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Evaluation of Hospital Information Systems (HIS) in terms of their Suitability for Tasks

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ABSTRACT

In the context of hospital information systems (HIS), "suitability for the task" refers to several factors, including not imposing additional tasks on users, executing everyday activities in their entirety, and displaying all relevant information on the screen. In this descriptive cross-sectional study, a multi-stage sampling strategy was utilized to select hospitals to participate in the study. In other words, the first thing done was to locate hospitals with companies that supplied them with health information systems. Then, one hospital was selected among those that were provided funding by each of the companies. The ISO Metric Standard Questionnaire 9241 was utilized for this investigation. The evaluation of HIS aptitude for the job will be based on his responses to these 15 questions in the questionnaire. The data were examined by employing descriptive tests and the software SPSS. According to the investigation results, the average number of HIS characteristics suitable for the undertaking was 3.04 out of 5. This feature has an average rating of 2.96 out of 5 stars from paraclinical users. The scores of 3.03 and 3.13 given by secretaries and nurses, respectively, are presented here. Items that received bad ratings, such as the imposition of tasks that were not within the user's obligations, highlight the fact that the majority of users consider that such systems are not following their responsibilities, despite all of the claims that have been made regarding the benefits of computer information systems in the field of medicine. In other words, these kinds of systems have not only failed to simplify the regular duties of their users, but they have also resulted in the users having to execute those actions multiple times. The users initially write the data down on paper before entering it into the digital information systems. As a result, those responsible for developing computerized information systems used in healthcare should emphasize the appropriateness of these systems for the job.

Key words: Hospital Information System, Tasks Suitability, Usability, ISO 9241/10, Evaluation Studies

INTRODUCTION

The term "health information systems" (HIS) refers to a collection of data and ideas regarding the care provided to patients intended to enhance the management of those services. According to McWay (2008), hospital information systems are necessary for delivering effective and efficient medical treatment in hospitals. According to Sallas et al. (2006), the value of new technologies is growing due to their capacity to cut costs, save time and money, enhance the process of executing the work, and minimize the number of medical errors. As a result, developed nations have committed large budgets to further research in this area. According to Mandapuram (2016), the amount of money spent annually on the development of information technology in the healthcare industry in the United States is expected to be 36 billion dollars.

Several issues contribute to the challenges associated with the installation and use of computers in healthcare environments. These factors include the rapid emergence of new technology, high costs, implementation problems, insufficient credit of systems, and software constraints. According to Gutlapalli (2017a) and Gutlapalli (2017b), one of the challenges that must be overcome to develop and accept health information systems successfully is determining whether or not such systems adequately meet the information requirements of their users. According to Rogers (1995), evaluation is a valuable method for finding efficient information systems in the healthcare industry. Evaluations of information systems in the medical field have been conducted in a significant number up to this point. The vast majority of them, on the other hand, have concentrated on the contentment of patients and financial issues. According to Wilson (2008), a system is considered ineffective when it cannot fulfill its users' requirements and is not designed with the consumer in mind.

Because end users play a significant part in designing, implementing, and evaluating such systems, they view establishing and maintaining more suitable and efficient systems as critical. This is because such systems play an essential role in developing such systems. It is only possible to evaluate a system of information by first examining the consumers' level of comprehension of it. According to Mandapuram (2017a), the successful operation of an information system depends on the contentment of the system's users. When reviewing hospital information systems at the same time, the nature of healthcare delivery should be taken into consideration. This means that the comprehension of all categories of hospital users, such as physicians, nurses, and ward secretaries, should be considered throughout the evaluation. In addition, the opinion of users like nurses, doctors, and other members of the healthcare staff who spend a significant amount of time each day dealing with these systems must be considered (Hamborg et al., 2004). The findings of several studies that evaluated HISs suggest that the most significant link exists between the ease with which a task can be completed and the level of satisfaction experienced by users. According to Davidson and Heslinga (2006), the Hawaii Medical Center undertook a project to expand the utilization of information technology in chronic care administration. The outcomes of this investigation indicated a great deal of challenges associated with the utilization of health information systems. One of these challenges is the difficulty that comes with entering data. Most medical professionals favored the time-honored manual approach, which consisted of writing the necessary information on patient records by hand.

The National Information Technology Program for the National Health Service in the United Kingdom is a project with a budget of ten billion dollars and a timeframe of ten years that aims to construct the infrastructures of national health records (Mandapuram, 2017b). This undertaking constitutes the most extensive national initiative ever undertaken anywhere in the world. This project presents several challenges, including a lack of control over the costs of healthcare in hospitals, a disregard for the needs of patients, an absence of assurance regarding the service provider's ability to make effective use of information systems for their work, and the unwillingness of healthcare providers to alter how they carry out their responsibilities. The usability, availability, validity, conformance, and timeliness of accountability of a system all play a role in determining its overall quality. When a user can carry out their responsibilities in a manner that is successful and pleasurable, we call that a usable information system. Usability is a measurement of effectiveness, efficiency, and the user's pleasure in attaining specified goals, according to the National Standards Organization's definition. The number of studies that try to evaluate the usability of a hospital information system is relatively low, even though the number of hospitals that are equipped with such systems is constantly growing. This can only be made up for by the researchers paying more attention to these kinds of studies; in other words, there needs to be an increasing number of investigations.

IsoMetrics is an appropriate and trustworthy instrument that can assess the usability of healthcare information systems. IsoMetrics is a questionnaire evaluating graphical user interfaces on the international standard ISO 9241/10. The document ISO 9241 is broken down into 17 parts and seven prsevennciples. The 17 parts consist of a general introduction, general guidance on task requirements, visual display requirements, keyboard requirements, workstation layout, and postural requirements, environmental requirements, display requirements with reflection, requirements for displayed colors, requirements for non-keyboard input devices, dialog principals, usability statements, presentation of information, user guidance, menu dialogs, command dialogs, direct manipulation dialogs, a menu dialog, a command dialog, a direct manipulation dialog, and a direct manipulation dialog. In addition, the seven principles include compliance with user expectations, error tolerance, suitability for individualization, suitability for learning, and appropriateness for the work at hand. Self-descriptiveness and controllability are also included. According to Mandapuram and Hosen (2018), these seven principles should be considered when evaluating usability. When researching the usability of information systems, these guiding principles are always kept in mind. The first principle of ISO 9241, known as appropriateness for the task, is being investigated as part of this research project.

According to Mandapuram et al. (2018), "suitability for the task" means that an information system should provide its user with the means to carry out the assigned task efficiently and effectively. In addition, the information essential for

determining the candidate's suitability for the job should be displayed on the screen. Antibiotic Wizard is a software developed in Germany that features antibiotic therapy guidance for intensive care units. IsoMetrics was utilized to evaluate the software after it had been put to use in the intensive care unit for six months so that its weak spots could be determined. In order to accomplish this goal, the perspectives of forty doctors practicing a wide range of medical disciplines were compiled. According to Thodupunori and Gutlapalli (2018), the program was successful because it received more than half the possible points across all categories, including its fit for the purpose. The evaluation of these systems plays a significant role in detecting their weak areas; therefore, the researchers chose to analyze the suitability of the HIS for the work. In order to accomplish this goal, the first principle of IsoMetrics 9241/Part 10 was utilized.

METHODS

This is a descriptive study using a cross-sectional design. The hospitals were part of the research environment, and the people who used the HISs at those hospitals were part of the research population. The research population included nurses, ward secretaries, and others who used paraclinical units. When conducting this study, the researchers considered the feedback provided by nurses, people who received care in paraclinical units, and ward secretaries. One nurse was chosen randomly for every ten beds, and one patient was chosen from each paraclinical unit. This helped establish the total number of nurses needed. In addition, the feedback provided by the ward secretaries working at each of these hospitals was analyzed. This study took into consideration the feedback provided by a total of 285 users, including 98 nurses, 88 secretaries, and 77 people who utilized paraclinical units.

The initial section of IsoMetrics 9241, part 10, was utilized to ascertain whether an individual was suitable for the responsibility involved in hospital information systems. The questionnaire comprises 75 questions, 15 of which pertain to the first principle discussed in part 10 of the IsoMetrics 9241 standard. The survey was developed with five different limitations, ranging from a response of "completely disagree" (1) to "completely agree" (5), with an additional option for "no comments." This aimed to demonstrate the users' perspectives on each of these concepts. The weight given to each inquiry ranged anywhere from one to five points. The items on the questionnaire labeled "A1" and "A8" contained negative wording throughout. While the data were being entered into SPSS, these items were scored in the other direction to cancel out their effect (Gutlapalli, 2016). A descriptive test was utilized so that the data could be analyzed.

RESULTS

During this investigation, three distinct user groups were polled regarding the degree of compatibility between themselves and the hospital information system. The standardized IsoMetrics questionnaire was filled out by 285 people, with 98 nurses, 88 department secretaries, and 77 users of paraclinical units making up the total number of respondents. Twenty-two different kinds of users could not be classified. According to Table 1, most users (37.3%, to be exact) were individuals who had attended university and studied nursing. In addition, the majority of users (115 persons, which is equivalent to 62.5%) had between 1 and 9 years of working experience, while 57 people (31%) had between 10 and 19 years of working experience (table 2). Eighty-eight point two percent of the users were females.

Regarding their education level, the vast majority of the subjects (65.5% of them) held a bachelor's degree. Only 90, or 34.1%, of the 285 users possessed the ICDL certificate; to put it another way, almost 66 percent of users needed the necessary level of computer literacy to function with the information system. During this time, most users (178 people, equivalent to 62.7%) reported having a moderate degree of information literacy.

Table 1: Info details regarding the respondents of the survey regarding hospital information system users

		Frequency	Percent
Age group	20-29	101	37.0
	30-39	119	43.6
	40-49	44	16.1
	50-59	8	2.9
	60<	1	0.4
	Total	273*	100
Sex	Female	247	88.21
	Male	33	11.78
	Total	280*	100
Education	Under diploma	1	0.4
	Diploma	78	27.8

	Bachelor of Science	184	65.5
	Master of Science	11	3.9
	Total	281*	100
ICDL certification	Yes	90	34.1
	No	174	65.9
	Total	264*	100
Field of Study	Nursing	137	56.8
	Psychology	4	1.7
	Human sciences	24	10
	Art	5	2.1
	Medical records	17	7.1
	Social sciences	3	1.2
	Pharmacology	1	0.4
	Computer sciences	3	1.2
	Medical library studies	1	0.4
	Accounting	7	2.9
	Tourism	1	0.4
	Experimental sciences	15	6.2
	Management	2	0.8
	Radiology	9	3.7
	Engineering	3	1.2
	Public Health	2	0.8
	Chemistry	1	0.4
	Total	241*	100
Work Experience	1-9	115	62.5
	10-19	57	31.0
	20-29	12	6.5
	Total	184*	100

* The missing data accounts for the gap between this amount and the total number of cases (285) that were investigated.

According to what was described in part titled "Methods," each of the questions received a score ranging from one to five points, with the boundaries ranging from "completely disagree" to "completely agree," as well as an option for "no comments." According to the data in Table 2, the overall score for appropriateness to the assignment was 3.04. The users gave the three items of A7 (understanding the arrangement of the fields on-screen for doing the task), A12 (reflecting the terminology used in the software in the work environment), and A3 (performing the entire work entirely while using the software) the highest scores, which were 3.72, 3.49, and 3.28, respectively. These scores reflect the users' highest levels of satisfaction with each of these aspects of the software.

The following categories have yielded the lowest total scores overall:
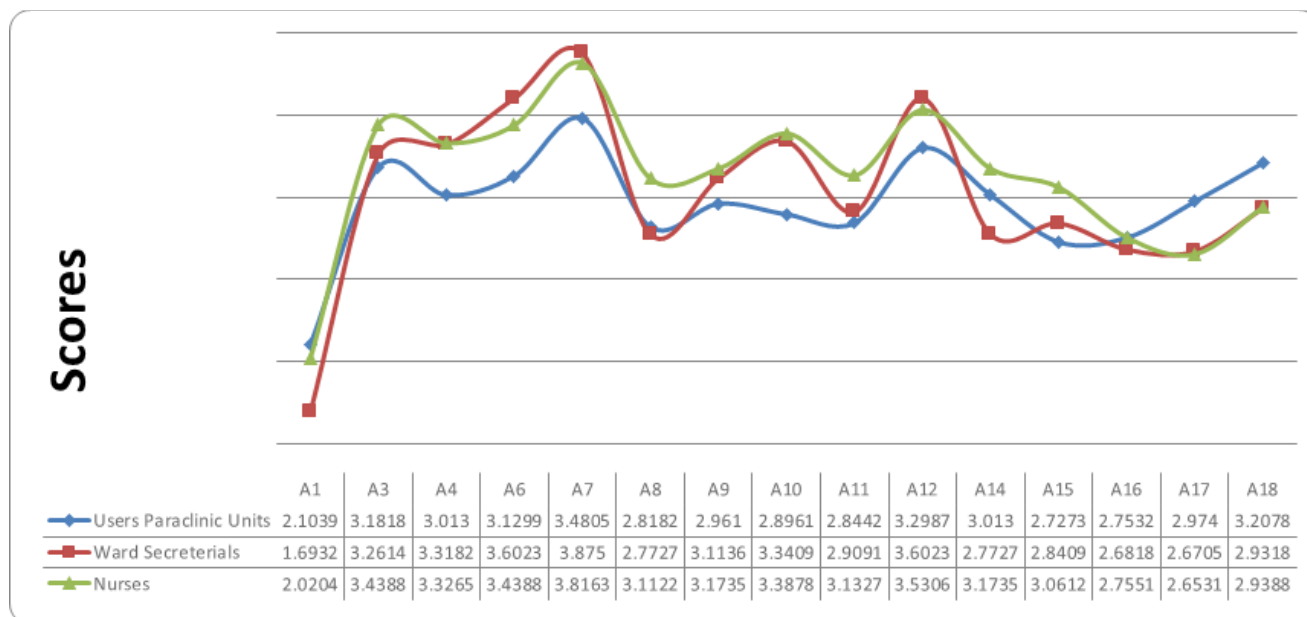
(A1)   The imposition of tasks that do not fall under the purview of the user's tasks (1.95).
(A17) Managing the presentation of the findings following the requirements of the user (on the screen, to the printer, etc.) (2.72).
(A16) Accessibility of the essential commands required for completing the work (2.73).
(A8)   Going through a variety of procedures in order to carry out the responsibilities (2.89).

The personnel in the paraclinical units, which made up the other two groups of users, gave the items "availability of the main instructions for performing the task" (A16) and "giving help in performing tasks by providing information on the screen" the highest scores possible. It is possible to see a difference in the scores provided for item A10, which stands for excellent software adaptation to the user's needs, by looking at Graph (1). The Graph demonstrates that when it comes to this particular aspect of the system, the nurses and secretaries are more satisfied with it than the users of the paraclinical units.

Table 2: Mean scores and standard deviations of the items that users rated about the task's suitability from their perspective

Item	Items considered in suitability for the task	Mean	SD
A1	The software imposes on us tasks that are not within our duties.	1.95	1.12
A3	The software allows us to perform our entire work completely.	3.28	1.21
A4	The functions implemented in the software support us in performing our tasks.	3.24	1.26
A6	The data entry method is consistent with the tasks we will perform.	3.24	1.18
A7	The arrangement of the fields on-screen is understandable for the task we do with the software.	3.72	1.21
A8	To perform our tasks, we should go through different steps.	2.89	1.24
A9	How data is, output is suited to the tasks I want to perform with the software.	3.11	1.09
A10	The software is quite suited to the requirements of my work.	3.20	1.08
A11	I can find all of the needed information on a screen.	2.97	1.20
A12	The terminology used in the software reflects that of my work environment.	3.49	1.11
A14	The software provides me with repeat functions for work steps that must perform repeatedly.	3.01	1.24
A15	I can quickly adapt the software to my new tasks.	2.91	1.15
A16	The important commands needed to perform my task are easily accessible.	2.73	1.17
A17	I can manage how to present the results based on my needs. (On the screen, to the printer, etc.)	2.72	1.27
A18	The way the data are presented on the screen supports me in performing my work.	2.98	1.24

Graph 1: A comparison of the mean scores received by users of several hospital information systems regarding their appropriateness for the task

	A1	A3	A4	A6	A7	A8	A9	A10	A11	A12	A14	A15	A16	A17	A18
Users Paraclinic Units	2.1039	3.1818	3.013	3.1299	3.4805	2.8182	2.961	2.8961	2.8442	3.2987	3.013	2.7273	2.7532	2.974	3.2078
Ward Secreterials	1.6932	3.2614	3.3182	3.6023	3.875	2.7727	3.1136	3.3409	2.9091	3.6023	2.7727	2.8409	2.6818	2.6705	2.9318
Nurses	2.0204	3.4388	3.3265	3.4388	3.8163	3.1122	3.1735	3.3878	3.1327	3.5306	3.1735	3.0612	2.7551	2.6531	2.9388

DISCUSSION AND CONCLUSION

According to the research results, the minimum score required for task suitability in hospital information systems in India is 1.13, and the maximum score allowed for job suitability is 4.60. The mean score was 3.40, and the standard deviation was 0.619. In addition, Christopher analyzed the effectiveness of computers in clinical information systems based on the feedback provided by professionals in the field of nutrition. He assigned a score of 5.22 out of 7 to the task's appropriateness. The users of these computers, on the whole, gave positive feedback about them in their evaluations. Even though this research produced an encouraging result, it is only somewhat better than typical. As a result, we cannot consider it a hospital information system that can be utilized for the practical completion of activities, and it is required to make additional efforts to eliminate the flaws currently present.

There may be a variety of factors behind the disparities in ratings among the user groups, particularly regarding certain goods. The inability of the software to adequately fulfill the requirements of user groups operating in their respective domains constitutes the single most critical factor that the designers of information systems should pay particular attention to in their work. For instance, compared to the scores received by the other two groups, the paraclinical users' group received a lower score for the criterion of total consistency between the software and the job requirements (A10). This finding suggests the importance of considering the users' demands at such units and addressing those needs. When it came to how satisfied they were with the health information system in Norway, secretaries, nurses, and doctors, all reported significantly different levels of happiness with the system. Secretaries, in contrast to nurses and doctors, had indicated that their responsibilities were significantly more straightforward when they began using the automated system rather than the manual one. According to the findings of research conducted by Smelcer (2009), medical professionals believe that a significant amount of training time is required to learn how to work inside the system and that doing so affects their overall level of productivity. Therefore, many user groups within a hospital have a variety of perspectives on hospital information systems due to their duties. While some users believe that the usage of such systems makes their work more accessible, there are also those users who believe that the contrary is true. One of the reasons for such a thing in India's hospitals is that the HIS developers need to pay more attention to each group's unique requirements in their system creation.

Differences in the total work experience may also impact the evaluation outcome gained while utilizing the information system (the total amount of time spent utilizing the system). Hamborg et al. found out in their evaluation of the hospital information system that in comparison to the doctors, nurses, and secretaries had awarded higher grades to the system for its appropriateness with the task. However, it is essential to note that the number of doctors who have only recently begun utilizing the system is significantly higher than the number of newcomers who fall into the other two categories. Therefore, it is reasonable to assert that the length of time that users have spent working with the system is directly proportional to their level of contentment with it.

The degree to which an information system conforms to the tasks performed by its users and how data are submitted into the system is one factor that determines how easily that system may be used. In this investigation, the figure's value that suggests such conformance was discovered to be 2.73. The preferences and abilities of the users are a factor in determining the degree of conformance between how data are entered into the system and the fulfillment of tasks. Therefore, those responsible for developing information systems should consider this aspect to improve both the efficiency of their products and the level of satisfaction experienced by end users. In this study, a total of 54 users participated, and 19% of them thought the procedure for entering the data needed to align with their responsibilities. Ninety-two users, or 32.3%, held a moderate perspective, and 139 users, or 48.8%, considered inputting the data compatible with the tasks they were performing. Individuals responsible for developing information systems have had something like this in mind. The findings of a study that Miller-Jacobs and others carried out reveal that medical professionals utilize various methods of entering data into the system. Those proficient in typing typically type the data while entering it at the patients' houses. Some people are more laid back when it comes to dictating. Tablet user interfaces are utilized by some of the remaining participants (Thyvalikakath et al., 2008). A score of 3.20 out of 5 was attained in an investigation that was carried out analogous to the one by Hamborg et al. (2004).

According to the findings of this study, 23.9% of users stated that the program not only did not assist them in completing their jobs but also actively impeded them from doing so. About 85 users (29.8%) held a moderate perspective, and 132 users (46.2%) believed that the software would allow them to carry out everyday chores. In addition, the findings of the study carried out by Thyvalikakath et al. (2008) revealed that 28 percent of the users were unable to complete their jobs while using the system. In addition to that, the tasks were carried out incorrectly in thirty percent of the instances. Therefore, they recommended that additional research be carried out addressing documentation problems when utilizing such systems.

One of the things that should be considered is locating the necessary data on the screen (A11). According to the findings of this study, thirty-three percent of hospital users (94 total) stated that the existing information system needed to

provide them with a single display page that contained all of the necessary data. Ninety-four users, or 33%, held a reasonable opinion, while 97, or 34%, believed that the details they needed were shown to them on a screen. Also, the outcomes of research carried out by Ash et al. (2004) and Schleyer et al. (2007) reveal that if the information is displayed on different screens, it will lead to challenges for the users, which will ultimately result in the users making decisions that are of lower quality. According to Thyvalikakath et al. (2008), it is also recommended that all of the data associated with a single duty be presented simultaneously. Additionally, according to Thyvalikakath et al. (2008), it is recommended that any additional or irrelevant menus that appear on the screen be avoided as much as possible.

In addition to the utilization of the seven criteria provided by IsoMetrics, other variables ought to be taken into consideration both before and during the process of evaluation:

- The objectives of the company for which the user is responsible
- The requirements of user groups
- The many responsibilities that each information system must meet
- The resources and technologies that are at the user's disposal

Overall, this review's findings show that a significant amount of work needs to be done before the performance of India's existing HISs can be considered totally satisfactory. According to Bodepudi et al.'s research from 2019, hospital administrators need to be provided with sufficient information to make an informed decision regarding the type of information management system they would like to implement. One of the problems and rocky points that hospitals face in the process of mechanizing their operations is "which software is more effective, more suitable, and more cost-effective." The presentation of such systems by private companies means that completing such research can force these companies to compete with one another to improve their goods, which is a good thing for consumers.

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