Usability Testing and Design of Social Networks Sites for Hospitals: Jordanian Hospitals as a Case Study

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Abstract: Usability is an important issue studied by many researchers and practitioners. Specifically, this research are interested in evaluating usability and designing of social networks which it is designed specially for hospital to be available for the stakeholders to share the knowledge. This paper aims to design and evaluate the usability of a Jordanian Medical Social Network (JMSN). In order to evaluate it, we designed a prototype based on the Extended TPB (ETPB). The study has conducted a survey with the stakeholders in the Jordanian hospitals, to get their viewpoints about the performance of the prototype using Usability and User Experience (USE) method. Therefore, the questionnaire was send to 172 of the workers in the various sectors in Jordanian hospitals after they use the prototype; we have analyzed the results, which showed that the prototype that has been designed to the study is usable. Most of respondents agree that the social network was easy to use, easy to learn, useful and satisfied.

Key words: Knowledge sharing · Social Networks · ETPB · Jordanian hospitals · Knowledge Sharing Behaviour

INTRODUCTION

The social networks have become a significant aspect for stakeholders in the hospitals to provide a communication channel to share knowledge. Social networks currently are regarded as the best means to create and share knowledge among communities of practice in healthcare organizations [1]. Social network sites enable people to connect with each other, online irrespective of global frontiers [2]. Likewise, Mostaghimi and Crotty [3] have said that, the increase of using social networks have brought the world into a single window. Savalle *et al.*, [4] have argued that this shrinking of world leads to the emergence of a new sort of organization.

The exchange of expertise and knowledge might enhance the knowledge management in the organizations; this will result in producing desired results. Accordingly and as a result of the significance of knowledge sharing behaviour, it is essential to recognize the factors, which improve knowledge sharing among people by social networks. Moreover, the design, usability and functionality of the social networks are critical if the stakeholders are continuing providing essential knowledge to their colleagues in a timely and efficient manner.

This research employs a prototyping technique to reflect the factors which are building the proposed model (Extended TPB) in order to measure the effects on knowledge sharing among stakeholders in Jordanian hospitals. Figure 1 shown in Extended TPB.

Prototype: Recently, the use of prototype has been increased for various purposes [6]. It has been used for different reasons; it offers an effective and beneficial way to present the ideas; so it simplifies the understanding of ideas between the people. Moreover, it's important because it is a way to discuss the issues that affect the design [7].

The prototyping system life cycle (PSLC) is a conceptual framework for prototypes [8]. The prototyping cycle consist of six stages as shown in Figure 2:

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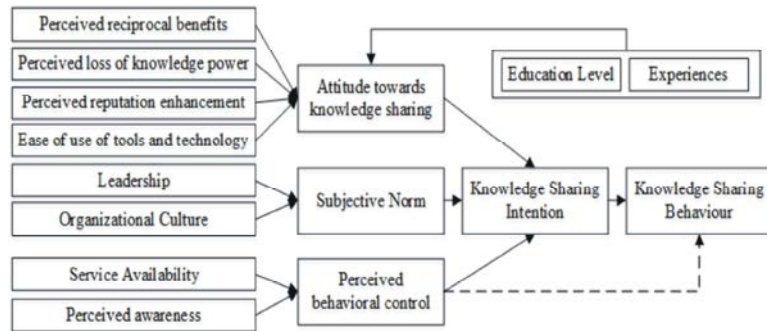Universiti Tenaga Nasional, 43000 Kajang, Selangor, Malaysia.

Fig. 1: Extended Theory of Planning Behaviour (ETPB)
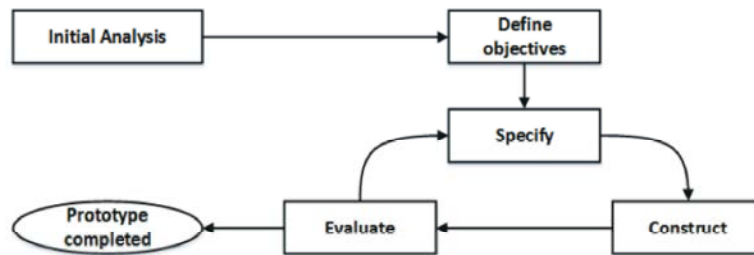Source: (Alhalhouli *et al*. [5])

Fig. 2: Prototyping System Life Cycle (PSLC)
Source: (Bennett *et al*. [7])

This study adopted the PSLC framework to design the prototype interface to reflect the factors of model and to achieve the user satisfaction.

Evaluation Paradigms: Preece *et al*. [9] identified four evaluation methods: (1) 'quick and dirty' evaluations, (2) system usability testing, (3) field studies and (4) predictive evaluation. This research selects system usability testing to measure the user's satisfaction on prepared tasks for which the system was typically designed. In other words, it is a process employed to identify the problems that the user may face while using the system.

The study used USE to measure the usability according to the comparative study conducted by Alva *et al*. [10] between five types of questionnaires used to assessing the usability of website, in which they compare the MUSiC, MAGICA, WAMMI, USE, IsoMetrics and QEM. The results show that one of the simplest questionnaires studied, the USE (with 30 rating scales), yielded among the most reliable results across sample sizes. It is also interesting that the USE is more important when the study measure the performance of users.

The USE is uncomplicated, 30-item scale divided into four dimensions (usefulness, ease of use, ease of learning and satisfaction) which offers an overall view of objective assessments of usability. The USE is a Likert scale. Generally, it is thought that a Likert scale is based on multiple choice questions, where a statement is made and the respondents then indicate their agreement or disagreement degree with the statement on a five (or seven)-point scale. Nevertheless, the construction of a Likert scale is more delicate than this suggests. Even though Likert scales are presented in this format, the statements with which the respondent indicates agreement and disagreement have to be meticulously determined [11].

Model Mapping: The development of a prototype is considered as another test of the proposed research model (ETPB) as the prototype will undergo validation of user satisfaction. In addition, the prototype is considered as a guide for Jordanian hospitals to develop fully integrated social networks in the future. This research has employed a low-fidelity prototype to reflect and studies the proposed model through uploading the prototype of the JMSN to be online and available for use by the stakeholders in the Jordanian hospitals. Table 1 shows that the prototype designing principles where based on the conceptual model factors.

Table 1: Prototype designing principles according to the model factors

Factors	Prototype designing Principles	Source
Perceived reciprocal benefits	- Provide a request methods of knowledge from co-workers	
	- Provide different ways to answer the co-workers requests	[12]
Perceived loss of knowledge power	- Providing the means to save the ownership of knowledge and experience	[12]
Perceived reputation enhancement	- Provide specific instruments to enhance the reputation for the participant.	
	- Provide a notification way to notify the participant about the new Feeds	
	- Provides a valuable service	[12]
Ease of use of tools and technology	- Easy to use	
	- Provides a valuable service	[13], [14]
Leadership	- Organize the groups and the roles of groups	
	- The availability of all services such as login checking, registration, posting, privacy, contact information, security and other services	[12] [15]
Organizational Culture	- Organize the hierarchical for stakeholders	
	- Delineate the roles for the stakeholders	
	- Delineate the channels to share the knowledge	[12], [16], [17]
Service Availability	- Provide several ways for users to connect, interact, post and share contents while on the go (Mobile)	[12]
Perceived awareness	- Quality of awareness input	[18], [19], [20]
	- Organize the awareness on a limited interface	
	- Provides necessary information for awareness	
	- Ensure the broadcasting of awareness	
Education	- Easy to use and easy to understand for people with different education levels	
	- Provide different ways for each operation if possible	[21]
Experiences	- Provide valuable services, knowledge and experiences	
	- Ease of use and the effect of the subjective norms on intentions will be higher for less experienced users because they are more easily influenced, therefore designers must focus on ease of use to acquire more clients.	[22], [23], [24]

The process of prototype building is based on the conceptual model, which is includes 14 of hypotheses [5]. Furthermore, the prototype is designed with the aim of evaluate the conceptual model theoretically after using prototype from the stakeholders for a period of time.

Social Network Prototype for Hospitals: The main objective from the designing of user interface is to visualize the demographic and behavioural factors. Design of interface affects the demographic and behavioural factors [6, 12, 13, 15, 20, 21, 22 and 24]. To investigate from the effects of the factors on the stakeholders to enhance the readiness for knowledge sharing using social networks in Jordanian hospitals, a prototype has been developed.

The social network prototype for hospitals is designed according to the design guidelines of Kärkkäinen & Laarni (2002) [25] and Crumlish *et al*. [12]. The proposed prototype is therefore designed to reflect the following characteristics:

Perceived Reciprocal Benefits: According to Crumlish *et al*. [12], for the interface it is important to focus on the ways to reply and request of knowledge to/from co-workers, the researcher explain it is better to

design several ways to help the user to perform the tasks and be sure that the user can do it in minimal clicks. Here, there is six methods can be used by user to finish his task without any effort and with least number of clicks (such as: Direct chat, Shoutbox (group chat), Mail, Status, Comment and Friends) as shown in Figure 3.

Perceived Loss of Knowledge Power: There are several techniques that users can use which leads to encourage them to share the knowledge. Firstly, prevent unauthorized user from using the social network site until registration/sign in process; secondly, give the user the required permissions according to user level and type; thirdly, give the users the ability to establish his/her own pages with controls capability; fourthly, display all information about the publishers and beneficiaries from knowledge; and finally, give the user full control to determine the setting for their posts (such as video, photos, pages, polls, status, … ets.) [12]. Figure 4 illustrated one of the methods that push users to share the knowledge using social networks.

Perceived Reputation Enhancement: According to Crumlish *et al*. [12], during interface design it's important to focus on some web control (e.g. user ratting) that show
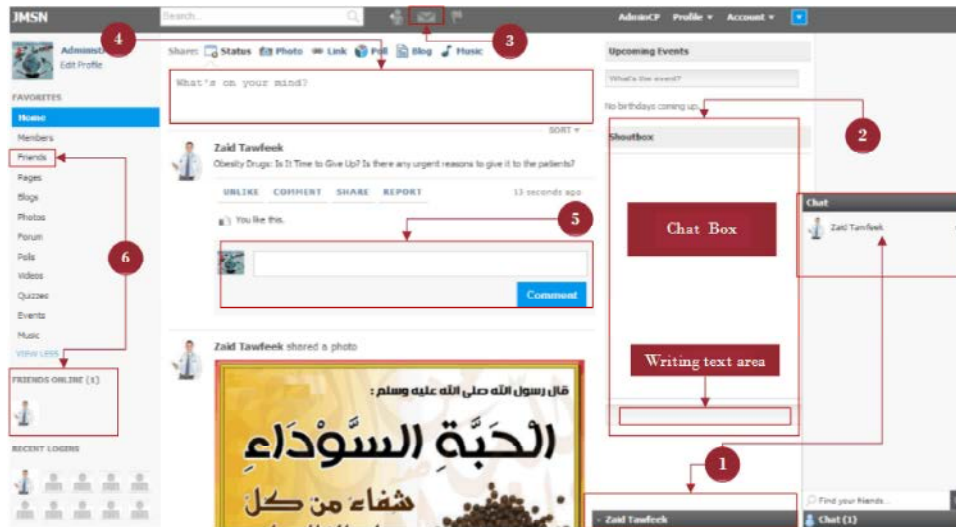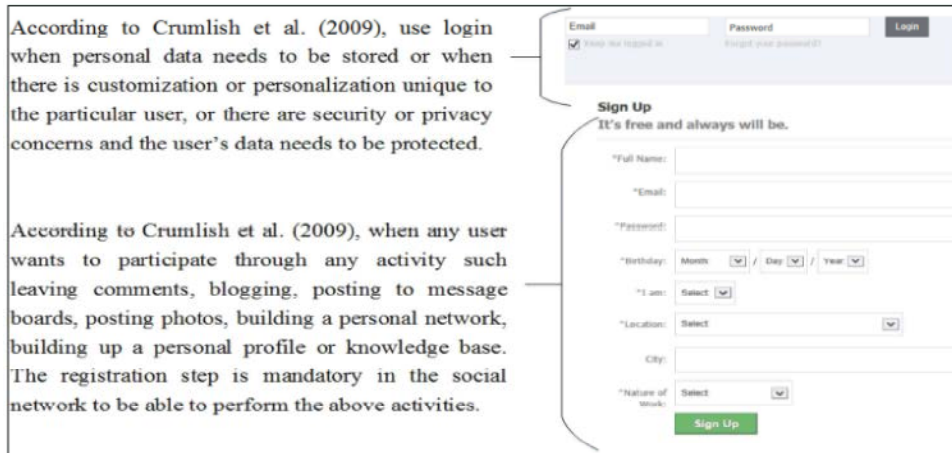
Fig. 3: Users Methods to Ask Questions and Answers

According to Crumlish et al. (2009), use login when personal data needs to be stored or when there is customization or personalization unique to the particular user, or there are security or privacy concerns and the user's data needs to be protected.

According to Crumlish et al. (2009), when any user wants to participate through any activity such leaving comments, blogging, posting to message boards, posting photos, building a personal network, building up a personal profile or knowledge base. The registration step is mandatory in the social network to be able to perform the above activities.

Fig. 4: Users Registration and Login

According to Crumlish et al. (2009), the participant use user rating when the user wants to leave an opinion quickly. from this instroment the profile owner can take an idea about the participants opinion of his knowledge and experiences.
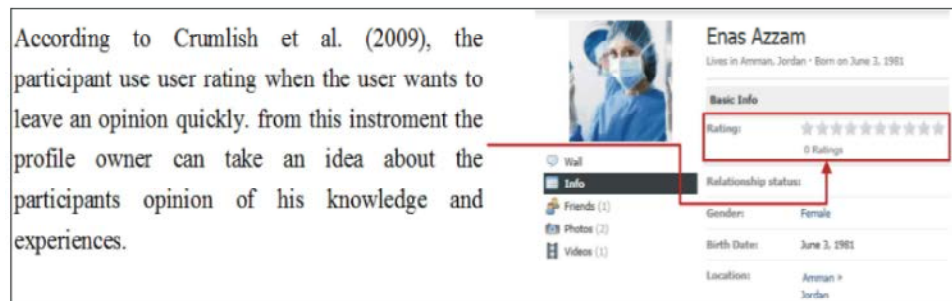
Fig. 5: Profile Rating

the interest rate which gained from the posted knowledge and experiences. In parallel, by showing the expertise to others, participants gained recognition and respect resulting in improved self-concept [26, 27]. Figure 5 shows one of the required web controls to enhance the reputation.

Ease of Use of Tools and Technology: This is defined by Davis [14] as the degree, to which a person believes that using a particular system would be free of effort. In the design process in this research the aim is to make the prototype easy to use, easy to learn and easy to understand by employing a navigation bar in the

1. In the design process in this research the aim is to make prototype easy to use, easy to learn and easy to understand for the stakeholders in the hospitals. So this prototype applies the navigation bar, dropdown menu and icons in interface design to facilitate the usage of social network site.

2. The graphical element in the interface should not be too large. the services for social networks have to be well focused and well organized.

3. Use of icons in the social networks sites. the dropdown menu also have been used.

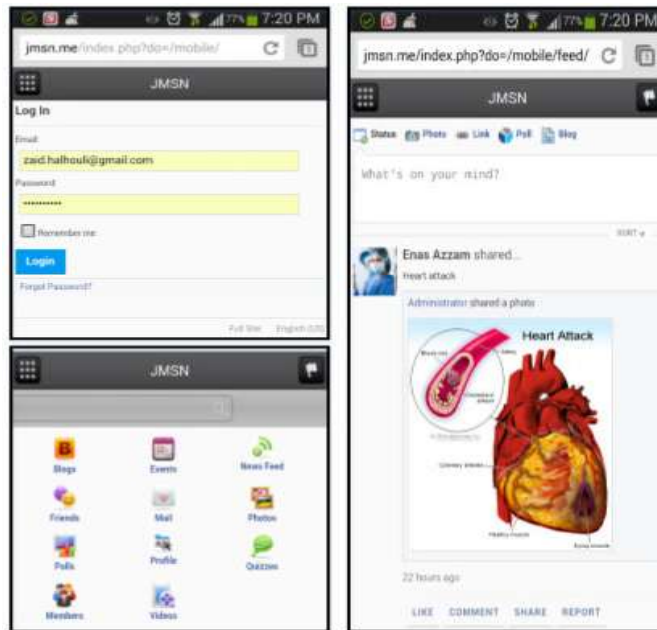
Fig. 6: Profile Page with Different Options

Fig. 7: Mobile Interface

prototype; the use of icons avoids linking for navigation. The dropdown menu, icons and navigation bar are also illustrated in Figure 6.

Leadership and Organizational Culture: The studies of Lee *et al*. [28] and Srivastava *et al*. [29] suggests that leadership plays a key role in promoting and cultivating knowledge sharing behaviour. There are a set of roles performed by leaders such as organizing, envisioning, spanning, knowledge building and social maintenance [15]. According to the Crumlish *et al*. [12] there is strong relation between the leadership and the implementation of the roles in organizational culture, which it is reflected in the interface design. A study conducted by McDermott

and O'Dell (2001) [30] confirmed that there is a levels in the organization and these levels need an organizer to draw the relations between the workers to divide roles and to determine the tasks.

Service Availability: Service availability means the availability of service on different types of devices such as: desktop computers, laptops and Smartphone to use the service at any time any where [12, 31]. Figure 7 illustrates the mobile interface and features.

Perceived Awareness: There is a low in the awareness about the value of benefits that participants can be acquired by knowledge sharing [32]. According to

Table 2: Reliability Testing of the Measurement Scales for the Usability

Variables (groups)	N of items	Cronbach's Alpha
Usefulness	8	0.847
Ease of Use	11	0.906
Ease of Learning	4	0.889
Satisfaction	7	0.921

Table 3: Mean for System Usability Scale (USE) Questions

Variables (groups)	Mean	Std. Deviation	Std. Error Mean
Usefulness	5.7028	.83762	.06387
Ease of Use	5.8340	.78026	.05949
Ease of Learning	5.9782	.85833	.06545
Satisfaction	6.2674	.94212	.07184

Kohlhammer & Zeltzer (2004) [18] it is necessary to specify and organize the awareness methods when designing the interface. Besides, several studies focused on the awareness broadcasting through different methods to make sure that awareness messages was delivered to all participants [19, 20].

Usability Analysis and Results: For the test of prototype, the questionnaires were distributed to 172 persons, whom used the JMSN prototype, to get their opinions about the developed prototype. The sample was selected from the main sample used for the main survey.

This evaluation helps to explore users' attitudes towards the JMSN prototype. The researcher asked the respondents to use and explore the prototype. Moreover, the researcher provided a user tasks to respondents to guide them what to do with the prototype and to insure that all of participants are familiar with the prototype.

Users' perceptions of the JMSN were examined by the perception survey to find out the prototype usability which is designed for this study. First of all, to confirm the assumption of equal variances for the scores, Levene's statistics were examined. The variance equivalence test for each group was confirmed in "easy to use" ($p < 0.05$), "easy to learn" ($p < 0.05$), "satisfaction" ($p < 0.05$) and "usefulness" ($p < 0.05$). The second step now is to measure the reliability test for each group separately. The results confirmed that all the scales met the required Cronbach's alpha (0.70 and above) therefore test showed that the results are reliable [33, 34] as shown in Table 2.

The analysis result of the respondents provides a good insight about the opinions and provides a positive feedback about the prototype. The survey results are shown in Table 3.

According to the survey results, it's evident that the prototype which designed to the study is usable. Most of respondents agree that the JMSN was easy to use, easy to learn, useful and satisfied, because the mean value for all variables greater than 5.7 as shown in Table 3.

CONCLUSION

This paper presents two main contributions. The first one the JMSN, employed to help stakeholders in the hospitals to share knowledge through using the social networks that are accessed via using personal computers or Smartphone's. The second contribution, provide a suitable method for the usability test, which used to measure the range of the users' satisfaction of the tool.

This study has discussed the major issues related to the design of a social network site for the hospitals (JMSN). Furthermore, it has also discussed the prototype evaluation methods and the validation process. In this respect, the USE has proved to be a valuable evaluation tool, as it is robust and reliable. The USE is freely available for assessing usability and has been used for a variety of research projects and industrial evaluations.

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