



Research Article

IT Acceptance by Nurses in Morocco: Application of a Modified Unified Theory of Acceptance and Use of Technology

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Abstract

This communication aims to identify factors supporting the acceptance of IT by nurses in Morocco. It referred to a reduced version of UTAUT model and added the trust construct to study this acceptance. The study was conducted in health public and private hospitals in Agadir city, South of Morocco. It revealed that only Social influence and Trust influenced significantly this acceptance.

Keywords: IT acceptance, Trust, nurses, UTAUT, Morocco

Introduction

Since 2001, Morocco has embarked on an ambitious reform process to enable the health system to be able to satisfy the care demand, and improve the performance of healthcare organizations. For this issue the Project Financing and Managing Health Sector was adopted. This project establishes an integrated and standardized care services to the Moroccan population. It seeks to give better support to healthcare professionals in their daily activities and to improve the quality and efficiency of the promulgated care services. Health Information System (HIS) was

considered the main goal of this project; Nurses, as the core of the each healthcare process, were the first actors concerned with this project.

Referring to Kijsanayotin et al (2009), the IT user acceptance is one of the major determinants of the IT project success. Hence this communication aims to identify factors influencing IT acceptance by nurses practicing in Morocco. It is based on a reduce version of the UTAUT model, and proposed a new construct, "trust", to understand this acceptance. The study concerned nurses

working in health public and private organizations located in Agadir city, South of Morocco.

The first paragraph will review the literature on the UTAUT Model, and present recent application of this model in healthcare context. The second one will describe the research model and cite the hypothesis. The third will explain the research methodology. The fourth paragraph will point out data analysis and results. The last paragraph will contain conclusion and managerial implication and limits of this research.

Theoretical Background

The following paragraph presents the Unified Theory Acceptance and Use of Technology and highlights some of its recent applications in healthcare context.

UTAUT

In 2003, Venkatesh, Morris, Davis, & Davis combined eight models to explain individual IT acceptance. These models integrated: Theory of Reasoned Action, Technology Acceptance Model, Motivational Model, Theory of Planned Behavior, a Combined Theory of Planned Behavior/Technology Acceptance Model, Model of Personal Computer Utilization, Innovation Diffusion Theory and Social Cognitive Theory. The fourth Authors pointed out five important limits of these eight models: (1) Simplicity of the used technologies (2) Except for a few studies, most participants were students (3) Measurement time was, in general, after acceptance or rejection decisions (4) Nature of measurement was in general cross-sectional and (5) Most of studies were conducted in a voluntary usage setting. Therefore, they noticed the need for a unified view of user's technology acceptance. Thereby, they developed the Unified Theory of Acceptance and Use of Technology (UTAUT) model to explain individual intention to use IT and subsequent the actual use of this technology. UTAUT model includes four core factors of intention and usage of IT: (1) Performance

Expectancy, (2) Effort Expectancy, (3) Social Influence, and (4) Facilitating Conditions. Gender, Age, Experience and Voluntariness of use were considered as the moderating variables. This model attempts to explain how different individuals influence IT use.

Empirically the authors validated the UTAUT model throughout longitudinal studies conducted in six organizations. They found that this model explained roughly 70% of the variance in intention to use IT. Moreover, they concluded that Performance expectancy, Effort expectancy, Social influence, and Facilitating conditions are direct determinants of intention behavior and usage. Also, they added that gender, age, experience, and voluntariness of use mediated the impact of the four key constructs on IT usage Intention and behavior.

UTAUT in Healthcare Context

The UTAUT model has been tested in many areas such as mobile services among consumers (Carlsson, Carlsson, Hyvonen, Puhakainen, & Walden, 2006), industry (Pai & Tu, 2011), banking (AbuShanab, Pearson, & Setterstrom, 2010; Zhou, Lu, & Wang, 2010) and education ((Baltaci-Goktalay & Ozdilek, 2010; Pynoo et al., 2011). However Holtz and Krein (2011) noted limited applications of this model to investigate IT acceptance in healthcare context. The following subparagraph synthesis some applications UTAUT in this context.

In 2007, Chang, Hwang, Hung, & Li attempted to predict Clinical Decision Support System (CDSS) acceptance by physicians. They used only four constructs of the UTAUT model and excluded it moderated variables. 140 physicians were participated from three hospitals, but only 115 questionnaires were completed, representing 82.14% response rate. Most of them were male, aged between 40 and 50 years old, with 1-5 years computer experience. Results showed that the research model explained 43% and 28% of the variance respectively for use behavior and behavior intention. Moreover, Performance expectancy and Effort expectancy had the significant

impacts on physicians intention to use CDSS, however the impact of social influence on behavior intention was less significant, and the Facilitating conditions had a slight impact on CDSS use.

Hennington and Janz (2007) applied UTAUT to identify the most commonly discussed barriers physician adoption of Electronic Medical Record (EMR).

As for Schaper and Pervan (2007), they examined IT acceptance and utilization by Australian occupational therapists. They used a mixed-mode methodology substantial quantitative, qualitative and longitudinal to collect data on technology acceptance and use amongst occupational therapists across Australia. They distributed 6453 questionnaires, but only 2036 were returned, showing a 31% response rate. Most of them were female (95.5%) with 37 years old as average of age. Results revealed that Effort expectancy influenced significantly occupational therapists' usage intention; however, performance expectancy and social influence had no influence on this intention.

In 2008, Duyck et al. studied the individual user acceptance of PACS by the radiology department staff of the Ghent University Hospital. They elaborated a questionnaire basing on scales and items of UTAUT. This questionnaire was distributed to 94 individuals, but only 56 were usable. Results showed that Facilitating conditions and Performance expectancy were proved to be the strongest predictor of behavioral intention. As for Effort expectancy and Social influence, they showed no significant influence on this intention.

Wills et al (2008), leveraged the UTAUT model to evaluate the nurses acceptance and use of EMR. Only 52 of the participants completed correctly the questionnaire, 94% of them were female, 59% of them aged between 35 and 54 years old. Authors found that the research model explained 51% of the variance for behavioural and 28.2% for the use. Moreover, Social Influence has the most direct impact on nurses' intention to use IT, followed by

Performance expectancy, Facilitating conditions and Effort expectancy.

Kijsanayotin, Pannarunothai and Speedie (2009) employed a modified UTAUT to understand factors influencing IT acceptance and use in community health centers in Thailand. They used a cross-sectional survey to collect data. Their survey rate was 82% with 1323 respondents, 54% of them were male. Results showed that the proposed model explain 54% of variance for intention to use and 27% for Actual. Moreover, intention to use health IT is determined by Performance expectancy, Effort expectancy and Social influence.

In 2009, Aggelidis & Chatzoglou based on UTAUT constructs to examine HIS acceptance by Greek hospital personnel. The study concerned the whole population of HIS users in the region with 341 persons, but only 283 respondents had completed the questionnaire. Authors found that, Effort expectancy, Performance expectancy, Social influence and Facilitating condition affected significantly hospital personnel behavioral Intention.

Steele et al (2009) explored factors fostering elderly person's acceptance and perception of WSN-based health monitoring systems. They referred to salient acceptance model such as UTAUT. Focus groups were conducted with 13 elderly individuals. Results showed that only the Social influence significantly the intention to use WSN. However, Performance expectancy and Effort expectancy may not be the most important determinants of this intention.

Hennington et al (2009) developed an understanding of nurses' experiences using an electronic medical record (EMR) system in a mandatory usage context. Only 23 nurses and four nurse managers were interviewed. Results revealed a strong connection between Performance expectancy, Social influence and EMR use. As for Effort expectancy construct, nurses developed a negative perception of this construct towards EMR usage.

Venkatesh, Sykes and Zhang (2011) adapted the UTAUT model to context of EMR adoption

by doctors. Data were collected only from private hospital and concerned 202 full-time doctors employed. Only 141 were retained, and represented a response rate of 70%. Authors concluded that the original UTAUT did not perform well in explaining doctors' intention to adopt EMR, and only age as a moderator explained significantly this intention with variance of 44%.

Furthermore, Holtz and Krein (2011) tried to understand how hospital nurses perceived the implementation of a new EMR. They combined both qualitative and quantitative research methods for two samples of nurses Registered Nurses and Licensed Practical Nurses. 113 had participated, representing 21% as response rate. 92% of them were female, aging between 30 and 39 years old.

Performance expectancy was found to be significant. As for the impact of Effort expectancy, it was not as important as once assumed by Venkatesh et al., 2003. Concerning Facilitating conditions, it was not analyzed by the two authors.

Recently, Jeng & Tzeng (2012) examined factors predicting medical professionals' behavioural intention to use a new Clinical Decision Support System (CDSS). They applied the fuzzy Decision-Making Trial and Evaluation Laboratory (DEMATEL) technique to explore the causal relationship between the UTAUT variables. Results showed an insignificant relationship on Social Influence towards the intention of using the CDSS, and a significant relationship between Performance Expectancy and this intention.

Moreover, Ifinedo (2012) extended and modified the UTAUT by including compatibility, to study technology acceptance by healthcare professionals except physicians in the Canadian province: Nova Scotia. 491 responses were collected out of the 1335 questionnaires mailed out, but only 227 were exploited, 77% of them were female. The author concluded that healthcare professionals' technology acceptance can be predicted by effort expectancy, social influence, and facilitating

conditions. A for Performance expectancy, it had no positive impacts this intention.

Research Model and Hypotheses

The research model is inspired from the reduced version of the UTAUT model. It excludes Facilitating conditions construct, moderating variables and actual use. Besides to Performance expectancy, Effort expectancy and Social influence, it integrates Trust as a new construct to predict the Moroccan nurses intention to use IT (figure 2)

Performance expectancy is defined as *"the degree to which an individual believes that using the system will help to attain gain in job performance"* (Venkatesh et al, 2003 p. 447).

Venkatesh et al suggested that the construct is valid across all stages of acceptance and in both mandatory and voluntary settings. (Aggelidis & Chatzoglou, 2009; Duyck et al., 2008; A. Hennington et al., 2009; Holtz & Krein, 2011; Jeng & Tzeng, 2011; Kijisanayotin et al., 2009; Wills et al., 2008) found that performance expectancy had a positive influence on the intention behavior. In this communication, we hypothesize that:

Performance expectancy will have a positive influence on the Moroccan nurses' intention to use IT.

Effort expectancy in the UTAUT is composed of constructs such as perceived ease of use and complexity. Schaper and Pervan (2007), Chang et al (2007), Aggelidis and Chatzoglou (2009) (2009), Kijisanayotin et al (2009) noted that healthcare professionals who perceive IT to be easy to use will more readily use such systems in their work. However, other researchers found that Effort expectancy was not useful to predict intentions of healthcare professionals (Duyck et al., 2008; Steele et al., 2009). In this communication we hypothesize that:

Effort expectancy will have a positive influence on the Moroccan nurses' intention to use IT.

Social influence is defined as *"the degree to which one perceives that important others believe one should use the system"* (Venkatesh et

al, 2003 p.451). It includes items of three constructs: Subjective norm, Social factors and Image. Social influence means that an individual's intention is influenced by perceptions and opinions of people in his or her environment. In healthcare context, Aggelidis and Chatzoglou(2009) noted the positive influence of the social influence on behavioral intention, others did not confirm this notation(Schaper & Pervan, 2007). For this communication we hypothesize that:
Social influence will have a positive influence on the Moroccan nurses' intention to use IT

Trust is defined as the 'measure of the belief and goodwill that policymakers feel in and for,

trusted people (Doney et al, 1998). Garbarino and Johnson (1999) added that trust is the customers' confidence in quality and reliability of the services offered by an organization. Prior studies pointed out the positive direct relation between trust and intention (Gefen et al,(2003). In healthcare context Smith and Manna (2004), Smith(2006) and Tung et al (2008) underlined the importance of the trust construct to foster IT acceptance by healthcare professionals. For this communication we hypothesize that:

Trust will have a positive influence on the Moroccan nurses' intention to use IT

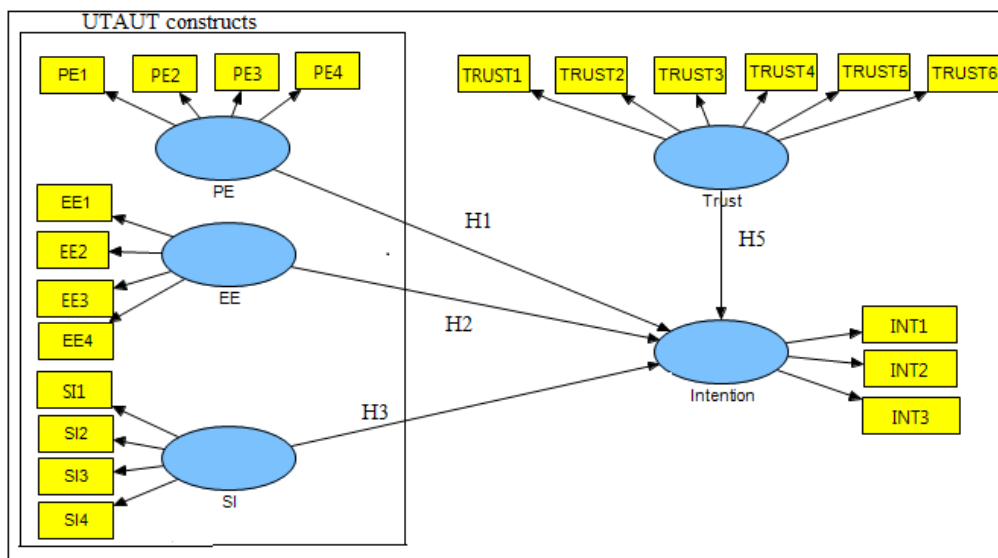


Figure 1. Research Model

Research Methodology

Nurses working for both public and private health organizations located in the city of Agadir represent the target population. They correspond to a total of 400 individuals. This study is limited only to 250 individuals. The data collection process took place from five weeks, from the middle of Mai 2012 till the middle of June

2012. This delay is due to the resistance of some nurses to answer questions and to their low education level making the French version of the questionnaire difficult to understand. Hence, it is necessary to translate questions from French to Arabic or Berber. Of the 250 questionnaires distributed, 200 were

completed and retained for the analysis representing 80% of the response rate. Most of the respondents were female (60%) and aged less than 25 years old (51.5%). 75.5% of these respondents got an IT training and most of them (57.5%) worked at private healthcare organization (Table 1).

Scales used for this study were adapted from the works of Venkatesh et al (2003) and Tung et al (2008). The measurement items were anchored on a 7-point Likert scale from "strongly disagree" (1) to "strongly agree" (7) in which respondents indicated an appropriate response.

Table1. Demographic profile of the sample (N=200)

Variable	Content	N	(%)
Gender	Male	80	40
	Female	120	60
Age	20- 25 years	103	51.5
	25-40 years	80	40
	40- 65 years	17	8.5
IT Training	Yes	151	75.5
	Non	49	24.5
Place of activity	Public	85	42.5
	Private	115	57.5

Data Analysis and Results

To test the research model, authors used the Partial Least Squares (PLS) technique, which is appropriate to validate predictive models using reflective latent constructs (Chin, 1998). This technique also places minimal demands on sample sizes and data distribution assumptions. Authors used SmartPLS software version 2.0M3 to assess both of the measurement model and the structural model.

Measurement Model

The reliability of construct measurement was assessed by the composite reliability and internal consistency. The internal consistency was assessed the Cronbach's Alpha coefficient. It is verified when the alpha is above 0.7. Regarding table 2, all constructs indicated composite reliability above 0.7. Moreover, internal consistency of the scales is verified, because their Cronbach's Alpha exceeded threshold value and confirmed a satisfactory reliability.

Table 2: Items loading, Construct composite reliability (CR), internal consistency reliability (ICR)

Construct	Items	Item loading	Construct CR	ICR (Cronbach's alpha)
Effort expectancy	EE1	0,651849	0.853155	0.782623
	EE2	0,807876		
	EE3	0,838438		
	EE4	0,772417		
Performance Expectancy	PE1	0,862778	0.909393	0.867565
	PE2	0,884688		
	PE3	0,790298		
	PE4	0,842553		
Social influence	SI1	0,858854	0.852130	0.767638
	SI2	0,771803		
	SI3	0,720751		
	SI4	0,716723		
Trust	TRUST1	0,819942	0.923924	0.901358
	TRUST2	0,682979		
	TRUST3	0,795545		
	TRUST4	0,814119		
	TRUST5	0,916496		
	TRUST6	0,867025		
Intention	INT1	0,726979	0.889476	0.737632
	INT2	0,873161		
	INT3	0,825963		

Convergent validity assessed the degree to which different instruments are able to measure the same construct (Portney and Watkins, 2000). It is measured by the factor loadings of the items on the model's constructs. Barclay, Higgins, and Thompson (1995) recommended that an observed principle for convergent validity is to retain items with loadings of 0.70 or more. Table 2 showed that all items, except EE1

(0.651849) and TRUST2 (0.682373), indicated a loading value above 0.7.

Discriminate validity is assured when the AVE value is above the threshold value of 0.50 and square root of the AVE is larger than all other cross correlations (Gefen and Straub, 2005). Table 3 showed the diagonal values (bold) are greater with respect to the corresponding correlation values in the adjoining columns and rows, hence the discriminate validity was confirmed.

Table 3: AVE, Diagonal elements are the square root of the shared variance between the constructs and their measures (AVE); off-diagonal elements are correlations between constructs s (N= 200).

	AVE	EE	Intention	PE	SI	Trust
EE	0.594294	0.7710				
Intention	0.657707	0,446761	0.81099			
PE	0.7155381	0,688430	0,470753	0.8458		
SI	0.591621	0,638110	0,556201	0,675215	0.7691	
Trust	0.671024	0,516569	0,459762	0,589837	0,590959	0.8192

Structural Model

The structural model provides information about the model’s predictive power given by R² and information about path significance. Results showed that the research model explained 35% of total variance in the intention to use IT by nurses (figure 2).

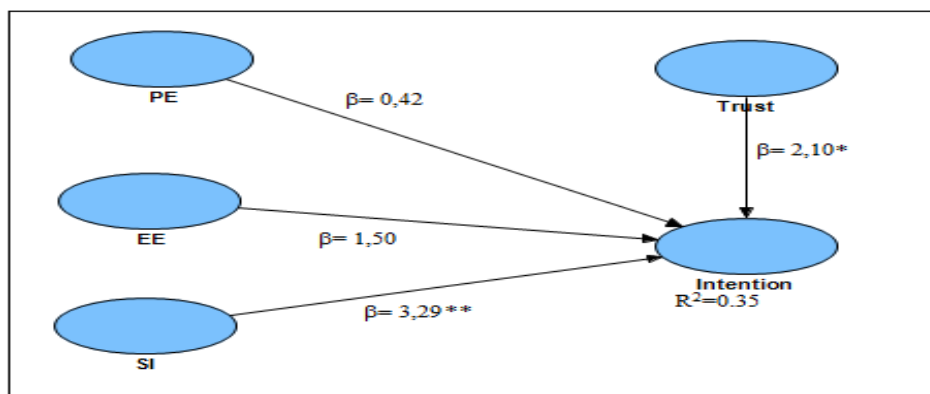
Hypothesis 1 (H1), supposing that Performance expectancy will have a positive influence on nurses intention to use IT was not supported ($\beta=0.42$). It means that Moroccan nurses don’t give more importance to the utilitarian aspect of Information technology.

Hypothesis 2 (H2), suggesting that Effort expectancy will have a positive influence on nurses intention to use IT, was not

supported ($\beta=1.50$). Hence, Moroccan nurses will not be ready to use ITs even these technologies are understandable and easy to use.

Hypothesis 3 (H3), predicting that Social influence will have a positive influence on nurses intention to use IT, was supported ($\beta=3.29$). This result suggests that Moroccan nurses are significantly influenced by their peers and their decisions to use IT depend on others healthcare professionals.

Hypothesis 4 (H4), supposing that Trust will have a positive influence on nurses intention to use IT, was supported ($\beta=2.10$). This result indicates that while the Moroccan nurses trust in IT, it will foster its acceptance.



*p < 0.05, **p < 0.01

Figure 2: Structural model

Conclusion

This communication aims to identify factors influencing IT acceptance by nurses working in public and private Moroccan healthcare organizations. Results suggest that both of the reduced version of the UTAUT model, and the Trust construct were able to provide an explanation of nurses IT acceptance. These results showed that only two factors seem to be significant for this acceptance. The first one, Social influence implies that nurses are very influenced by social norms in their professional field. Hence their IT acceptance decision is firstly influenced by opinions of their peers. The second, Trust, posits the nurses' confidence in quality and reliability of the services offered by using IT in their administrative and healthcare tasks.

As managerial implication the current study, it proposed a useful tool for hospital managers needing to assess the integration of the new technologies in their organizations, and helped them to understand factors fostering IT acceptance especially by nurses.

The sample size of 200 represents a limitation to this research. Besides the Gender (60% of respondents were female), and age (51.5% of the respondents had less than 25 years old) could bias results. Future work should attempt to integrate more constructs and include more accurate representation of the sample.

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