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Effective factors in Information Technology (IT) acceptance in the view of the nurses working in ICU

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ABSTRACT

Aims: Using IT for preventing unpleasant events due to medical errors, decrease of death and length of stay is attended more than before. The aim of this study was nurses' understanding of IT acceptance according to IT acceptance model.

Methods: It was a descriptive-analytic study.47 critical care nurses were chosen through available method from three chosen hospitals of Tehran in 2012. Data collection tool was a questionnaire based on IT acceptance model and planned behavior theory by considering trust variable.Spearman rho test was used to determine correlation between the main constructs and simple linear regression test was use to predict the correlation between the technology acceptance model constructs.. Data were analyzed by SPSS16 software and descriptive and inferential statistical tests.

Results: There was significant relationship (P=0.02) between nurses' education level with their trust on IT. There was strong correlation between trust and understanding ease of use. There wasn't any correlation between attitude constructs, behavioral control and subjective norms with nurses' intention to use IT. Behavioral intention to use IT is remarkably influenced by understanding ease of use.

Conclusion: Educational planners and IT managers can promote ICU nurses intention to use technology by strengthening constructs of perceiving ease of use, subjective norms and trust.

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1. Introduction

IT has been used for patients' improvement in health care systems of the entire world [1, 2]. US medical institute stated the importance of IT for improvement of immune in 2000 [3]. Considering high incidence of adverse events and medical errors in ICU [4, 5, 6] and due to shortage of specialist nurse numbers in ICU, using electronic systems and remote monitoring are necessary for preventing dangerous events and improving patients' outcome [6]. Based on the present studies, IT system in intensive care

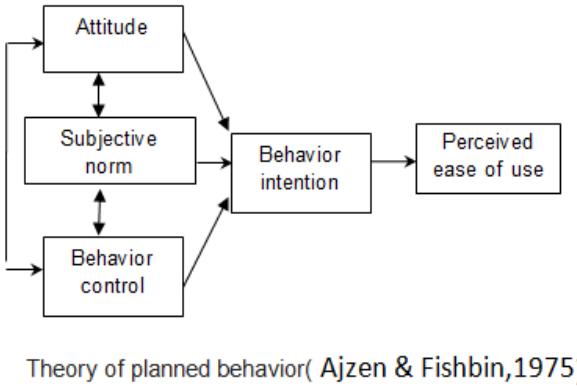
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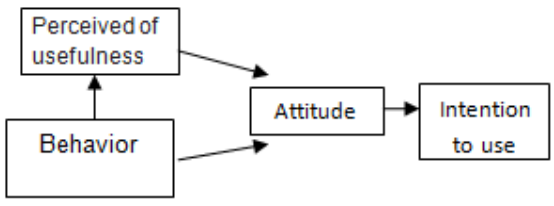
has many benefits such as; decrease of hospital death, decrease of length of stay, decrease of cost and increase of care quality [7]. Using IT without paying attention to substructures and different cultural, legal, technical and managerial contexts lead to failure or inefficiency of systems, and IT acceptance by customers and staff are among factors that if are not attended cause waste of the systems' sources [8]. It is while successful use of modern technologies at bedside is related to the user's acceptance to the high extent [9, 10]. Effective factors on technology acceptance in personal level can be assessed by using technology acceptance model [11]. Regarding this, technology acceptance model is used as an important predictor of IT use related to health [12]. Technology acceptance model has been used during time in different populations and in different technology systems. The most use of that has been in education, business and IT. Variables of technology acceptance model include; understanding ease of use (the degree that the person believes that using a special system is not hard), understanding usefulness (subjective probability of technology effect in increase of efficiency), behavioral trend (to like or to not like using information system as a final behavior) and attitude (total feeling about desirability or undesirability of a subject or special behavior) [9, 13]. Vaslious in studying staff's trend in one of the hospitals in Greece about using IT by using technology acceptance model showed that understanding usefulness, ease of use and attitude influence hospital staff's behavioral intention to use technology remarkably [14]. Findings of the study of Ketikidies showed that understanding ease of use influences intention to use technology of health care by nurses directly, but understanding usefulness does not have any effect on intention to use [15].

Planned behavior theory is about relationship between attitude and behavior. The main construct of planned behavior theory is based on this assumption that person's behavior is influenced by his/her trends [16, 17]. Planned behavior theory has been provided for increasing prediction ability of reasoned action theory by entering understanding of action control, and by using that, relationship among beliefs, attitudes, behavioral and actions trends can be studied in different areas of knowledge such as health care [18]. Variables of planned action theory include subjective norms (person's understanding of important peoples' views for doing or not doing an action), attitude (person's positive or negative feeling about his/her special action), understanding action control (understanding easiness or hardness of

Figure 1: Technology acceptance model (right)and planned behavior theory model (left)



Theory of planned behavior(Ajzen & Fishbin,1975)



Technology Acceptance Model (Davis & et al ,1989)

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an action) and action trend (person's intention to use system for future activities). [19, 20, 21, 22, 23].

Considering that there are very little studies about intention to use IT in clinical nursing and most of nursing researchers studied developing and testing measuring tools of attitude towards computer modern technologies, so researchers decided to study related factors to IT acceptance by nurses working in ICU based on technology acceptance model and planned behavior theory along with trust variable.

2. Methods

It was a descriptive analytic study. Samples of the study were nurses, working in general ICU of three chosen hospitals of Tehran in 2012. Sampling had been done through probable method, with available form and based on inclusion criteria. Regarding this, 47 nurses had been studied. Being a full-time nurse and having the experience of at least 6 months working in ICU and voluntarily participation were inclusion criteria. Information collection tool was questionnaire. Questionnaire was designed based on constructs and constituent factors of Davis's technology acceptance model and Ajzen and Fishbin's planned behavior by considering trust variable (figur 1).

The first part of the questionnaire was the questions related to demographic features. The second part included 24 items in 3-grade Likert scale from I don't agree with 1 score to I agree with 3 scores. Questions were in 7 constructs of understanding usefulness, understanding ease of use, attitude, mental norms, behavioral control, decision to use and trust respectively. Content validity had been assessed by 5 nursing faculty members. Total results of content validity were satisfying for the study. Internal reliability of tools constructs was counted by using Chronbach's alpha coefficient that showed 0.89.

In order to determine questionnaire construct validity, exploratory factor analysis was used. In order to determine the ability of the questionnaire for factor analysis, Kasier-Meyer-Olkin sampling adequacy criteria test had been used. Bartlett's Test of Sphericity and Matris's adequacy criteria test had been used. Then factor analysis had been done through main components with Varimax rotation. In order to extract number of the factors, Eigen Value method, higher than one was used, and in order to maintain every item in extracted factors, factor loads of 0.50 and higher than that were considered.

Also samples of the study were informed about confidentiality of their responses. Data were analyzed by SPSS16 software. Spearmanro correlation coefficient had been used in order to assess relationship between model main constructs and simple regression test for predicting relationship between IT acceptance model constructs.

3. Results

The mean age of the nurses of the study was 35±8.39. 25 (53. %) males and 30 (68. # %) married and 36(78.3%) had nursing BA Degree and the mean of work experience in ICU was 10.95±5.82. Frequency and percentage of every one of the technology acceptance items are in table 1.

Mean and standard deviation of subjective norm construct criterion (2.51±0.79) was less than other electronic technology acceptance constructs from nurses' point of view.

Considering abnormality of the data frequency, according to Kolmogrov Smirenov test ($p<0.001$) results of nonparametric Mann-Whitney test analysis showed that the mean of score of ease of use grade ($p<0.41$) in male nurses was 20.20 and in female nurses 28.32 and the mean of subjective norm score ($p<0.013$) in male nurses 19.38 and female nurses 29.25 showed significant difference.

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Table 1: ICU nurses' understanding of items related to IT acceptance and planned behavior theory

Understanding usefulness (mean± standard deviation =2.87±0.48)	I don't agree	I have no idea	I agree
	Number (percent)	Number (percent)	Number (percent)
Improvement of my performance following using technology	11(23.4)	5(10.6)	31(66)
Improvement of my productivity following using technology	6(12.8)	8(17)	33(70.2)
Increase of my efficiency following using technology	3(6.4)	10(21.3)	34(72.3)
Usefulness of technology use in the units	2(4.3)	9(19.1)	36(76.6)
Understanding ease of use (mean ±standard deviation=2.88±0.39)			
Clarity of my interaction regarding technology	6(12.8)	9(19.1)	32(68.1)
I need to have lots of subjective effort for my interaction with technology	2(4.3)	5(10.6)	40(85.1)
It is easy to do works through technology	1(2.1)	8(17)	38(80.9)
It is easy to work with technology	4(8.5)	3(6.4)	40(85.1)
Attitude (mean ±standard deviation=2.92±0.27)			
It is a good idea to use technology in providing cares	5(10.6)	7(14.9)	35(75.4)
it is wise to use technology in providing cares	1(2.1)	6(12.8)	40(85.1)
I like to use technology in providing cares	2(4.3)	7(14.9)	38(80.9)
It is pleasant to experience using technology	1(2.2)	8(17.4)	37(80.4)
Subjective norm (mean ±standard deviation=2.51±0.70)			
Patients' views are important in deciding to use technology	12(25.5)	11(23.4)	74(51.1)
Opinion of the people ,who influence me is about the necessity of using technology is important	4(8.5)	8(17)	35(74.5)
Peoples' idea is valuable for me about using technology	9(19.1)	8(17)	30(63.8)
Behavioral control (mean ± standard deviation=2.72±0.61)			
Having the ability of using technology	12(25.5)	4(8.5)	31(66)
Using technology in complete control	7(14.9)	9(19.1)	31(66)
Having equipment and knowledge of using technology	4(8.5)	8(17)	35(74.5)
Intention to use (behavioral trend) (mean± standard deviation=2.90±0.22)			
Intention to use technology in the case of availability	3(6.4)	8(17)	36(76.6)
Prediction of using technology, in the case of availability	5(10.6)	0	42(89.4)
Using technology to the possible extent in the case of availability	1(2.1)	6(12.8)	40(85.1)
Reliability (mean± standard deviation=2.90±0.38)			
My understanding about reliability of technology	1(2.1)	11(23.4)	35(74.5)
My understanding about that technology provides good services	1(2.1)	4(8.5)	42(89.4)
My understanding about that technology helps the patients	1(2.1)	7(14.9)	39(83)

There wasn't any significant difference ($p>0.05$) between acceptance model constructs score and other demographic variables of the samples of the study (age, marital status, experience of working in ICU and the education level). Just there was significant difference ($p=0.022$) education level with trust variable. The mean of grade score of "trust" in

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Table 3: understanding relationship between constructs of technology Acceptance model and planned behavior theory

R	R^2	P
0.677	0.458	0.001
0.415	0.172	0.004
0.506	0.256	0.003
0.094	0.009	0.001
0.226	0.051	0.001
0.332	0.111	0.001
0.633	0.401	0.001
0.215	0.046	0.001
0.411	0.169	0.014
0.054	0.003	0.001
0.488	0.238	0.054

nurses with MA was 33.75, in BA nurses 23.10, and in nurses with associate degree 11.58. Results showed that there was positive and significant correlation between all the IT acceptance model constructs with ease of use ($p<0.05$). The most correlation coefficient was between understanding usefulness and easiness (R=0.641), attitudes towards using with ease of use (r=0.538) and behavioral control with intenti on to use (r=0.5 54) (table2).

Considering the standardized regression coefficients, relationships between technology acceptance model constructs are specified in figure 2.

As it can be seen, there was low correlation between ease of use with intention to use (as the model final outcome) (r=0.332 and $p<0.001$). Attitude, behavioral control and subjective norm were not in relationship with intention to use technology. On the other hand, there was very little correlation between trust with subjective norm (r=0.054 and $p<0.001$) and ease of use with subjective norm (r=0.094 and $p<0.001$) (table 3).

Findings of the study showed that subjective norm does not affect using IT. Also intention to use IT is not influenced by attitude constructs and understanding usefulness, these two findings are in contrast with the studies of Vaslius and Ketikidies [14, 15]. But similar to findings of the mentioned studies, understanding ease of use had direct effect on intention to use.

This is probably related to the level of intensive care nurses' knowledge of modern technologies like advanced hemodynamic monitoring devices or new digital mechanical ventilation devices and also to be familiar with patient's information data processing in computer systems, with this meaning that intention to use such technologies by nurses depends on their knowledge level. Egi stated that high trust has remarkable and direct effect on understanding usefulness, understanding ease of use and doctors' attitude towards using care electronic health systems [24].

Figure 2: Relationship between constructs of technology acceptance model and planned behavior theory model in accepting IT by nurses working in ICU.

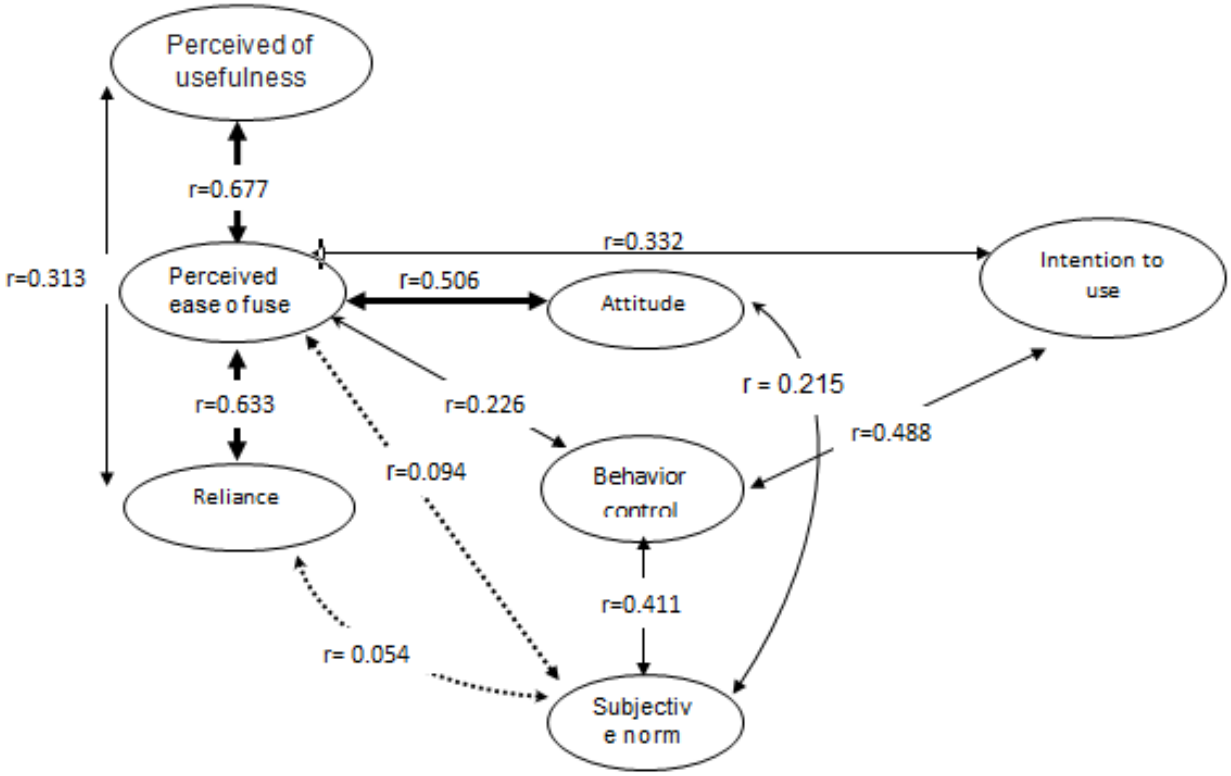
Also in our study, trust variable had effect on understanding usefulness. But unlike the mentioned studies, there wasn't any significant correlation between trust and nurses' attitude. In Davis' technology acceptance model, understanding usefulness and ease of using technology were the most important determining factors of behavioral intention to use technology [12].

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Also results of several studies show that understanding usefulness has strong and significant effect on nurses' intention to use IT in ICU [7, 13, 24]. Chang in stating nurses' electronic learning in Taiwan showed that understanding ease of use has remarkable effect on understanding technology and these two variables have remarkable effect on intention to use [25].

However, in our study, there was no significant correlation between understandings of nurses working in ICU about usefulness of IT with their behavioral trend, it means intention to use such technology. One of the important variables of the study beside the used models was trust. Trust is the heart of all the relations [26]. Trust effects behavioral control through self-control [27].

Studies show that high trust causes promotion of attitude and behavior [28, 29]. According to the results of the study, trust variable had significant relationship only with education level as a foreign variable , it means that nurses with higher education level have more appropriate subjective perception about usefulness of IT in their work system.



According to the finding of the study, it seems that higher education level with increasing trust in nurses improve their subjective approach in understanding modern IT usefulness in providing care.

Khorasani showed that subjective perception of usefulness and attitude of IT have positive effects on taking decision to use electronic learning in Medical students [30]. Salari stated that there is correlation between understanding usefulness and understanding easiness with nursing students' acceptance of electronic in learning [31]. But findings of our study showed that attitude and understanding usefulness has no effect on taking decision to use IT. Difference in population of the study can be an important reason in inconsistent results.

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5. Conclusion

Findings of the study showed that among related constructs to the technology acceptance model and planned behavior theory, it is only understanding ease of using technology, which effects weekly on the expected outcome or trend to behavior. Among three intermediate variables of attitude, control and subjective norm, it was only behavior control, which was influenced by ease of use and subjective norm and could have very little effect on behavioral control. Educational planners and IT managers can increase intention to use technology by nurses in ICU environments through strengthening understanding of ease of use, understanding behavioral control and subjective norm.

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