Medical Informatics

Reasons for the Success or Failure of a Hospital Information System: A Systematic Review

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Abstract	Original Research Article

Objectives: Information and communication technologies have significantly improved the quality of healthcare information management and operations. Hospital information systems (HIS) have become popular and used by most healthcare facilities, both public and private hospitals and clinics. For the best implementation of the health information system, it is necessary to know the reasons leading to failure or success. Objectives is to determine the main reasons for success and failure through a systematic review to help underdeveloped countries like Morocco, which is starting to implement the HIS. ***Methods***: The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement was adhered during the conduct of this systematic review. This systematic review was based on the PubMed database, the Google Scholar search engine Scopus, and science Direct over a considered period of 10 years from 2013 to June 2023. We have included articles dealing with either success factors or failure factors following the implementation of a hospital information system that were published between 2013 and 2023. ***Results***: 28 studies were selected to highlight 8 factors likely to cause success, the most important of which were organizational and behavioral factors containing sub-factors, and 6 factors likely to cause HIS failure, the most important of which was the technical factor. ***Conclusion***: These factors must be considered by the personnel in charge of implementing new information systems to increase the chances of success and to minimize the reasons that can lead to the failure of these systems.
Keywords: Systematic review, hospital information systems, Health Information Systems, Organization and Administration, Physicians.

I. INTRODUCTION

Many healthcare facilities around the world are adopting hospital information systems (HIS) to improve the quality and efficiency of care. The development of the first HISs, essentially in the United States and in a few European countries such as the Netherlands, Sweden and Switzerland, dates back to the mid-1960s [1]. In underdeveloped countries like Morocco, which is starting to implement the HIS, we need to know and draw inspiration from the key points that can lead to success in order to prevent failures.

Globally, an information system can be defined as: an organized set of resources (hardware, software, personnel, data, procedures, etc.) allowing the acquisition, processing, and storage of information (in the form of data, text, images, sounds, etc.) within and between organizations.

An information system is also a set of social actors who memorize and transform representations via information technologies and operating modes. In other words, an information system is the set of interrelated technical and organizational components that collect, process, store and disseminate information to support day-to-day operations, decision making, coordination and control within an organization [2].

To ensure that the HIS will be accepted and subsequently used by the intended users and will produce the desired results, leaders want to fully understand the extent to which the HIS is achieving its strategic goals, processes, and end results of the system's introduction, particularly its impact on the quality and efficiency of health care.

The information system is introduced in the hospital to facilitate the work of health professionals and to help managers make the right decisions, but this is often not the case. There are several systems in place that are not well used, or even abandoned after their use.

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Therefore, one of the objectives of medical informatics is to evaluate the processes and results of introducing HIS in-healthcare organizations.

The objective of this work is to cite the causes of success and failure reported in the literature during 10 years from 2013 to June 2023.

II. METHODS

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement was adhered during the conduct of this systematic review. This systematic review was done based on the PubMed database and Google Scholar search engine; the search was done in English using the keywords presented in Table 1. The duration considered in our study was 10 years from 2013 to June 2023.

Table 1: Terms and keywords used in the search

Base or search engines	Key words used
Pubmed	▪ (hospital information system [Title/Abstract]) AND (failure[Title/Abstract]) ▪ (health information system[Title/Abstract]) AND (failure[Title/Abstract]) ▪ (health information system[Title/Abstract]) AND (success[Title/Abstract]) ▪ (Hospital information system[Title/Abstract]) AND (success[Title/Abstract])
Google Scholar	▪ "hospital information system success" ▪ "hospital information system failure" ▪ "health information system success" ▪ "health information system failure"
SCOPUS	▪ (TITLE-ABS-KEY ("hospital information system") AND TITLE-ABS-KEY ("failure") OR TITLE-ABS-KEY ("success")) AND (LIMIT-TO (PUBYEAR , 2023) OR LIMIT-TO (PUBYEAR , 2022) OR LIMIT-TO (PUBYEAR, 2021) OR LIMIT-TO (PUBYEAR, 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2017) OR LIMIT-TO (PUBYEAR , 2016) OR LIMIT-TO (PUBYEAR , 2015) OR LIMIT-TO (PUBYEAR , 2014) OR LIMIT-TO (PUBYEAR , 2013))
Science direct	▪ "Health information systems Failure" ▪ "Health information system success" ▪ "Hospital information system success" ▪ "Hospital information system failure"

We have included articles dealing with either success factors or failure factors following the implementation of a hospital information system that were published between 2013 and 2023. The studies examined are those that have reported success or failure factors, or that have studied HIS evaluation models.

III. RESULTS

After performing this search, 991 of the articles were initially selected, 233 from Pubmed, 198 from Scopus, 400 from Google Scholar, and 160 from Sciences Directes. We eliminated 37 duplicates, we retained after reading the titles 60 articles, then we retained 50 documents after reading the abstracts. After

reading the full article, 28 documents were retained (Figure 1).

The results reveal that, among the methods proposed for the evaluation of the success or failure factors of HIS, we found the use of questionnaires [3–24], two systematic review published in 2015 and 2016 [25, 26] as well as two qualitative studies based on interviews [27, 28] is more emphasized, and two other studies were in the form of a literature review concerning the theme [29, 30].

Most of the selected studies considered factors such as behavioral factors, management, organization, functional factors, technical factors, financing, political, legal, and ethical factors as success factors (Table 2).
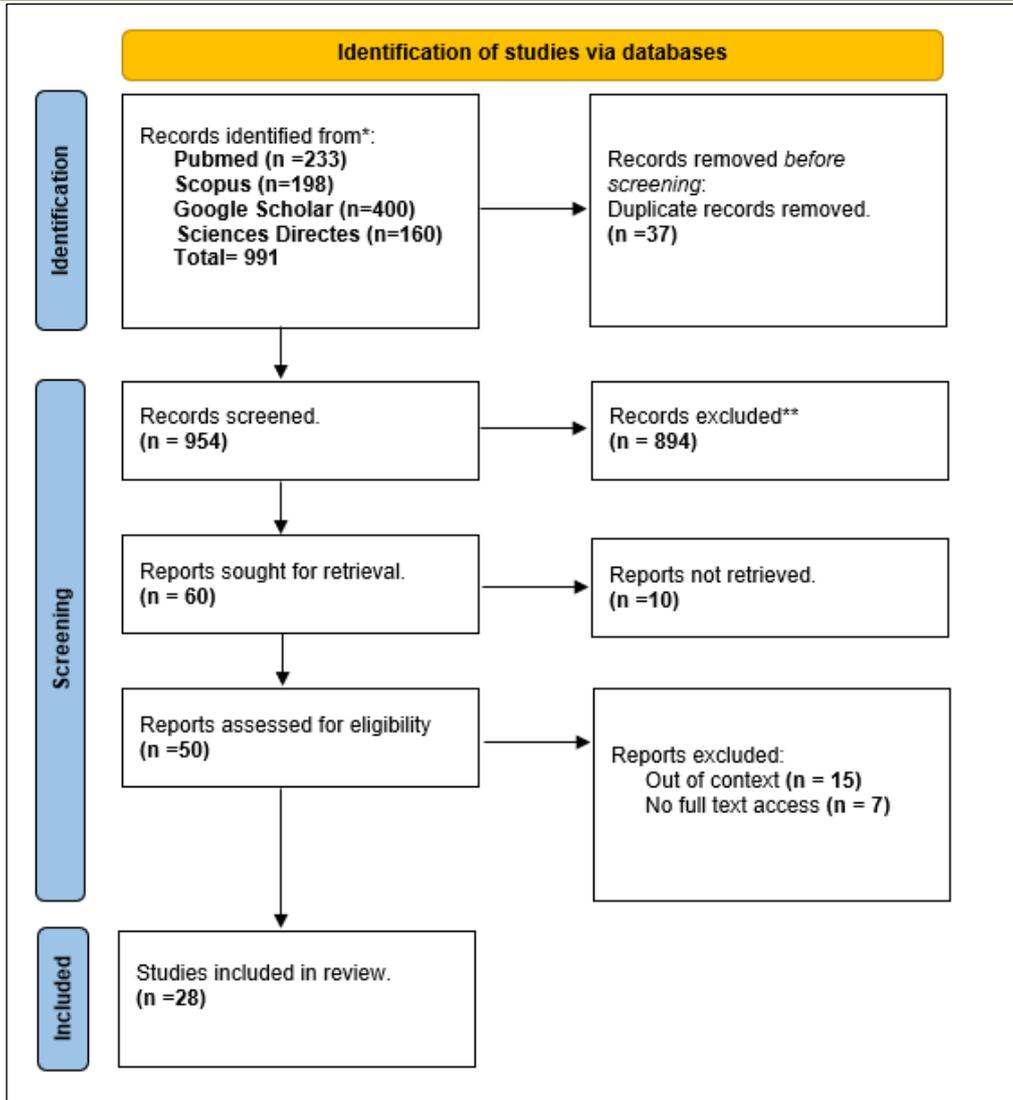
Figure 1: Flowchart of search and select the included articles in systematic review

Table 2: HIS success factors and their frequency in the selected studies

Factors	Component of the factor	Frequency N (%)	Corresponding studies (references)
Functional	• Preparation of user requirements • Alignment of the role and design of the HIS (task-technology fit) • Flexibility in the face of dynamic changes and the evolution of the organizational context • Improve performance and clinical outcomes	8(28)	[3, 7, 13, 18, 20, 22, 25, 27]
Organizational	• A clear division of work between departments and units, each focusing on its own strengths. • Decentralized management • Visionary leadership of the organization and the implementation process are also key factors for successful innovation. • Collaboration and cooperation • Participation in decision making. • Working from the workflow • Top management support	10(35)	[13, 15, 18, 22, 23, 25–29]
Behavioral	• User involvement	8(28)	[4, 5, 10, 13, 15, 16, 23, 30]

Factors	Component of the factor	Frequency N (%)	Corresponding studies (references)
	• User knowledge and skills • Stakeholder, user, and patient satisfaction • Motivational activities • User acceptance (perceived ease of use of system, perceived usefulness of system)		
Management	• Leadership commitment • Formulation and expression of a clear vision for the company showing that HIS is part of it. • Setting clear objectives and instructions • Flexible planning • Forward-looking and proactive control • Dealing with the impact of change • Internal communication and clear feedback • Having a strategy • Managing the diversity of stakeholder objectives • Using a formal project management methodology • Allocating, making available and prioritizing the hospital's competing resources (human, financial, physical and time resources) • Identify and mitigate risks (risk management) • Consider IT implementation as a change process. • Understand the socio-technical nature of HIS • Regular assessments and use of their results at different stages of the HIS life cycle	6(21)	[29, 30, 10, 14, 16, 26]
Techniques	• IT support for end users builds confidence in new technologies. • Integration with existing system • Interoperability and interconnectivity • Ease of use • Quality of information (relevance, usefulness, completeness, etc.) • Response time • Flexibility and adaptability, allowing for functional and technical changes. • Use of appropriate standards, coding, and nomenclature • Understanding of the socio-technical nature	8(28)	[29, 10, 12, 25, 18, 14, 8, 20]
Financial	• Sufficient funding • Ongoing financial investment in the information system • Manage financial needs	4(14)	[15, 25, 18, 16]
Legal and ethical	• Compliance with legal requirements • Compliance with existing business ethics rules • User profiles guarantee patient confidentiality	4(14)	[13, 25, 18, 26]
Political	• Political games/conflicts • Willingness to invest in IT systems. • Reliable external partners	2(7)	[15, 25]

Among the factors that lead to the failure of HIS implementation, they were cited in 9 selected studies.

The main causes of failure were distributed as follows: Behavioral barriers, organizational barriers, functional barriers, financial barriers, technical barriers, barriers related to security and data confidentiality (Table 3).

Table 3: Main factors of failure cited in the studies selected in our study

	Components of the factor	Frequency N (%)	Corresponding studies (references)
Behavioral	- User dissatisfaction - Increased workload for clinicians. - Reluctance to change. - Providers stop using the query-based system when they can't find the patients or information, they need	7(25)	[9–11, 21, 26, 29, 30]
Organizational	- Adverse workflow issues. - Continuous system requirements. - Paper persistence issues. - Inadequate end-user engagement and unrealistic deadlines - Lack of top management support	4(14)	[6, 11, 26, 29]
Functional	- Low data quality - Insignificant use of data - Lack of a project leader - Need to enter data into the Electronic Health Record (EHR) and HIS	3(11)	[10, 26, 30]
Financials	- Financial limitations - Insufficient resources - Inadequate funding	2(7)	[29, 30]
Techniques	- Identify problems in the previous information system. - Exchange existing HIS data with other hospitals' HISs. - Lack of infrastructure and staff - Inadequate equipment, lack of internet access - Insufficient technical support - Qualified staff insufficient - Insufficient training - Discontinuous follow-up - Time commitment is unrealistic. - Poor and not very user-friendly interface - Frequent interruption of the system	8(32)	[6, 9–11, 19, 26, 29, 30]
Security and privacy	- Clinicians may be concerned about patient privacy and confidentiality. - Refusal to share existing HIS data with other hospitals' HISs.	2(7)	[9, 29]

IV. DISCUSSION

In our study we have tried to highlight the different factors of success and failure of the implementation of the hospital information system, through the extraction of these elements from the studies that have been published in the last 10 years. The particularity of our review is to have extracted both the success factors and the failure factors of the hospital information system, trying to detail the sub-factors that have led either to its success or to its defeat.

There are many factors that can be both factors of success in the case of good conduct and causes of failure in the case of failure.

Among these factors, the organizational factor was reported in 35% of articles as a success factor, and among these sub-factors leading to success are the clear division of labor between departments and units, so that each focuses on its own strengths, as well as collaboration and participation in decision-making, are the main reasons for the success of an HIS [13, 15, 18, 22, 23, 25–29]. On the other hand, this organizational factor was reported in 14% of articles as a failure factor, and we found that these sub-factors included workflow problems, ongoing system requirements, persistent paper, insufficient end-user commitment and unrealistic deadlines [6, 11, 26, 29].

Among the factors cited as contributing to success or failure in the event of failure, behavioral

factors were cited in 28% of articles as a success factor, where user involvement and the satisfaction of stakeholders, users and patients are among the essential elements in guaranteeing the success of the HIS [4, 5, 10, 13, 15, 16, 23, 24, 30]. The same factor was mentioned in 25% of articles as a cause of failure, presented essentially by user dissatisfaction, increased tasks for clinicians and reluctance to change [9-11, 21, 26, 29, 30].

The technical factor was reported both as a success factor and as a failure factor. It was reported in 28% of the articles as a success factor, where we noted the importance of end-user IT support, which helps build confidence in new technologies, flexibility and adaptability, enabling functional and technical changes [8, 10, 12, 14, 18, 20, 25, 29]. The same factor was mentioned as a failure factor in 32% of other articles, where the main reasons were confrontation with the problems of the previous information system, lack of infrastructure and qualified personnel, lack of access to the Internet, insufficient technical assistance, inadequate training, and discontinuity of follow-up after implementation [6, 9–11, 19, 26, 29, 30].

In our study, we also find the functional factor, which can be both a factor of success and, in the event of failure, can lead to failure. This factor was noted as the key to success in 28% of the studies, with improved performance and functionality to meet specific user needs representing the main elements of the functional factors [3, 7, 13, 18, 20, 22, 25, 27]. The functional factor was also noted as a failure factor in 11% of studies, represented by low data quality, insignificant data use and the absence of a project champion [10, 26, 30].

The financial factor has also been reported as both a factor leading to success and a factor of failure. It was reported in 14 % of articles as a success factor represented by sufficient and continuous funding in the information system, which will enable financial needs to be managed [15, 16, 18, 25]. This factor can also cause failure, which was reported in 7% of articles, represented essentially by insufficient resources and inadequate financing in relation to the financial factor [29, 30].

Among the success factors cited, we find management factors, which were cited in 21 % of articles and were dominated by the commitment of managers, the clear definition of objectives and instructions, enabling forward-looking and proactive control of work progress, and the importance of flexible and realistic planning of the various tasks required of HIS designers [10, 14, 16, 26, 29, 30].

We also note the existence of legal and ethical factors that were present in 14% of the selected studies as success factor and which had as a priority the respect of legal requirements, and compliance with existing business ethics rules [13, 18, 25, 26]. Political factors were emphasized in 7 % of the selected works, noting the willingness to invest in IT systems and the search for reliable external partners as important elements for a successful HIS project [15, 25].

Among the causes of failure are clinicians' concerns about patient privacy and confidentiality, and the refusal to exchange data from existing HISs with HISs in other hospitals in 7% of the articles cited [9, 29].

CONCLUSION

This systematic review has provided a panoramic view of common factors that can be both factors of success and failure, depending on the context of the study. Among the reasons for success of a HIS, the organizational factor seems to have a major role in the realization of a project such as a HIS, on the other hand among the factors which hinder the implementation and the success of a HIS we find mainly the technical factor. These factors must be considered by the staff in charge of implementing a new information system especially in underdeveloped countries, to increase the chances of success and minimize the reasons that can lead to failure of such systems.

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