technology (HIT) and the quality of health information can reduce medical errors, lower operational costs, and improve the quality of healthcare processes. Moreover, adopting HIT could save billions of dollars, reduce adverse drug events, and lead to a better doctor-patient relationship (Alolayyan, Alyahya, Alalawin, Shoukat, & Nusairat, 2020).

This study aims to uncover how information technology has influenced the changing dynamics of knowledge management in hospitals and what challenges may arise in its use. Furthermore, it will shed light on the interaction between healthcare personnel and information technology, emphasizing the importance of proper preparation and training for staff.

Through this in-depth analysis, the study intends to contribute to an understanding of the responsibilities and opportunities that information technology brings to knowledge management in healthcare, promoting an integrated and effective approach to its use within hospital environments.

LITERATURE REVIEW

This literature review aims to provide a careful and detailed update on the role of information technology in knowledge management within hospital settings. Reviewing the literature is a critical step in thoroughly understanding the challenges and benefits that information technology brings to the healthcare sector.

Through the analysis of scientific articles and other relevant studies, it is possible to identify key developments and trends in the use of information technology in healthcare. Articles addressing this topic have been carefully selected to ensure a solid literature base for this case study.

An important aspect of this literature review is identifying the fundamental changes brought about by information technology in knowledge management within hospitals. The use of electronic patient records, integrated care systems, and technological applications are among the key areas reviewed carefully to reflect their progress and impact on the efficiency and quality of healthcare.

In addition to the benefits, this review also aims to address the challenges and potential issues that may arise with the implementation of information technology in hospital environments. This detailed literature analysis will include findings from previous studies, providing a strong foundation for further discussion and analysis in this case study.

Through the literature review, the aim is to create a theoretical framework and rich context for the case study, helping to formulate specific research questions and focusing on the analysis of results.

The Role of Information Technology in Knowledge Management in Hospitals

Use of Electronic Patient Records (EPR)

This thesis relates to electronic patient data and medical practice. Electronic Patient Records (EPR) consist of patient data stored electronically and accessible via computers. Although there are many types of EPR systems, they all differ from paper-based records in that the same patient record can be read simultaneously on multiple computers, and data can be entered from multiple sites at the same time. (Svenningsen, 2002)

More specifically, the expected effects of Electronic Patient Records (EPRs) can be understood in three categories. First, patient data is currently recorded in many different places and is often copied from one document to another, leading to errors. With EPRs, much data will need to be recorded only once—at the source—and can be pasted into various documents without the risk of being misread or forgotten: the data will be consistent everywhere, and errors will be minimized. Second, in most hospital departments, patient data is often difficult to obtain either because it has been recorded incorrectly or because others are using it. In contrast, EPRs are easily accessible, and as a result, they are expected to improve internal communication and division of labor within the

organization, ultimately enhancing the efficiency and quality of healthcare. Third, patient data is currently stored in individual hospitals. However, patients are often admitted to different hospitals, and data from previous admissions can be difficult, and sometimes even impossible, to access. Therefore, patients are often treated as "new cases" each time they are admitted to a hospital. The vision is that when EPRs are implemented across all hospitals, patient data can be easily exchanged, thereby improving inter-organizational efficiency and the quality of healthcare. (Svenningsen, 2002)

Integrated Care Systems (ICS)

The current strategic priorities of Integrated Care Systems (ICS) include developing personalized care planning approaches to improve shared decision-making. The real-time digital distribution of ICSs, accessible to all healthcare providers, as well as to patients, caregivers, and families through an online patient portal, will support patients in sharing what truly matters to them, reduce the need to recount their stories, and better achieve their care preferences. (Neale, Onions, & Still, 2021)

Personal Health Records (PHR) refer to a representation of health data related to a patient's care, managed by the patient, aimed at promoting continuity of care in a reliable, accessible, and secure manner. The primary expected benefit is empowering both patients and healthcare professionals towards a more interconnected healthcare system centered on the patient, promoting shared and personalized care throughout a citizen's lifespan. The concept of PHR has developed parallel to the development of Electronic Health Records (EHR). PHR was first mentioned in an early report by the U.S. Institute of Medicine entitled "Computer-Based Patient Records: A Key Technology for Health Care." The report described the anticipated requirements for such an endeavor. In Europe, the PHR concept was introduced through the European Directive 95/46/EC, which initially allowed and simultaneously proposed the direct interaction of individuals with their health data, including data entry from home, work, and leisure locations. Advances in healthcare practices, limitations of traditional healthcare processes, and the need for access to health information create an ever-increasing demand for electronic health systems everywhere. In this regard, PHR systems offer citizens the opportunity to become more active in their care by combining data, knowledge, and software tools. PHR systems are citizen-centered, in the sense that their management is the primary responsibility of the citizen. Through a PHR application, the citizen/patient can provide information about their daily life status, maintain their medical examination data, and define access rights to their personal data, utilizing that access to improve health and disease management. (Katehakis et al., 2018).

Application of Technology and Its Impact on Healthcare

Information and Communication Technology (ICT) is a broad term that encompasses any product that stores, retrieves, manipulates, transmits, or receives electronic information in digital form. The application of ICT in healthcare, known as Health Information Technology (HIT), includes a range of technologies used to electronically collect, transmit, display, or store patient data. HIT is also a concept that describes the application of computerized systems to access healthcare information from patients, healthcare providers, insurance companies, and other government agencies.

The use of HIT helps reduce medical errors, costs, and paperwork; enhances the efficiency and quality of healthcare; and empowers both patients and healthcare professionals. HIT encompasses a wide array of products, technologies, and services, including telehealth and mobile health technologies, cloud-based services, medical devices, telemonitoring tools, assistive technologies, sensors, Electronic Health Records (EHR), and other information technology applications in healthcare. These technologies can assist users in collecting, sharing, and utilizing health information for various purposes.

Due to the proven benefits of such tools, the use of these technologies seems inevitable. However, the balance between the benefits and risks of using information technology in healthcare organizations in the coming years is not clear. Therefore, to improve the planning and successful implementation of these technologies, the use of technology forecasting methods has been recommended. By employing these methods, healthcare organizations and policymakers can consider potential issues that may arise in the future. Given the rapid development of information technology, the anticipated benefits and future challenges of HIT will significantly influence the decisions made by policymakers. (Hemmat, Ayatollahi, Maleki, & Saghafi, 2017).

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Challenges of Using Information Technology in Hospitals

Privacy and Security of Information

One of the significant issues concerning Personal Health Records (PHRs) is how this technology can protect the privacy of patients' health information. The issue of network communication is another common problem; therefore, storing individual medical information online can expose sensitive health information to unauthorized entities. Medical data may disclose critical information beyond physical attributes such as height, blood pressure, weight, and other quantitative data related to the patient's physical body. Critical personal data, such as surgical procedures, fertility issues, diseases, emotional disorders, and psychological conditions, are often shared with great hesitation by many patients.

Several threats to patient information confidentiality may include the following:

- Curiosity and Internal Abuse: Healthcare personnel may misuse their access for personal benefits such as spite, profit, revenge, or other motives by extracting patient information.
- Accidental Disclosure: Throughout various digital data transfers among multiple entities, healthcare providers may make mistakes that result in data exposure.
- External Interference: Hackers, network intruders, former employees, or others may steal or access information, disrupt operations, damage systems, and steal equipment.
- Uncontrolled Secondary Use: Patient information is used solely for providing primary care, but it may be exploited for purposes not mentioned in the contract, such as research." (Tanwar, Tyagi, & Kumar, 2019).

Preparedness and Acceptance of Healthcare Personnel

The importance of timely availability of medical information for healthcare professionals to optimize diagnosis and the clinical decision-making process to determine treatment has been well-documented. With the advancement of digital technologies, Electronic Medical Records (EMRs) have emerged as the preferred method for recording, storing, retrieving, and collecting health and medical information. The potential benefits of EMRs are widely recognized. EMRs are the electronic format of medical data that replace traditional paper-based medical records used by healthcare professionals. An EMR is a longitudinal and real-time electronic record of a patient's medical information created, collected, managed, and consulted by clinicians and authorized staff within any healthcare delivery environment.

Several terms are associated with these data, including Electronic Health Records (EHR), Electronic Patient Records (EPR), and Computerized Medical Records (CMR), among others. These terms are often used interchangeably. We have adopted the definition of an EMR provided by the National Alliance for Health Information Technology in this study: "an electronic record of health-related information for an individual that may be created, collected, managed, and consulted by clinicians and authorized staff within a healthcare organization," even if it is used interchangeably with the term 'EHR.' The ability of healthcare providers and students to use EMRs effectively leads to the achievement of expected clinical outcomes. Furthermore, research has also shown that the lack of training results in duplication and redundancy of work, a low rate of EMR adoption, and failure to use EMRs optimally. Studies have also indicated that the absence of training has made the learning process about EMRs longer. Planning, organizing, and delivering education for users on the proper use of EMRs has been recognized as a crucial facilitator for achieving the optimal benefits of this tool. Therefore, training policies and strategies play a significant role in the successful implementation of technology and the continued use of EMR systems. Given the importance of EMR training, researchers have explored various aspects and methods of training in recent years, such as on-the-job training and the effectiveness of various educational interventions, but each of these studies has focused on specific aspects of training and thus does not provide a comprehensive overview of EMR training. To the best of our knowledge, there is no review summarizing the latest strategies and conceptual methodologies for EMR training for different target groups, considering the various outcomes of those training sessions. (Samadbeik, et al., 2020).

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The proposed framework can be effectively utilized to facilitate knowledge sharing in the daily practices of an organization, making it an integral part of routine work (rather than an addition) and cultivating a culture of knowledge sharing. It provides a set of guidelines to enhance knowledge workers' motivation to engage in knowledge exchange tasks and to overcome fundamental individual, organizational, and social barriers. However, considering individual knowledge as a personal asset of a knowledge worker that provides competitive advantage, there should be no intent to manipulate or mandate knowledge sharing. The extent of participation in the activities in question should depend on the individual knowledge worker. The proposed framework can also be leveraged during the development of Knowledge Management Systems (KMS) as it offers a structured and well-documented list of factors closely associated with its requirements analysis phase. The joint examination of social and technical dimensions contributes to an organization's increased awareness and understanding of the social implications resulting from investments in information technology to redesign its knowledge-sharing processes.

Due to the variability of individual and organizational behaviors, it is impossible to predict which of the proposed incentives and to what extent might best promote knowledge sharing within a specific organization. The same incentive may have a different impact in two different organizations (for example, what motivates one individual may not be apparent to another). Conversely, linking a specific catalyst for knowledge sharing to a particular type of common knowledge is challenging. For this reason, our approach does not distinguish between different types of communicated knowledge (tacit or explicit, descriptive or procedural, etc.). (Evangelou & Karacapilidis, 2005)

Encouraging Patient Participation in Managing Their Health Data through Information Technology

As a result, patients should be encouraged to become more involved in managing their care. Frequent real-time communication and feedback are essential in supporting behavioral change and empowering patient engagement in the healthcare process. However, the traditional model of care delivery, which involves face-to-face interaction with a trusted healthcare expert or provider, can only be applied to a limited number of patients, thus having a restricted impact and reach. In an effort to reach and engage a larger number of patients, researchers and clinicians have begun to explore the role of information technology (IT) platforms in patient engagement and interventions for promoting healthy behavior changes. It is assumed that the face-to-face interaction in the traditional model can be mimicked by support from peers or peer groups on social media. IT platforms are being embraced as a means to enhance patient engagement in the healthcare process, improve the quality of care, support healthcare safety, and provide cost-effective health services to patients. (Sawesi, Rashrash, Phalakornkule, Carpenter, & Jones, 2016).

PROBLEM STATEMENT

This chapter aims to identify and define the main issues related to the role of information technology in knowledge management in hospitals and to present the need for a detailed analysis to address the potential challenges and risks.

Increase in the Use of Information Technology in Healthcare

One of the primary issues is the increasing use of information technology in the healthcare sector. This brings significant changes to how health information is stored, processed, and utilized. Healthcare has lagged behind many other industries in leveraging IT capabilities to improve services, knowledge, communication, outcomes, quality, and efficiency. Given the complexity of modern medicine, it is inevitable that IT will play an increasingly significant role in enhancing the quality of healthcare. As noted by the Institute of Medicine (IOM) Committee on Quality Health Care in America, "Information technology must play a central role in redesigning the healthcare system if fundamental improvements in quality are to be achieved over the next decade." To make meaningful progress, substantial reengineering of the healthcare delivery system is needed, requiring changes in various technical, sociological, cultural, educational, financial, and other critical factors. (Ortiz & Clancy, 2003)

Protection of Privacy and Security of Health Data

The rise of new technologies in healthcare practices has significantly modified traditional methods of handling patient information. Today, practitioners want to access relevant patient information on any device at any given time. In particular, the implementation

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of management and exchange of medical images via cloud platforms offers an attractive solution for accessing, sharing, viewing, and storing images. However, medical data and applications are subject to a range of legal and ethical regulations dictating data security. Additionally, patients are increasingly aware of their privacy and the value that certain data may hold for external parties.

The literature often considers three types of electronic health cloud models: private, public, or hybrid. Private clouds are the most commonly used, as data and applications remain under the control of a well-defined entity and its users. Public clouds, on the other hand, offer all the benefits of cloud computing in terms of service and computational power, but within a space of reduced local security mechanisms and privacy protection. Electronic Health Clouds also deal with two different types of health data: Personal Health Records (PHR) and Electronic Health Records (EHR). The former are managed directly by the user, who can upload their health data and share it with their chosen physician. (Vincent, Pan, & Coatrieux, 2016).

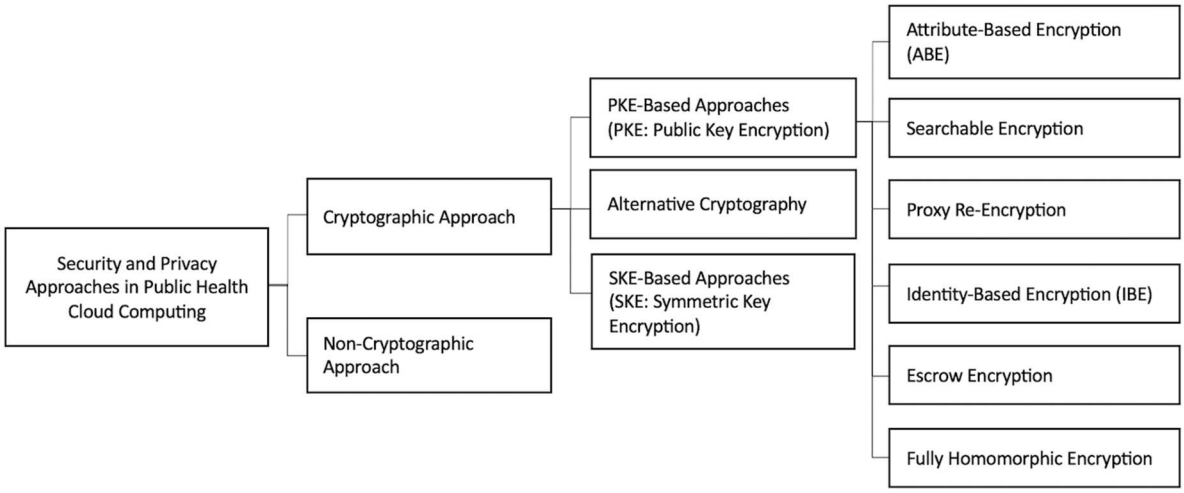

Figure 1. Taxonomy of Security and Privacy Approaches in Electronic Health "Clouds." (Vincent, Pan, & Coatrieux, 2016)

Raising the Need for Education and Training of Healthcare Staff

Progress toward the widespread and sustainable adoption of digital technologies in specific clinical environments and healthcare systems worldwide remains relatively slow. The lack of knowledge and awareness regarding new technologies and the skills to utilize them among healthcare professionals is one of the main barriers to the implementation of digital health in clinical practice. In the Global Strategy on Digital Health 2020-2025, the World Health Organization (WHO) explicitly proposes the integration of knowledge and skills related to digital health into the education and training curricula of healthcare professionals and allied health workers.

High levels of digital engagement and literacy skills among young people position them well to understand the fundamental requirements for the successful implementation of digital health. It is crucial to educate future healthcare professionals about current and predictable technological innovations and enable them to adapt to forthcoming changes in their field. However, given the limited digitization of health management systems for learning, concerns remain about privacy, security, quality, and accuracy in medical education. Therefore, there is an urgent need to create systematic courses on digital health in medical schools to train the next generation of physicians in integrating medical theory and digital technology and equipping them with the ability to work within the medical digital system in the future. (Ma et al., 2023)

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Table 1: Summary of Issues in the Use of Information Technology in the Healthcare Sector

No.	Topic	Description
1	Increase in IT Usage	A noticeable increase in the use of information technology in the healthcare sector, with significant impacts on the storage, processing, and utilization of health information. The potential challenges of data security and integrity are mentioned as a key issue.
2	Protection of Privacy and Security of Health Data	The risks of violating patient privacy with the use of information technology are increasing. The need for policies and security measures to protect health data has been emphasized as important.
3	Lack of a Common and Integrated Interface	In the absence of a common interface and standardization of health information systems, coordination and sharing of information among hospitals and healthcare institutions present considerable obstacles.
4	Raising the Need for Education and Training of Healthcare Staff	Improving the training and preparation of healthcare personnel for the effective use of health information technology presents a significant challenge. Investments in training and development are necessary to address this issue.
5	Ethical Conflicts in the Use of Information Technology	The use of information technology in medicine brings ethical challenges, particularly regarding decisions about diagnosis and treatment. The need for an ethical approach in this aspect has been emphasized as important.
6	Encouraging Patient Participation in Data Management	The possibility of encouraging patient participation in managing their health data through information technology has been considered as a potential avenue to enhance the integrity and reliability of the information.
7	Impact of Information Technology on Doctor-Patient Relationships	The use of information technology has the potential to enhance the trustworthiness and transparency in doctor-patient communication, creating opportunities for a more open and trustworthy relationship between them.
8	Raising the Need for Protective Policies and Laws	Policies and laws regulating the use of information technology in medicine are crucial for protecting the integrity and security of health data.

Methodology

The methodology of this study will include a detailed examination of published online articles to gather information and analyse the role of information technology in knowledge management in hospitals.

Identification of Information Sources

Initially, reliable online information sources will be identified and selected, including scientific articles, research reports, and official websites of health organizations. These sources will be chosen based on their relevant content and credibility.

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Content Analysis

After identifying the sources, a content analysis will be conducted to understand how information technology has been used in knowledge management within hospitals. This analysis will include identifying trends, challenges, and advantages of utilizing information technology in the healthcare environment.

Evaluation and Interpretation of Results

Following the content analysis, the results will be evaluated and interpreted to understand the impact of information technology on knowledge management in hospitals. This includes identifying the advantages and challenges of using information technology, as well as recognizing potential areas for improvement.

The research methodology based on examining published articles online provides a quick and effective way to gather information and identify current trends in the use of information technology in knowledge management in hospitals.

Presentation and analysis of results

Presentation of Results

In this section, we will present and analyse the results of our research on the role of information technology in knowledge management in hospitals. The research results summarize the advantages and challenges of using information technology in this context and provide an overview of its effects on improving healthcare.

Table 2. Presentation of Results

Aspect	Results
Access and Information Sharing	Electronic health record systems have facilitated access to and sharing of information for patients and healthcare personnel.
Reduction of Errors	The use of information technology has reduced errors in medication administration and patient treatment.
Efficiency and Productivity	The implementation of information technology has increased the efficiency and productivity of healthcare personnel.
Coordination and Collaboration	Information technology has improved coordination and collaboration among departments and healthcare teams in hospitals.

Analysis of Results

The analysis of the results indicates that the use of information technology in hospitals has brought significant advantages in knowledge management. The main advantages include:

- Improved access to and sharing of information for patients and healthcare personnel.
- Reduction of medication errors and treatment mistakes through integrated electronic health record systems.
- Increased efficiency and productivity of healthcare staff by facilitating patient documentation and monitoring.
- Enhanced coordination and collaboration among departments and healthcare teams through information technology platforms.

On the other hand, several challenges and issues arise from the use of information technology in knowledge management, including:

- Increased technical and financial difficulties in implementing and maintaining information systems in hospitals.

- Information security and protection of patients' personal data.
- Digital environment pollution with unnecessary information and administrative overload.
- Negative perceptions among healthcare personnel regarding changes to their daily practices and resistance to adopting information technology.

The analysis of these results will provide a clear summary of the challenges and advantages of using information technology in knowledge management in hospitals and will assist in formulating appropriate recommendations for improving current practices.

CONCLUSIONS AND RECOMMENDATIONS

After a thorough investigation and analysis of the role of information technology in knowledge management in hospitals, we arrive at several important conclusions and recommendations:

Conclusions:

- Information technology has a significant impact on knowledge management in hospital environments.
- The use of electronic patient records and other technological applications has improved the efficiency and quality of healthcare.
- We emphasize the importance of training and preparing healthcare personnel to effectively use information technology.

Recommendations:

- Hospital organizations should continue to invest in information technology infrastructure to enhance knowledge management.
- Efforts are needed to ensure that healthcare personnel possess adequate knowledge and skills to utilize information technology tools.
- An integrated approach is required to ensure that information technology is suitable and effective in serving patients.

These conclusions and recommendations align with the findings of the research and are crucial for improving practices and healthcare services in hospital environments.

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