UNDERSTANDING AND ADDRESSING THE 'FIT' BETWEEN USER, TECHNOLOGY AND ORGANIZATION IN EVALUATING USER ACCEPTANCE OF HEALTHCARE TECHNOLOGY

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Keywords: Evaluation study, Evaluation dimension, Importance of 'Fit' between user,Technology and organization, Examples of good 'Fit' and poor 'Fit'.

Abstract: In this paper, we discuss the importance of addressing the 'fit' between user, technology and organization in evaluating user acceptance of healthcare technology. We give an overview of evaluation dimensions and explore two models that are related to 'fit'. We demonstrate how users' acceptance factors in previous studies could be better explained through the perspective of 'fit' between user, technology and organization. We believe that the importance of 'fit' needs to be understood in greater detail among the evaluation research community. The 'fit' between user, technology, and organization needs to be addressed together with the factors that influence user acceptance. This paper attempts to gain empirical support for the inclusion of 'fit' between user, technology and organization when evaluating user acceptance of the healthcare technology.

1 INTRODUCTION

Evaluation of the impact, effect and acceptance of healthcare technology has greatly developed over recent years and has led to a huge number of methodological and practical publications (Randell and Dowding, 2010; Schaper and Pervan, 2007; May et al., 2000). Given the important role that healthcare technology has on the delivery of quality services, it is important that the acceptance of technology by healthcare professionals is evaluated, to ensure it fulfils the needs and purpose of the implementation (Bowns et al., 1999; Bleich and Slack, 2010; Bossen, 2007). Decision makers often believe technology will bring benefits to the organization as a whole and to the patients, in particular, and that it should be fully embraced. However, in some cases the implementations does fail (Southon et al., 1999; Vishwanath and Scamurra, 2007). In some other cases, the same systems implemented in two different settings resulted in two different outcomes, where in one setting it was widely accepted and in another setting it was rejected by the users (Travers and M.Downs, 2000; Gremy et al., 1999). This is an interesting scenario to be investigated, particularly the reasons for such differences in outcomes. To understand user acceptance of healthcare technology, we need to understand not only what are the factors influence acceptance but also how well these factors 'fit' together. Although, a number of publications have discussed the issue of 'fit' within their evaluation studies, this is insufficient because importance of 'fit' with the organization needs to be explored in greater detail, together with user and technology, in order to better understand issues surrounding healthcare technology implementation. Thus, there is a strong current need to understand, address and gain empirical support for the 'fit' *factor* when evaluating user acceptance of healthcare technology.

2 EVALUATION DIMENSION: USER, ORGANIZATION, TECHNOLOGY

Information systems are embedded within social systems in which different people and environments interact with each other. In order to evaluate user acceptance issues, we need to evaluate three 'players' which could influence users' acceptance factors. These are the user, the organization and the tech-

Azizah K. S-Mohamadali N. and M. Garibaldi J..
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DOI: 10.5220/0003696901190124
In *Proceedings of the International Conference on Health Informatics* (HEALTHINF-2012), pages 119-124
ISBN: 978-989-8425-88-1
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nology itself. According to (Despont-Gros et al., 2005), evaluation frameworks need to incorporate five common features, which are (a) user characteristics, (b) Clinical Information Systems (CIS), (c) process characteristics, (d) environment characteristics, and (e) impact. In our opinion, process characteristics are the result of interactions between user, technology and the environment in which the technology is used. Impact is also the result of interaction between these three players. All these five features could be explained from the perspective of the user, technology and organization 'fit'. Furthermore, as stated by (Chau and Hu, 2002), technology acceptance has three dimensions; characteristics of the individual, characteristics of the technology and characteristics of organizational context. Several other evaluation frameworks also categorises factors that influence user acceptance of the technology under these three broad dimensions which are user, organization and technology (Schaper and Pervan, 2007; Yusof et al., 2008; Lorenzi, 1999). Therefore, when evaluating user acceptance issues these three players all need to be evaluated together to understand how well they 'fit' together. It is important to understand that together with factors which influence user acceptance, the present or absence of 'fit' between user, technology and organization also will have an impact on user acceptance.

3 'FIT' RELATED MODEL

In this section, we are going to illustrate briefly two models that discuss the 'fit' or equivalents to a 'fit' factor. The first is the task-technology model by (Goodhue, 1995) and the second is the 'design-reality gap model' by (Heeks, 2006).

3.1 Task-Technology Model

One area constantly received attention among IS researchers when considering technology acceptance issues is 'fit' which is based on the Task-technology Fit model (TTF). TTF holds that information technology is more likely to have a positive impact on its individual performance and be used if the capabilities of the technology match the tasks that the user must perform. As (Goodhue et al., 2000) writes, "performance impacts are dependent upon the 'fit' between three constructs: technology characteristics, task requirements and individuals' abilities". This model focuses on the degree to which systems' technology characteristics match users' task needs, hence the name 'task-technology' model. According to this model, the higher the fit between tasks and technology, the better is the performance. (Bleich and Slack, 2010) demonstrates the importance of 'fit' between user and technology in their article. As stated, "the key enthusiastic acceptance of electronic medical records is computing that is easy to use and helpful to doctors and other clinicians in the care of their patients". Management needs to understand that introduction of any new systems have to match with the skills of the users. In our opinion, the TTF model has a limitation. TTF model focuses and discusses only the 'fit' between user and task, and between task and technology. It does not explicitly consider the importance of the fit between user and organization, nor between technology and organization. TTF needs to incorporate the organization factor into its dimension to better understand user acceptance issues.

3.2 Design-reality Gap Model

Another model which introduces almost similar concepts as TTF Model is called the 'design-reality gap' model, commonly known as ITPOSMO (Heeks, 2006). The ITPOSMO model suggests that success or failure of new health information systems depends on the existence of the gap between reality and design conception of health information systems. The larger is the gap between the design of the system and the reality of the system when it is operational, the higher is the chance of system implementation failure. This concept is very similar to the concept proposed by TTF model. The distinction would be, however, that TTF discusses the issue of acceptance from a 'fit' perspective, while ITPOSMO discuss it from a 'gap' perspective. Furthermore, the ITPOSMO model presents more dimensions of evaluation than the TTF model itself. The model introduces seven evaluation dimensions which include information (data stores, data flow), technology (both hardware and software), process (the activities of user and others), objectives and values, staffing and skills, management systems and structures and other resources (particularly time and money). We believe this model could be improved with the inclusion of an organization factor into its evaluation dimensions.

4 THE FIT BETWEEN USER, TECHNOLOGY AND ORGANIZATION

As described earlier, to evaluate user acceptance issues, all three (user, technology and organization)

need to be evaluated together to examine how well they 'fit' together. The 'fit' will have an influence on the users' acceptance factor. The higher is the 'fit' between user, technology and organization, the higher will be its influence on those factors related to user acceptance.

The success or failure of information systems depends largely on the 'fit' between these three players. A concept of 'fit' is essential to understand implementation issues within the organization's current setting. A user with certain IT skills is not a sufficient requirement for the use or acceptance of a new system but rather their skills must match with the requirement of the system itself. This demonstrate the needs of 'fit' between user and technology. And if the user does not have the necessary skills to use the system, management is responsible to provide necessary training to ensure technology is accepted and used accordingly. If the 'fit' between user and technology is low, it will eventually result in the rejection of the system (Tsiknakis and Kouroubali, 2008).

Selection of new information systems needs to support both objectives and strategies of the organization. Any new system needs to be aligned with the current settings and social organization it was meant to support. This indicates the need of 'fit' between technology and organization. Kaplan and Shaw's recommendations for IT evaluation highlight the following, "Evaluation needs to address more than how well a system works. Evaluation also needs to address how well a system works with particular users in a particular setting and further why it works that way there, and what works itself means" (Kaplan and Shaw, 2004) (pg. 220). This clearly shows the need to evaluate technology along with the organization, as well as the people using it, i.e. the 'fit' along with factors that influence acceptance.

Another example which demonstrates the 'fit' between user, technology and organization is in work by (Bossen, 2007). The author conducted a three month case study on the daily use of a computerized problem-oriented medical records (CPOMR) at a university hospital in a county in Denmark. The findings show that the use of systems led to more time spent in documenting clinical work. This was due to the fragmentation of a patient situation into separate problems, and that the system also could not provide an overview of patient records when needed. Although the system is useful for patients with few and simple problems, it is not useful for patients who were admitted for longer periods of time. The prototype system was concluded as not supporting daily clinical practice. This is an example of absence or poor 'fit' between user and technology. This example clearly shows the presence of poor 'fit' between user and technology.

As the above examples suggest, many of the existing studies on user acceptance could be better explained from a 'fit' perspective. Previous studies have mainly identified those factors which influence user acceptance (Martens et al., 2008; Meade et al., 2009; Chau and Hu, 2002). We believe it is insufficient to understand the reasons for different acceptances of the same system. In evaluating user acceptance issue, researchers need to evaluate not only factor which influence user acceptance but also to evaluate the 'fit' between user, technology and organization. For example, a number of studies have identified for example 'ease of use' as one user acceptance factor (Tsiknakis and Kouroubali, 2008; Schaper and Pervan, 2007). However, when we evaluate acceptance of this 'ease of use' factor on its own, we cannot provide answers as to why the same system is accepted in one setting and rejected in another setting. This factor, 'ease of use', is basically dependent on the 'fit' *factor* . Users who accept the system may have the necessary skills and knowledge to use the system which means there is a good 'fit' between user and technology. And user who rejects the system may not have the skills and knowledge needed to use the system, which is an absence of 'fit'. This clearly illustrates that identifying 'ease of use' as the sole factor to influence user acceptance is inadequate. It has to be incorporated with a 'fit' factor.

From literature, we have identified various user acceptance factors. These factors, we believe, could be better explained from a 'fit' perspective to better understand user acceptance issues. The factors are also divided between good 'fit' or poor 'fit'. Table 1 provides some examples of user acceptances' factor which could be categorized as good 'fit'. Table 2 demonstrate examples of user acceptance factor which could be categorized as poor 'fit'.

5 CONCLUSIONS AND FUTURE WORK

This paper aims at providing an understanding of addressing the 'fit' between user, technology and organization factors when evaluating user acceptance issue. To better understand issues on user acceptance of healthcare technology, evaluation frameworks need to incorporate 'fit' factor together with user acceptance factors. 'Fit' between user, technology and organization could serve as a determinant of those factors that influence user acceptance. By understanding 'fit' between these three players, we may understand why

Table 1: Categorizing user acceptances' factor as examples of Good 'Fit'.

Factor(s)	Reference(s)
System benefited user and/or patient	(Travers and M.Downs, 2000; Bleich and Slack, 2010; Randell and Dowding, 2010)
Time spend is less on clinical related work	(Lee et al., 2008)
User have computer experience/ knowledge/ skills	(Folz-Murphy et al., 1998; Ammenwerth et al., 2006; Lee et al., 2008)
Organization provides training and accommodate team requirement	(Lorenzi and Riley, 2003; Bowns et al., 1999; Aggelidis and Chatzoglou, 2009; Meade et al., 2009)
System provides sufficient speed to accomplish jobs	(Folz-Murphy et al., 1998; Martens et al., 2008; Ash et al., 2000)
Systems is ease to use and useful	(Dishaw and Strong, 1999; Carayon et al., 2010; Yen et al., 2010; Chang, 2010)
User gets support from top management/managerial commitment	(Travers and M.Downs, 2000; Yusof et al., 2008; Tsiknakis and Kouroubali, 2008)
Organization promotes team spirit/ team-work	(Travers and M.Downs, 2000; George R. Harper and Dawn R. Utley, 2001; Bowns et al., 1999)
Management provides supportive working environment and in-house technical support	(Randell and Dowding, 2010)
Management provides right technology which meets the requirements of the job	(Folz-Murphy et al., 1998)
Technology is designed for all level of users	(Carayon et al., 2010)
Good help desk support by vendor/technical support/administrative support	(Martens et al., 2008; Aggelidis and Chatzoglou, 2009)

Table 2: Categorizing user acceptances' factor as examples of Poor 'Fit'.

Factor(s)	Reference(s)
System negatively impacted staffs' work flow	(Travers and M.Downs, 2000; Bleich and Slack, 2010; Randell and Dowding, 2010)
System's problem such as content, computer generated forms, hardware and interface	(Lee et al., 2008)
System did not meet user's practice requirement	(Folz-Murphy et al., 1998)
Poorly designed system which increases workload/paperwork	(Bossen, 2007; Meade et al., 2009; Lammintakanen et al., 2010)
Information systems which is not ready to be used and does not support management.	(Ellis and May, 1999; Lammintakanen et al., 2010)
Lack of standardized terminologies which clinicians used to work with	(Tsiknakis and Kouroubali, 2008)
User who has less/insufficient experience with technology, limited skills to use the systems	(Bossen, 2007; Short et al., 2004)
Technology that does not meet clinical needs or match with work flow	(George R. Harper and Dawn R. Utley, 2001)
Lack of internal IT support	(Tsiknakis and Kouroubali, 2008; Vishwanath and Scamurra, 2007)
Lack of coordination at operational level	(Lammintakanen et al., 2010)
Insufficient training	(Lee et al., 2008)
Organization does not provides training or educational program to the user	(Vishwanath and Scamurra, 2007)
Insufficient number of computer, printer problems, system downtime, system breakdown	(Lee et al., 2008)
Mismatch or misalignment between facilities and social organization it meant to support	(Southon et al., 1999)
Interaction problem between new system and existing system - complex, time consuming, susceptible for error	(Heeks, 2006; Jr. et al., 2010)
Prototype lacking in functionality or usability	(Bossen, 2007)
Technical problems/multiple updates to the information systems/operating system	(Martens et al., 2008; Lorenzi and Riley, 2003; Carayon et al., 2010)

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the same system implemented in two different setting results in two different outcome. Most of the previous studies only identify those acceptance factors, but these factors could not stand on their own. The present or absence of user acceptance factors depend on the 'fit' function. In this paper, we have argued for the importance of understanding and addressing the 'fit' between user, technology and organization in evaluation studies. The 'fit' between user, technology and organization could serve as a function of those factors that may influence user acceptance of the technology. We believe 'fit' is an essential element to understand user acceptance issues. This paper provides some fundamental basics of 'fit', sufficient for researchers to consider the inclusion of 'fit' factor within user acceptance factors. We believe 'fit' should be addressed in all future evaluation studies.

In future, we are going to validate our proposed model of user acceptance of healthcare technology. The model has incorporated a 'fit' function which serves as a core determinant of the factors that influence users' intention to use technology. A case study of the intention of medical students to use medically related software in their work practice will be conducted to test the applicability of our proposed model. All the items measured in the questionnaire will be based on the proposed model.

ACKNOWLEDGMENTS

Noor Azizah KS Mohamadali would like to gratefully acknowledge the funding received from both the Public Service Department of Malaysia and the International Islamic University of Malaysia (IIUM) that is helping to sponsor this research.

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