Hospital Information System Usability Evaluation in Iran: A Users’ Viewpoint Study

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Abstract

Introduction: The wide application of Hospital Information System (HIS) in healthcare organizations requires the professional evaluation of softwares in an operational way. Therefore, it is necessary to evaluate the performance of such systems based on their users’ view. Consideration of systematic error tolerance index on HIS users, including not losing of data and possibility of returning to the previous state in case of errors, perceivability of error messages, possibility of error correction, and the like are all factors that if not understood can make the design and deployment of a software rather unsuccessful.

Materials and methods: This is a cross-sectional and descriptive study was conducted in 2009-2010. First, the error tolerance index of Iran’s Hospital Information System (IRU-HIS) was evaluated by using an instrument called Isometric 9241-10. Then, the results were compared with those of three other softwares. Cronbach’s alpha reliability test and one-sample t-test were used to compare the error-tolerance indexes of the different systems. For the analysis of data, SPSS and Excel were applied.

Results: The findings of the study revealed that IRU-HIS error tolerance was 2.95 on average with a standard deviation of 0.68. The reliability of the study was rather high (α=0.852). All users gave the highest points to the three items of ‘confirmation request in case of destructive operation like deletion of data’, ‘absence of small mistake leading to serious consequences’ and ‘the need for less effort for the correction of errors’ (3.58, 3.37 and 3.21), respectively. The analysis of mean error tolerance showed that IRU-HIS was better than IS-HMED and SAP HR R/3, but considerably weaker than Microsoft’s Word (0.68).

Conclusion: The results revealed that the evaluated Iranian hospital information systems did not have an approach to error correction as well as appropriate data presentation and clear error messages. Therefore, if we seek an optimal interaction between users and information systems, we should consider all systematic error tolerance indexes because the inconsideration of such indexes will result in an increase in errors and have a negative effect on the efficiency of the system and users’ interaction with it.

Keywords: Evaluation; Hospital information system; Standard Isometric 10-9241; Systematic error tolerance

Introduction

There are different users who apply information systems in health care services. A critical background for implementation of computed information systems is that users’ interactive and interfaces should be streamlined and usable through their working practice [1,2]. However, it is impossible to evaluate such systems without study of their users’ understanding. Moreover, users’ satisfaction of information systems assure desirable implementation of these systems [3,4].

Today, Hospital Information Systems (HIS) are widely used all over the world [5]. Since 1990’s, computers are utilized in health care organizations to access the medical records, nursing practice and legal issues documentations. Also, quality assurance, health economics, and accounting records have been considered together with medical records. Nevertheless, paying attention with these documents has been ignored by health care policymakers [6].

HIS user’s viewpoint, like medical professionals, should be confident regarding the quality of these systems [7]. In order to verify and optimize HIS usability, it is necessary to determine usability engineering and study human-computer interaction [3,8,9].

HIS evaluation has mainly focused hospital financial aspects, patients’ concern, and therefore a large number of HIS users like nurses, physicians, and the other health care professionals who deal with this system have been ignored to be evaluated. Those employees who spend a lot of time to fill-up the forms, review medical diagnosis result, and help to flow the voluminous information, need application management of HIS [6,10]. Therefore, it is necessary to evaluate the performance of this system according to their user’s viewpoint [5].

In the field of software economics, Isometrics tools have been developed and validated to study certain important indicators for evaluation of goal attainment such as systematic error tolerance, user friendliness and the rate of this software [6]. Isometrics is a reliable technique for HIS evaluation [10,11]. Also it is a technique to evaluate the usability of software ergonomics applications according to ISO 10-9241.
9241 part 10 standards which is used on the German version of the Europeans’ software or EN ISO 9241-10. This software follows the standards of international ergonomic development and describes the basis of general ergonomics. There are 7 clear principles for the development and evaluation of the software’s dialog that covers the evaluation of systematic error tolerance [6]. Using the software appropriately, and as a result, improving its productivity, are very important of EN ISO224-10.

In the study of Isometric error tolerance, users’ needs are validated and confirmed through error approaches in operational methods. The final result of this approach is the exact choice of software and assurance of its reversable actions [6,10,11].

In this study, at first, we want to evaluate Iranian Hospital Information System (IRU-HIS) Isometric error tolerance index. Then, we will compare the results of this study with those of the three different reference products, i.e., Windows Microsoft’s Word Software, IS-H’MED, and management plan SAP HR R/3.

The reasons for selection of the mentioned software’s, their tolerance, and the applicability of their evaluation are based on Isometric 9241-10 questionnaire (Table 1).

**Materials and Methods**

A Cross sectional, and descriptive study was conducted among 12 hospitals in Tehran, Iran during 2009-2010. Four general hospitals belong to private section and eight of them were governmental. These hospitals could covered all area of Tehran. The research tool for data collection was Isometric 9241 standard questionnaire that measured the viewpoint of the hospitals employees about terms of error tolerance of HIS. This questionnaire was comprised of 15 questions which included five items of Isometric 9241 and each item consisted of preservation of data in case of errors, possibility of retrieval to the previous state in case of errors, comprehensibility of error messages and possibility of error correction through simple steps as four sub items. All questions were measured using 5-point Likert scale of agreement with response.

Options ranging from (strongly disagree=1) to (strongly agree=5).

Some of the questions (F1, F13) had negative nature. In order to eliminate this problem when entering data into SPSS, these questions were given marks conversely. The validity of the questionnaire was confirmed by a panel of experts and its reliability was performed by using test-retest method yielded a Cronbach’s alpha coefficient. Tehran University of Medical Sciences Ethics Committee approved their participation, because all of participants have verbally asked to participate and their view point about HIS error tolerance. For the analysis of data, SPSS software more applied and one sample t-test were used to complete the error tolerance indexes of different systems. Then, nine data processing companies that had provided HIS for the hospital were identified, i.e., one company which covered per hospital.

**Results**

Most (56.8%) of HIS users were nurses. Moreover, most (115, 44%) of them had 1 to 9 and (57, 22%) had from 10 - 19 years of work experience. The HIS users were mostly females (232, 88.2%), (160, 65.5%) of them had BSc. degree. Of the 263 users, only (90, 34.1%) had ICDL certificate. In the other words, (175, 66%) of the users did not have the necessary computer literacy to use HIS. This is while most users (165, 62.7%) declared their computer general literacy as moderate.

All users gave the highest scores (3.58, 3.37 and 3.21) to the three items of (F4) ‘asking for a confirmation in case of destructive performance such as data deletion’, (F1) ‘non-emergence of minor errors leading to serious consequences’ and (F5) ‘need for less effort for error correction’, respectively.

The lowest scores given pertain to the following items:

• (F7) Non-emergence of systemic errors (e.g. crashes) at the time of working with the software (2.36).

• (F10) having the necessary safety in softwares to prevent unintended actions (2.74).

• (F11) presentation of useful information for the recover from error situations (2.74) (Table 2).

Table 3 shows the comparison between the indexes of error tolerance in IRU-HIS and such indexes in Windows Microsoft’s Word of (10), IS-H’MED [11], and SAP HR R/3 [12]. In the analysis of error tolerance mean, IRU-HIS has a better rank compared with IS-H’MED and SAP HR R/3. However, in comparison with Microsoft’s Word, it is considerably weaker (0.68).

**Discussion**

Conformity with technology, people and organization are the important parts of Health Information System (HIS) [7]. Many evaluation studies have focused on technical aspects or clinical processes of hospitals and none of them explains the reason why HIS operates well or weakly with certain users and in a certain structure [6]. Therefore, the evaluation of HIS is an issue which has been ignored by the users in health sector [11]. Over the past years, the efficiency of Isometric tools for the evaluation of users’ viewpoints has been studied in many researches [4,6,10].

With the application of Isometric approach, the findings of the present study showed that IRU-HIS error tolerance ranged between 2.87 and 3.02, with a mean of 2.95 and standard deviation of 0.66.

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year of evaluation</th>
<th>Software name</th>
<th>Number of users</th>
<th>Software’s application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamborg et al.</td>
<td>2004</td>
<td>IS-H’med</td>
<td>182</td>
<td>—Creation of release plan, review of diagnostic and laboratory findings, documentation of diagnostic findings, diagnostic related group (DRG), medical examination order, documentation of medical examinations, nursing category, and ordering meals.</td>
</tr>
<tr>
<td>Gruber</td>
<td>2000</td>
<td>SAP-HR</td>
<td>28</td>
<td>—Evaluation done at the University Hospital of Heidelberg, Department of Internal Medicine.</td>
</tr>
<tr>
<td>Gediga et al.</td>
<td>1999</td>
<td>Microsoft Word for Windows (Version 2)</td>
<td>55</td>
<td>—Support of many tasks in the field of human resource management such as personnel time management, training and event management, and payroll accounting</td>
</tr>
</tbody>
</table>

**Table 1: Software’s evaluated by IsoMetrics.**
Compared with the other systems, the obtained figure is rather positive; however, the present situation cannot be an appropriate index to adapt with the users’ needs and it is necessary to put more efforts on the investigated cases to remove the shortcomings.

One of the 15 items of systematic error tolerance evaluation pertained to the time when the system asked for confirmation of destructive operation. As an example, when the user deletes data unintentionally or unintentionally, in the first step, the software asks if he is assured about such deletion. This is an example of asking for confirmation of destructive operation. (e.g. deletion of data etc.), I am always first promoted to confirm the action.

Item (F11) concerned the presentation of sufficient data to improve errors; for example when a user selects a link wrongly and needs certain information as how he can return to the previous state, or when he enters a number wrongly [13]. In a study done by Rohring et al. the points for these items were also reported as 3.04 and 2.38, respectively [6]. Many studies have shown that if we wish to have an optimal interaction between users and information systems, we should consider all systematic error tolerance standards because inconsideration of such standards leads to an increase in errors and has a negative effect on the efficiency of the system and the interaction between the system and its users [6,9,13]. The results of the study showed that IRU-HIS enjoyed moderate performance level in terms of systematic error tolerance standards. Consideration of particular points in error tolerance index items and comparing them with other systems and with the ones mentioned in this study indicated the unacceptability of error tolerance indexes of hospital information system under their study. It is to be mentioned that such reference systems as In-house Hospital Software with an error tolerance mean of 2.77 [5], or WinWord with a mean

This study revealed that the evaluated HIS lacked a proper approach to error correction, presentation of appropriate data, and clear error messages. In such a case, some bits of information may be lost. The errors which happen can easily be corrected and confirmed by users before the data are permanently deleted; however, when used inappropriately, systems do not give any warning. Moreover, not all data are sent back for correction before being processed [5,10,13,14].

Conclusion

Altogether, the results of the study indicate a rather long way to achieve a perfectly desirable performance of the existing hospital information systems in Iran as far as the error tolerance index is concerned. In fact, the error tolerance indexes of these systems need to be improved. It is also necessary that designers and developers of hospital information systems enhance error tolerance in future editions to increase the acceptance of systems in integrated networks because the enhancement of a system in terms of user-friendliness and error tolerance is a key point for the success of any software.

Independent evaluations of this index in any software in greater detail and through different methods are necessary to inform hospital officials to choose an optimal system. That is because one of the ambiguous points which still exist regarding the hospitals about to be mechanized is the question ‘which software has a more appropriate, more efficient, and more economical error tolerance index?’ Since such systems are provided by private companies, the implementation of performed studies can cause a competition among these companies to enhance the quality of their products.

Limitations and implication

The limitations of any field study are magnified when the realities of taking the concepts and techniques developed in one culture are applied to another culture. Also, one of the main limitations of present study is that, it was conducted at one specific time. Second, the users were conducted by questionnaire. It is possible that their information-collection process is convenient for present research, but it might have introduced into the final result of the research. The practical implications of this study include that Iranian healthcare policy makers and other their professionals, because their server would not have been possible without their assistance. We would like to thank Mrs. Zahra Abdollahi for typing and anonymous reviewers for helpful suggestions.

This research has been approved by Tehran University of Medical Sciences, Deputy of Research Affairs. The authors declare that they have no conflicts of interest.

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