Role of information systems for management in multispeciality hospitals to improve performance: A conceptual framework

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Abstract. *Hospital information systems are widely used globally with an embedded role of information technology focusing on life enhancement and cost-cutting strategies, including patient care information systems and managerial information system. A very few studies focused on this topic and our study provides better insight for those willing to understand and incorporate information systems in hospital management. A survey was conducted for primary data. The results indicate the significance of this study. This opens a window for researchers with accurate data, information, and advanced research methodologies.*

Keywords: information, hospital information systems, managerial information system, hospital management, healthcare services.

JEL Classification: C10, I19.

1. Introduction

Information systems are at the core of many large corporations to aid decision-making and control. An information system is used to gather, store and process data; deliver knowledge, information, and digital products; run and manage operations; communicate with clients and suppliers and engage in market competition. Electronic markets and inter-organizational supply networks are all driven by information systems. For example, businesses use information systems to manage their financial accounts and human resources and advertise online to reach potential customers.

Walmart uses information systems to become the world's leading retailer. Google, a search engine company that generates most of its revenue from advertising; Alibaba, a B2B e-marketplace, and many such companies use information systems. Governments use information systems to offer services at a reasonable cost. Most aspects of personal lives are also dependent on and conducted through information systems, which are typically internet-based, including socializing, studying, buying, banking, and entertainment.

Healthcare has been a significant subject of study for academics in business and other disciplines due to its significance to individuals, governments, and the economy's rising expenditures. High costs lead to difficulty in affording world-class healthcare services is still a matter of concern in many countries, especially India. Information systems have a lot to offer in terms of controlling healthcare expenses and enhancing services.

Types of Information Systems include Management Information System, Decision Support System, and Transaction Processing System. Some other types have been designed for specific purposes, like Office Automation Systems, Knowledge Work Systems, etc. A significant information system is designed to aid in organizational management. These systems rely on data gathered through transaction processing systems from sources such as the Web, suppliers, customers, and business partners.

Similarly, hospital information systems and the embedded role of information technology developed with a particular focus on enhancing life and cost-cutting strategies can work wonders. For example, a hospital information system can mainly include an information system of patient care and a managerial information system.

1.1. Industry overview – global scenario

The size of the global market for hospital information systems was estimated to be 115 billion USD in 2022 and expected to be 132.1 billion USD in 2023. The sale of hospital information systems by organizations, sole proprietors, and entities that are used to store and manage healthcare data makes up the hospital information systems market. Systems that gather, store, manage and communicate patient medical records are referred to as hospital information systems. On a single platform, this system unifies all the hospital operations and data.

The research report on the hospital information systems market is from The Business Research Company that provides market statistics, including global market size, regional shares, competitor's market share, detailed market segments, market trends and

opportunities, and other additional information to understand Hospital Information Systems with an in-depth analysis of the existing and future state of the business.

1.2. Industry overview – Indian scenario

Many hospitals in India still rely on manual procedures and are unable to handle the massive amounts of data being produced. IT entered the sphere of hospital administration very late. There were no standardized solutions available until the middle of the 1990s. However, many hospitals were unable to be integrated with more modern systems and could not produce the desired outcomes. The development of large corporate hospitals, many of which deployed robust IT solutions in the second half of the 1990s, sparked a significant need for updated solutions. The big IT businesses produced some hospital information system solutions in response to the market's growing demands.

Despite the intention of healthcare organizations to adopt advanced computerization, many challenges and obstacles are hindering their growth as well as their performance. Even when automation is used, the implementation of these projects always takes longer than expected or compromises the implementation vision that was initially intended. In contrast to other settings, implementing and adapting information systems in hospitals is a challenging process.

1.3. Key players in industry and market capitalization

Some of the prominent players in the global hospital information system market include:
- Siemens Healthineers – 57.66 billion USD.
- McKesson Corp. – 52.91 billion USD.
- GE Healthcare – 84.85 billion USD.
- Cerner Corp. (Oracle) – 27.91 billion USD.
- Philips Healthcare – 12.21 billion USD.

2. Objectives
- To evaluate the effectiveness of information systems and their contribution to the healthcare units.
- To compare and analyze the functionality and the quality of hospital services before and after implementing information systems.
- Assess how information systems can help hospitals improve their managerial staff's performance.
- To develop strategies for boosting healthcare system effectiveness using information systems.

3. Hypothesis

One can list many benefits of implementing hospital information systems viz, easy access to data, improved efficiency, the reduced scope of errors, cost reduction, efficient time management, improved patient care, and increased data security and retrieving. The different types of information systems accessible to managers are created for performance

assessment and planning, measurement of workload, resource allocation, shift scheduling, communication, and other related activities.

Various studies have shown what a difference adopting these technologies makes to the healthcare system. For instance, studies have shown that health service-providing systems use important advantages like decreasing patient waiting times, decreasing mortality, managing drug side effects, granting quick and timely access to up-to-date patient information to health care professionals, reducing medical errors, achieving optimal service management, and improving care processes by up to 60%. Based on these studies, we framed the following hypothesis as a part of our study.

H1: Information systems are very efficient in enhancing the services provided by healthcare units.

As mentioned above, because of numerous mediating and determining elements, including organization, people, and technology, information systems in any hospital are unavoidable. The use of IT and the application of quality standards to customer satisfaction have lagged in a hospital setup compared to that of business and industrial information systems. In the hospital information system, customers are divided into internal and external categories. Internal clients in the healthcare industry include doctors, nurses, laboratory techs, pharmacists, the quality department, and others that interact with essential processes. Patients, patients' families, insurance companies, vendors, health service researchers, etc. are examples of external clients.

The various obstacles to implementing information systems in a hospital, include user resistance to new technology, a lack of user input in the system's design and development (a practice known as "User-Centered Design" or UCD), integration with healthcare workflows, and untrained users. The findings in a research paper highlight that one of the most important elements in achieving the best hospital information systems performance is training. One way to lower barriers to implementing the HIS is to first train users to become more familiar with its purpose and benefits. From this, we framed the following hypothesis.

H2: Training the employees is required for implementing the information systems.

4. Research methodology

This study is a mixed method approach including qualitative and quantitative research based on content analysis, statistical analysis, reliability of the results, etc. Qualitative research is conducted to gain insight and understand the role of information systems for managers in healthcare where they are already being used. Data were collected from research journals, pdfs, surveys, information, and observations from the internet. Quantitative research is conducted to test these insights and determine if they can be used to improve performance holistically. Data were collected from case studies (interviews, focus groups) and a survey of published works on the internet.

A study was conducted at a private health organization in Bangalore where 79 members were randomly selected including hospital staff and doctors in this hospital. We received 75 valid responses. The survey data received were compiled in MS Excel. The data involved pre-framed questions, observations, and related information available on the internet. Content analysis was performed and later transferred to SPSS for statistical analysis. Descriptive statistics like frequency and percentage analysis were conducted. This is followed by a t-test with a pre-determined p-value that should be less than 0.05, to identify and understand the significance of the same.

5. Results and inferences

Details of the study, based on the results obtained from the analysis are as follows.

The usual range for Cronbach's alpha reliability coefficient is 0 to 1. Assuming the variables have a higher degree of internal consistency if they are closer to the coefficient is to 1.0, the output of the reliability test for 23 variables run in SPSS is as shown in Table 1.

Table 1. *Reliability statistics*

Cronbach's alpha	No. of Variables
0.681	23

The study included 79 individuals with a 95% response rate. It gives an idea of the changes that occurred with the implementation of information systems in healthcare and hospital management concerning a private hospital in Bangalore.

40% of the respondents are females and 60% are males. Most of them are postgraduates, followed by graduates, followed by people who received secondary level education and PhD.

Figure 1. *Frequency distribution of respondents' age*
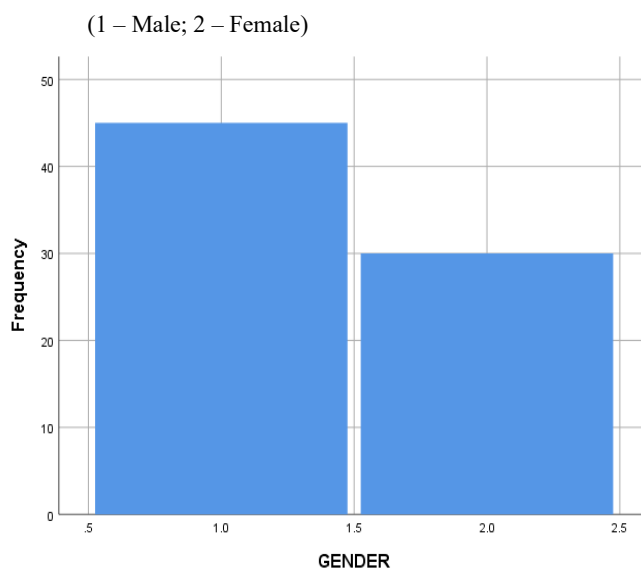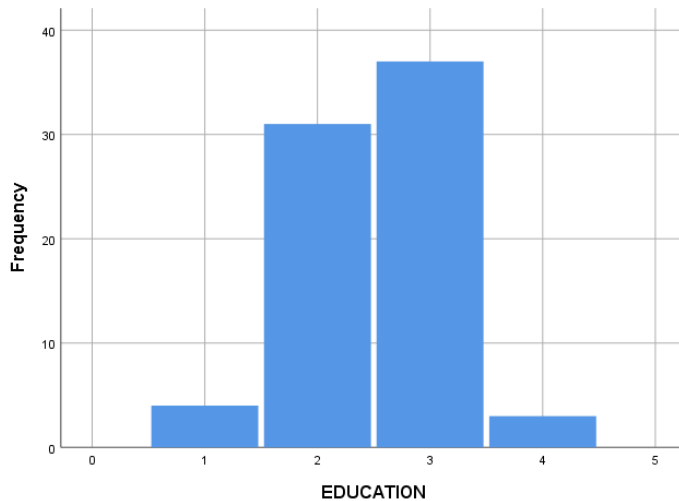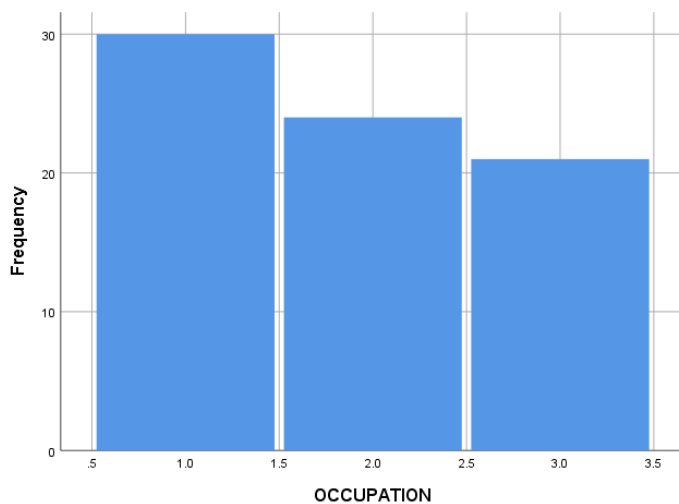
(1 – Male; 2 – Female)

Figure 2. *Frequency distribution of respondents' qualification*

(1 – Secondary; 2 – Undergraduate; 3 – Postgraduate; 4 – PhD)

Figure 3. *Frequency distribution of respondents' occupations*

(1 – Hospital administration staff; 2 – Paramedical staff; 3 – Doctors)

40% of them are hospital administration staff, 32% are paramedical and 28% of them are doctors. 67% of the respondents have a basic idea of the hospital information systems that they are using.

Based on the results obtained, an inference can be drawn that the implementation of information systems in healthcare, hospital management, and administration has shown an evident change in terms of improved performance and increased customer satisfaction. As we can see, the significance level for all variables is above 0.05 except for A4, A5, B1, B2, B7, C2, and C6 (7 of 23 variables), which indicates that we can reject the null hypothesis.

The hypotheses can be considered significant as the p-values for all variables (except a few, which are greater than 0.05) are less than 0.05 in the independent samples test in the output.

Table 2. *Significance of hypotheses*

Variables	Variances	SIG(2-TAILED)
Have a basic idea of hospital information systems & their use in the management	Equal variances not assumed	0.032
It serves the purpose of all the functional modules in your hospital	Equal variances not assumed	0.000
Is there any other context where you think this can be installed to improve performance	Equal variances not assumed	0.001
Staff using it are fully aware of the system and can use it efficiently	Equal variances not assumed	0.012
There is a separate department specially formed to manage information systems	Equal variances not assumed	0.040
Establishment of smart goals and putting them into action	Equal variances not assumed	0.029
Immediate procurement of required but unavailable resources	Equal variances not assumed	0.016
The present software being used for information systems is sufficient to meet your current as well as future requirements	Equal variances not assumed	0.040
Must improve the collaborative environment	Equal variances not assumed	0.037
Efficient Talent Management	Equal variances not assumed	0.043
The hospital ensures periodic strategic assessment	Equal variances not assumed	0.040
The hospital developed a key performance indicator	Equal variances not assumed	0.011
Hospital evaluation practices pertain to strategic initiatives	Equal variances not assumed	0.042
The hospital is successful in implementing corrective actions when strategic initiatives are failing	Equal variances not assumed	0.042
The hospital is well-equipped to handle any change that could occur (Ex: pandemic, recession, etc.)	Equal variances not assumed	0.014

Based on this, we can understand that H1 and H2, i.e., information systems are efficient in enhancing the services provided by the healthcare units, and training the employees required for implementing the information systems respectively stands true.

This study highlighted the importance of routine data generated at health facilities as a gateway to use health information and a primary source of information for the ongoing monitoring of health services. It highlights the multiple advantages resulting from efficient data utilization. This study aimed to evaluate how frequently this hospital used health information for its improvement and the factors that were related to it.

This study showed good usage of routine health information. There may be a difference between our research area and the other hospitals. According to reports, efficient and effective implementation, as well as utilization, is essential for the healthcare information system because it gives information for planning, establishing goals, and putting plans into action. The number of people who used regular health information in our country, however, is lower according to our study from online sources than in studies from other countries. This could be a result of the different structures of health information systems and the attitudes of health professionals toward standard health information systems. Reports also indicated that one crucial element for enhancing the quality and utilization of data for decision-making at all levels of the health system is upgrading the health information system with an emphasis on technological, behavioral, and organizational structures.

Based on the results, of health workers with good data analysis skills compared to those with low skills, greater chances were found for those factors (hypotheses) that demonstrated a significant relationship with routine use of health information systems. The results of further research that were published in other papers, corroborated the conclusion.

This may be attributable to health professionals' aptitude for turning mundane data into insightful information. Although the use of health information depends on data analysis abilities, an Indian study highlighted the importance of organizational elements in honing those skills.

The likelihood of using a hospital information system is higher if one wants to decide based on this study. It can be easier among health workers who had received the required training, similar to studies conducted by others. This may be because health workers who received the required training could gather, examine, and use data produced during ordinary daily tasks.

Table 3. *Accepted p-value*

S. No.	Hypotheses	p-value
1	H1	<0.005
2	H2	<0.005

The observation that the p-value for H1 and H2 is less than 0.05 clearly shows that the null hypothesis must be rejected. With the adoption of information systems in healthcare, there is a variation in the mean ranks of the two different hypotheses assumed. Based on this, we can deduce that H1 and H2 are equally significant to achieve the desired outcome.

6. Conclusion

The study determines the prevalence and factors that affect the routine use of health information systems. Participants' attributes were broken down into statistics like frequencies and proportions. More than half of the respondents say that routine use of hospital information systems is beneficial yet challenging, according to this study. The type of health facility, regular feedback, training, data analysis skills, and supervision was found to have a significant impact on the routine use of hospital information systems. As a result, strengthened supervision, regular feedback, and training are highly recommended for health facilities. It is also necessary to conduct additional research and analysis to determine customer satisfaction levels, the culture of healthcare professionals, and ways to address the issues associated with using hospital information. Future research can use the instrument employed in this study to evaluate hospital information systems. In this study, a method for calculating the hospital information system success rate based on users' perspectives was created. By using this technique, it is possible to compare the success rates at various institutions. Additionally, our findings highlight the perspectives of its users in a developing nation.

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