The Evaluation of Hospital Information System Usability and Its Effectiveness on Customers' Satisfaction Based on ISO 9241-10

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ABSTRACT

The study aimed at determining whether there is any relationship between Careware (Hospital Information System) usability and customer satisfaction (Patient). It also aimed at identifying any differences between the usability of Careware in two medical centers (The Arab Center for Heart and Special Surgery and Al-Estiklal Hospital). The type of research is a single cross-sectional design in which the collection of data from the respondents was carried out only once. In order to achieve the objectives of the study, the researchers adapted IsoMetrics questionnaire, a usability inventory that provides a user-oriented summative approach to software evaluation on the bases of ISO 9241 (Part 10). Another questionnaire was designed based on previous studies and the theoretical framework. Both questionnaires were distributed to a sample of (380) patients in the two hospitals. 342 questionnaires were return; however, 22 questionnaires were dropped, because they deemed to be invalid for data analysis. Data was analyzed using the statistical package for social sciences (SPSS) version (20). The study revealed that Careware usability has a statistically significance effect on customers' satisfaction (Patient). The study also found that there are no differences between Careware usability in both medical centers.

Keywords: Hospital Information System, Customer Satisfaction, effectiveness.

INTRODUCTION

The widespread distribution of Hospital Information Systems (HIS) in healthcare institutions requires professional evaluation to assess the practical usefulness of these applications. The usability of a product is considered as a precondition for the usefulness of an application. It is defined with respect to "the extent to which the product can be used by specific users to achieve specific goals with effectiveness, efficiency, and satisfaction in a specific context of use" (ISO 9241 Part 11, 1998). Unfortunately, today not many applications fulfill this demand.

There is a multitude of methods for the purpose of information system evaluation. Questionnaires are well suited for the summative evaluation of software applications, especially in larger organizations like hospitals. They are economic evaluation techniques, which can be applied to a larger number of users at the same time with comparatively small financial effort (Smith, 2003).

HIS customers can be classified as being internal or external (Vincent *et. al*., 1999; Wixon & Wilson, 1997). Internal customers are physicians, nurses, laboratory technologists, pharmacists, and others within a healthcare facility that interacts with the essential processes. External customers are patients, patients' families, insurance providers, suppliers, health services researchers and others. For the purpose of this study, the researchers concentrate on the external customers, particularly the patients. Careware is the most popular hospital information system in Jordan and has been implemented in several large hospitals. Careware varies

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from one hospital to another in terms of the way it is used. It is sometimes customized to fit the way a hospital is operated.

Study Problem

The study problem can be summarized in the following questions:

1. Are there any Differences between the usability of Careware in Arab Center for heart and Special Surgery and Al-Estiklal Hospital?
2. Is there any relationship between Careware usability and Arab Center for heart and Special Surgery customers' satisfaction (patients)?
3. Is there any relationship between Careware usability and Al-Estiklal Hospital customers' satisfaction (patients)?

Study Objectives

The objectives of the study are:

1. To determine if there are any differences between the usability of Careware in Arab Center for heart and Special Surgery and Al-Estiklal Hospital.
2. To determine if there is any relationship between Careware usability and customers satisfaction (patient) in both hospital.

Significance and Contribution of the Study:

Despite the large number of studies about the usability, there is a scarcity of research that evaluates hospital information system usability and tests its relationship with customer satisfaction and compares the information systems of two hospitals. Moreover, this study, as far as the researchers aware, is conducted in an environment (Jordanian Context) where no previous research efforts have been made to investigate the issue and it there for, represents originality in this field. For this reason, the current study evaluates the usability of hospital information systems using the IsoMetrics summative questionnaire that is new in the Arab world in general and Jordan in specific. Also, it is envisaged that this study will reveal some important lessons for Jordanian hospitals in improving their HIS to enhance their customers' satisfaction.

Research Hypotheses:

The following hypotheses have been developed:

The First Main Hypothesis:

H0: There are no statistically significant differences between Careware usability among hospitals at ($\alpha \leq 0.05$).

Sub-hypotheses:

H01: There are no statistically significant differences between Careware "Suitable for the task" among hospitals at ($\alpha \leq 0.05$).

H02: There are no statistically significant differences between Careware "Self descriptiveness" among hospitals at ($\alpha \leq 0.05$).

H03: There are no statistically significant differences between Careware "Controllable" among hospitals at ($\alpha \leq 0.05$).

H04: There are no statistically significant differences between Careware "Conform with user expectation" among hospitals at ($\alpha \leq 0.05$).

H05: There are no statistically significant differences between Careware "Error tolerant" among hospitals at ($\alpha \leq 0.05$).

H06: There are no statistically significant differences between Careware "Suitable for Individualization" among hospitals at ($\alpha \leq 0.05$).

H07: There are no statistically significant differences between Careware "Suitable for learning" among hospitals at ($\alpha \leq 0.05$).

The Second Main Hypothesis:

H0: There are no statistically significant relationships between Careware Usability and The Arab Center for

Heart and Special Surgery customers' satisfaction (patient) at ($\alpha \leq 0.05$).

The Third Main Hypothesis:

H0: There is no statistically significant relationship between Careware Usability and Al-Estiklal hospital customers' satisfaction (patient) at ($\alpha \leq 0.05$).

Theoretical framework and previous studies:

Information Systems in Healthcare:

An ideal hospital information system should focus on the integration of clinical as well as financial and administrative applications (Hartson, 1998). At present time, most systems are Financial Information Systems (FIS), Management Information Systems (MIS), or Hospital Information Systems that combine FIS and MIS. In order to improve hospital services in a time-efficient and cost-effective manner, both FIS and MIS must be linked to a Clinical Information Systems (CIS). This system is centered around patients and clinical processes. It consists of: ward-related Nursing Information Systems (NIS) and non-ward Departmental Information Systems (DIS) (Shneiderman, 1998). Examples of DIS are Radiology Information Systems (RIS) and Pharmacy Information Systems (PIS). With such synergy, the key issue is the integration of digital data so that the authorized personnel can retrieve necessary information anywhere and anytime they need. The required data is usually different in nature and is called multimedia data. To review a patient's record, the healthcare provider may need to look at radiographic images, listen to voice data with video sequence and live signals (intensive care scenario), and read the notes of other physicians. It is in this context when there is also a need for an integration of HIS with Integrated Digital Medical Records (IDMR) and other advanced information systems such as Picture Archiving Communication System (PACS) and Document Information Systems (Doc IS) to handle massive amounts of multimedia data.

Customers' Satisfaction

Customer satisfaction is a customer's feeling of pleasure or disappointment resulting from comparing products falls short of expectation. The customer is satisfied if the performance matches the expectation and is more than satisfied if the performance exceeds expectations (Kotler & Armstrong, 2012, Foster, 2010). Satisfaction is the consumer's fulfillment response and its judgment that a product or service feature, or the product or service itself, provides a pleasurable level of consumption–related fulfillment (Zeithmal & Bither, 2003). This definition means that satisfaction is the customer's evaluation of a product or service in terms of whether that product or service has met their needs and expectation. Failure to meet customer needs and expectation is likely to result in dissatisfaction with the product or service. In addition to a sense of fulfillment in the knowledge that one's needs have been met, satisfaction can also be related to other types of feelings, depending on the particular context or type of service. For example, satisfaction can be viewed as contentment--more of a passive response that customer may associate with service they don't think lot about or service that they receive routinely over time.

Satisfaction may also be associated with feelings of pleasure for service that make the customer feel good or are associated with a sense of happiness. However, satisfaction is a dynamic, moving, target that may evolve over time, influenced by a variety of factors, particularly when product usage or the service experience takes place over time, satisfaction may be highly variable depending when customer has experience in using service (Zeithmal & Bither, 2003).

Previous Studies:

Gediga *et al*. (1999) present a questionnaire (IsoMetrics) which collects usability data for summative and formative evaluation and documents its construction. The summative version of IsoMetrics shows high reliability of its subscales and gathers valid information about differences in the usability of different software systems. Moreover, Gediga et al. (1999) demonstrate that the formative version of IsoMetrics is a powerful tool for supporting the identification of software weaknesses. Finally, the researchers (Shridon, 2011, Renold & Chopra, 2012) propose a procedure to categorize and prioritize weak points, which subsequently can be used as basic input to usability reviews.

Christoph and Bludau (2002) described common evaluation methods and their comparison and presented an extension of established instruments for evaluation, which was tested in clinical environment. Their main focus is laid upon the ISO 9241 Part 10 and the principles of organization described therein: self descriptiveness, controllability, conformity with user expectations, error tolerance, suitability for individualization and suitability for learning. These standards are integrated into different questionnaires (e.g., IsoMetrics, Iso-Norm), which are the basis for further development of the adoption to mobile computer evaluation. They gave an overview on usability of questionnaires based on ISO 9241 Part 10, together with their extension in the part of the handheld-specific questions. The results permit a first estimation about the applicability and functionality of handheld computers in a clinical environment. They evaluate if such an extension of the ISO-based questionnaire is appropriate for describing the full applicability of handheld computers.

Martinsson (2003) performed a usability evaluation on DORIS, a software computer system currently used at Danderyd's hospital, located in Stockholm. DORIS is used to send referrals between the hospital's x-ray division, doctors and other staff members within the hospital. The study work is limited by focusing exclusively on the part of the user interface used by the hospital staff not working within the x-ray division. Further, the study work is limited to include doctors within four of the hospital's divisions. These doctors were included and served as the test group when performing the usability evaluation. Four Interviews and several functional tests were conducted with the doctors. During the performance of the functional tests, all users were asked to perform different tasks using DORIS. The researcher monitored all functional tests by an experimenter. The result of the study shows that the most extensive problem with DORIS is based on the system's lack of speed. Also the results shows that the interface problems were mainly related to the system's lack of consistency and to the fact that its functions are poorly structured, involving too many steps. With respect to these results, a user interface prototype has been developed. The purpose of this prototype is to exemplify of how an interface with higher usability focus could be developed and implemented.

Mueller-Prothmann *et al*. (2003) mentioned that usability is a key factor for the effectiveness, efficiency and acceptance of Online Knowledge Communities (OKCs). It is also a critical issue for their existence, success and future evolution. The researcher aims at laying a foundation for the development of a usability evaluation criteria catalogue. Usability for online communities is outlined first. A systematic overview of facility-types and technical components of OKCs provides the basis for the development of usability criteria. The OKCs Usability Evaluation Criteria Catalogue supports summative evaluation of OKCs as well as the development of heuristics for the designing of OKCs.

Hamborg *et al*. (2003) present the usability questionnaire IsoMetrics that is based on the international standard ISO 9241 Part 10. The questionnaire was applied to assess the

usability of a Hospital Information System. The equivalence of the online and a paper-and-pencil format of the questionnaire were investigated. The results show that the different formats do not affect the subject's ratings. IsoMetrics was proven to be a reliable technique for software evaluation in the field of hospital information systems supporting usability screenings in large organizations.

Schimiguel *et al*. (2004) investigated aspects of interface quality for Web Geographic Information Systems (GIS) applications. The approach adopts an inspection evaluation based on ISO 9241. Preliminary results show the effectiveness of such an approach to user interface evaluation as a complement to tests with users. They have verified that the interface evaluation of web applications in general, needs some additional criteria and rules. In addition, they acknowledge the necessity of adapting and extending these norms to consider other relevant aspects in the Web GIS applications.

Jung (2006) examined healthcare professionals' attitudes regarding the adoption, use and perceived benefits of healthcare information technology (HIT). He developed a survey instrument focused the perceived benefits of HIT adoption. He also reviewed the construct of perceived benefits in various research areas to identify established approaches to predicting individual's intentions to adopt technology. The items of perceived benefits taken from previous studies were developed and modified, and three benefit dimensions (direct, indirect and strategic benefits) were described.

Rainer *et al*. (2007) aimed to evaluated the usability of a guideline assistance system for empiric antimicrobial therapy in the Intensive Care Unit called "Antibiotic Wizard" with the help of the IsoMetrics inventory (based on the ISO 9241-10 for computer-assisted workflows). Forty physicians from different specialties at different levels of training were surveyed in order to detect deficiencies in the use of the program. The results of these surveys were compared to surveys on the word processing software Word for Windows (WinWord) from Microsoft. The usability of the "Antibiotic Wizard" was deemed good. Some weaknesses were found in the fields of "Error tolerance" and "Controllability". These problems will be corrected in future versions.

Study Model

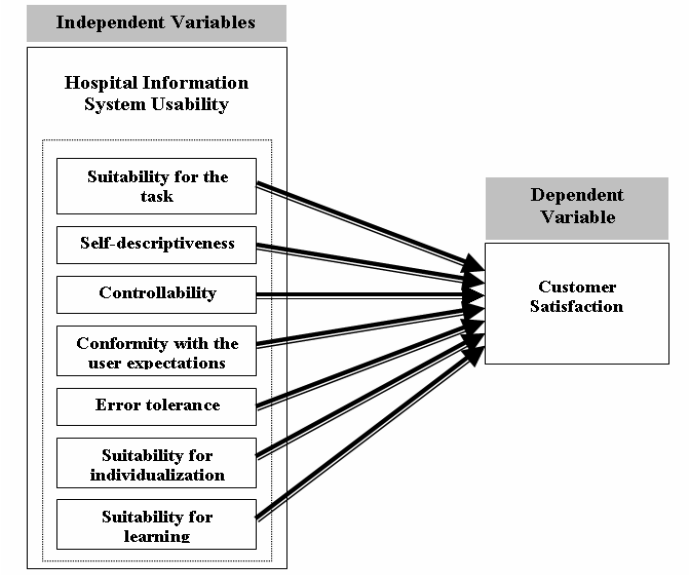

Figure (1): Theoretical Model of the Study

Study Methodology:

Study Population and Sample:

The population of this study includes all seven Jordanian private hospitals that use the Careware Software. Four of these hospitals have more than 70 users. Two hospitals, namely, Al-Estiklal Hospital (EH) and Arab Center for heart and Special Surgery (ACH) were chosen as a sample for this study.

Two types of questionnaires were utilized to collect data for this study. The first is the IsoMetric summative questionnaire developed by Gediga *et al*. (1999); the second questionnaire has been developed by the researchers to measure the customer satisfaction. A total of 380 questionnaires were administered personally among which 342 were returned. Out of these, 22 were invalid for further use; therefore, the questionnaires that filtered into further analysis were 320, representing a response rate of 84.2%. Analysis was carried out using SPSS version (20).

Instrument Validity and Reliability:

Validity: The customer satisfaction questionnaire was reviewed by four experts with expertise in the scope of this study to make sure that each item is measuring exactly what is intended to measure. Upon receiving their feedback, the questionnaire was revised taking into consideration their suggestions, comments, and directions to establish the validity of the instrument.

Reliability: Reliability is the degree to which an instrument measures the same way each time it is used under the same conditions with the same subjects. That is, reliability refers to the accuracy (consistency and stability) of measurement by the instrument or repeatability of an assessment over a variety of conditions (Bernard, 2000). Variables with composite measures were evaluated for their internal consistency through the Cornbach's Alpha measure. The higher the Cronbach's Alpha value, the greater is the internal consistency of the items making up a composite measure (Litwin, 1995). The Alpha's for the customer satisfaction questionnaire is (0.956) which is good because it is greater than accepted percent (0.60) (Sekaran, 2010). The IsoMetrics questionnaire is a reliable and valid according to the previous literature review.

Table (1): Distribution of Respondents (Users) In both Hospitals

Estiklal Hospital			**AC. Hospital**	
Categorize	**Frequency**	**Percent**	**Frequency**	**Percent**
Gender				
Male	44	55.0	33	41.3
Female	36	45.0	47	58.8
Total	80	100.0	80	100.0
Age				
less than 25	23	28.8	19	23.8
between 25-30	27	33.8	23	28.8

Estiklal Hospital			**AC. Hospital**	
Categorize	**Frequency**	**Percent**	**Frequency**	**Percent**
between 30-35	18	22.5	26	32.5
between 35-40	7	8.8	8	10.0
more than 40	5	6.3	4	5.0
Total	80	100.0	80	100.0
Education				
Tawjehi	4	5.0	2	2.5
Diploma	29	36.3	28	35.0
Bachelor's	46	57.5	47	58.8
Master	1	1.3	3	3.8
Total	80	100.0	80	100.0
Experience				
less than 5	55	68.7	48	60.0
between 5-10	25	31.3	22	27.5
between 11-15	0	0	10	12.5
Total	80	100.0	80	100.0
IT Experience				
Expert	10	12.5	13	16.3
Advance	40	50.0	46	57.5
Novice	30	37.5	21	26.3
Total	80	100.0	80	100.0

Data Analysis and Findings:

Characteristics of the Sample:

Table (1) shows that 55% of the participants (users) are male and 45% are female in EH and 41% male and 58% are female in AC.Hospital. This result reflects a high percentage of female workers in both hospitals not like other firms in Jordan, but the nature of hospitals work rely more on female in dealing with patients specially the female one. Also, the table shows that most of the users are between less than 25-35 this is because

the young people are more capable in using the computers. 95% of the respondents (users) in E.Hospital and 97.5% in AC hospital have a high academic degree, which mean that the respondents are qualified enough to provide reliable information.

Table (2): Distribution of Respondents (Patients) In both hospitals

Estiklal Hospital			**AC. Hospital**	
Categorize	**Frequency**	**Percent**	**Frequency**	**Percent**
Gender				
Male	55	68.8	41	51.3
Female	25	31.3	39	48.8
Total	80	100.0	80	100.0
Age				
less than 25	13	16.3	12	15.0
between 25-30	13	16.3	8	10.0
between 30-35	10	12.5	18	22.5
between 35-40	16	20.0	19	23.8
more than 40	28	35.0	23	28.8
Total	80	100.0	80	100.0
Education				
Tawjehi	18	22.5	23	28.8
Diploma	30	37.5	26	32.5
Bachelor's	27	33.8	29	36.3
Master	5	6.3	2	2.5
Total	80	100.0	80	100.0

Table (2) shows that (68.8%) respondents (patients) in E.Hospital and (51.3%) in AC.Hospital are males. Also, the table shows that the patients in E.Hospital are ranged from 35 years old to more than 40 years (53%), while the patients in AC.Hospital from 30 years old to more than 40 years (75.1%) of the patients.

Table (3): Means, Standard Deviation of the Variables

Variable	Mean		S.D	
	AC.H	E.H	AC.H	E.H
Suitability for the task	3.47	3.43	0.52	0.59
Self-descriptiveness	3.42	3.38	0.54	0.64
Controllability	4.05	3.97	0.65	0.63
Conformity with user expectations	3.56	3.51	0.54	0.57
Error tolerance	3.26	3.31	0.63	0.64
Suitability for individualization	3.00	3.05	0.65	0.61
Suitability for learning	3.40	3.48	0.51	0.50
Customer satisfaction	3.86	4.00	0.93	0.99

Descriptive Statistics:

In Table (3) the highest mean was for the variable "Controllability" in both hospitals which means a great measurety of the Users agreed that they are able to start the sequence of Careware and influence its direction as well as speed till they reached their aim. All the variables mean in the table are greater than the scale, which is 3.

Normal Distribution Test:

To test whether data is normaly distributed, Kolmogorov- Smirnov test (K-S Test) was used prior to the Hypothesis testing in order to use parametric statistical techniques which required normal distributed data. The result of (K-S) test is shown in table (4) below. The table shows that data is normally distributed and parametric analysis methods can be used safely.

Table (4): K-S Test

Construct	Mean	Std.	Absolute	+ dev	- dev	(K-S)	P
Suitability for the task	3.50	0.39	0.99	0.99	-0.09	1.24	0.08
Self-descriptiveness	3.34	0.46	0.95	0.05	-0.09	1.19	0.11
Controllability	3.98	0.52	0.91	0.05	-0.09	1.15	0.14
Conformity with the user	3.43	0.45	0.93	0.06	-0.09	1.17	0.12
Error tolerance	3.30	0.50	0.13	0.06	-0.13	1.67	0.01
Suitability for individualization	2.98	0.57	0.11	0.08	-0.11	1.45	0.02
Suitability for learning	3.41	0.36	0.11	0.11	-0.07	1.45	0.02
Customer Satisfaction	3.93	0.96	0.27	0.16	-0.27	3.52	0.00

Hypotheses Testing:

The First Main Hypothesis:

H0: There are no statistical significant differences between Careware Usability in both hospitals.

Table (5): Main Hypothesis Hl Testing

T. calculated	T. tabulated	T. Sig.	Result of H0
.411	1.96	.682	accepted

T- test was used to test the hypothesis and it found that (calculated t =0.411) is less than tabulated t . According to the decision rule: Accept H0 if calculated value is less than tabulated value and reject H0 if calculated value is greater than tabulated value. And the significant "t" value (0.682). Therefore, the null hypothesis will be accepted.

Sub-hypothesis:

H01: There are no statistical significant differences between Careware "suitable for the task" in both hospitals.

Table (6): Sub-hypothesis1 Testing

T. calculated	T. tabulated	T. Sig.	Result of H0
0.423	1.96	0.673	accepted

Table (6) shows that the calculated value (0.423) is less than tabulated value (1.96), and the significant "t" value (0.673), indicating that the null hypothesis will be accepted.

H02: There are no statistical significant differences between Careware "Self descriptiveness" in both hospitals.

Table (7): Sub-hypothesis 2 Testing

T. calculated	T. tabulated	T. Sig.	Result of H0
0.396	1.96	0.692	accepted

Table (7) exhibits that the calculated value (0.396) is less than tabulated value (1.96) and the significant "t" value (0.692), indicating that the null hypothesis will be accepted.

H03: There are no statistical significant differences between Careware "Controllable" in both hospitals.

Table (8): Sub-hypothesis 3 Testing

T. calculated	T. tabulated	T. Sig.	Result of H0
0.735	1.96	0 .463	accepted

Table (8) found that the calculated value (0.735) is less than tabulated value (1.96) and the significant "t" value (0.463), indicating that the null hypothesis will be accepted.

H04: There are no statistical significant differences between Careware"Conform with user expectation" in both hospitals.

Table (9): Sub-hypothesis 4 Testing

T. calculated	T. tabulated	T. Sig.	Result of H0
0.564	1.96	0.574	accepted

Table (9) point out that the calculated value (0.564) is less than tabulated value (1.96) and the significant "t" value (0.574), indicating that the null hypothesis will be accepted.

H05: There are no statistical significant differences between Careware "Error tolerant" in both hospitals.

Table (10): Sub-hypothesis H5 Testing

T. calculated	T. tabulated	T. Sig.	Result of H0
0.494	1.96	0.622	accepted

Table (10) revealed that the calculated value (0.494) is less than tabulated value (1.96) and the significant "t" value (0.622), indicating that the null hypothesis will be accepted.

H06: There are no statistical significant differences between Careware "Suitable for Individualization" in both hospitals.

Table (11): Sub-hypothesis 6 Testing

T. calculated	T. tabulated	T. Sig.	Result of Ho
0.498	1.96	0.619	accepted

Table (11) showed that the calculated value (0.498) is less than tabulated value (1.96) and the significant "t" value (0.619). So, the null hypothesis will be accepted

H07: There are no statistical significant differences between Careware "Suitable for learning" in both hospitals.

Table (12): Sub-hypothesis H7 Testing

T. calculated	T. tabulated	T. Sig.	Result of Ho
1.084	1.96	0.280	accepted

Table (12) concluded that the calculated value (1.084) is less than tabulated value (1.96) the significant "t" value (0.280). So, the null hypothesis will be accepted.

The Second Main Hypothesis:

H0: There are no statistical significant relationships between Careware usability and The Arab Center for heart and Special Surgery Hospital customers' satisfaction (patient) at ($\alpha \leq 0.05$).

Table (13): The second Main Hypothesis Testing

F. calculated	F. tabulated	R	R s	F. Sig.	Result of Ho
32.671	1.96	0.872	0.761	0.000	Rejected

ANOVA test was used to test the hypothesis and it found that calculated F (32.671) is greater than tabulated F. According to the decision rule: Accept H0 if calculated value is less than tabulated value and reject H0 if calculated value is greater than tabulated value. Therefore, the alternate hypotheis will be accepted. The value of correlation (R) = 0.872 means that there is a statistically significant positive relationship as the significance is (0.001). The value of correlation support the decision of rejecting the null hypothesis.

The Third Main Hypothesis:

H0: There are no statistical significant relationships between Careware usability and Al-Estiklal hospital customers' satisfaction (patient) at ($\alpha \leq 0.05$).

Table (14): The Third Main Hypothesis Testing

F. calculated	F. tabulated	R	R s	F. Sig.	Result of H0
37.468	1.96	0.886	0.785	.000	Rejected

ANOVA test was used to test the hypothesis and it found that calculated F (37.468) is greater than tabulated F. According to the decision rule: Accept H0 if calculated value is less than tabulated value and reject H0 if calculated value is greater than tabulated value. Therefore, the alternate hypotheis will be accepted. The value of correlation (R) = 0.886 means that there is a statistically significant positive relationship as the significance is (.001), indicating that the null hypothesis will be rejected.

Table (15): Pearson Correlation Matrix

	DV	IV	V1	V2	V3	V4	V5	V6	V7
DV	1								
IV	.717(**)	1							
V1	.385(**)	.264(**)	1						
V2	.638(**)	.679(**)	.214(**)	1					
V3	.598(**)	.589(**)	0.124	.527(**)	1				
V4	.523(**)	.557(**)	0.116	.491(**)	.470(**)	1			
V5	.665(**)	.646(**)	.212(**)	.369(**)	.420(**)	.339(**)	1		
V6	.424(**)	.405(**)	.163(*)	.256(**)	0.092	.299(**)	.309(**)	1	
V7	.419(**)	.289(**)	.212(**)	.210(**)	0.079	0.128	.243(**)	.412(**)	1

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Power of the model

Pearson correlation matrix was used to test the power of the model. Table (15) showed that the correlation coefiecient R= 0.717 between the independnts variables and the dependent one. Accordingly the value of the Variance Inflation Factor (VIF) was calculated utilizing the folloing formula:

$$VIF = \frac{1}{1-(0.717)^2} = \frac{1}{0.485911} = 2.06$$

As the value of VIF is less than 5, it could be safely said that the model used for this study is an appropriate one.

Results, Conclusions and Recommendations:

Results:

Based on analyzing the data and testing different hypothesis, the following results have been found:

First; there are no differences between Careware Usability in both hospitals. Most of the studies in Literature review specially Gediga (1999) ,Simon, (2010), Christoph & Bludau (2002), Mueller (2003), Rainer (2007) and Hamborg (2003) agreed on the important of evaluating the information system usability, so they used questionnaire IsoMetrics that is based on the international standard ISO 9241 Part 10. They found that the summative version of IsoMetrics shows a high reliability of its subscales and gathers valid information about differences in the usability of software systems. Hamborg (2003) and the researcher in this study found IsoMetrics was proven to be a reliable technique for software evaluation in the field of hospital information systems supporting usability of the software. This study differs with the previous studies by attending to test the effectiveness of the software usability on the customer (patient) satisfaction. Second; there are no differences between Careware "suitable for the task" in both hospitals. Third; there are no differences between Careware "Self descriptiveness" in both hospitals. Fourth; there are no differences between Careware "Controllability" in both hospitals. This result is supported by the finding of Davis (2009). Fifth; there are no differences between Careware "Conform with user expectation" in both hospitals. Sixth; there are no differences between Careware "Error tolerant" in both hospitals. Seventh; there are no differences between Careware "Suitable for Individualization" in both hospitals. Eighth; there are no differences between Careware "Suitable for learning" in both hospitals. Ninth; Careware usability has a statistical significance effect on customers satisfaction (patient) in both hospitals that agreed with Asheri (2006) study that the IT application has a positive effect on customer satisfaction.

Conclusions:

The study has arrived to the following conclusions:

- There are no differences between Careware usability in both hospitals; someone might say that's normal because the two hospitals are using the same software, but the fact is the hospital can customize the software according to the way it runs the business. Also, the study concluded that the two hospitals using Careware in similar way, they eliminate some windows already exists in Careware and they didn't involve the physicians and nurses in data entry and screens.

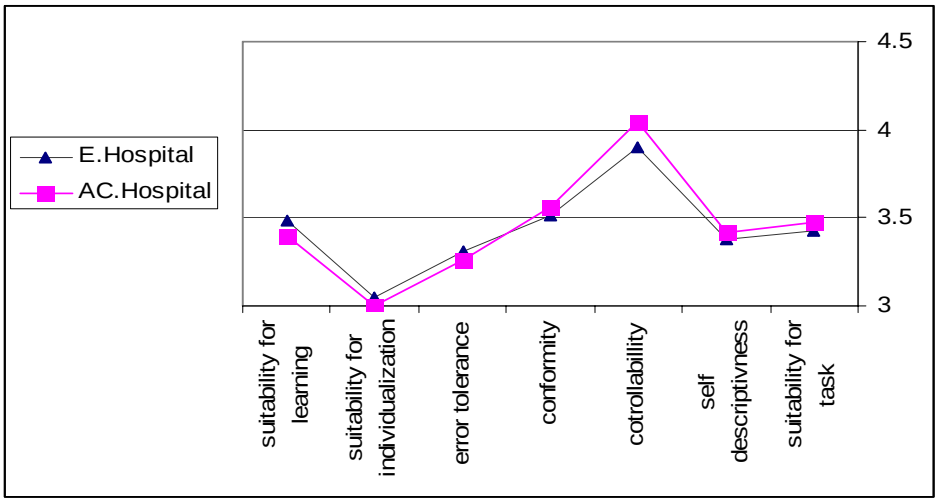

Figure (2): Careware Usability

Figure (2) revealed that AC.Hospital mean was greater than the E.Hospital mean in four points:

1. Suitable for the task.
2. Self-descriptiveness.
3. Controllability.
4. Conform to the user expectations.

- Careware usability has a positive effect on customer (patient) satisfaction in both hospitals that means the both hospitals take the right decision to use Careware.

Recommendations:

In the light of the above mentioned conclusions, the study introduces a number of recommendations to the hospitals information technology managers:

1. Using questionnaire IsoMetrics formative version during the implementation of software to illustrate the weak and strengthen points of the HIS.
2. Using questionnaire IsoMetrics summative version to evaluate the usability of software if it's already implemented.
3. Choosing the best software that covers all the requirement of well hospital operating system.
4. Considering the patient needs while implementing a HIS.
5. Considering the user needs while implementing a HIS.
6. Considering the hospital future expanding while implementing a HIS.

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تقييم استخدام نظام معلومات المستشفى ومدى فاعليته في تحقيق رضا العميل (المريض) استناداً إلى ISO 9241-10

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ملخـص

هدفت هذه الدراسة إلى بيان ما إذا كانت هنالك علاقة بين (Careware) كنظام للمعلومات في المستشفيات وبين رضا المرضى ، كذلك هدفت الدراسة إلى تحديد الفرق إن وجد عند تطبيق هذا النظام في المركز العربي للقلب، ومستشفى الاستقلال في المملكة الأردنية الهاشمية. تعد هذه الدراسة دراسة مقطيعية، حيث إن البيانات قد تم تجميعها من المستجيبين لمرة واحدة. لتحقيق هذه الأهداف تمت الاستعانة باستبانة ISOMetrics المستوحاة من ISO 9241-10 لتقييم أنظمة المعلومات. وتم تصميم استبانة أخرى لقياس رضا المرضى وذلك بالرجوع إلى الدراسات والمراجع السابقة. وزعت 380 استبانة على كلا المستشفيين سابقي الذكر واسترد منها 342 استبانة، إلا أنه تم إلغاء "22" استبانة لعدم صلاحيتها للتحليل . تم تحليل البيانات باستخدام (SPSS) version 20. وقد أثبتت النتائج وجود تأثير حقيقي لاستخدام أنظمة المعلومات في المستشفيات على رضا المرضى، وعدم وجود فروق حقيقية بين المستشفيين عند تطبيق النظام نفسه.

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