

Implementing Health Information Systems in Jordanian Healthcare: A Scoping Review of Opportunities, Challenges, and Key Factors

Heba M. Hatamlah ¹, Muhanad M. Hatamleh ², Zaydoon Mohammad Hatamleh ³, Othman Ibrahim ⁴

¹Assistant Professor (Health Informatics), Hospital management Department, Faculty of Business Philadelphia University, Amman – Jordan

²Department of Applied Dental Science, Faculty of Applied Medical Sciences, Jordan University of Science and Technology, Irbid 22110, PO Box 3030, Jordan

³PhD candidate (Information Systems), University Teknologi Malaysia, Malaysia; Senior lecturer, Skyline University College, UAE

⁴Department of Information Systems; University Teknologi Malaysia, 81310 skudai, johor, Malaysia
hhatamlah@philadelphia.edu.jo, mmhatamleh5@just.edu.jo, Zeidounh@yahoo.com

Abstract. This paper presents a literature review on the implementation and impact of health information systems (HIS) in the Jordanian healthcare industry. The review aims to synthesize the existing knowledge on the opportunities, challenges, and key factors influencing the adoption and success of HIS in Jordan. A total of 20 studies published between 2006 and 2021 were included in the review, covering various aspects such as electronic health records, enterprise resource planning systems, and predictive analytics. The findings highlight the potential benefits of HIS in improving healthcare quality, efficiency, and staff performance. However, the review also identifies several challenges, including infrastructure limitations, financial constraints, and the need for adequate training and support. The paper discusses the methodological approaches used in the reviewed studies and provides recommendations for future research and practice. Despite the growing recognition of the importance of HIS in Jordan, there is a need for more comprehensive and rigorous evaluations of their implementation and impacts to guide policy and decision-making in this field.

Keywords: healthcare, health information system, Jordan, organizations, research, health data monitoring, Jordanian healthcare system, population-based systems, health data administration, electronic records, ERP systems.

1. Introduction

A health information system is a critical system that involves civil registration and the incorporation of a statistics system. The system is critical for fostering health information data that is critical for monitoring and planning. HIS, as a health information system is commonly known, further aids in policy-making and in evidence promotion. Health information systems and statistics systems are critical in the fact that they provide the necessary information that contributes to the expansion of the health sector. The availability of health information systems data at the national level makes it possible to evaluate the quality of providing quality health services. Jordan has population-based systems that follow internationally stipulated quality standards and requires further investigation due to the need in defining growth points. A health information system is a critical system for the effective administration of health data. It involves civil registration and the incorporation of a statistics system, fostering health information necessary for monitoring and planning. The following study involves an in-depth review paper that delves into enterprising health information systems, with a specific focus on the Jordanian healthcare industry.

HIS, as a health information system is commonly known, further aids in policy-making and in evidence promotion. Health information systems and statistics systems are essential in the fact that they provide the necessary information that contributes to the expansion of the health sector. Despite the crucial significance of HIS, the extant literature has major issues and limitations, notably in the area of implementation and efficacy in Jordan. There is a lack of extensive information on the importance of HIS and their function in the healthcare sector, the specific context of HIS in Jordan, and population-based systems that correspond to international standards. The subsequent report answers the questions about the success determinants of information systems in healthcare, electronic health plans impact the healthcare system in Jordan, HIS's opportunities and challenges, and adoption of enterprise resource planning (ERP) systems. The assessment will address these gaps by reviewing the existing state of HIS in Jordan, identifying limitations and problems, and making recommendations for improvement.

2. Literature Review

Early research focused on the success of information systems with a critical determinant on the success determinants of both individuals and organizations. Sabherwal and Jeyaraj (2006) revealed that system quality affects the success of diverse systems and is improved through increased training on information systems. The attitude of the users towards the information systems had increased impacts on the success of the system. While affirming the importance of the participating users, the effects have only been derived through the existing systems that are being developed. The literature focused on the essence of conducting more training and improving the attitude of users towards the information system as critical in fostering the success of information technology in the future.

Also, there was an increased focus on the nature of healthcare spending and the use of healthcare spending in information technology in early research. However, the most significant focus was on the OECD countries. Anderson, Frogner, Johns, and Reinhardt (2006) revealed that the implementation of health information technology was pivotal in lowering healthcare spending and fostering the quality of healthcare. The literature focuses on the need for governments to invest in these healthcare systems as a way of fostering the quality of healthcare.

2.1. Electronic Health Plan in the Jordanian Healthcare System

Important research has further been conducted on the electronic health plans in the healthcare system in Jordan by Rawabdeh (2007). In his analysis, he focused primarily on the electronic health trend plans in the Jordanian system of healthcare. The research presents important aspects on how the current rate of electronic coverage in Jordan. Rawabdeh elucidated began the journey through legislation that aimed at increasing the reimbursements for electronic health in 1988 (2007). The country began providing

telemedicine services in the national medical care scheme. The legislation was critical as it fostered the delivery of health services. Rawabdeh observed some of the improvements, such as the expansion of the telemedicine services, especially in the Arab region, and the maintenance of the medical reimbursements in the delivery (2007). Thus, the research on electronic health plans in Jordan mostly agrees on the good impact of legislative acts and the expansion of telemedicine services, as noted by Rawabdeh. However, there are exceptions over the extent to which these improvements have been universally beneficial throughout different regions in Jordan, with some research finding disparities in implementation and access that Rawabdeh does not entirely address.

2.1.1. Spending on Health Care Plan

In the same literature, it was revealed how the health sector in Jordan has evolved from a society where only a small percentage was incorporated in healthcare to becoming one of the largest healthcare sectors in the country. The country's spending on healthcare increased from slightly above 7% of the GDP in 1998 to over 10% in 2004. The growth is a representation of how healthcare costs have increased in relation to domestic costs. However, there were challenges that were witnessed as will be unraveled electronic health sector in Jordan. One of the most significant challenges, as mentioned by Rawabdeh, include the unequal distribution in technology and in the access of ICT applications (2007). The challenges mainly result as a result of the differences in the digital divide and level of education in Jordanian society. The challenges that have inhibited access to ICT application range from an underdeveloped infrastructure in the telecommunication sector, high tariffs, weak policies, and the inefficiency in the relevant organizations that are involved in the health sector. While a literature emphasizes significant advances in Jordan's healthcare sector, there are continuing issues, such as the unequal distribution of technology and access to ICT applications compounded by the digital divide. There are also varied education levels, and infrastructural shortcomings that demonstrate that systemic challenges continue despite general improvement.

2.1.2. Differences in the Healthcare Plan Between the Public Health Sector and Private Sector

Revelations have further been made on the differences between the public sector and the private sector. Public hospitals account for more than 66%, while the private health sector comprises 34% of all the health sectors. There is a low penetration of telephones in the country and a high cost of subscription and computer ownership. The research focused primarily on the lapses that exist within the Jordanian health information system that may inhibit healthcare delivery in the country. It was palpable from the literature that the privacy of personal information relating to health and data security is a significant challenge in the health care system. The literature was primarily conducted with the aim of advocating for a data protection policy that will spur the country's health sector. Therefore, there is agreement on the urgent need for strong data protection policies to address significant privacy and security challenges. The disagreements are focused on the effectiveness of current measures and the pace of reform implementation. Based on the texts, a discrepancy between the public and private health sectors in Jordan, the dominance of public hospitals and the barriers to technology adoption due to high costs and low penetration persist.

2.2. Opportunities and Challenges Emanating from the Use of Healthcare Information System Opportunities

Extensive literature has further been conducted on the opportunities and challenges that emerge from the use of healthcare information systems. In this literature, Ngafeeson (2014) acclaimed that HIS has the ability to foster the success of healthcare delivery and circumvent medical errors. One of the opportunities that have been mentioned in the literature includes the fact that it saves cost. HIS has the ability to reduce expenses, especially those relating to meeting the stipulated standards and keeping records. Secondly, health information systems have the ability to reduce medical errors. Rawabdeh (2007) revealed that more than 50% of the errors could be circumvented through the implementation of technology in the health sector.

The health information systems have further been implemented as having the ability to foster the

average quality of health. The improvement in health emanates largely from the reduction in medical errors. Through the implementation of a HIS, the accuracy of the data documentation is improved, while the summarization of data also becomes possible, the increased support in the decision-making process and the reduction in the medical errors. The use of HIS was further mentioned as having the ability to foster continuous improvement in information exchange, which is critical in fostering the health support system.

Also, significant literature has been conducted on the evaluation of healthcare information in developing countries. Al-Yaseen, Al-Jaghoub, Al-Shortbaji, Salim (2010) revealed that there was increased adoption of post-implementation evaluation in private hospitals. However, only a few hospitals conduct an evaluation to ascertain the success of their information technology system. The significant differences appear between the implementation and evaluation practices of private and public hospitals. The former adopting post-implementation evaluations more frequently than the latter. This raises questions regarding the overall efficacy and sustainability of HIS improvements across various healthcare settings.

2.2.1. Challenges

Despite the opportunities that have been brought about by health information systems, various challenges exist. One of the challenges that exist emanates largely from the challenges emanating from the healthcare setting. Challenges can further occur from the regulatory environment and challenges within the HIS system. The lack of adequate training for the personnel undertaking or implementing the HIS has been mentioned as another critical challenge.

Literature from the Indian public sector was critical in unraveling the essence of electronic healthcare systems, which consequently makes it possible to unravel its application in the Jordanian health system. In this literature, Kaushik and Raman (2014) revealed that policy is critical in influencing the flow of government information, which informed the need to introduce strong government policies in support of a health architecture for an information management system. The introduction of stringent policies makes it possible to incorporate an effective resource planning system that will address diverse needs in the health sector.

The literature above conformed on a large part with studies conducted in Hakeem Jordan in the following year. Nassar, Othman, Hayajneh, and Ali (2015), attempted to develop an integrated success model for an electronic health record, revealed that the presence of highly trained employees who are implementing the EHR system, there was an increased chance for improved service delivery in the health information system. In so doing, it becomes easy to achieve the goals of all the stakeholders involved, including the medical practitioners and the patients. Studies by Kaushik and Raman (2014) and Nassar et al. (2015) demonstrate the importance of strong government policies and well-trained personnel, but opinions in various sectors and regions differ, pointing to an uneven landscape in HIS adoption and effectiveness.

2.3. The Implementation of Enterprise Resource Planning in the Healthcare System

Extensive literature has further been conducted on how enterprise resource planning systems can be implemented. Kontio, Lundgren-Laine, Kontio, and Korvenranta (2014) focused on different ERP systems and their impact on the health sector. ERP systems are critical in healthcare management, clinical management, and the management of financial data. However, despite the essence of the three aspects, it is difficult for ERP to be implemented in all three years. Nonetheless, ERP has a significant influence on the performance of a health organization. The systems have mainly emanated out of the fact that there is an increasing need for information management, which is critical in spurring everyday processes. Thus, these systems' complexity and resource requirements make full implementation a significant problem and indicate the need for more flexible and scalable solutions catered to particular organizational requirements.

Even though the focus of this study is on Jordan, analyzing the literature relating to close neighbors such as Oman is critical. Al-Gharbi (2014) revealed that the information system in Oman, known as Al-

Shifa, was the standard project that ought to be used in the management of information technology. The project management standards have different phases and critical areas of project management. The phases that are being used make it possible to initialize and conceptualize the project effectively. Al-Gharbi (2014) highlights Oman's Al-Shifa information system's performance as an IT management model, but the applicability of the same project management principles in other regional contexts, such as Jordan, is a multifaceted topic for a discussion.

2.4. Implementation of ERP Systems in the Jordanian Healthcare System

Research has further been conducted on the implementation success of ERP systems in the Jordanian system of healthcare. Almajali, Masa'deh, and Tarhini (2016) asserted that there was a positive correlation between the satisfaction of the users and the training offered on ERP systems. Therefore, the research sensitized the need for users to be trained effectively before operating in the healthcare systems in Jordan.

2.4.1. Importance of Training in the Implementation of ERP systems

The training is critical as it enables the firms to become familiar with the existing operating procedures. The positive relationship is particularly created as a result of the nature of supportive leadership and the increased satisfaction on the part of the patients. The use of ERP implies that the management of data in the hospital institution is advanced, and the procedures of the operations are advanced. The existing literature further point to a situation where a significant satisfaction of the patients can foster the performance of a health institution. The study found that there was a close correlation between the satisfaction of the users and the successful implementation of the ERP. However, the existence of the mediating effect between the satisfaction of the users and the training was nil. Cultures that have effectively adopted the use of ERP affirm that the importance of adequate education and user training is adequate for the system. The results of the study pointed that the majority of the respondents had inadequate training, which may result in short-term gains, but consequently lead to long-term failures. The main triggers for the long-term failures in the Jordanian system were perceived to be the ignorance of the system and the end-users. The research affirmed the need to conduct more research to unravel the differences in the cultural attitudes that may exist within the Jordanian society, which may have an impact on the change management and the implementation of training. The differences can impact the uptake of the ERP, which may present challenges to the healthcare system. The research noted a direct correlation between the variables mentioned above and the success of the ERP implementation. In this regard, it was assumed that there is a need to scale the training for the new technology, especially the ERP system, to understand the accurate requirements that are needed to enforce the success of any new ERP system. Training is critical in fostering the success of the ERP implementation to make it possible for hospital users to adapt effectively to any new system.

Also, ensuring that the people are trained effectively and kept abreast with all new and emerging information will ensure that the benefits of the ERP system are achieved. It is critical to conduct training as it is an integral factor that can foster the implementation of the ERP, which implies that it should be addressed to solve some of the challenges that may emerge. Some of the factors that can lead to the failure of the ERP system if not properly addressed include the lack of a proper scheduling process. Also, a limited budget may inhibit the success of an ERP system. Finally, the literature focused on inadequate commitment and experience that may make it difficult for the trainers to successfully implement the ERP, which is a critical part of enterprise health information system. The literature achieves a consensus regarding the value of strong training programs and supportive leadership, but not concerning the divergence in the degree of these elements' successful application. Budgetary restrictions and appropriate scheduling procedures might appear just as important for the long-term viability of ERP systems in Jordan's healthcare industry.

2.4.2. Healthcare Surveillance to Improve Training in The Public Health Sector

The literature on the Jordanian system has primarily centered on the public health system. Sheikhal, Abdallat, Mabdalla, Qaseer, Khorma, Malik, Profili, Ro, and Haskew (2016) unraveled critical

literature on the nature and the implementation of the public surveillance of the health care system in Jordan. The research unraveled that the understanding and improvement of the health status of the Jordanian community largely depends on the surveillance that has been conducted on public health. The literature focused on the essence of new technologies, with a particular focus on clinical guidelines and definitions of standard cases to foster accurate diagnosis of different health conditions. The research revealed how the Jordanian health care surveillance experienced significant challenges, which was a significant inhibitor towards providing quality healthcare in the country. The implementation of an enterprise approach was perceived as critical in the planning and implementation of an effective health surveillance system. The benefits of an enterprise approach were articulated in detail, which included the ability to provide a data collection system that is standardized for the entire healthcare system. The system works effectively by focusing on every case and further employs mobile technology to foster the collection of data in real-time. The system further makes it possible to incorporate a mobile-based technology that helps in the collection of data. Standardized data is particularly critical as it makes it possible to foster the decision-making process within different healthcare levels. There are differences on the enterprise approach's viability because of the current logistical and infrastructural limitations within the Jordanian public health system, despite the approach's promise to standardize data collecting and improve decision-making.

2.5. Impact of Human Resource Information Systems in Fostering Performance of Jordanian Private Hospitals

While the focus has largely focused on public hospitals, as revealed in the study above, there exists literature on the impact and use of these systems in private hospitals. Khashman and Khashman (2016) revealed that health information systems played a pivotal role in helping private health organizations to foster their performance. Therefore, the increased focus on the use of HIS will be critical in improving the performance of the private healthcare system in Jordan.

2.6. Factors Determining the Decisions to Incorporate Human Information System in Hospitals

The implementation of a health information system through the adoption of electronic health records is impacted by different factors. Sulaiman and Magaireah (2014) affirmed that access control was one of the factors that impacted security. Secondly, the research revealed that privacy is a significant issue that hampers the protection of patients' data. Therefore, it is critical to implement security mechanisms and authentication programs that will foster authentication and protection of data. The accuracy of the data is another vital component that impacted the reliability. The successful implementation of the system can further be hampered by financial constraints and administrative issues. The availability or lack thereof of human personnel and an appropriate IT infrastructure can also promote or inhibit the implementation of a successful system.

Different factors have been evaluated relating to the influence of the decision-making process in the adoption of human resource information systems. Alam, Masum, and Hong (2016) indicated that personnel with IT knowledge in the health sector play a critical role in influencing the use of IT applications in the health sector. The study affirms the importance of human adoption in fostering the success of the health information sector. However, there are still gaps in our knowledge on more general socio-technical aspects apart the security issues highlighted by Sulaiman and Magaireah (2014) required for successful deployment, such as IT infrastructure and workforce readiness.

2.7. National Policies and Strategies Aimed at Fostering Health Quality in Jordan

Extensive literature has been conducted on different strategies that have been implemented within the Jordanian state. El-Jardali and Fadlallah (2017) revealed that Jordan had made pivotal progress in fostering the attention to quality and national plans of health. The country, together with Lebanon, has established different requirements for the licensing process that influence the investments in the information system of the health sector. However, there was an evident lack of a national policy that fosters the safety of the patients and leads to a quality improvement of the entire health system. Rather than having a national policy, Jordan has legal measures that have not been articulated clearly and

national plans that lack proper responsibilities within the entire system. Also, there lacks a national standardization guideline that can be used by regulators within the healthcare sector. In this regard, the literature sensitized on the need to foster a continuous improvement culture and further foster adequate training on patient safety and quality improvement.

2.7.1. Use of Enterprise Architecture to Foster Health Quality

The literature has received backing in subsequent years. The literature above was backed up by Higman, Dwivedi, Nsaghurwe, Busiga, Rulagirwa, Smith, Wright, Nyinondi, and Nyella (2018) in their analysis on ways of designing health information systems through the use of an enterprise architecture, which specifically focused on developing countries. The research focused on different themes, one of which unraveled the essence of multiple sectors and sources of data. Various aspects were unraveled, such as an increased ability to foster system flexibility and standards of data. Also, the research further centered on the need to foster data interoperability and desirability in group models. There is an agreement in the literature on the use of enterprise architecture to improve health quality on its ability to increase system flexibility and data standards.

2.8. Predictive Analytics in the Health Sector

While the focus of this study is primarily on Jordanian society, the focus on the literature on neighboring countries provides an insight into the essence of health information systems. Alharthi (2018) asserted that predictive analytics has become important in a clinical setting, especially in the treatment of chronic diseases. In Saudi Arabia, there is a high reliance on paper-based records, which informs the need to digitize the records. The research above reveals that the majority of the countries in the GCC countries, including Jordan, have lagged behind in the digitization of health systems.

2.8.1. The use of Digital Resource Enterprise in Healthcare

Later studies focused on the implementation of planning systems within the resource enterprise. The resource enterprise is achieved mainly through the digitization of quality services in healthcare services. Fiaz, Ikram, and Ilyas (2018) evaluated the perception of healthcare professionals in fostering healthcare services through the implementation of enterprise resource planning. ERP, which is a critical part of health information systems, was perceived to have a positive effect on the ability to provide quality healthcare services. The use of ERP was perceived to have a positive impact on all stakeholders involved in the healthcare sector and the quality of information being provided in the healthcare sector. The implementation of a successful ERP system makes it possible for professionals within the healthcare sector to provide apt and quality services.

Recent studies have focused on the use of health systems in the exchange of enterprise health information compared to the use of one vendor and readmissions that have not been planned. Vest, Unruh, Freedman, and Simon (2019) revealed that the use of health information enterprises would be common compared to the use of enterprise health records. The use of one vendor in the HIS made it possible to avert readmission. However, the impact of adopting a health information enterprise was not significant.

Current studies have primarily focused on the characteristics of electronic health with a specific focus on their impact on medical performance and the quality of health. Alazzam, Khatib, Mohammad, and Alassery (2021) elucidated how different aspects of electronic health systems such as health information systems have contributed towards the performance of medical personnel, the performance of health centers, and the interaction between the patients and the medical practitioners in Jordan. The research primarily focused on the effectiveness of one integrated model. The research revealed that the use of a health information system played a pivotal role in fostering the performance of the staff in and the care of the patients. Conversely, the use of the system provided critical but indirect improved relationships between the patients and the medical practitioners. However, the quality of the system was a critical determinant that presented direct and indirect benefits to the patients and medical practitioners. The use of a health information system was found to improve the quality and speed of accessing health care services. Also, it presented significant benefits to averting detection mistakes and errors, which

inhibited access to quality health care. Despite the existence of various demerits to the system, improved participation by the patients is perceived as integral in fostering system utilization.

Therefore, I acknowledged the predictive analytics' potential to improve clinical decision-making in the health sector in the reviewed literature. Nevertheless, the disagreement about the speed of digital health systems' adoption and integration across the GCC indicates a significant knowledge gap in this area. Theory frameworks like the Technology Acceptance Model and the Information Systems Success Model are major references for Jordanian healthcare IT publications. These frameworks support the Sabherwal and Jeyaraj's (2006) emphasis on system quality and user attitudes as critical success factors. The work of Rawabdeh shows how institutional theory influences policy and organizational behavior through legislative tactics and system expansions. Overall, these frameworks convey difficulties faced by Jordan's healthcare information systems, the adoption of new technologies, and the implications of policy.

3. Research Methodology

The following section will culminate with an assessment of a particularly preferred methodology set and analysis that can be used over the others. I have chosen a systematic review approach for this study, as it can ensure detailed and precise procedure and enable a well-organized analysis of the surveys that have already been done. Through a methodical process of locating, assessing, and consolidating all pertinent research on the subject, I can guarantee an exhaustive and objective report. Moreover, such a methodology is especially well-suited for the intricate domain of health information systems, as this area comprises a lucid, fact-based comprehension of the efficacy and consequences of distinct systems and approaches.

The databases searched primarily include Google Scholar, PubMed, ScienceDirect, and JSTOR using the keywords such as HIS, EHR, ERP, Predictive Analytics in Healthcare, healthcare in Jordan. My inclusion/ exclusion criteria involve studies published no earlier than 2006; only peer-reviewed journals and articles; reports centered on health information systems, predictive analytics, ERP in healthcare, and electronic health systems. Additionally, I have chosen writings employing a range of research techniques, including as questionnaires, interviews, pilot studies, field surveys, mixed methods, case studies, electronic database searches, regression analysis, and meta-analysis with precise goals, techniques, and outcomes.

The data extraction and synthesis process incorporated a rational review of each study to collect consistent and reliable data. The data extraction was conducted independently to give objective information and minimize biases and prejudices. After the extraction, I combined and compiled data, highlighting recurring themes, contrasting and comparing findings. Whenever feasible, I employed meta-analytic approaches to synthesize quantitative data to offer more comprehension of the links and effects surveyed. Finally, I summarized the findings and organized a thorough report of the state of the field, highlighted areas for further investigation and possible limitation risks.

3.1 Case Study Approach

Al-Gharbi (2014) primarily used a case study approach. The case study can be categorized as part of an information system management. Also, a focus group methodology was used in the study.

Anderson, Frogner, Johns, and Reinhardt (2006) also incorporated a case study approach. The focus of the methodology was on the United States and OECD countries. My opinion is that the research included important aspects relating to the economy.

Alharthi (2018) relied primarily on the use of a case study analysis. The case studies covered recent studies in data mining, especially in relation to chronic ailments. My opinion regarding this research is that it captures the analysis in the most effective way and consequently unravels important aspects relating to this study.

Kaushik and Raman (2015) incorporated a case study approach for the research. The case primarily relied on a representative case that provided a link between the causal relationship, which may provide an appropriate conclusion. In my opinion, the use of the cases is pivotal as it makes it possible to understand the impact of HIS in different case scenarios.

3.2 Mixed Methods Approach

El-Jardali and Fadlallah (2017) used mixed methods that were combined with the use of a documentation review. Also, the study incorporated the use of stakeholder surveys and interviews from informants. The methodology was critical as it made it possible to achieve quality improvements in five different components that aimed to analyze the impact of the system on the safety of the patients and in fostering quality healthcare. Alam, Masum, Masum, Beh, and Hong (2016) incorporated the use of varimax rotation that was aimed at unraveling the validity of the discrimination and convergence. Other methodologies that were used include mean difference and the analysis of variance, or what is commonly known as ANOVA. The results revealed that the ANOVA analysis supported the hypothesis. Ngafeeson (2014) primarily relied on the use of research models as the main research methodology. The models are applicable in different hospital settings and proved critical in informing the effectiveness of the HIS system. I found this form of methodology important but limited in the fact that it cannot provide critical explanations to individual sections. Alazzam, Khatib, Mohammed, Alassery (2021) utilized a deductive approach and further incorporated a quantitative approach in the methodology. The use of a quantitative approach was pivotal in influencing in unraveling the hidden aspects of information systems. The use of the quantitative model was critical in unraveling how electronic health sections affect the performance and relation between stakeholders. Fiaz, Ikram, and Ilyas (2018) also utilized a mixed-methods approach was further used in the collection of data, where both primary and secondary sources were utilized. The use of mixed methods made it possible to unravel important aspects relating to the use of health information systems.

3.3 Electronic Databases Approach

Kontio, Lundgren-Laine, Kontio, and Korvenranta (2014) primarily relied on international electronic databases when conducting the methodology. The searches covered a period of nine years, beginning from 2000 to 2009, investigating PubMed, Emerald, CSA Engineering Research Database, ScienceDirect, ISI Web of Knowledge and Cinahl databases (Kontio et al., 2014). I found the methodology useful as it captured diverse articles relating to this topic. The methodology relied on search words and keywords such as Enterprise Resource Planning, Healthcare, Literature Review, Qualitative Study, and Thematic Synthesis Technique to develop the research (2014). The used keywords relate directly to my research topic, which further points to the value of this study to this report.

Rawabdeh (2007) primarily incorporated an electronic health system that aims to unravel the potential of health-related commercial activities. A random sample was conducted through phone interviews. Online health was further compared to the traditional healthcare system. The incorporation of the random sample was critical in affirming providing critical aspects regarding the topic. mHigman, Dwivedi, Nsaghurwe, Busiga, Rulagirwa, Smith, Wright, Nyinondi, and Nyella (2017) primarily relied on the use of electronic databases to evaluate literature reports dating from 2010 to 2016. Fourteen articles were used in the analysis. The methodology adopted was critical in providing the necessary solutions needed in this research.

3.4 Questionnaires and Interviews Approach

Sulaiman and Magaireah (2014) primarily adopted a qualitative methodology that aimed to study the design of a case study. Open-ended interviews were conducted with relevant professionals in the field

who are involved in the development of an EHR system. The use of open-ended interviews made it possible to understand critical aspects relating to this field.

Al-Yaseen, Al-Jaghoub, Al-Shorbaji, and Salim (2010) used questionnaires to derive answers to the research. The questionnaires were assessed in private hospitals, and were 60 of them. My opinion regarding the use of the questionnaire is that it was the most appropriate for the research. Young (2016) collected data included the use of a questionnaire instrument. The research population evaluated private hospitals that are allocated in these hospitals. My opinion on this research is that the use of this methodology was effective in the study of a large population.

Fiaz, Ikram, and Ilyas (2018) incorporated the use of questionnaires as the primary type of methodology. A mixed-methods approach was further used in the collection of data, where both primary and secondary sources were utilized. The use of mixed methods made it possible to unravel important aspects relating to the use of health information systems.

3.5 Pilot Studies and Field Surveys

Sheikhali, Abdallat, Mabdalla, Qaseer, Khorma, Malik, Profili, Ro, and Haskew (2016) primarily used a pilot study as the primary methodology method. The pilot study covered 50 health facilities in Northern Jordan in 2015, between the month of May and December. My opinion on the methodology is that it was effective in the fact that it allowed for extensive consultations. Almajali and Masa'deh (2016) primarily relied on the use of field surveys. The surveys incorporated a seven-point Likert scale to make the analysis. I believe that the use of the Likert scale was critical in fostering the scale of the field survey.

3.6 Regression and Meta-Analysis

Nassar, Othman, Hayajneh, and Ali (2015) incorporated two types of analysis, which included correlation and t-test analysis. The t-test analysis revealed a significance of .000 for the relevant aspects that were considered in the degree of freedom, which amounted to 199. The high t-value was derived for different sections such as learning and growth, finances, customers, internal processes, information, and systems. A Spearman correlation was further used to ascertain the strength between the perspectives relating to internal success.

Vest, Unruh, Freedman, and Simon (2019) used a fixed regression model in the analysis. The regression model involved an assessment of several hospitals that were part of the health system in seven states. In my opinion, the use of the regression analysis made it possible to exchange information easily and consequently unravel a proper analysis.

Sabherwal, Jeyaraj, and Chowa (2006) incorporated the use of a meta-analysis in the research. Meta-analysis involves the use of procedures for analyzing descriptive statistics. My opinion regarding the methodology is that it was appropriate for this study, which aimed to analyze individual studies.

The methodology which I felt was best for this study was the one that covered a significant period of time. Particularly, I felt that Kontio, Lundgren-Laine, Kontio, and Korvenranta (2014) was critical as it was able to evaluate electronic databases that span for almost a decade, beginning from 2000 to 2009. However, the articles that used surveys, interviews, questionnaires, and case study models were also pivotal since they helped in augmenting our understanding of this imperative subject.

3.7. Risk of bias evaluation

The factors that were taken into consideration encompassed the process of participant selection, research group comparability, outcome assessment, and statistical techniques employed. I paid a specific attention to the production of random sequences, concealment of allocation, participant and staff blinding, and completeness of outcome data in randomized experiments. In non-randomized studies, I assessed confounding factors, selection bias, and the reliability of the data collection

techniques. Exclusion of studies with a high risk of bias meant that the results derived from the systematic review were grounded in the most trustworthy and objective data.

4. Results

The following is an in-depth analysis of the results relating to all articles used in this study in no particular order. In so doing, the analysis aims to unravel the analysis that supersedes the other and a personal opinion relating to the findings.

4.1. Studies included:

Stage	Number of studies	Reasons for exclusion
Identified	70	-
Removed	55	Duplicates
Screened	55	-
Excluded	36	Significantly outdated; without specified methodologies.
Presented in the review	19	-

4.2. The characteristics of the included studies in a tabular format:

Study	Study design	Sample size	Setting	Key findings
Alam et al. (2016)	Mixed Methods (the HOT-fit model with TOE framework)	550 copies of structured distributed among HR executives of 92 private hospitals	Hospitals	Determined the key elements affecting hospitals' adoption of HRIS such as consecutively IT infrastructure, top management support, IT capabilities of staff, per-ceived cost, competitive pressure, perceived compatibility, centralisation, perceived complexity, formalisation, innovativeness of senior executives, technology vendor support, relative advantage, and government regulations and support.
Alazzam et al. (2021)	Quantitative	212 medical personnel working in 19 healthcare facilities	Jordanian health centers	Features of the e-health system positively impact healthcare quality and medical performance.
Al-Gharbi et al. (2015)	Case study, the focus group methodology	The homogeneous group of people	Oman	Represented a significant accomplishment and a turning point in the direction of the effective use of IT in healthcare.
Alharthi (2018)	Overview	699 tissue samples	Saudi Arabia	Government should urgently start and encourage extensive initiatives to digitize health records.
Almajali et al. (2016).	A survey questionnaire distributed to	175 responses	Jordanian Healthcare Sector	Found predisposing factors for successful ERP system deployment in the medical field such as the training,

	ERP users in Jordanian healthcare organizations			supportive leadership, ease of use, and users' satisfaction.
Al-Yaseen et al. (2010)	Questionnaires	60 private hospitals, 19 completed questionnaires	Jordanian private hospitals	About two thirds (68.5%) of private hospitals do not collect data to demonstrate the effectiveness of their IT/IS, and are unable to use the information from OUE to enhance their evaluation methods, provide better results, and lower variance. The most common justifications for OUE adoption depend on the formalities of project approval and system expenses.
Anderson et al. (2006)	Comparative Study	OECD Countries	OECD Countries	The United States continues to spend more on health care than any other country in the world. Now, it is over 2.5 times higher than any other OECD nation, although started the process of implementation up to twelve years later than these nations.
El-Jardali & Fadlallah (2017)	Mixed Methods (documentation review, stakeholder surveys and key informant interviews)	Representatives from the Ministry of Health; accreditation program directors and surveyors; quality experts; representatives from professional associations; and directors and managers of health care organizations	Lebanon and Jordan	The private sector is the main source of healthcare financing and provision in Lebanon. Due to the country's complicated political structure and the civil war, the government's limited ability to administer has caused the private sector to grow and expand quickly in an unregulated way. The Ministry of Health (MOH) is the main payer and supplier of medical services in Jordan. While private sector governance is largely fragmented and poorly regulated, it is highly centralized within Jordan's Ministry of Health.
Fiaz et al. (2018)	Mixed Methods (primary and secondary sources are utilized for the collection of data, including a self-administered questionnaire)	279 medical professionals of five healthcare organizations	Lahore, Pakistan	The findings show that using an enterprise planning system improves system quality in healthcare services, organizational information quality, and individual outcomes.

Higman et al. (2018)	Literature Review	14 articles published in 2010 to 2016	Resource-limited countries	India, Sierra Leone, South Africa, Mozambique, and Rwanda reported developing the system to fulfill national requirements and put in place a unified HIS framework. Taiwan and Jordan concentrated on particular HIS components, such as electronic medical records and disease surveillance.
Kaushik& Raman, (2015)	Case Study based approach	Indian public sector	India	The recently developed data-driven EA offers an EA-based strategy for healthcare management that a business can intend to implement. With this method, the scheduling of medical professionals and medication administration resources can be more precise and need-based. This could contribute to improved resource management, healthcare, and financial optimization.
Khashman & Khashman (2016)	Quantitative	39 hospitals, 170 employees working in HR departments	Private Hospitals in Amman	The study's findings demonstrated the beneficial effects of HRMS applications on organizational performance. Specifically, it was discovered that staff members in private hospitals' human resources departments had positive attitudes toward all HRMS applications. The outcomes of the research also showed that staff members in private hospitals' human resources units had favorable opinions about the efficacy and efficiency of their organizations.
Kontio et al. (2014)	Review	135 articles were analyzed 9 articles were accepted for deeper analysis.	Healthcare	According to the analyzed studies, the healthcare industry employs ERP systems for the management of financial data, clinical data, materials, and human resources. Materials management was the primary purpose of ERP systems.
Nassar et al. (2015)	Case Study using both qualitative and quantitative methods	Firstly, a group of 12 staff participated in the focus group from Prince Hamzah Hospital with different	Jordanian public hospitals named Prince Hamzah Hospital	The findings indicate that the cause and effect relationship is based on learning and growth, and the system and information quality perspectives because whenever a skilled worker is employed in a high-quality EHR system, services improve. This will lower expenses to achieve the main

		specialties. Secondly, A total of 500 questionnaires were distributed, of which 220 were returned, and 20 were spoilt. It is contained 54 questions divided into two parts demographic information and internal success perspectives.		objective, which is patient and hospital staff happiness.
Rawabdeh (2007)	Qualitative	Random Jordanian Healthcare Officers	Jordanian Health Care System	Jordanian healthcare institutions, especially those in the public sector, are not yet ready to use ICT. The Jordanian government ought to prioritize funding fundamental scientific and technical research, closing the digital divide, encouraging public-private collaborations, supervising global cooperation initiatives, and setting up the necessary legal and financial frameworks.
Sabherwal et al. (2006)	Meta-analysis methods	121 studies	Information Systems	The findings corroborate the hypothesis regarding the relationship between the two context-related elements (H4), three of the four hypothesized relationships among user-related constructs (H2A–H2D), and all five of the hypotheses regarding the context's impacts on user-related constructs (H5A–H5E).
Sheikhali et al. (2016)	Study with an enterprise architecture approach	50 health facilities	Northern Jordan	Current public health surveillance programs are frequently inconsistent, disease-specific, disjointed, and of low quality. Public health surveillance systems continue to face challenges in adopting

				new technology, standardizing case definitions and clinical guidelines for correct diagnosis, and gaining timely and trustworthy data access. The application of information and communication technology, together with other technological and analytical advancements, may contribute to the real-time collection of standardized data in public health monitoring systems.
Sulaiman & Magaireah (2014)	Case Study	TOE framework	Healthcare organizations in Jordan	Reliability, Top Management Support, Technology Readiness, Government Policy, Legal Environment, and Competition are appropriate for the TOE's defined context, where the technical context emphasizes the need of embracing cloud in terms of privacy, security, and dependability.
Vest et al. (2019)	Longitudinal analysis	211 system-member hospitals in 7 states	USA	The study sample enterprise HIE at a higher rate than EHR (24% vs. 75%). Adopting a single EHR vendor environment, however, was linked to a 0.8% lower chance of readmission within 30 days following discharge.

4.4 Research Gaps and Limitations

One of the limitations that were evidenced in this study is the fact the research relied primarily on secondary sources of data rather than primary sources of data. The reliance on these secondary sources of data implies the current state and implementation of health information systems in Jordan is unknown. The other limitation emanated from the fact that the information on Jordan was limited. Compared to other countries in the European Union and Northern America, the information on Jordan was limited. However, despite the limitations, the information was sufficient to provide the needed analysis for this study.

The research gap is important as it addresses important gaps that have not been addressed over the years. Health information systems are critical in the world today, which implies that there is a growing interest not only from the Jordanian government but also from multiple health organizations within the country. Therefore, in the near future, many organizations should look into the existing literature to derive ways of incorporating and implementing health information systems. Therefore, it is critical to address these existing gaps to ensure that there is strong research on this subject, and consequently, expunge the current knowledge gaps. Addressing the knowledge gaps is critical in circumventing errors and conflicts emanating as a result of limited knowledge and understanding on this subject. Consequently, addressing the gaps will increase awareness on this subject, which will promote innovation and the eventual success of health information systems in Jordan. Finally, addressing the gaps will further expand the government's commitment to health information systems.

5. Discussion

The reviewed studies analyze the uptake and effects of enterprise resource planning ERP and health information systems HIS in healthcare settings throughout a number of nations, including Jordan, Saudi Arabia, Oman, and others. emphasize how important these systems are for management support, personnel skills, regulatory environments, and IT infrastructure. From a practical side, these results suggest that healthcare institutions need to make significant investments in solid IT infrastructure, which covers all required network capabilities in addition to hardware and software components. Healthcare personnel should participate in ongoing training programs to guarantee they possess the skills requisite to operate these systems.

The findings' policy implications hint that governments create and implement rules, such as interoperability, data security, and system integration guidelines, to encourage the HIS and ERP systems usage. The limitations point to the necessity to look at how benefits persist over time and identify any new difficulties that may arise. The potential of emerging technologies, such artificial intelligence and machine learning, to improve the usefulness of HIS and ERP systems is quite huge. Therefore, the scholars should investigate these areas more to provide recommendations to design more user-friendly interfaces and enhance general acceptability among healthcare professionals. As stated in the introduction, the investigated studies helped to understand the primary impact of enterprising health information systems on medical industry, mainly on the Jordanian healthcare industry. The results of the studies by Alam et al. (2016) and Almajali et al. (2016), point to important components necessary for a successful HIS installation, including IT infrastructure, user happiness, training, IT capabilities, and top management support. Jardali & Fadlallah (2017) and Alazzam et al. (2021) both emphasize the benefits of e-health systems on healthcare performance and quality, and the important role the Ministry of Health played in centralizing healthcare services in Jordan.

Researches by Sheikhalil et al. (2016) and Rawabdeh (2007) highlight difficulties with public health monitoring programs and ICT adoption such as low quality, consistency, and preparedness issues. Conversely, Kaushik & Raman (2015) and Fiaz et al. (2018) noted that advancements emerge in information management and system quality. Thus, the research explains the opportunities and difficulties of HIS, and the implementation of enterprise resource planning (ERP) systems. The Jordanian healthcare specialists can greatly improve their field by recognizing and addressing these gaps and modifying the existing state of HIS in the country. Although opinions on the advantages of these systems are alike, there are differences in data gathering methods, ICT adoption preparedness, and the effects of governance structures. Alharthi (2018) emphasizes the pressing need for Saudi Arabia to digitize health records, and Al-Gharbi et al. (2015) highlight the noteworthy accomplishments in Oman regarding the data extraction. Nevertheless, Al-Yaseen et al. (2010) note that assessment and development initiatives are impeded by the fact that a large number of private hospitals in Jordan do not adequately gather data. According to Rawabdeh Jordanian healthcare institutions are not yet prepared for ICT adoption, requiring competent staff and advanced EHR systems (2007). The potential bias of the review itself has been the author's (mine) prejudice concerning the Jordanian healthcare structure, HIS, and EHR. However, the research has been approached with an objective viewpoint without application of subjective opinion and earlier perceived information. The second bias that could have appeared is review of studies with positive conclusions exclusively. The issue has been resolved by investigating surveys that not only describes the benefits of the today's medical facilities' approaches to cure, but highlights the limitations and areas for improvement.

6. Recommendations and Future Work

Despite the growing interest in health information systems, there are still some gaps that exist, especially in the Jordanian health sector. As a result of the slow uptake of electronic health systems implementation in the country, there should be an increased focus on training and re-training of staff on electronic health,

which will foster the successful implementation of HIS in the country. Also, increased awareness is critical in encouraging the uptake of health information systems in the country among all the involved stakeholders. Additionally, primary data collection via questionnaires, interviews, and in-person observations at Jordanian healthcare facilities should be the top priority for future research.

A more thorough and representative picture of HIS adoption and usage in Jordan requires an extensive range national studies that encompass public and private hospitals, and urban and rural locations. The analysis should also employ the data that allows for comparison of Jordan's HIS and EHR implementation to the other nations' experiences with an included report about the different socioeconomic environments.

7. Conclusion

This literature review provides important insights into the current state of knowledge on health information systems (HIS) in the Jordanian healthcare industry. The findings suggest that HIS have the potential to significantly improve healthcare quality, efficiency, and staff performance in Jordan. However, the successful implementation and adoption of these systems are influenced by various factors, including technical infrastructure, financial resources, organizational readiness, and human capacity. The review highlights the need for more comprehensive and systematic evaluations of HIS implementation and impacts in Jordan, using robust methodological approaches and considering the perspectives of diverse stakeholders. Future research should also focus on identifying the key enablers and barriers to HIS adoption and exploring strategies to overcome the challenges and optimize the benefits of these systems. In conclusion, this review underscores the importance of continued efforts to promote the development, implementation, and evaluation of HIS in the Jordanian healthcare industry. Policymakers, healthcare organizations, and researchers should work together to create an enabling environment for HIS adoption, ensure the availability of necessary resources and support, and foster a culture of continuous learning and improvement in this field. By leveraging the potential of HIS, Jordan can enhance the quality, accessibility, and efficiency of its healthcare services and ultimately improve the health outcomes of its population.

References

- Barbarosoglu, G. & Pinhas, D. (1995). Capital rationing in the public sector using the analytic hierarchy process. *The Engineering Economist*, 40, 315-341.
- Alam, M., Masum, A., Beh, L. & Hong, C. (2016). Critical Factors Influencing Decision to Adopt Human Resource Information System (HRIS) in Hospitals. *PLOS ONE*, 11, 1-22.
- Alazzam, M., Al Khatib, H., Mohammad, W. & Alassery, F. (2021). E-Health System Characteristics, Medical Performance, and Healthcare Quality at Jordan's Health Centers. *Journal of Healthcare Engineering*, 2021, 1-7.
- Al-Gharbi, K., Gattoufi, S., Al-Badi, A. & Al-Hashmi, A. (2015). Al-Shifa Healthcare Information System in Oman: A Debatable Implementation Success. *The Electronic Journal of Information Systems in Developing Countries*, 66, 1-17.
- Alharthi, H. (2018). Healthcare predictive analytics: An overview with a focus on Saudi Arabia. *Journal of Infection and Public Health*, 11, 749-756.
- Almajali, D., Masa'deh, R. & Tarhini, A. (2016). Antecedents of ERP systems implementation success: a study on Jordanian healthcare sector. *Journal of Enterprise Information Management*, 29, 549-565.

- Al-Yaseen, H., Al-Jaghoub, S., Al-Shorbaji, M. & Salim, M. (2010). Post-Implementation Evaluation of HealthCare Information Systems in Developing Countries. *The Electronic Journal Information Systems Evaluation*, 13, 9-16.
- Anderson, G., Frogner, B., Johns, R. & Reinhardt, U. (2006). Health Care Spending and Use of Information Technology in OECD Countries. *Health Affairs*, 25, 819-831.
- El-Jardali, F. & Fadlallah, R. (2017). A review of national policies and strategies to improve quality of health care and patient safety: a case study from Lebanon and Jordan. *BMC Health Services Research*, 17, 1-13.
- Fiaz, M., Ikram, A. & Ilyas, A. (2018). Enterprise Resource Planning Systems: Digitization of Healthcare Service Quality. *Administrative Sciences*, 8, 38.
- Higman, S., Dwivedi, V., Nsaghurwe, A., Busiga, M., Sotter Rulagirwa, H., Smith, D., Wright, C., Nyinondi, S. & Nyella, E. (2018). Designing interoperable health information systems using Enterprise Architecture approach in resource - limited countries: A literature review. *The International Journal of Health Planning and Management*, 34, e85-e99
- Kaushik, A. & Raman, A. (2015). The new data-driven enterprise architecture for e-healthcare: Lessons from the Indian public sector. *Government Information Quarterly*, 32, 63-74.
- Khashman, I. & Khashman, A. (2016). The Impact of Human Resource Information System (HRIS) Applications on Organizational Performance (Efficiency and Effectiveness) in Jordanian Private Hospitals. *Journal of Management Research*, 8, 31.
- Kontio, E., Lundgren-Laine, H., Kontio, J., Korvenranta, H. & Salanterä, S. (2014). Enterprise Resource Planning Systems in Healthcare. *International Journal of Information Systems in The Service Sector*, 6, 36-50.
- Nassar, D., Othman, M., Hayajneh, J. & Ali, N. (2015). An Integrated Success Model for an Electronic Health Record: A Case Study of Hakeem Jordan. *Procedia Economics and Finance*, 23, 95-103.
- Rawabdeh, A. (2007). An e-health trend plan for the Jordanian health care system: a review. *International Journal of Health Care Quality Assurance*, 20, 516-531.
- Sabherwal, R., Jeyaraj, A. & Chowa, C. (2006). Information System Success: Individual and Organizational Determinants. *Management Science*, 52, 1849-1864.
- Sheikhali, S., Abdallat, M., Mabdalla, S., Qaseer, B., Khorma, R. & Malik, M. et al. (2016). Design and implementation of a national public health surveillance system in Jordan. *International Journal of Medical Informatics*, 88, 58-61.
- Sulaiman, H. & Magaireah, A. (2014). Factors affecting the adoption of integrated cloud-based e-health record in healthcare organizations: A case study of Jordan. In *Proceedings of the 6th International Conference on Information Technology and Multimedia. International Conference on Information Technology and Multimedia (ICIMU)*.
- Vest, J., Unruh, M., Freedman, S. & Simon, K. (2019). Health systems' use of enterprise health information exchange vs. single electronic health record vendor environments and unplanned readmissions. *Journal of The American Medical Informatics Association*, 26, 989-998.