

Organizational, Financial and Regulatory Challenges of Implementing Hospital Information Systems in Saudi Arabia

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Abstract. Hospital information systems (HIS) are a core component of the healthcare system. These systems have been in use for decades worldwide and for many years now in the Middle East. Many hospitals in Saudi Arabia started to adopt HIS, but still faced with many challenges. On top of these come the organizational, financial and regulatory challenges. The main objective of this study is to identify, analyze and evaluate these three categories of challenges perceived by healthcare professionals in order to provide decision makers with suggestions and recommendations on proper actions. The study used survey methods to collect data from healthcare professionals at two main Saudi hospitals known for their experience implementing HIS, and then analyzed the results to describe and evaluate challenges. The study validated 10 organizational, 6 financial and 6 regulatory challenges and explored participants' experiences regarding each. The study sorted challenges importance from the most to the least; financial challenges came first, then organizational challenges while regulatory challenges came last. Government hospital users had more concerns than private, regarding all of the three categories of challenges. Some demographic variables, such as age, gender, experience and profession, had significant influence on the perception of healthcare professionals towards different challenges. The study recommends providing or outsourcing the required experience of hospital management to choose, to implement and to evaluate HIS performance. Redesigning workflows to match HIS is a viable option for successful implementation. Clear time frame for implementation is very essential. Allocating proper and enough investments, especially at the initial phase of implementation, is important. Feasibility studies on benefits versus costs of implementing and using HIS are crucial for decision makers. Much work still to be done on developing regulations, policies and procedures on both hospital and national levels to govern adoption, implementation and utilization of HIS.

Keywords. Hospital Information Systems, Organizational Challenges, Financial Challenges, Regulatory Challenges, Saudi Arabia, Hospitals.

1. Introduction

Hospital information systems (HIS) are considered a major part of the healthcare system, on which many of the processes of care delivery - in hospitals and different types of healthcare organizations - depend [1]. The importance of hospital information systems

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emerges from the importance of their role in managing different patient data and information including key personal data about the patient and other comprehensive medical data; documenting all medical services that have been provided to the patient such as investigations, diagnoses, treatments, follow up reports and important medical decisions [2]. Although a lot of advantages as well as potential benefits are described and discussed in many recent studies and published work, the processes of adoption and implementation of hospital information systems in most developing countries are still facing many challenges and barriers that are completely different from the challenges faced in developed countries [3].

Despite that developing countries are facing a series of health crises and many diseases, which puts hospital information systems at a very important standing point for these countries, and despite the evidence that hospital information systems can improve quality, safety and reduce costs of healthcare provision; the adoption and implementation of these systems in many developing countries is still not as successful as planned [4]. The level and extent of adopting, implementing and using hospital information systems in Saudi Arabia, for example, is still poor and far less than expected [5, 6]. The delay in adopting and implementing hospital information systems in Saudi Arabia hospitals in addition to the lack of a national health information system actually represents a major challenge for the whole Saudi health care system [7] and despite the potential benefits that hospital information systems offer to the healthcare industry, the failure rates in health IT-related projects are extremely high in Saudi Arabia [8]. Together, these factors were the main motivation for conducting a research study that addresses different organizational, financial and regulatory challenges in adopting and implementing hospital information systems in Saudi Arabia.

Hospital information systems adoption and implementation in Saudi Arabia are not actually about acquiring and installing new technology, new hardware or new software. This process all over the world is more about equipping healthcare organizations and hospitals with tools and methods to achieve their essential business objectives through providing users and healthcare professionals with technical capabilities that make new things possible and by engaging users into changing their behaviors to effectively use the new capabilities to generate the target results [9]. This is why coordinating the implementation of hospital wide information systems and electronic medical records have many big challenges both from a managerial or an administrative perspective as well as from a clinical perspective. Planning for the work involved with driving and controlling a paradigm shift of this magnitude is often underestimated if not simply overlooked. Actually the organization must commit to the change with strong sponsorship, dedicated resources, and adoption of a flexible implementation approach that can be tailored to the individual practices while maintaining the integrity of the standardized solution and workflow models [10].

It is the responsibility of the hospital top level management to formulate a strategy for the development, implementation, operation and maintenance of hospital information systems and electronic medical records. Most studies divided these strategies into three phases [11, 12]. The first is the pre implementation phase, which includes project governance, in terms of developing the vision and the reason why we are doing this, project management leadership, deciding who should be the leader in charge, tell about benefits, manage attitudes, assess preparedness and address barriers, who should be

involved, in terms of multiple stakeholders, whom should be part of the implementation, how to choose software carefully and decide what kind of specifications and functions do we really need, data integration and technology usability factors [13, 14]. The second is the implementation phase which includes workflow analysis and redesign when needed, training of users, especially for those who had never used a computer before, implementation assistance in the form of providing help and support when needed, preparing methods of feedback for user to report problems and addressing privacy and confidentiality issues [15, 16]. The third is the post implementation phase which includes technical support, creating user groups to make people help each other and finally providing incentives if more work is needed and work overload is expected [17, 18].

The challenges of increased initial costs as well as operational and maintenance costs of hospital information systems and electronic medical record are frequently cited obstacles and barriers to the successful adoption and implementation of these systems, especially in developing countries. Despite that very few studies could actually prove that a hospital information system can rapidly demonstrate a positive return on investment when implemented [19, 20], these studies were conducted over very specialized or very limited types of healthcare settings, and there is still a big gap before we can generalize this concept on the implementation of hospital information system as a whole. High initial costs and uncertain financial benefits are usually considered as primary barriers of adopting and implementing hospital information systems. This barrier is complicated by uncertainty over the size of any financial benefits that may be gained over time. In most practices, upfront costs were the major part with some practices holding additional costs, in the form of decreased revenue, from seeing fewer patients during the hospital information system initial and transition implementation period [21].

There are certain regulatory and legal issues that could easily form a type of challenge in the way of successful and timely implementation of hospital information systems. Difficulties in the implementation of hospital information systems might include the lack of protocols and standards regarding their use inside the hospital, privacy issues related to the ease in which electronic information could be accessed or disclosed and the threats of breaking confidentiality or even information loss [22]. The digital nature of the hospital information system may be met with challenges such as data accessibility and the potential for data loss, despite that these systems should always be protected by access controls, such as user accounts, including user names and passwords, so that only authorized users could actually get into the system and use its functions [23]. Maintaining proper access control to the hospital information system is essential to protect patients' privacy and information confidentiality. Hospital information system developers should work hard on developing mechanisms and tools that can support adaptable access controls. Tools for authoring and analyzing the access control rules and also tracking the access processes are the main guarantee of patient privacy, information confidentiality and security [24].

Some published studies focused on the technical and human challenges of implementing hospital information systems in Saudi Arabia, such as challenges, related to awareness, training and usability of systems including hardware and software of the hospital information systems [25]. Other studies focused on identifying the current status of using hospital information systems and other related health information technology in Saudi Arabia and some other developing countries [26]. The main objective of this study

is to identify, analyze and evaluate the most important organizational, financial and regulatory challenges perceived by healthcare professionals to the successful adoption and implementation of hospital information systems in Saudi Arabia, and in developing countries generally, in order to provide system implementers and policy makers with suggestions on future plans, decisions and actions to overcome adoption and implementation challenges.

2. Research Methodologies

2.1. Developing the Research Questionnaire

This research study was based on the use of quantitative survey methods, through the development, validation and application of a self-administrated questionnaire to collect data and information directly from different categories of healthcare professionals including mainly physicians, nurses, technicians and administrative staff of Saudi hospitals, mainly two selected hospitals; one private and the other one is governmental, and then analyze the results of these answered questionnaires using the SPSS – Statistical Package for Social Sciences software to determine the statistically significant variables and factors associated with the three categories of challenges facing the adoption and implementation of hospital information systems and determine the order and rank of these challenges.

The research questionnaire was designed to include five sections of questions; the first is the demographic section, with questions about the participant, including gender, age, profession; being a physician, a nurse, a technician or an administrator, level of qualification, total healthcare experience and work department. The aim of collecting this information is to discover any possible relation of these demographic factors with the participants experience about organizational, financial or regulatory challenges of adopting and implementing hospital information systems. The second section was designed to collect some data about the type and extent of the implemented hospital information system within the studied hospital. The subsequent three sections of the questionnaire included statements and questions about the organizational, financial and regulatory challenges facing the processes of adopting and implementing hospital information systems in Saudi Arabia. The answers of the questions of these three sections were designed into a five levels Likert scale, to measure the opinions and experiences of healthcare professionals about different types of challenges. Typically, the five Likert scale answers include “Strongly Disagree”, “Disagree”, “Neutral”, “Agree” and “Strongly Agree” with a score of one to five respectively [27].

As mentioned above, the third section of the questionnaire was designed to collect data about organizational challenges of implementing hospital information systems in Saudi Arabia from the perspective of different healthcare professionals. Questions about organizational challenges focused on the level of hospital management commitment and support of adopting and implementing hospital information systems, the existence of strategic planning for the adoption and implementation of hospital information systems and the level of managerial experience necessary to choose and implement the best hospital information systems, and if the hospital management is providing the necessary

training for the staff on using hospital information systems and providing effective monitoring and protection on hospital information systems. The questions also asked if there was a need to redesign healthcare workflow processes to match with the hospital information system and if the implementation was done according to the scheduled project or took more than the expected time. Organizational factors seem to be mediating all other types of factors and other challenges. By adopting a change management perspective, we can develop some interventions that could overcome the various identified challenges [28]. This section included ten main statements representing the measured organizational challenges.

The fourth section of the questionnaire was designed to collect data about the financial challenges of implementing hospital information systems. Questions about financial challenges focused on the initial cost of the hospital information system and the cost of implementation, the operation and maintenance costs and if there was an identified lack of capital resources to invest in hospital information systems or a lack of feasibility studies that show the benefits versus costs of implementing and using hospital information systems and if the hospital information systems implementation consumed much of the hospital resources or the hospital was not certain about the existing return on investment after implementing and using the hospital information system, since many hospitals lack capital resources to invest in hospital information systems and even those who have the money, they sometimes lack the feasibility studies that show the benefits versus costs of implementing and using hospital information systems. Healthcare organizations should perform a cost-benefit study to analyze the financial effects of hospital information systems in their settings before they buy or implement such systems [20]. This section included six main statements representing the measured financial challenges.

The fifth, and last, section of the questionnaire was designed to collect data about the regulatory challenges of adopting and implementing hospital information systems. Questions about regulatory challenges focused on the easiness of information accessibility or disclosure when using the hospital information system, the level of data confidentiality and the risk of information loss. The questions also focused on monitoring, liability and accountability issues in addition to the existence of laws, regulations, policies or procedures that govern using hospital information systems in the hospital or on higher levels, such as ministry or state. The conflict between the power of technology to access information and the ongoing concern about privacy and security is ever increasing. While we need higher electronic access to medical information, issues relating to patient privacy, information confidentiality and reducing vulnerability to security breaches grow up [29, 30]. This section included six main statements representing the measured regulatory challenges.

2.2. Research Population and Research Sample

The population of this research study included four categories of healthcare professionals; physicians, nurses, technicians and administrators, who are working mainly in two of the major Saudi hospitals and are in contact with some type of hospital information systems fully or partially implemented in their hospitals and departments. For the purpose of studying this large population, a representative sample was planned; a group of participating healthcare professionals were recruited to answer the survey

questionnaire. The researcher selected these two hospitals based on their history in adopting and implementing hospital information systems.

The researcher approached the hospitals selected for the study through formal channels, meeting with seniors in the hospitals' management, to get the approval for accessing and contacting healthcare professionals at the hospital during their working hours. Research ethics forms and related committees, through the research centers of the two hospitals, were consulted for their consents and the researcher got their approval before starting data collection.

The challenge was in the process of selecting and recruiting healthcare professionals as participants in the study. The researcher started with studying the two hospitals in terms of working staff and decided to take participation from the major four categories of professionals; doctors, nurses, technicians as well as administrators. The researcher aimed at including 5% of the professionals' population in the two hospitals as a sample for the research. The researcher used systemic random methods for the selection of participating healthcare professionals. The researcher tried to make sure that each category of professionals in the population of the study is proportionally well represented in the sample of the study.

2.3. Data Collection Process

A pilot study was conducted, at the beginning of the study, using the preliminary research questionnaire on a limited number of different healthcare professionals, from both hospitals, to get their feedback on the questions used in the survey and to help the researcher in developing better formulae for the questions and clearer sentences, eliminate irrelevant or apparently repeated questions and rearrange some of the questions to fit better in the sequence of the survey. The final questionnaire was used to collect data directly from the selected healthcare professionals. The questionnaire was administrated in two versions; English language version and Arabic language version; where collected data were then translated by the researcher into English. Study data were collected over six month's duration; from March, 2012 to September 2012 and included 153 valid responses from both hospitals. The whole study was completed and results reported by the end of October 2012.

3. Research Results

The researcher used MS Excel, MS Access and SPSS software to conduct a multi-level statistical analysis and started by calculating the reliability coefficient for the ten organizational challenges, the six financial challenges and the six regulatory challenges before conducting more descriptive or inferential statistical analysis. A very high Cronbach's Alpha coefficient (0.914) for organizational challenges, (0.796) for financial challenges and (0.803) for regulatory challenges resulted from this reliability testing, which was a good sign for the reliability of the results later on.

Descriptive statistics were conducted and reported for the general variables, these are the demographic data of the study participants, as well as for the data about the

implemented health information system in the hospital. Organizational, financial and regulatory challenges data were also analyzed using both descriptive as well as inferential statistics to detect the possible relations or associations between demographic data as well as data on hospital information systems implemented with different organizational, financial and regulatory challenges perceived by different healthcare professionals. Frequency analysis for organizational, financial and regulatory barriers sorted them according to the answers of the participants from the most important to the least, using the scores of the five Likert scale answers.

Both males and females were almost equally represented in the research sample and respondents, the study had nearly the same percentage for both of them and this was a good sign for the participation of females in the healthcare field in a developing country such as Saudi Arabia. This is not unexpected, because the healthcare field in general is one of the most mature business fields in Saudi Arabia and it is very balanced in terms of hiring males and females with no gender discrimination which is consistent and proved by the results of a local research study [7]. Table 1 shows the gender distribution of participants with their percentages.

Table 1. Gender Distribution of Respondents

Value	Frequency	Percentage
Male	75	49.0
Female	78	51.0
Total	153	100.0

Regarding the age groups with the most participation, most of the participants (about 85%) were from the two middle groups, between 26 and 50 years of age and this is also expected, because people who are younger than 25 years and those who are older than 50 years are already less in the healthcare field in Saudi Arabia. Another point is that people over 50 years might have less interest in research participation, especially when it comes to sophisticated information technology. Table 2 shows the age group distribution of participants with their percentages.

Table 2. Age Group Distribution of Respondents

Value	Frequency	Percentage
Less than 25 years	11	7.2
26 - 35 years	68	44.4
36 - 50 years	62	40.5
Over 50 years	12	7.8
Total	153	100.0

Regarding qualification of participants, and as a general concept, most of the healthcare professionals are either college graduates or post graduate qualified with Masters and PhD degrees; this is why these two categories were the largest among all of the study participants. While total years of experience varied. Table 3 shows the level of qualification of participants with their percentages.

Table 3. Qualifications Distribution of Respondents

Value	Frequency	Percentage
Higher education	75	49.0
College degree	71	46.4
Associate degree	4	2.6
High school	3	2.0
Total	153	100.0

Regarding the profession distribution, doctors were the most responsive category of study participants and they took the largest portion of participation, this could be explained by the physicians nature of resistance, such as conclusions presented by some researchers in their study about barriers to the acceptance of electronic medical records by physicians [28]. Actually it was expected that nurses would be the largest group participating in the research because, by nature, they are the largest working force in hospitals, but it seems that they were always busy and overloaded with much work tasks, so they simply have limited time to spend participating in such research as long as it is a voluntary participation. Table 4 shows the profession distribution of participants with their percentages, where doctors were the biggest category.

Table 4. Profession Distribution of Respondents

Value	Frequency	Percentage
Doctor staff	93	60.8
Nursing staff	12	7.8
Technician Staff	27	17.6
Employee/Administrator	21	13.7
Total	153	100.0

More than 65% of the study participants were from the private hospital while less than 35% of the participants were from the government hospital. Healthcare professionals working in private hospitals might be more motivated to participate in healthcare research. They feel that their voice is heard and that they can change things around them easily. In Saudi Arabia, and in most Middle East countries, the private healthcare section is usually more advanced than the government, except for the very specialized or independent government hospitals. Private hospitals and healthcare organizations are selecting professionals usually in a more effective way and despite professionals are working for longer hours and with bigger load of tasks, they are still more motivated by the competitive nature of work. These assumptions and explanations are still consistent with a local research study [7].

Regarding the extent of implementing hospital information systems in hospitals, 60% of participants said they are working on a partially implemented hospital information system and only 40% reported that they are working on a fully implemented system. These figures are actually very similar to what has been reported a few years ago

by one local study conducted in Saudi Arabia by Altuwaijri (2008), describing the Saudi healthcare sector, which witnessed significant progress in the recent decades without equivalent advancement of the electronic health field [6]. A noticeable fact is that 100% of the participants are already using hospital information systems and most of them are using these systems in all or most of their job tasks. This clears out the generally good experience of most of the participants in using hospital information systems and consequently their ability to judge and evaluate the challenges of implementing and using such systems.

75% of the participants already used hospital information systems even before they joined their current job, and only 25% of the research participants were using the hospital information systems for the first time at their current job. But maybe some of them have been here in the current job for years, so they still have good experience. The most commonly used IT tools were communication, email & voice mail in addition to the hospital information system's applications. This is also similar to the findings of the referred study [6].

The analysis of the challenges shows their ranking according to their importance from the opinion, perspective and experience of the healthcare professionals. This part of the analysis should help hospital information systems' developers and implementers to address important challenges first, which would support successful implementation of such systems in Saudi Arabia and other developing countries. Table 5 shows the ten organizational challenges sorted and ranked, by the responses of participants, from the most important to the least, in addition to an overall score for the ten organizational challenges statements together.

Table 5. Organizational challenges sorted from the most to the least, according to participants' responses

Questionnaire Statements	Mean	Opinion
Workflow needs redesign to match with HIS operations	3.92	Agree
HIS implementation took more than expected time	3.84	Agree
Management doesn't have the necessary experience to evaluate HIS performance.	3.59	Agree
Management doesn't have the experience to choose & implement best HIS.	3.56	Agree
Management doesn't provide the necessary training for the staff on using HIS.	3.36	Neutral
No live model for HIS was demonstrated to hospital management before implementation.	3.34	Neutral
Hospital management doesn't provide effective monitoring/protection on HIS.	3.31	Neutral
Hospital management has no strategic planning for adoption and implementation.	3.26	Neutral
Hospital management is not supporting the adoption and implementation of HIS.	2.54	Disagree
Hospital management is not convinced with importance and benefits of using HIS.	2.51	Disagree
Organizational Challenges Overall	3.32	Neutral

Table 6 shows the six financial challenges sorted and ranked, by the responses of participants, from the most important to the least, in addition to an overall score for the six financial challenges statements together.

Table 6. Financial challenges sorted from the most to the least, according to participants' responses

Questionnaire Statements	Mean	Opinion
High initial cost of HIS implementation	3.92	Agree
High operation and maintenance costs of HIS	3.74	Agree
No feasibility studies that show benefits versus costs of implementing & using HIS	3.52	Agree
Lack of capital resources to invest in HIS	3.50	Agree
Uncertainty about return on investment after implementing HIS	3.24	Neutral
Implementation consumes lots of hospital resources for less than expected benefits	3.12	Neutral
Financial Challenges Overall	3.51	Agree

Table 7 shows the six regulatory challenges sorted and ranked, by the responses of participants, from the most important to the least, in addition to an overall score for the six regulatory challenges statements together.

Table 7. Regulatory challenges sorted from the most to the least, according to participants' responses

Questionnaire Statements	Mean	Opinion
Lack of laws or legislation that govern using HIS on national level	3.47	Agree
Users of HIS are monitored and may be subjected to liability/ accountability	3.44	Agree
Electronic health information is easily accessed/disclosed	3.42	Agree
Lack of policies or procedures that govern using HIS on hospital level	3.41	Agree
Using HIS may lead to information loss, corruption or hacking	3.01	Neutral
Using HIS may threaten confidentiality of health information	2.94	Neutral
Regulatory Challenges Overall	3.28	Neutral

4. Discussion and Conclusions

Looking into the analysis of the organizational challenges we find that study participants were neutral overall about the group of organizational challenges; they didn't see organizational factors, related mainly to hospital management, as causes or elements in the process of hindering or delaying hospital information systems implementation. On the other hand, and in contrast to our research results, many studies confirm that technology alone is not sufficient to achieve a well-functioning electronic information system in healthcare. Certain organizational aspects, such as lack of support from the organizational culture, could delay or even fail the implementation of hospital information systems [31]. But when we look into the detailed scores of each of the ten organizational challenges, we find that participants agreed on four of them as sources of challenge in the way of successfully implementing hospital information systems. The fact that many workflows and healthcare processes needs redesign to match with the newly implemented system is one challenge that is discussed extensively in many studies [32].

The delay in the implementation beyond the scheduled time is another challenge that might waste resources and increase the costs [12]. Participants also agreed that hospital management does not have the necessary experience to choose and implement the best hospital information system, before implementation, nor does it have the suitable experience to evaluate the performance of the hospital information system, after implementation [33]. Some published research focused on the organizational challenges of implementing hospital information systems, considering this project as a transformation or a change management project, where the hospital policies and procedures play an important role in the success of systems implementation [12]. Other studies focusing on the determinants of hospital information systems successful adoption used a completely different set of challenges; the researchers associated the successful implementation of systems to environmental uncertainty, type of system affiliation, size, and urban-ness of hospitals and considered hospital information systems adoption an organizational survival strategy for hospitals to improve quality and efficiency [34].

Participants agreed clearly that the financial matters are a major problem and a main challenge to overcome for successful implementation of hospital information systems. They believe hospital information systems have high initial costs plus high operations and maintenance costs, in addition they believed that there is a lack of feasibility studies that show the benefits versus costs of implementing and using hospital information systems. These findings could be debated by many published research work about costs versus benefits of using health information technology, such as the documented findings of Shekelle and his colleagues in 2006, where all their cost benefit analyses predicted substantial savings from hospital information systems implementation and use. In addition, the benefits were expected to outweigh the investment costs. However, their calculated time to break even varied much from 3 to 13 years. They concluded that hospital information systems have the potential to improve care and manage costs for specific healthcare organizations, despite that there is still a lack of capital resources to invest in hospital information systems [35].

Participants were neutral overall about the group of regulatory challenges, but agreed that regulatory matters, such as rules, regulations, policies and procedures, were creating some kind of challenge for hospital information systems implementation. They agreed that the lack of laws or legislations that govern using hospital information systems both on hospital level and on national level is a major challenge, which is completely consistent with a very recent systematic review study conducted on the health information technology implementation progress in the Arab world and found that most countries lack national health policies, regulations or guidelines to adopt health information technology solutions [26]. Participants also agreed that because of the lack of such regulatory policies and procedures that govern using hospital information systems on the hospital level as well as on national level, users of hospital information systems might be subjected to liability and accountability and electronic health information might be easily accessed or disclosed.

Through inferential statistics, we find that female participants considered regulatory challenges more important than both organizational and financial challenges, while male participants valued financial and organizational challenges as more important. When we compare private hospital participants to their peers in the government hospital we also

find many differences that have statistical significance. Government hospital participants had significantly higher scores for all of the three categories of challenges; organizational, financial and regulatory, which is consistent with the discussions of previously mentioned studies [5, 6, 7, 8 and 26]. Previous experience with hospital information systems could also make a difference in the opinions of the participants. Participants with previous hospital information systems experience could identify the three categories of challenges; organizational, financial and regulatory as important more than participants with no previous experience. The age factor could affect the participants' opinions; younger participants considered financial challenges more, while older participants considered organizational and regulatory challenges more. The profession nature of the participants, being doctors, nurses or technicians could affect their opinions about many regulatory challenges. Qualification factor of participants could also affect their opinions regarding many of the financial challenges.

As a conclusion, organizational challenges; related to hospital management and organization experience of implementing hospital information systems, financial challenges; related to the initial expensive costs of implementing hospital information systems as well as operating these systems and regulatory challenges; related to the lack or deficiency of laws, regulations, policies and procedures that govern implementing and using systems all are major barriers and challenges in the way of successful implementation of these systems in Saudi Arabia. The government hospital had more complains and concerns than private hospitals, where financial funds are less, organizational experiences regarding choosing, implementing and supporting systems are less and there are less mature regulations, policies and procedures on using hospital information systems. In general, financial challenges were ranked first, organizational challenges came next and regulatory challenges came last. This study could identify, define and sort the detailed organizational, financial and regulatory challenges that should be managed to achieve successful implementation of hospital information systems in Saudi Arabia and in developing countries generally.

5. Importance of This Work for Developing Countries

This study focuses mainly on evaluating, categorizing and sorting organizational, financial and regulatory challenges of implementing hospital information systems in Saudi Arabia specifically and in similar developing countries generally. The ultimate objective and importance of this study is to provide healthcare decision makers and policy makers, in developing countries, with evidence based discussions and recommendations, based on the identified challenges by healthcare professionals who are the end users of such systems using these systems on daily basis and suffering from such challenges. It is essential to highlight different organizational, financial and regulatory challenges that face implementing HIS in developing countries, so as to develop specific recommendations to overcome such challenges. This study should help healthcare decision and policy makers in developing countries to develop more effective plans for successful implementation of hospital information systems. In the next section, specific recommendations to overcome specific challenges are discussed.

6. Recommendation for Implementing HIS in Developing Countries

6.1. Overcoming Organizational Challenges

- It is important for hospitals especially in developing countries to redesign their medical and administrative workflow to match with hospital information systems operations and specifications. This adaptation is important for smooth and successful implementation [36].
- Implementing hospital information systems should be strictly controlled by a time frame and project management schedules; not to let the hospital information systems implementation take more than expected time and waste scarce healthcare resources, especially in developing countries [37].
- Hospital management should develop their experience to choose, implement and evaluate hospital information systems and their performance over time. If hospital management cannot develop such experience in house, they should be advised to recruit experts to the hospital team or simply outsource the process of hospital information systems selection and evaluations [38].
- Hospitals in developing countries should check for installed live models of the systems in other hospitals, mainly in more developed countries as well as in other developing countries, so as to evaluate the system while in the production phase in similar settings and/or environments [39].
- System protection and monitoring should be one of the priorities of the hospitals in developing countries; to keep an eye always on the correct and accurate structure and content of hospital information systems [40].
- Hospital management should develop a strategic plan for the adoption, implementation and future development of hospital information systems [41].
- Hospital management should provide necessary initial and continuous training for hospital staff on how to best utilize hospital information systems, they might need to send healthcare professionals abroad to study how such systems work in other countries and to identify required knowledge domains and training skills needed for their home hospitals [42].

6.2. Overcoming Financial Challenges

- Allocating the proper funding and enough capitals investments, especially at the start of the hospital information systems implementation projects is crucial to overcome the high initial cost of hospital information systems implementation. This process should be done on two levels, the first is the higher level of the ministry of health in developing countries and the second is the lower level of the hospitals themselves [43].
- Designing the annual budgets of the hospitals to encompass the high operation and maintenance costs of HIS is also very essential, which should be a part of the regular expenses of operations and not a burden on the hospital resources in developing countries, by being unscheduled or unplanned [44].
- Conducting feasibility studies that show the benefits versus costs, through cost-effectiveness and cost-benefit analysis, of implementing and using hospital information systems, which should support the requests for the funding of such projects from the ministry of health and other shareholders in developing

countries. Such feasibility and analysis studies could drive expectations and forecasting on the return on investment after implementing and using HIS for short term as well as for long term durations [45].

- Proper planning of hospital resources in the phases of hospital information systems development and implementation because if the resources are not well planned, they might get overused during HIS implementation projects, especially at the initial phases [46].

6.3. Overcoming Regulatory Challenges

- Ministry of health and health authorities in developing countries should develop and enhance rules, policies and regulations, on the national level, for the use of hospital information systems. In parallel with that, hospitals should also start developing their own policies and procedures that govern and control the utilization of data, information and HIS internally, including signing privacy and confidentiality users' agreements, non-disclosure agreements and users' informed consents [47].
- Users should be educated, trained and committed to using hospital information systems with caution; not to disclose or abuse information and be aware that otherwise they will get into liability, accountability and legal problems [48].
- In developing countries, passwords and personal system accounts should never be shared among users, otherwise the accountability will be lost and users will not be able to protect themselves from the mistakes of others [48].

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