Evaluating User Satisfaction and Organisational Benefits of Electronic Medication Management System in an Australian Hospital

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Abstract

Evaluating technology acceptance is often applied to voluntary systems. However, workflow systems used in healthcare settings are mainly mandatory systems. Given the differences, we re-consider the outcome measures to model intention to use and usage to cater for the mandatory nature of the healthcare information systems. The new perspective would allow us to adjust our measures to model technology acceptance in the form of benefits. In this research, we utilised the Unified Theory of Acceptance and Use of Technology (UTAUT) including four constructs of that lead to an intermediate variable, user satisfaction, with an ultimate outcome variable of organisational benefits. The research model was evaluated using survey data from 202 users of an electronic medication management system in an Australian hospital. The results indicated that performance expectancy, effort expectancy, social

influence, and facilitating conditions have led to increased user satisfaction. Furthermore, user satisfaction has led to increased organisational benefits.

Keywords electronic medication management system, UTAUT, technology acceptance, user satisfaction, organisational benefit, mandatory system

1 Introduction

Developments in Information Technology (IT) have a significant influence on many areas of our daily life. One of the main application areas of IT is the health domain, which has some different features from other application fields of IT. In the domain of evidence-based healthcare, it requires more rigorous and robust evaluation of the technologies. Therefore, some health technology evaluation frameworks (e.g. reference) have been developed e specifically for health organisations like hospitals. However, many robust evaluation frameworks for technologies in the health domain are mainly suitable and used for medical devices and drugs (Phillips et al, 2017). For evaluating of health information systems, general information systems evaluation frameworks such as Technology Acceptance Model (TAM; Davis, 1989; Davis et al., 1989) would require re-evaluation for mandatory health information systems as those models are based on the voluntary and individual use of information systems.

In addition, the goal of using technology acceptance models is to evaluate whether a technology is well accepted or not by an individual user, which does not present further outcomes or impacts of the acceptance such as organisational benefits. To further address the issue relating to benefits realisation, this paper tries to integrate existing TAM frameworks, (Davis, 1989; Davis et al., 1989), Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh et al., 2003), and Information Systems (IS) Success Model (Delone & Mclean, 1992), and present a refined model and apply it to a mandatory health information system setting. We present our model and analysis based on an implementation of an electronic medication management system (eMeds) in an Australian hospital.

Australia had 698 public hospitals nationwide in 2014-2015, which are primarily owned and managed by the state and territory governments (AIHW, 2016). NSW (New South Wales) Government is providing integrated care programs to improve the quality of patient care and the health outcomes with the eHealth Strategy for NSW Health: 2016-2026. As a part of the digital health roadmap, the systematic roll-out of eMeds (an Electronic Medication Management System) in hospitals is an important strategy to support the improved quality, safety and effectiveness of medication management in NSW hospitals. Our research goal is to apply existing technology acceptance model to evaluate the acceptance of eMeds in an Australian hospital. The refinements and modifications of the constructs would improve our understanding for future health technology implementations. The rest of this paper has been organised into the following eight sections: related work, hypothesis, research methodology, hypothesis testing, discussion, contribution, limitations and future research, and conclusion.

2 Related work

There are many seminal information systems evaluation frameworks such as TAM (Davis, 1989; Davis et al., 1989), Task-Technology Fit model (Goodhue & Thompson, 1995), and IS success model (Delone & Mclean, 1992). These frameworks were not developed with the same purposes or perspectives, so the focuses and outcomes of these frameworks are very different from each other. Davis's TAM (1989) is a user-oriented model which provides measurement scales for predicting user acceptance of information technology. Whereas IS Success model (Delone & Mclean, 1992) presents some critical factors of IS success and tries to see the impacts of these factors as the indicators of IS success. Additionally, Task-Technology Fit model (Goodhue & Thompson, 1995) focuses on perceived performance impacts as an outcome and proposes user evaluation of fit between task and technology characteristics as the determinants.

Delone & Mclean's IS Success Model (1992) is originally composed of success factors such as system quality and information quality, which influence use, user satisfaction, and individual impacts, and presents organisational impacts as an ultimate outcome. This model has been updated and extended by the authors (Delone & Mclean, 2003) and some other researchers (Pitt et al., 1995; Petter and McLean, 2009) with an addition of service quality as another success factor and applied in evaluation of various kinds of information systems. Delone & McLean (2003) suggested net benefits as an ultimate outcome, which can include all the "impact" measures such as individual impacts, organisational impacts, consumer impacts, and so on. Goodhue & Thompson (1995)'s outcome is individual impacts on their effectiveness, productivity, and performance, which can belong to Delone & McLean (2003)'s net benefits.

A big difference between TAM (Davis, 1989; Davis et al., 1989) and other two models is that TAM focuses on the acceptance of technology, intention to use and actual use, whereas other two models focus on distal outcomes after using information systems such as individual and organisational benefits. It is important and necessary to integrate and link these frameworks under a common logical structure with a common linking pin. In order to do this, we need to have a further look at TAM. TAM has been a widely

used general information systems evaluation framework, which influences many evaluation frameworks of health information systems (Yu et al., 2016).This TAM was extended as TAM2 (Venkatesh and Davis, 2000) and further as UTAUT (Venkatesh et al., 2003). TAM emphasized human factors and user's perspective, but this model provided a simplified analysis tool which mostly focused on user and technological factor (Yu et al., 2016). TAM is known as it's two major constructs affecting IT acceptance, which are perceived usefulness and perceive ease of use (Davis, 1989; Davis et al., 1989). These two major constructs in TAM have been modified to similar meaning constructs in UTAUT, which are effort expectancy and performance expectancy respectively (Venkatesh et al., 2003). Furthermore, UTAUT has more constructs such as facilitating conditions and social influences, which are derived from other existing theories and literature.

The construct performance expectancy is the degree to which users feel that the system is useful, which means the degree to which users think that this system helps their work and performance (Venkatesh et al., 2003). Moreover, another construct, effort expectancy, is the degree to which users feel that the system is easy to use (Venkatesh et al., 2003). The existing theories or literature explain the causality that both performance expectancy and effort expectancy have a positive effect on behavioural intention to use or actual use. The construct, facilitating conditions, is "the degree to which an individual believes that an organisational and technical infrastructure exists to support use of the system" (Venkatesh et al., 2003, p.453). In other words, facilitating conditions is similar to organisational supports, which means that users can get help or guidance provided by the organisation in using the system. This construct is also one of the major constructs in UTAUT and the causality to intention to use has been proven empirically in many other papers.

Basically, TAM is an individual level acceptance model and mostly used for voluntary use of IT system. Therefore, there is a lack of research in mandatory systems such as e-medication management system. Most hospital information systems are mandatory systems. Thus, users do not have choice but to use. If there is an option to reject the system, it is regarded as a voluntary system. In line with this context, here we need to modify outcome variable of TAM, behavioural intention, with user satisfaction to make it fit a mandatory health information system, which can be used further as a linkage to connect existing theories. Moreover, TAM (Davis, 1989; Davis et al., 1989) or UTAUT (Venkatesh et al., 2003) emphasized user's perspective such as individual user's acceptance. However, these models need to be extended to distal outcomes which can mean 'success' of IS because user satisfaction has a lack of robust theoretical underpinnings as a measure of IS success (Goodhue, 1995). Hence, organisational benefits of using eMeds such as effectiveness, efficiency and safety need to be added as a measure of eMeds success.

3 Hypothesis

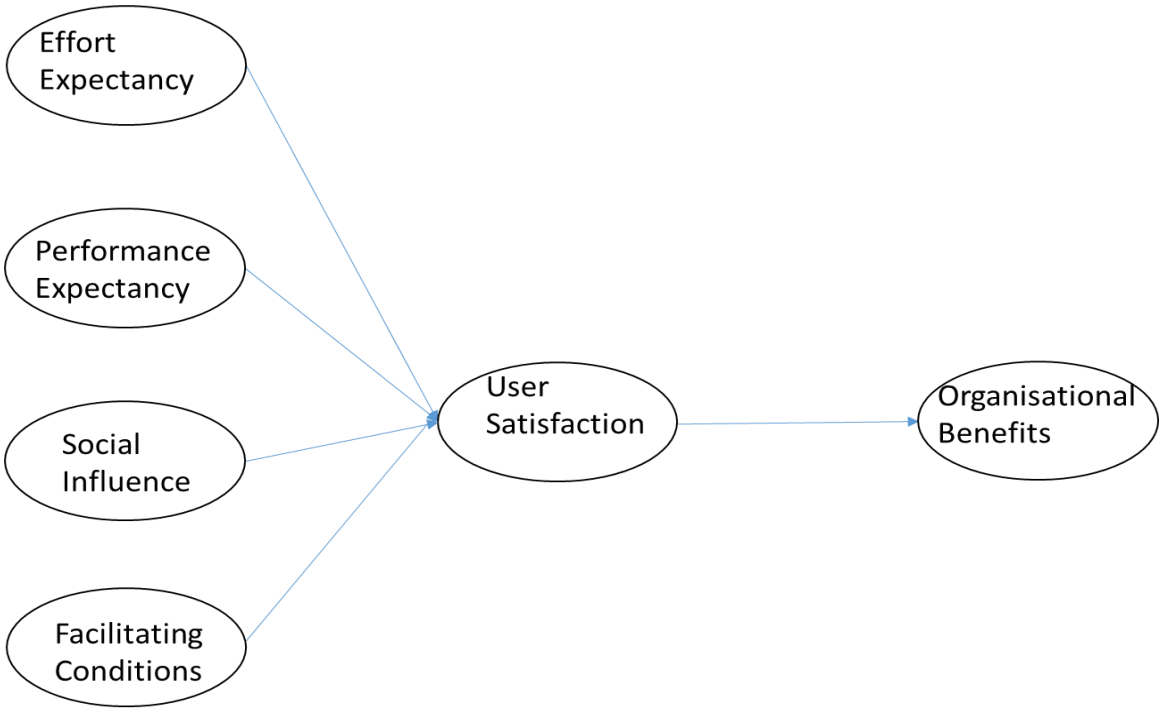

Figure 1. Research model

Figure 1 shows the research model proposed in this paper, which is trying to test a set of hypothesis developed accordingly.

In the original model, TAM (Davis, 1989; Davis et al., 1989) had a construct, attitude. This construct has not been used in the later model such as TAM2 (Venkatesh and Davis, 2000), UTAUT (Venkatesh et al., 2003), and TAM3 since the model without attitude is explained well and has more parsimony especially in voluntary use of information systems (Brown et al., 2002). However, Melone (1990) stated that attitude means user satisfaction, the degree to which users are satisfied with the system. Moreover, attitude is important for understanding the factors of a mandatory information system (Brown et al., 2002). Attitude has two determinants in TAM, one of which is perceived ease of use. This construct has been integrated with other concepts such as complexity (Thompson et al., 1991) and ease of use (Moore and Benbasat, 1991) to be further developed to effort expectancy in UTAUT (Venkatesh et al., 2003), which refers to as the degree to which a systems is easy to use, user friendly, and understandable. UTAUT showed that effort expectancy has a positive effect on behavioural intention, which has a hidden construct of user attitude. Some literature showed effort expectancy is a factor positively affecting user attitudes and user satisfaction (Brown et al., 2008; Hong et al., 2002; Thong, 1999; Thong et al., 2006; Chan et al., 2010). Based on this, we hypothesize that effort expectancy has a positive effect on user satisfaction.

H1: Effort Expectancy has a positive effect on user satisfaction.

Performance expectancy has evolved from some similar constructs such as perceived usefulness (Davis, 1989; Davis et al., 1989), extrinsic motivation (Davis et al., 1992), job-fit (Thompson et al., 1991), relative advantage (Moore and Benbasat, 1991), and outcome expectations (Compeau and Higgins, 1995; Compeau et al., 1999). Venkatesh et al. (2003) showed that performance expectancy has a positive effect on behavioural intention, which was explained without user attitudes as discussed above. Same as effort expectancy, performance expectancy has been proven to be a factor which positively influences user attitudes and user satisfaction (Brown et al., 2008; Hong et al., 2002; Thong, 1999; Thong et al., 2006; Chan et al., 2010). Similarly, Seddon & Kiew (1994) showed that usefulness has a positive effect on user satisfaction. Thus, we hypothesize that performance expectancy has a positive effect on user satisfaction.

H2: Performance expectancy has a positive effect on user satisfaction.

The concept of facilitating conditions includes not only organisational supports but also technical infrastructure for using the system (Venkatesh et al., 2003) as this construct has been derived from the concepts including perceived behavioural control (Ajzen, 1991; Taylor and Todd, 1995a; 1995b), facilitating conditions (Thompson et al., 1991), and compatibility (Moore and Benbasat, 1991). According to Venkatesh et al. (2012), facilitating conditions have a positive effect on behavioural intention which involves user attitudes or user's response. User's response on facilitating conditions is different depending on the extent to which organisational supports and technical infrastructures are provided (Hsieh et al., 2008; Sykes et al., 2009). In addition, Chan et al. (2010) showed that facilitating conditions had a positive effect on user satisfaction. Thus, we can also hypothesize that facilitating conditions have a positive effect on user satisfaction.

H3: Facilitating conditions have a positive effect on user satisfaction.

The next construct, social influence, is defined as the extent to which other people's belief has an influence on an individual's perception (Venkatesh et al., 2003). This construct originally came from subjective norm in Theory of Reasoned Action (TRA; Fishbein and Ajzen, 1975) and has been used widely with similar representation such as social factors (Thompson et al., 1991) and image (Moore and Benbasat, 1991). Venkatesh et al. (2003) showed that social influence has a positive effect on behavioural intention, which can be modified by replacing an outcome variable, behavioural intention, with user satisfaction in the context of a mandatory information system. Furthermore, Chan et al. (2010) showed that social influence has a positive effect on user satisfaction. Thus, we can also hypothesize that social influence has a positive effect on user satisfaction.

H4: Social influence has a positive effect on user satisfaction.

Benefits are defined as the intrinsic and extrinsic utility (Kim and Kankanhalli, 2009; Sirdeshmukh et al., 2002) or the increase in outcomes and the decrease in inputs (Joshi, 1991). Goodhue & Thompson (1995) measured the outcome, performance impact, of their Task-Technology Fit model by perceived individual performance impacts as individual performance cannot be measured objectively. This construct has a similarity with perceived usefulness of TAM (Davis, 1989) and performance expectancy in UTAUT (Venkatesh et al., 2003), and net benefits of IS success model (Delone & Mclean, 2003) especially in terms of measurement items. Delone & Mclean's (1992) original IS Success Model

proposed that user satisfaction has a positive effect on individual impact. This model has been empirically tested in some other studies especially the relationship between user satisfaction and individual benefits has been validated by Etezadi-Amoli & Farhoomand (1996), Igbaria & Tan (1997), and Guimaraes & Igbaria (1997), which showed that user satisfaction has a positive effect on individual impact. In addition, Yuthas & Young (1998) and Torkzadeh & Doll (1999) tested the correlations between these two constructs and showed there are high correlations between them. Moreover, the relationship between user satisfaction and organisational impact has been empirically tested by Gelderman (1998) and Yoon et al. (1998). The former showed significant correlations between them and the latter showed that user satisfaction has a positive effect on perceived organisational benefits. In the updated IS Success Model, Delone & Mclean (2003) showed that user satisfaction has a positive influence on net benefits. Based on this theoretical background, we hypothesize that user satisfaction has a positive effect on perceived organisational benefits.

H5: User satisfaction has a positive effect on organisational benefits.

4 Research Methodology

The organisation surveyed is an Australian public hospital in Sydney, NSW, which has about 1,200 employees. The roll-out period of the eMeds is the first four weeks from eMeds implementation date of 28th February 2017 (between 28th February and 24th March 2017). The questionnaire was distributed to the users of eMeds, including doctors, nurses, pharmacists, administrative staffs, and so on. The survey items were developed based on extant literature and theories such as UTAUT to capture the response to the new eMeds from the user's perspective. Data collection started in the second week of the roll-out on 6th March 2017 and ended on the 13th April 2017. In total, we had 206 respondents, 4 of which were removed after data examination as they have many missing data. For some records with a few missing value, imputation with the mean substitution was performed. After imputation, we finally have 202 data for analysis in total, which includes responses from 65 junior doctors, 24 senior doctors, 101 nurses, 12 pharmacists.

In order to analyse the underlying structure of the interrelationships among the items measured through the questionnaire survey, confirmatory factor analysis (CFA) has been conducted. As the constructs and items in our research model were developed based on the existing theories and literature, CFA is appropriate for validating items for the measurement of certain constructs in our research model (Hair et al., 2008). The final latent variables and the number of their measurement items are shown in table 1.

Latent variable	Number of items
Organisational Benefits (OB)	5
Facilitating Conditions (FC)	3
Effort Expectancy (EE)	7
Social Influence (SI)	3
Performance Expectancy (PE)	5
User Satisfaction (US)	5

Table 1. Variable structure

In order to check the convergent validity and the discriminant validity of the questionnaire survey instrument, confirmatory factor analysis using AMOS was conducted. First, convergent validity was investigated by the standardized factor loading, CR (Composite Reliability), and AVE (Average variance extracted). As can be seen in table 2, the standardized factor loading were all significant (p-value <0.001) and greater than 0.7 except for OB5 (0.684). A commonly employed threshold value to accept individual item reliability is not absolutely but roughly 0.7 (Hair et al., 2008), and in practice loadings less than 0.7 but greater than 0.5 have often been deemed acceptable (Hulland, 1999; Mettler, 2012). In this sense, OB5 is acceptable and included in the following analysis. The values of composite reliability (CR) for all latent variables are greater than 0.7 and the values of the average variance extracted (AVE) for all latent variables are also greater than 0.5. Hence, convergent validity of the survey instrument was supported.

Secondly, discriminant validity was examined with the square root of AVE for each latent variable and the correlations between the latent variables. As shown in table 3, the square root of AVE for each latent variable (diagonal element) is greater than the correlations between latent variables (off-diagonal elements). Thus, discriminant validity of the survey instrument was supported.

Variables	Standardized loading	Error	AVE	CR
OB1 <--- Organisational Benefits	0.917	0.159		
OB2 <--- Organisational Benefits	0.913	0.166		
OB3 <--- Organisational Benefits	0.834	0.304	0.692	0.918
OB4 <--- Organisational Benefits	0.790	0.376		
OB5 <--- Organisational Benefits	0.684	0.532		
FC1 <--- Facilitating Conditions	0.867	0.248		
FC2 <--- Facilitating Conditions	0.911	0.170	0.776	0.912
FC3 <--- Facilitating Conditions	0.864	0.254		
EE1 <--- Effort Expectancy	0.889	0.210		
EE2 <--- Effort Expectancy	0.880	0.226		
EE3 <--- Effort Expectancy	0.842	0.291		
EE4 <--- Effort Expectancy	0.927	0.141	0.781	0.961
EE5 <--- Effort Expectancy	0.843	0.289		
EE6 <--- Effort Expectancy	0.885	0.217		
EE7 <--- Effort Expectancy	0.916	0.161		
PE1 <--- Performance Expectancy	0.884	0.219		
PE2 <--- Performance Expectancy	0.940	0.116		
PE3 <--- Performance Expectancy	0.964	0.071	0.859	0.968
PE4 <--- Performance Expectancy	0.964	0.071		
PE5 <--- Performance Expectancy	0.879	0.227		
US1 <--- User Satisfaction	0.897	0.195		
US2 <--- User Satisfaction	0.948	0.101		
US3 <--- User Satisfaction	0.954	0.090	0.858	0.968
US4 <--- User Satisfaction	0.932	0.131		
US5 <--- User Satisfaction	0.899	0.192		
SI1 <--- Social Influence	0.724	0.476		
SI2 <--- Social Influence	0.846	0.284	0.709	0.878
SI3 <--- Social Influence	0.942	0.113		

Table 2. Testing results of convergent validity

	OB	FC	EE	PE	US	SI
OB	0.832					
FC	0.333	0.881				
EE	0.631	0.543	0.884			
PE	0.713	0.477	0.768	0.927		
US	0.676	0.570	0.793	0.825	0.926	
SI	0.713	0.522	0.736	0.745	0.782	0.842

(Note : Diagonal elements represent the squared root of AVE for that construct)

Table 3. Testing results of discriminant validity

5 Hypothesis testing

Since CFA results showed the validity of the underlying structure of the items measured, we moved to the testing of the structural model. The path analysis of the structural equation model was performed using AMOS for testing hypotheses proposed in the previous section. The testing results of the hypotheses with the structural model are shown in figure 2. Among four antecedents of user satisfaction, performance expectancy has the highest positive significant effect on user satisfaction (path-coefficient=0.404, $p<0.001$), supporting hypothesis H2. Other three antecedents also have significant positive effects on user satisfaction. Effort expectancy has a lower path-coefficient of 0.239 ($p<0.001$), providing empirical support for hypothesis H1. Similarly, social influence shows the path-coefficient of 0.253 ($p<0.001$), supporting hypothesis H3. Facilitating conditions indicates the lowest path-coefficient of 0.114 ($p<0.05$), providing statistical support for hypothesis H4. A total of 79.1 percent of the variance

of user satisfaction is explained by above four relationships. Moreover, user satisfaction has a significant positive effect on organisational benefits, with a standardised effect size of 0.693 (p<0.001), statistically supporting hypothesis H5, which accounts for 48 percent of the variance of organisational benefits.

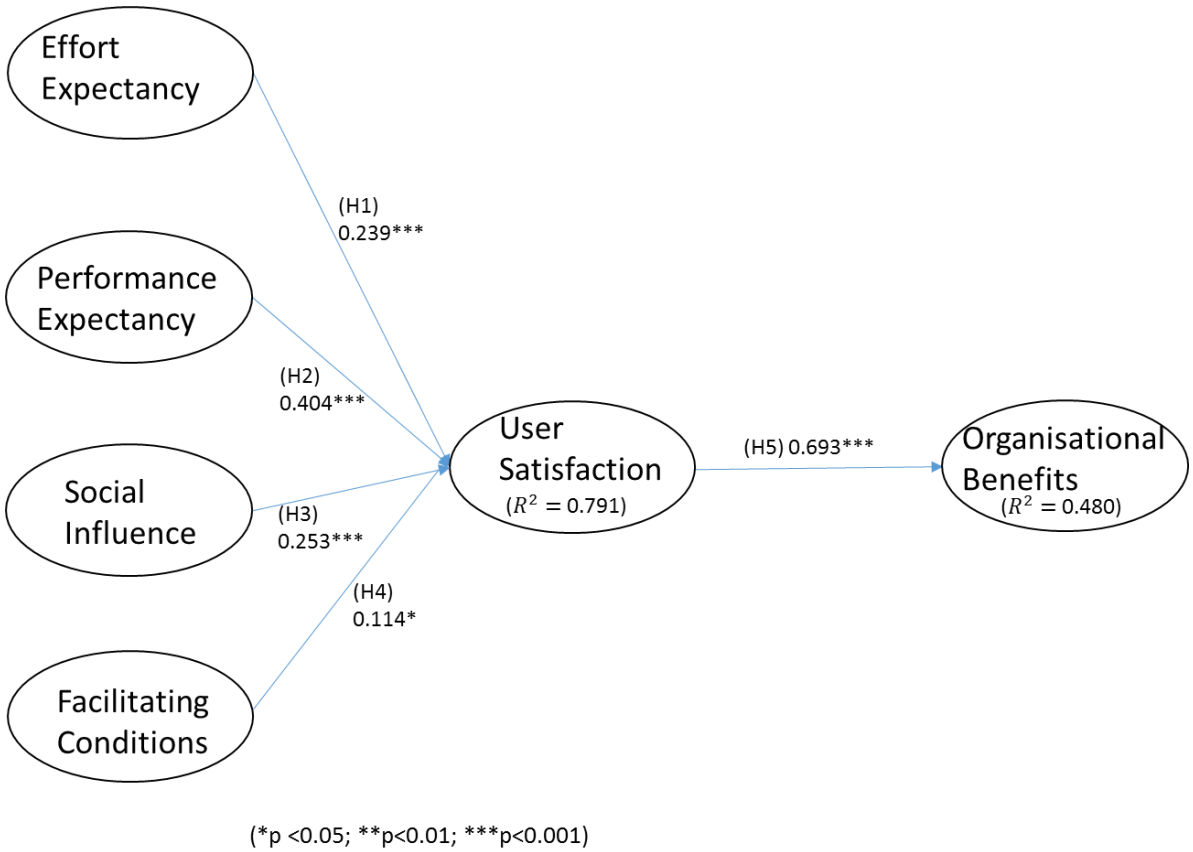

Figure 2. Results of the structural equation model

The overall fit of model can be assessed by various indices such as chi-square statistic, standardized root mean square residual (SRMR), Normed-Fit Index (NFI), Non-Normed Fit Index (NNFI), comparative fit index (CFI), Root mean square error of approximation (RMSEA), and so on. There is no one golden index for evaluating the model fit, thus we had better use a set of indices (Crowley and Fan 1997). The chi-square statistic is sensitive to the sample size, so the relative chi-square or normed chi-square (Wheaton et al., 1977) is alternatively used. Hayduk (1987) recommended that the value of normed chi-square less than 3 indicates a good fit. A good fit is indicated when the value of the SRMR is less than .08 (Hu and Bentler, 1999), the RMSEA is less than 0.10 (MacCallum et al., 1996), and the CFI and NNFI are greater than 0.90 (Hu and Bentler, 1999). As can be seen in Table 4, all of the goodness of fit indices belong to the acceptable range.

Goodness of fit indices	Value
Normed chi-square	2.298
SRMR	0.0611
CFI	0.936
NNFI	0.928
RMSEA	0.080

Table 4. Measures of goodness of fit

6 Discussion

This research provides meaningful findings which can be interpreted significantly and discussed further. One is that existing UTAUT constructs such as effort expectancy, performance expectancy, social influence, and facilitating conditions increase user satisfaction, which is a conceptually different outcome from the original UTAUT model. This means that we can normally make a decision voluntarily

on whether we accept or reject a technology but we should use and measure a different concept when we have no choice but to use that technology. The items measured for user satisfaction are different from those for behavioural intention in the original UTAUT model, so these two constructs should be applied respectively to the right context.

Another difference from the original UTAUT model is that facilitating conditions did not have a significant effect on behavioural intention in the original UTAUT model, which was explained to be because the effect has been captured by effort expectancy (Venkatesh et al., 2003). However, this research tried to see the relationship between facilitating conditions and user satisfaction and showed that it has a significant influence on user satisfaction. One of the reasons why this research showed difference is that UTAUT is more generally applicable to the acceptance of information technology without more specific consideration of mandatory use of information systems in an organisational setting. The data collected in forming UTAUT were from four organisations, two of which use information systems voluntarily (Venkatesh et al., 2003).

More importantly, the findings specific to the context of eMeds in an Australian hospital need to be discussed. In general, we think of facilitating conditions as an ICT service desk or a call centre which provides users with remote assistance in most cases. In case of eMeds implementation, the ICT support team provided 24 x 7 (24 hours a day, 7 days a week) services, having people on site in order to go to the point of care where issues are being raised. This is crucial point for the users as it gives completely different feeling that they are well catered and well supported. Thus, this can be clearer reason why facilitating conditions in this specific context have a positive effect on user satisfaction.

Another important point in the context of this case is eMeds development involving clinicians with recent practice experiences. Moreover, the governance around this eMeds project made active participation of users. This point might be more important in a voluntary system context, but it is also meaningful in the context of a mandatory system in terms of increasing user satisfaction.

Another major finding is significant relationship between user satisfaction and organisational benefits. In this research, we asked users to what extent they feel that a series of benefits are being realised. Moreover, the questions we asked to the users are not about individual or personal benefits but about organisational benefits such as effectiveness, safety, and quality of medication management. Whereas user satisfaction is measured as whether they like or are happy with using the system personally or individually. Therefore, we are assuming that if they are satisfied with the system, then they would feel that organisational benefits are realising as a result of their satisfaction.

7 Contribution

The main contribution of this research is to connect two different theories, mainly UTAUT and IS Success model, with a customised common construct as a linking pin, user satisfaction, in a healthcare setting. This research is not only applying the current theories in a specific setting, use of an electronic medication management system in an Australian hospital, but also adjusting the outcome constructs with more appropriate ones for the context in that setting. The first outcome construct of UTAUT is behavioural intention to use, which means whether or not users are willing to use the system. However, in a mandatory system such as electronic medication management system in a hospital, intention to use is not meaningful construct as users should use the system regardless of their intention to use. Therefore, we replaced this outcome construct with user satisfaction. Moreover, we added one more construct, organisational benefits, as a distal outcome which makes user satisfaction a moderating construct between the outcome construct (organisational benefits) and determinant constructs such as effort expectancy, performance expectancy, social influence, and facilitating conditions.

Practically, this research can provide meaningful insights on evaluation of eMeds in other Australian hospitals especially with the focus on measuring implementation experience of users during the roll-out period. Moreover, as mentioned earlier, NSW government is deploying eMeds throughout NSW hospitals and the goal of introducing eMeds is increasing quality, safety and effectiveness of medication management in NSW hospitals, which are mostly included in the measurement of the variables of this research. Hence, this research is specifically relevant to reflect the level of success of the eMeds implementation in the context of Australian hospitals with the customized constructs such as organisational benefits from eMeds since rollout, facilitating conditions to support implementation of eMeds, user satisfaction since rollout, and so on.

8 Limitations and future research

This research has currently some limitations which can be developed further in the future. First, organisational benefits, one of the major constructs of this research did not measure whether or not it is realised. Thus, in order to reinforce and refine the hypotheses proposed, we need to empirically measure and test actual realisation of these benefits. This will make a stronger and meaningful theory, which can help to provide practical implications and insights in a healthcare setting.

Secondly, at this stage this research is only based on survey data. Thus, this research might only provide some general and broad ideas related to the current theories and literature. Qualitative data from focus group interviews with different user groups such as doctors, nurses, pharmacists, and support staffs may be included in future research in order to give more in-depth and specific implications especially, in healthcare context.

One motivation of the future research is that we invested a lot of money in IT and we need to see whether it is fully utilized and has better performance. Moreover, we have another motivation. For technology to improve productivity, efficiency, and safety in healthcare setting, it should be used by users, but in mandatory systems all users should use the system. Therefore, it is not the matter of use. Users need to be satisfied with the mandatory system. The difference in satisfaction might affect difference in usage pattern. For example, people who are satisfied with the system might fully utilize the system and have better performance. However, people who are not satisfied with the system just have a very limited use. They might have minimal and essential use. Hence, the future research will need to measure actual usage pattern and its difference and further any causality between actual use and realized benefits such as effectiveness, efficiency, and safety.

9 Conclusion

This paper tried to mainly examine how users evaluate an information system and what factors affect user's evaluation in a specific healthcare setting, which is an electronic medication management system in an Australian public hospital. Data of 202 respondents from questionnaire survey has been analysed and showed that three determinants such as effort expectancy, performance expectancy, and facilitating conditions have a positive impact on user satisfaction and that user satisfaction and performance expectancy have a positive impact on organisational benefits. This research also tried to connect extant seminal theories in terms of user evaluation of information systems, which can be specially tailored for a mandatory information systems context. Hopefully the results and experiences of this study can be helpful to other researchers in this area.

10 References

Ajzen, I., (1991), "The Theory of Planned Behavior", Organizational Behavior and Human Decision Processes (50:2) 2), 1991, pp. 179-211.

Australian Institute of Health and Welfare 2016.Australia's hospitals 2014–15 at a glance. Health services series no.70.Cat.no.HSE 175.Canberra: AIHW.

Brown, S. A., A. P. Massey, M. M. Montoya-Weiss, and J. R. Burkman (2002) "Do I really have to? User acceptance of mandated technology," *European Journal of Information Systems* (11) 4, pp. 283-295.

Chan, K. Y., Thong, Y. L., Venkatesh, V., Brown, S. A., Hu, J., and Tam, K. Y., (2010), "Modeling citizen satisfaction with mandatory adoption of an E-Government technology", Journal of the Association of Information Systems, 2010, Volume 11, Issue 10.

Compeau, D. and Higgins, C., (1995), "Computer Self-Efficacy: Development of a Measure and Initial Test", MIS Quarterly (19:2), 1995, pp.189-211.

Compeau, D. and Higgins, C., and Huff, S., (1999), "Social Cognitive Theory and Individual Reactions to Computing Technology: A Longitudinal Study", MIS Quarterly (23:2), 1999, pp. 145-158.

Crowley, S.L. and Fan, X. (1997), "Structural Equation Modelling: Basic Concepts and Applications in Personality Assessment Research," Journal of Personality Assessment, 68 (3), 508-31.

Davis, F. D., (1989), "Perceived usefulness, perceived ease of use, and user acceptance of information technology." *MIS Quarterly*, 13(3), 319–340.

Davis, F. D., Bagozzi, R., and Warshaw, P., (1989), "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models ", *Management Science* Vol. 35, No. 8 (Aug., 1989), pp. 982-1003.

DeLone, W. H. and McLean, E. R., (1992), "Information systems success: The quest for the dependent variable." *Information Systems Research*, 3(1), 60–95.

DeLone, W. H. and McLean, E. R., (2003), "The DeLone and McLean Model of Information Systems Success: A Ten-Year Update", *Journal of Management Information Systems* Vol. 19, No. 4, Information Systems Success (Spring, 2003), pp. 9-30.

Etezadi- Amoli, J., and Farhoomand, A.F. A structural model of end user computing satisfaction and user performance. Information & Management, 30, 2 (1996) , 65-73.

Fishbein, M., and Ajzen, I., (1975), " Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research, Addison-Wesley, Reading, MA, 1975.

Gelderman, M., (1998), "The relation between user satisfaction, usage of information systems, and performance." Information & Management, 34, 1 (1998), 11-18.

Goodhue, D., "Understanding user evaluations of information systems", Manag. Sci. 41 (1995) 1827–1844.

Goodhue, D. and Thompson, R., (1995), "Task-Technology Fit and Individual Performance", *MIS Quarterly* Vol. 19, No. 2 (Jun., 1995), pp. 213-236.

Guimarães, T., and Igbana, M, "Client/server system success: Exploring the human side", Decision Sciences, 28, 4 (1997), 851-875

Hair, J. H., Anderson, R. E., Tatham, R. L., Black, W. C., (1998), "Multivariate data analysis", Fifth edition, Upper Saddle River, N.J. : Prentice Hall.

Hayduk, L. A., (1987), "Structural Equation Modelling with LISREL", The Johns Hopkins University Press, Baltimore, Maryland.

Hong, W., J. Y. L. Thong, W. M. Wong, and K. Y. Tam (2002) "Determinants of user acceptance of digital libraries: An empirical examination of individual characteristics and system characteristics," *Journal of Management Information Systems* (18) 3, pp. 97-124.

Hsieh, J. J. P. A., A. Rai, and M. Keil (2008) "Understanding digital inequality: Comparing continued use behavioral models of the socio-economically advantaged and disadvantaged," *MIS Quarterly* (32) 1, pp. 97-126.

Hu, L.T. and Bentler, P.M. (1999), "Cutoff Criteria for Fit Indexes in Covariance Structure Analysis: Conventional Criteria Versus New Alternatives," Structural Equation Modeling, 6 (1), 1-55.

Hulland, J., (1999), "Use of Partial Least Squares (PLS) in Strategic Management Research: A Review of Four Recent Studies", Strategic Management Journal (20:2), pp. 195-204.

Igbaria, M., and Tan, M. The consequences of the information technology acceptance on subsequent individual performance. Information & Management, 32, 3 (1997), 113-121

Joshi, K., (1991), "A Model of Users' Perspective on Change: The Case of Information Systems Technology Implementation", MIS Quarterly, 06/1991, Volume 15, Issue 2.

Kim, H.W. and Kankanhalli, A., (2009), "Investigating User Resistance to Information Systems Implementation: A Status Quo Bias Perspective", MIS Quarterly, 09/2009, Volume 33, Issue 3.

MacCallum, R.C., Browne, M.W., and Sugawara, H., M. (1996), "Power Analysis and Determination of Sample Size for Covariance Structure Modeling," Psychological Methods, 1 (2), 130-49.

Melone, N. P., (1990), "A theoretical assessment of the user-satisfaction construct in information systems research." Management Science 36(1), 76–91.

Mettler, T., (2012), "Post-Acceptance of Electronic Medical Record: Evidence from a Longitudinal Field Study", Proceedings of the 33rd International Conference on Information Systems (ICIS), Orlando, 2012.

Moore, G. C., and Benbasat, I. "Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation," Information Systems Research (2:3), 1991, pp. 192-222

Petter, S. and Mclean, E. R., (2009), "A meta-analytic assessment of the DeLone and McLean IS success model: An examination of IS success at the individual level", Information & Management, 2009, Vol.46(3), pp.159-166.

Phillips, J., Poon, S.K., Yu, D. Lam, M., Hines, M., Brunner, M., Power, E., Keep, M., Shaw, T. and Togher, L. (2017), *A Conceptual Measurement Model for eHealth Readiness: A Team Based Perspective*, In Proceedings of the American Medical Informatics Association 2017 Annual Symposium (AMIA2017), Washington, DC, USA, 4 - 8 November.

Pitt, L.F., Watson, R.T., and Kavan, C.B., (1995), "Service quality: A measure or information systems effectiveness." MIS Quarterly, 19, 2 (1995), 173-188.

Schumacker, R. E., & Lomax, R. G. (2004). *A beginner's guide to structural equation modeling*, Second edition. Mahwah, NJ: Lawrence Erlbaum Associates.

Seddon, P.B ., and Kiew, M.- Y. A partial test and development of the DeLone and McLean model of IS success. In J.I. DeGross, S.L. Huff, and M.C. Munro (eds.), Proceedings of the International Conference on Information Systems. Atlanta, GA: Association for Information Systems, 1994, pp. 99-11

Sirdeshmukh, D., Singh, J., and Sabol, B. 2002. "Consumer Trust, Value and Loyalty in Relational Exchange," Journal of Marketing (66:1), pp. 15-37.

Sykes, T. A., Venkatesh, V., and Gosain, S., (2009) "Model of acceptance with peer support: A social network perspective to understand individual-level system use," *MIS Quarterly* (33) 2, pp. 371-393.

Taylor, S., and Todd, P. A. "Assessing IT Usage: The Role of Prior Experience," MIS Quarterly (19:2), 1995a, pp. 561-570.

Taylor, S., and Todd, P. A. "Understanding Information Technology Usage: A Test of Competing Models," Information Systems Research (6:4), 1995b, pp. 144-176.

Thong. J. Y. L. (1999) "An integrated model of information systems adoption in small businesses," *Journal of Management Information Systems* (15) 4, pp. 187-214.

Thong, J. Y. L., S. J. Hong, and K. Y. Tam (2006) "The effects of post-adoption beliefs on the expectation-confirmation model for information technology continuance," *International Journal of Human-Computer Studies* (64) 9, pp. 799-810.

Thompson, R. L., Higgins, C. A., and Howell, J. M. "Personal Computing: Toward a Conceptual Model of Utilization," MIS Quarterly (15:1), 1991, pp. 124-143

Torkzadeh, G., and Doll, W.J. The development of a tool for measuring the perceived impact of information technology on work. Omega - The International Journal of Management Science, 27, 3 (1999), 327-339.

Venkatesh, V. and Davis, F. D., (2000), "A theoretical extension of the technology acceptance model: Four longitudinal field studies." Management Science, 46, 186–204.

Venkatesh, V., Morris, M., Davis, G., and Davis, F. D., (2003), "User Acceptance of Information Technology: Toward a Unified View", *MIS Quarterly* Vol. 27, No. 3 (Sep., 2003), pp. 425-478.

Venkatesh, V., Thong, J. Y. L, and Xu, Xin, (2012), "Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology", MIS Quarterly: Management Information Systems, 03/2012, Volume 36, Issue 1.

Wheaton, B., Muthen, B., Alwin, D., F., and Summers, G. (1977), "Assessing Reliability and Stability in Panel Models," Sociological Methodology, 8 (1), 84-136.

Yoon, Y; Guimarães, T.; and Clevenson, A. Exploring expert systems success factors for business process reengineering. Journal of Engineering and Technology Management, 15, 2/3 (1998), 179-199.

Yu, D., Poon, S., Tran, V., Lam, M., Hines, M., Brunner, M., Keep, M., Power, E., Lowe, R., Shaw, T., Togher, L., (2016), "Exploring health technology evaluation in the context of ehealth : a qualitative study to understand its role in enabling interdisciplinary healthcare", Proceedings of the 24th European Conference on Information Systems (ECIS), Istanbul, Turkey, 2016.

Yuthas, K., and Young, S.T. Material matters: Assessing the effectiveness of materials management IS. Information & Management, 33, 3 (1998), 115-124.