Understanding EHRs continuance intention to use from the perspectives of UTAUT: practice environment moderating effect and top management support as predictor variables

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Abstract: This study attempts to comprehend factors influencing nurses' continuance intention to use electronic health records (EHR) system in Jordan since they as the key service providers in healthcare services are main users of the system. Their acceptance and usage of the system are imperative to evaluate the system's implementation success. A cross-sectional survey is conducted on the fully implemented EHR system public hospitals. Study framework is based on the extended model of the unified theory of acceptance and use of technology (UTAUT) and top management support (TMS). Results reveal effort expectancy, performance expectancy and facilitating conditions positively influence nurses' continuance intention to use and top management support as significant and negatively related to nurses' continuance intention to use. Results also disclose relationship between social influence and continuance intention to use as not significant. Multi-group analysis result indicates stronger relationship between effort expectancy and continuance intention to use is evident to ward nurses than special unit nurses. Findings confirm on the necessity to support new technologies specifically EHR system in hospitals and contributes to UTAUT theory through revealing the impact of top management support on continuance intention to use and establishing relevant measurement accuracy of study framework in Jordanian context.

Keywords: UTAUT; unified theory of acceptance and use of technology; continuance intention; EHR; electronic health records; TMS; top management support; nurses; Jordan.

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1 Introduction

Information technologies (IT) play a critical role in resolving the challenges encountered in health-care systems, especially in addressing issues related to the development of new strategies for effective healthcare service delivery (Agarwal et al., 2010; AL-Hadban et al., 2016). Despite numerous empirical submissions on the advantages of implementing IT in a healthcare system, a wide gap exists in the level of satisfaction that healthcare professionals like nurses and doctors have expressed concerning the use of IT (Buntin et al., 2011). Though the professional culture of nurses makes them generally favourable to adopting innovations (Callen et al., 2009), effectively coping with job demands has been a key factor influencing their decisions and behaviours regarding the use of IT (Zhang, 2013).

In the information systems research area, the post-adoption behaviour of IT has become a critical topic of discussion (Bhattacherjee, 2001; Bhattacherjee and Premkumar, 2004; Venkatesh et al., 2011a; Bhattacherjee and Lin, 2015). While numerous tactics have attempted to influence the adoption of innovations by potential users, the long-term viability of any innovation is predicated upon the continuance behaviour of users. This study, therefore, builds on Venkatesh et al.'s (2011a) model with a view to extending that model for a better understanding of the phenomenon of post-adoption behaviour.

Only a sparse number of empirical endeavours have clearly distinguished between pre-adoption and post-adoption (continued use) beliefs and attitudes of individuals (Karahanna et al., 1999; Bhattacherjee, 2001; Bhattacherjee and Premkumar, 2004; Venkatesh et al., 2011a; Bhattacherjee and Lin, 2015). Interestingly, this distinction is vital to further understand and manage such occurrences over time (Karahanna et al.,

1999). Whereas a potential adopter's intention to adopt is an exclusive function of normative pressures, only attitudes determine user intention. The attitudes of potential adopters rely on a rich set of innovation characteristics, like perceptions of usefulness, ease-of-use, result demonstrability, visibility, and trialability, and post-adoption attitudes in addition to influential beliefs related to the usefulness and perceptions of image enhancement (Karahanna et al., 1999). Consumer behaviour researchers (Howard and Jagdish, 1969) and cognitive dissonance theorists (Cummings and Venkatesan, 1976; Festinger, 1957) have provided support for such differences between adoption and usage. These theorists have argued that using a product may modify a person's perceptions, attitudes, and needs based on the actual usage of the product. As a result, the beliefs that motivate after-adoption usage of the product may not be like those that motivated adoption in the first place.

Using Electronic Health Records (EHR) as an IT system is fundamental to providing effective healthcare service delivery, improving efficiency, and promoting decision making and improving management (Daim et al., 2016; Gilani et al., 2016; Ayanso et al., 2015; Boswell, 2013). Hence, the application of EHR in a health system is critical to the development and adaptation of best practices. In view of the above, this study examines the factors that can explain nurses' continuance intention to use EHR in Jordanian public hospitals. This is intended to extend the unified theory of acceptance and use of technology (UTAUT) by including continuance intention as an endogenous factor (dependent variable) and top management support (TMS) as an exogenous factor.

Globally, health systems are currently facing challenges in the form of high costs and inadequate relevant resources (Ayanso et al., 2015; Ghazisaeedi et al., 2014). Presently, healthcare systems are becoming more complex due to rigors of coordination and communication between and health-care professionals vis-à-vis the struggle to strike a proper balance among the varying skills required to carry out their usual heavy workload (Ayanso et al., 2015; Mohammadzadeh et al., 2013). Moreover, pursuant to the need to reduce medical errors and improving the quality of care, having a system that encourages timely access to precise information, proper health data management and related information for users is critical (Ayanso et al., 2015; Mohammadzadeh et al., 2013).

Additionally, speedy access to health information (Prgomet et al., 2009), medical education and research improvements (Pawar et al., 2012), effective communication (Warren et al., 2011) and improved patient care and management (Clauser et al., 2011) are among the advantages of using IT in healthcare. Hence, using IT tools is a fundamental step for implementing best practices. Electronic health records included evidence and should be considered a vital, rich source of health informatics. The efficient and correct implementation of health records affects all processes related to the development of health systems in any society (Ghazisaeedi et al., 2014).

Information technology is changing the shape of globalised operations in all fields. Over the years, most developed countries have succeeded in implementing information technology in major parts of their economies including the healthcare sector. Conversely, developing countries, especially in the Arab world, are mostly behind in properly implementing HIT systems within their healthcare sectors. Most Arab countries have lagged in HIT, and government-funded public hospitals often lack professional utilisation of IT (Alsadan et al., 2015).

The Jordanian healthcare system is among those Arab countries encountering challenges related to accessibility, inefficient use of available resources, poor

management and inappropriate health information systems (Ajlouni et al., 2015; Ajlouni, 2010). Despite having implemented EHR systems, many countries, including Jordan, continue facing challenges, such as poor usability because EHR systems are not easy either to learn or to use. Thus, the ultimate promise of EHR systems may remain unfulfilled, and the work of the staff may not be made easier. Because of these difficulties, their performance may be affected negatively, and their productivity may decrease (Dua'A et al., 2013). In fact, some healthcare practitioners think that an EHR system is arduous, difficult, and annoying to use and may not guarantee patient privacy (Meinert and Peterson, 2009; Al-Nassar et al., 2011). Consequently, issues related to system ease of use, a decrease in user's performance and productivity will influence negatively the continuance intentions of users to utilise an EHR system after implementation. Eventually, they may stop using a system altogether and return to paper-based documentation.

Management support is critical in inspiring and boosting the adoption of IT in healthcare organisations (Yusof et al., 2008; Cresswell and Sheikh, 2013; Escobar-Rodríguez and Romero-Alonso, 2014). Moreover, management's knowledge and understanding of a HIS should reduce ambiguities associated with the introduction and implementation of an innovation in organisations (Abdul Hameed and Counsell, 2012; Thong and Yap, 1995; Thong, 1999). Boonstra and Broekhuis (2010) opined that management's belief and the attendant support that it provides to the functionality of the HIS influences the level of usability for healthcare personnel is critical. Without this support from management, the morale of personnel will be challenged and may eventually affect the adoption and use of the HIS (Terry et al., 2008; Thakur et al., 2012). Additionally, it has been posited that, when management support is absent regarding commitment implementing and using HIS, organisational goals and objectives and specific service-delivery goals may not be achieved (Davidson and Heslinga, 2006; Ludwick and Doucette, 2009).

In addition, utilising misapplied managerial tactics to facilitate adoption behaviour across various stages may result in unpleasant consequences, which may, in turn, lead to an overall reduction in IS effectiveness (Liao et al., 2009) or even the discontinued use of a system. Thus, top management support (TMS) has an overarching role.

2   Theoretical foundations

Understanding how and why potential users accept and use technology in relationship to Information Systems (IS) research is critical. Venkatesh et al. (2003) developed the UTAUT model, which is a combination of eight models related to the TAM (Davis, 1989) and the TAM 2 (Venkatesh and Davis, 2000). In giving credence to the UTAUT model, they argued that the model would useful for executives who wish to ascertain how users will accept the introduction of a new technology and what factors facilitate the acceptance of new technology. Basically, the UTAUT morphs the disjointed view of technology acceptance to a more unified view, in that the foremost theories and models of technology acceptance have been integrated into a single model (AbuShanab et al., 2010). Consequently, some IT-related studies on organisational and non-organisational settings have applied the UTAUT (Venkatesh et al., 2012).

The UTAUT is a combination of factors that influence the intention to use and definite the use of IT. Seven constructs comprising the UTAUT model significantly influenced the intention or usage (Venkatesh et al., 2012). However, of the seven constructs, performance expectancy (PE), effort expectancy (EE), social influence (SI) and facilitating conditions (FC) are the four key constructs of UTAUT that directly determine user acceptance and usage behaviour. The essence of these factors is that they concentrate on how users perceive the usefulness of a system in increasing their productivity. These factors also explain the ease with which people can learn to use a system. In addition, the role of significant persons in their places of work influences the behaviours of people with respect to their use of an IT. Also, the perceptions of the resources and support available to use the system have impacts (Brown and Venkatesh, 2005; Venkatesh et al., 2003).

2.1 Factors influencing information technology adoption and use

Prior studies on the implementation adoption and utilisation of EHR system have primarily focused on physician perceptions (Bahensky et al., 2008; Stubenrauch, 2009). However, examining perceptions of other healthcare professionals like nurses is appropriate. Basically, the professional culture of nurses favourably disposes them to adopt innovations (Callen et al., 2009), and how they effectively respond to the factors influencing decisions and behaviours related to the usage of IT is of critical concern (Zhang, 2013). Concerns have been raised about the effectiveness and efficiency of nurses' performance who must deal with the challenges of paper-based patient records and the EHR vis-à-vis the critical changes in clinical service-delivery that the introduction and use of IT in healthcare systems have impacted (Cornell et al., 2010). Succinctly put, the EHR is expected to ease access to critical clinical and related data, increase health promotion, reduce medical errors, increase clinical interventions and patient evaluation, and make the general management of the system better (Daim et al., 2016; Gilani et al., 2016; Ayanso et al., 2015; Boswell, 2011, 2013; Goorman and Berg, 2000). These and related functions are pertinent to the optimal functionality of nurses, in that they play a critical role in the health management system (Goorman and Berg, 2000; Staggers and Thompson, 2002; Institute of Medicine, 2010).

In Jordan, nurses represent the largest group of healthcare providers (Jordanian Ministry of Health, 2015). They are often at the front-line of healthcare delivery, yet few empirical endeavours have examined how they accept the use of IT. In view of the fact that nurses are critical stakeholders in the healthcare system, understanding their adoption tendencies for the development of successful implementation and training strategies would be worthwhile.

Some studies have examined IT adoption by nurses. Their findings have provided detailed descriptions of how nurses perceive satisfaction with the use of an EHR system (Hegney et al., 2006; Bickford et al., 2005; McLane, 2005). In addition, Lærum et al. (2004) explored the differences in satisfaction among several types of professionals using EHR including medical secretaries, nurses, and physicians. They found that the differences among the groups were related to the nature of their work and environment. Hence, this current study used a theory-based approach in further explaining and understanding nurses' continuance intention to use EHRs.

The UTAUT model has been useful in investigating technology adoption. It can basically be used for the identification of factors that are capable of influencing intention

and IT usage (Venkatesh et al., 2003, 2011a). This is because the UTAUT was assembled on findings from theoretical and experimental endeavours and in relationship to similar user acceptance models in the IT adoption literature, and more precisely in the healthcare setting. Unfortunately, additional constructs like TMS (Dong et al., 2009), which have been noted to influence technology adoption were conspicuously missing. Clearly, the role of TMS in explaining technology implementation success is known to be critical (Neufeld et al., 2007).

In Karahanna et al. (1999), the innovation diffusion and attitude theories were combined to examine variations in intention to use and continuance intention. In their submission, they noted that the use of a single set of beliefs to discuss distinct stages of the innovation-decision process may lead to complications in understanding such relationships, especially among potential adopters. They further submitted that normative pressures determine intention to adopt, while attitude determines user intention. Moreover, pre-adoption attitude was a perceptive factor of visibility, usefulness, ease-of-use, result demonstrability, and trialability. In concluding, Karahanna et al. (1999) noted that knowledge about beliefs, attitudes and norms are modified over time is limited. Considering the above, this current study used continuance intention as a dependent variable instead of an intention to use due to the sample frame of this study which was the public hospitals in Jordan that fully implemented EHRs, which mean nurses were already using EHRs. This study investigates their intentions to continue using them.

Performance Expectancy (PE) is how individuals believe that the use of a specific technology will aid them in effectively and efficiently performing tasks in the workplace (Venkatesh et al., 2003). Venkatesh et al. (2003) that noted extrinsic motivation, job fit, perceived usefulness, and outcome expectations are components of the PE construct. On a related note, perceived usefulness refers to a person's expectation that using a technology will translate into improved work performance (Davis et al., 1992). Interestingly, the perceived usefulness factor has been used in studies associated with usage intentions like Davis et al. (1989). In relationship to the present study, performance expectancy will be nurses' perception that the use of the EHR will boost their efficiency and effectiveness, ability to complete job responsibilities speedily, and improve the quality of care provided. Based on the literature review, performance expectancy can influence the continuance intention to use (Venkatesh et al., 2011a; Zhou, 2011). Thus, this study postulates:

Hypothesis 1: Nurses' continuance intention to use EHRs will be positively influenced by Performance Expectancy.

Effort expectancy is basically used to refer to ascertaining how easy it is to use a system (Venkatesh et al., 2003). Venkatesh et al. (2003), however, noted that complexity, ease of use, and perceived ease of use are the three basic concepts utilised in explaining the effort expectancy construct. On ease of use, Moore and Benbasat (1991) noted that ease of use connotes how people's level of perception in the use of a specific system is devoid of mental and physical effort. Complexity is defined as users' perceptions that the use of a technology is difficult to understand (Thompson et al., 1991). In relationship to this study, effort expectancy connotes nurses' perception of how easy it is to learn to use an EHR, and, by implication, become skilful in its use. The literature review shows that effort expectancy significantly impacts continuance intention to use (Venkatesh et al., 2011a). Thus, this study postulates:

Hypothesis 2: Nurses continuance intention to use EHRs will be positively influenced by effort expectancy.

Social influence connotes the extent of an individual's perception that significant others believe that they should use a new system (Venkatesh et al., 2003). Moreover, image, subjective norms and social factors are noted as the factors that comprise the social influence construct. Ajzen (1991) and Mathieson (1991) noted that subjective norms are the perceived social pressure that an individual feels in his/her willingness to, or not to perform a behaviour. In relationship to the present study, social influence is defined as nurses' perception of how notable other persons in the workplace approve (or disapprove) the acceptance and use of the EHR. The literature review shows that social influence can influence continuance intention to use (Zhou, 2011). Thus, this study postulates:

Hypothesis 3: Nurses' continuance intention to use EHRs will be positively influenced by social influence.

As defined by Venkatesh et al. (2003), a facilitating condition is the extent to which individual trusts that existing requisite structures in the organisation are established with the aim of supporting the use of the system. In measuring this construct, compatibility, perceived behavioural control and facilitating conditions are noted as components. According to Thompson et al. (1991), facilitating conditions are labelled as objective factors whose presence aids the easy accomplishment of a task. Furthermore, Thompson et al. (1991) noted that training users and further assisting them when they encounter difficulties in the use of a technology is important. In this study, facilitating condition is defined as the perception of nurses that certain factors in the hospital that either hinder or expedite their acceptance and use of the EHR. The literature review shows that facilitating conditions impact continuance intention to use (Zhou, 2011). Thus, this study postulates:

Hypothesis 4: Nurses' continuance intention to use EHRs will be positively influenced by facilitating conditions.

2.2   Influence of top management support

Top management support is the degree to which top management understands the importance of the IS function and the content of which is involved in activities (Ragu-Nathan et al., 2004). TMS (behaviour) is the "explicit and active support of the top management towards the introduction and development of new information technology" (Bruque-Cámara et al., 2004, p.138). Researchers believed that TMS is critical in enhancing the incorporation of technology into an organisation (Yigitbasioglu, 2015; Low et al., 2011; Jarvenpaa and Ives, 1991; Kwon and Zmud, 1987; Leonard-Barton and Deschamps, 1988; Purvis et al., 2001) as it facilitates EHRs continuance to use in several ways. The most difficult and challenging EHRs implementation relates to the nature of healthcare information systems and the critical role that they play amidst the complexies involved in the process. This includes several aspects such as distinctive and advanced technical features, the complexity of executing administrative roles and confronting of security and safety issues.

Initiating a new technology into an already complex and sophisticated system is more challenging. This is in view of the fact that change must be persistent and must include

numerous levels of individuals, their roles and relationships in addition to the socio-technical aspects or what are commonly known as business processes (Boswell, 2013; Greenhalgh et al., 2008). TMS is critical because the implementation of IS innovations is resource-intensive. Considerable material and managerial resources are required not only to develop IS applications and infrastructures, but also to support end users (Yigitbasioglu, 2015; Sharma and Yetton, 2003; Jarvenpaa and Ives, 1991; Kwon and Zmud, 1987; Leonard-Barton and Deschamps, 1988; Purvis et al., 2001). In addition, representational actions of support by managers contribute to successful implementation. This is so because these actions legitimise IS innovations, signal management commitment to successful implementation, and act as a convincing tool to end users to expend the effort required to adopt the innovations (Leonard-Barton and Deschamps, 1988; Purvis et al., 2001).

Based on the above, support and supervision of end users during implementation also contributes to implementation success (Bhattacherjee, 1996). Managers must work closely with end users to mandate, negotiate, persuade, motivate, and support them in adopting IS innovations. Management support is also considered critical for re-conceptualising work processes and for changing existing routines and processes that are critical for successful implementation (Purvis et al., 2001). In view of the above, TMS has an impact on continuance intention to use. Thus, this study posits:

> *Hypothesis 5: Nurses' continuance intention to use EHRs will be positively influenced by Top Management Support.*

2.3 The moderating role of department (Practice environment and nursing specialty)

Hospitals have many types of units, which provide diverse types of care and services for patients. Broadly speaking, hospital inpatient units can be separated into two categories based on the level (or acuity) of care they provide and equipment used. These are the Ward (Floor) department and special units (such as ICU, CCU, ER, dialysis, and operating room). Based on this variation, nurses job descriptions, obligations and roles vary (Washington State Department of Health, 2017).

Therefore, the interaction effect between specialty area and hospital must be considered when addressing the practice environment for using EHRs. Although differences exist in the quality of the nursing practice environment, differences between units within a hospital cannot be ignored. Therefore, specialty area by hospital interaction is vital for consideration because this shows that the experiences of nurses in a hospital are not homogeneous; instead, they are dependent on the specific specialty in which the nurses work within a specific hospital (Estabrooks et al., 2002). Thus, this study postulates:

> *Hypothesis 6: The strength of the determinants of CI (EE, PE, FC, SI and TMS) differ between nurses working in a Ward (Floor) department and nurses working in special units such that the strength of the relationship will be greater for nurses working in special units.*

Figure 1 is an extended model of the UTAUT and TMS.

Figure 1   Research framework
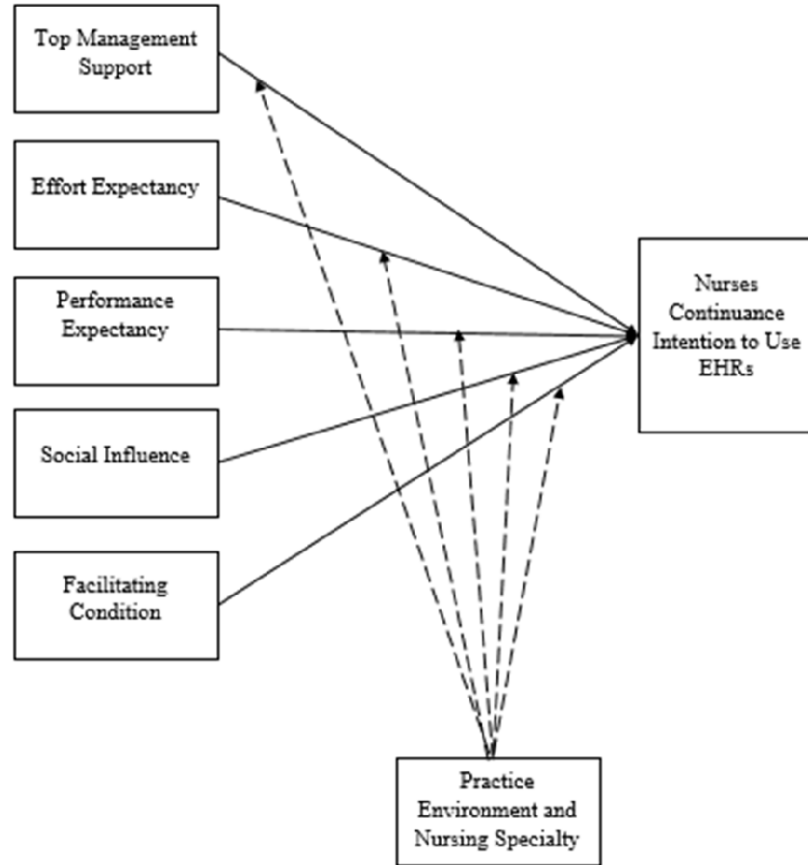
3   Methodology

The target population for this study was nurses working in public sector hospitals in Jordan who have the authority to use EHR system. However, little theoretically-driven research exists on nurses' acceptance of information technology use (Holtz and Krein, 2011). According to the Ministry of Health in Jordan, nurses have three classifications:

- registered nurses and midwives

- practical nurses

- portal nurses.

The only nurses who are authorised to use EHRs are registered nurses and practical nurses. Therefore, this study included the first and second types of nurses only. The sample frame are public hospitals that have fully implemented EHR in Jordan based on a list provided by email from Electronic Health Solution Company in Jordan.

According to the Electronic Health Solution Company, which is the company responsible for implementing EHR systems in the Jordanian public health sector, the

number of hospitals that have implemented fully EHR in Jordan comprises the 11 hospitals listed in Table 1.

The public hospitals in Jordan that have fully implemented the EHR system constitute the primary sample of the study, while the secondary sampling unit are nurses who have the authority to use EHR system.

The sampling procedure for this study was divided into two stages. The first was selecting the public hospitals that have fully implemented EHR, which were 11. However, the hospital Al_Hussein for Cancer Hospital could not participate. Hence, only 10 hospitals participated in the study. Due to the small number of hospitals, all hospitals were included in the study. The second stage of the procedure was selecting the nurses who worked in these hospitals using a probability sampling procedure called systematic random sampling. The researcher collected a list of nurses' names from their heads department. Thereafter, one name was randomly chosen after every 5th name in the list.

Table 1   Hospitals that have fully Implemented EHR in Jordan with the Number of Nurses

Province	Hospital Name	Number of nurses	Total nurses	Nurses by hospital
North	Princes Rahmah Hospital	RN: 132	149	23
		Diploma: 17		
	Princes Badeaha Hospital	RN: 126	137	21
		Diploma: 11		
	Al Mafraq Governmental Hospital	N: 123	141	21
		Diploma: 18		
	Al_Mafraq/Gyneocology and Paediatrics	RN: 90	110	17
		Diploma: 20		
	AL Ramtha Hospital	RN: 131	158	24
		Diploma: 27		
Central	Prince Hamzah Hospital	RN: 444	528	79
		Diploma: 84		
	Prince the Second Hussain Ben Abdullah	RN: 135	181	27
		Diploma: 46		
	Al Zarqa Governmental Hospital.	RN: 363	472	71
		Diploma: 109		
South	Ma'an Hospital	RN: 186	226	34
		Diploma: 40		
	Queen Rania AL Abdalla Hospital	RN: 70	92	14
		Diploma: 22		
Total	10 hospitals	RN: 1800	2194	331
		Diploma: 394		

Source: EHS (2015)

The sample population was (2194) nurses distributed among the listed 10 hospitals. As per Krejcie and Morgan (1970), the sample size for the study ranged between (322–327) nurses. However, to ensure a minimal sample response of (327), 510 questionnaires were distributed. The ratio of nurses from each hospital was calculated according to formula (Number of nurses in hospital 'X'/total number of nurses in all hospital) * Sample size). Only 490 questionnaires were returned, and 18 questionnaires were excluded because they were missing more than 50% of the data (Hair et al., 2010). This resulted in 473 usable responses, with 92% response rate. Table 2 illustrates the number of questionnaires collected from each hospital and ratio of nurses from each hospital.

Table 2   Demographic profile of respondents ($n = 473$)

Item	Category	N	Percentage (%)
Gender	Male	141	29.8
	Female	332	70.2
	Missing data	0	0
	Total	473	100
Age	20–30 years	208	44
	31–40 years	183	38.7
	41–50	75	15.9
	51–60	3	0.6
	Missing data	4	0.8
	Total	473	100
Education level	Diploma Degree	81	17.1
	Bachelor Degree	363	76.7
	Master's Degree	24	5.1
	PhD Degree	2	0.4
	Missing data	3	0.6
	Total	473	100
Profession experience	1–5	128	27.1
	6–10	123	26
	11–15	100	21.1
	16–20	74	15.6
	21–25	38	8
	26–30	6	1.3
	31–35	1	0.2
	Missing data	3	0.6
	Total	473	100

Table 2 Demographic profile of respondents (*n* = 473) (continued)

Item	Category	N	Percentage (%)
Current hospital experience	1–5	220	46.5
	6–10	118	24.9
	11–15	60	12.7
	16–20	46	9.7
	21–25	19	4
	Missing data	10	2.1
	Total	473	100
Hospital name	1	59	12.5
	2	23	4.9
	3	86	18.2
	4	36	7.6
	5	97	20.5
	6	29	6.1
	7	40	8.5
	8	23	4.9
	9	42	8.9
	10	38	8
	Missing data	0	0
	Total	473	100
Department	ICU	47	9.90
	CCU	24	5.10
	ER	52	10.1
	Dialysis	33	7.00
	Floor	223	47.1
	Operating room	94	19.9
	Missing data	0	0.00
	Total	473	100

4 Measurement

To ensure greater convergent and discriminant validity, constructs and items tested in previous studies. They were: continuance intention measured by using five items adapted from Basri (2012). The second variable was Performance Expectancy, which was measured using five items adapted from Holtz and Krein (2011). The third variable was effort expectancy, which was measured using five items adapted from Holtz and Krein (2011). The fourth variable was Social Influence, which was measured using eight items adapted from Holtz and Krein (2011). The fifth variable was facilitating condition,

which was measured using six items adapted from Holtz and Krein (2011). The sixth variable was TMS, which was measured using eight items adopted from Igbaria (1990). A complete list of items adapted for the data collection purpose is reported in Appendix 1.

To ensure the clarity of questions and the accuracy of the responses provided, the definitions and descriptions of the variables adopted in this study were specified clearly on the survey instrument. CI was defined as the intention of a user to continue using an IS post-adoption (Bhattacherjee, 2001). In this study, CI was operationalised as the intention of nurses to continue to use EHRs post-adoption.

However, because of cultural differences, several items were modified to suit the context of the current study. A translation of the survey instrument from English into Arabic was carried out based on the guidelines that Brislin suggested (1986). A pre-test study was conducted with four academic representatives who were familiar with information technology. Minor changes were made to the questionnaire based on the pre-test to improve the clarity of questions. All measurements were evaluated on a 5-point Likert-type scale (i.e., '1' = strongly disagree; '5' = strongly agree). (See also, Alsaad et al., 2017).

5   Data analysis

To achieve the research objectives, the researcher used SPSS Version 20 and PLS version 3.0 M3 as statistical tools. Partial Least Squares (PLS) was used to estimate the proposed model. As a structural equation modelling (SEM) technique, PLS can simultaneously test the measurement model and the structural model (Gefen et al., 2011; Ringle et al., 2012).

The description of the demographic characteristics of the respondents of this study was illustrated in Table 2 such as gender, age, education level, profession experience, hospital experience, hospital name and department. In addition, before running the inferential analysis normality and linearity tests has been done. Based on Figure A1 in Appendix 2, it is posited that the data was follow normal patterns and normality assumptions were not violated. Also, the output for linearity test is displayed graphically in Figure A2 in Appendix 3 and illustrates normal probability plot of regression standardised residuals for independent variables on the dependent variable was normally distributed.

The first step in PLS analysis process is to conduct reliability and validity tests of the measurement model. Reflective measurement models are evaluated on the following steps; indicator reliability, internal consistency (composite reliability), convergent validity (average variance extracted) and discriminant validity.

Table 3 shows the Cronbach's alphas, item loadings, composite reliability and Average Variance Extracted of all constructs. The CR coefficients of the constructs of the study ranged from 0.901 to 0.943. This suggests adequate internal consistency reliability of the measures used in this study (Bagozzi and Yi, 1988; Hair et al., 2011, 2014a).

Table 3 Item Loading, Cronbach's alpha, composite reliability, average variance extracted

Construct	Measurement items	Loadings	Cronbach's alpha	Composite reliability (CR)	Average variance extracted (AVE)
Continuance intention	CI1	0.886	0.925	0.943	0.769
	CI2	0.876			
	CI3	0.844			
	CI4	0.892			
	CI5	0.886			
Effort expectancy	EE1	0.857	0.884	0.916	0.690
	EE2	0.896			
	EE3	0.883			
	EE4	0.634			
	EE5	0.854			
Facilitating condition	FC1	0.821	0.872	0.907	0.661
	FC2	0.846			
	FC3	0.799			
	FC4	0.815			
	FC5	0.783			
Performance expectancy	PE1	0.899	0.881	0.926	0.808
	PE2	0.918			
	PE3	0.879			
Social Influence	SI1	0.635	0.885	0.909	0.559
	SI2	0.711			
	SI3	0.822			
	SI4	0.858			
	SI5	0.814			
	SI6	0.768			
	SI7	0.713			
	SI8	0.630			
Top management Support	TMS1	0.740	0.878	0.901	0.533
	TMS2	0.781			
	TMS3	0.758			
	TMS4	0.703			
	TMS5	0.740			
	TMS6	0.789			
	TMS7	0.681			
	TMS8	0.636			

Regarding convergent validity, the results shown in Table 3 indicate that the AVE's of all constructs were above the conventional value of 0.5. Meanwhile, the square roots of the AVEs for all constructs were calculated to estimate the discriminant validity as presented in Table 4. The results show that the square roots of the AVE scores were all greater than the correlations among the constructs, demonstrating discriminant validity. Additionally, the current study employed the cross-loading method to test the discriminant validity. Finally, collinearity between the constructs was examined. Using the PLS algorithm, VIF values for all constructs are generated and presented in Table 5. The variance inflation factor (VIF) is a regularly used approach to detect multicollinearity (Petter et al., 2007). VIF values of all constructs were less than the threshold of five. Therefore, the conclusion can be made that the variables did not have any multicollinearity issues to continuance intention to use.

Table 4   Discriminant validity of the constructs

	CI	*EE*	*FC*	*PE*	*SI*	*TMS*
CI	*0.877*					
EE	0.708	*0.830*				
FC	0.514	0.555	*0.813*			
PE	0.760	0.635	0.477	*0.899*		
SI	0.531	0.542	0.517	0.547	*0.748*	
TMS	0.439	0.490	0.560	0.475	0.611	*0.730*

PE: performance expectancy, EE: effort expectancy, SI: social influence, FC: facilitating condition, TMS: top management support, and CI: continuance intention.

Table 5   Tolerance and variance inflation factors (VIF)

Latent construct	*Collinearity statistics*
	VIF
Effort expectancy	2.023
Facilitating condition	2.006
Performance expectancy	1.889
Social Influence	1.932
Top management support	2.125

To evaluate the structure model and to test the proposed hypotheses, the main effect model was examined. To assess the significance of the various effects of the study model, the PLS path algorithm, which generates the path coefficient, was first run. This was followed by the run of the structural model using the bootstrap procedure by generating 5000 resamples (Hair et al., 2011, 2014b; Sarstedt et al., 2014). Then, to test moderating effect department type on the model, PLS SEM, Multi-Group Analysis (PLS-MGA) was done.

As seen in Table 6, Based on the study hypotheses, effort expectancy was significant and positive ($\beta = 0.335$, $t = 5.970$, $p < 0.01$) and influenced Jordanian nurses' continuance intention to use EHRs. Thus, H 1 is supported. Similarly, facilitating condition was significant and positive ($\beta = 0.101$, $t = 2.608$, $p < 0.01$) and influenced

Jordanian nurses' continuance intention to use EHRs. Thus, H 2 is supported. Also, performance expectancy was significant and positive ($\beta = 0.494$, $t = 10.015$, $p < 0.01$) and influenced Jordanian nurses' continuance intention to use EHRs. Thus, H 3 is supported. In addition, TMS was negative and significant ($\beta = -0.066$, $t = 1.656$) and influenced Jordanian nurses' continuance intention to use EHRs. Thus, H 5 was not supported. Moreover, social influence was insignificant and positive ($\beta = 0.067$, $t = 1.436$, $p < 0.05$) and did not influence Jordanian nurses' continuance intention to use EHRs. Thus, H4 was not supported.

In SEM, a multi-group analysis is conducted for testing differences between similar models estimated separately for two or more groups of respondents (Hair et al., 2010, 2013). Meanwhile, in PLS SEM, Multi-Group Analysis (PLS-MGA) can be explained as a process of making a comparison between PLS estimates across subpopulations (Hair et al., 2013; Henseler, 2012; Henseler and Fassott, 2010). The basic objective is to see whether a specific model behaves either differently or similarly for such groups.

Table 6   The structural model assessment

No.	Hypothesis	Beta	T Statistic	Decision
1	Effort expectancy → continuance intention	0.335	5.970***	Supported
2	Facilitating condition → continuance intention	0.101	2.608***	Supported
3	Performance expectancy → continuance intention	0.494	10.015***	Supported
4	Social influence → continuance intention	0.067	1.436	Not supported
5	Top mgt. support → continuance intention	−0.066	1.656*	Not supported

t-values > 1.645* (*p* < 0.05); *t*-values > 1.96** (*p* < 0.02); and *t*-values > 2.33*** (*p* < 0.01) 1-tailed test. EE: effort expectancy, FC: facilitating condition, PE: performance expectancy, SI: social influence, TMS: top mgt. support, and CI: continuance intention.

Testing of the moderation effect uses group comparisons approach when one of the interactive latent variables (independent or moderator) is not a continuance latent variable (Henseler and Fassott, 2010). Earlier works have argued that a moderator latent variable that is categorical in nature (e.g., gender, class, size, etc.) must be used as a grouping latent variable that requires transformation through the dichotomisation technique (high and low) (Hair et al., 2014a; Henseler and Fassott, 2010; Venkatesh et al., 2011).

In the current study, one demographic variable (department) was hypothesised to moderate the relationships between effort expectancy, performance expectancy, facilitating condition, social influence, TMS and continuance intention. Because of this, a multi-group analysis was conducted to observe how the model behaves for different department groups. For statistical estimations under multi-group analysis, the department can be separated into two groups:

- special units
- floor.

In view of that, the data were allocated (split in PLS3) as per the recommendations of Byrne (2010) and Hair et al. (2013). Separate datasets were created for the special units group (ICU, CCU, ER, Dialysis, Operating room), and the Floor group. The research study obtained data on special units (250 responses) vs. the Floor group (223 responses).

A comparison of each path in the structural model for special units with the corresponding path coefficient for ward (Floor) department was made, using multi-group analysis with t-statistics (Keil et al., 2000) (see Tables 7 and 8). The only path that differed significantly between the two subgroups was from effort expectancy to continuance intention to use EHRs ($p > 0.05$). This result indicates that the relationship between effort expectancy and CI was more significant for nurses working in special units than for nurses working in the ward (Floor) departments.

Table 7   Bootstrapping results

	Path coefficients original (Floor)	*Path coefficients original (special unit)*	*p-Values (Floor)*	*p-Values (special unit)*
EE → CI	0.197	0.450	0.007	0.000
FC → CI	0.145	0.050	0.003	0.174
PE → CI	0.542	0.456	0.000	0.000
SI → CI	0.126	−0.006	0.033	0.455
TMS → CI	−0.072	−0.021	0.106	0.345

t-values > 1.645* (*p* < 0.05); *t*-values > 1.96** (*p* < 0.02); and *t*-values > 2.33***
(*p* < 0.01) 1-tailed test.
EE: effort expectancy, FC: facilitating condition, PE: performance expectancy, SI: social
influence, TMS: top mgt. support, and CI: continuance intention.

Table 8   Parametric test

	Path coefficients-diff (Floor – special unit)	*t-Value (Floor vs. special unit)*	*p-Value (Floor vs. special unit)*
EE → CI	0.254	2.495	0.013*
FC → CI	0.095	1.265	0.206
PE → CI	0.087	0.906	0.365
SI → CI	0.133	1.531	0.126
TMS → CI	0.051	0.648	0.517

t-values > 1.645* (*p* < 0.05); *t*-values > 1.96** (*p* < 0.02); *t*-values > 2.33*** (*p* < 0.01)
1-tailed test. EE: effort expectancy, FC: facilitating condition, PE: performance
expectancy, SI: social influence, TMS: top mgt. support, and CI: continuance intention.

6   Discussion

This study was conducted to examine specific factors that influence nurses' continuance intention to use electronic health record systems in the Jordanian public sector (public hospitals that are fully implementing the EHR). Interestingly, the model of the study explained 0.674 of the variance of CI. By implication, the UTAUT was re-examined in a

new context. This is in response to the little research on factors that influence technology adoption in hospitals and related work-settings (Escobar-Rodríguez and Romero-Alonso, 2014). Moreover, little empirical underpinning exists on the use of the UTAUT in the healthcare setting (Venkatesh et al., 2011b). Unfortunately, the bulk of these studies were done in Western settings (Venkatesh and Zhang, 2010; Gagnon et al., 2012).

Because the technology adoption domain and the healthcare context are multidimensional settings (Jeyaraj et al., 2006; Yusof et al., 2008), the model was theorised to include one endogenous factor (CI) and one exogenous factor (TMS). The results revealed TMS to be negatively significant to the CI of EHRs. Hence, one hypothesis of this study was not supported. This finding contradicts Gambatese and Hallowell (2011) who argued that upper management support strongly predicted innovation implementation in construction firms. Also, Al-Hadban et al. (2016) and Sargent et al. (2012) who studied the effect of TMS on intention to use, found TMS to be positive and significant with respect to the intention to use innovations.

One plausible explanation for this result is that the training and support provided by top management for the nurses before using the EHRs was inadequate. Interestingly, the training conducted for the nurses on the use of the system by the Electronic Health Solution company lasted for only five days. Also, the nurses were not involved in the decisions on the workflow process as prescribed in setting-up of the system. Hence, producing a staff dedicated to closing the gap between nurses and IT and establishing a documentation committee volunteers to create nursing EHRs teams responsible for managing front-line contact with all clinical staff throughout the system design, training, implementation, and IT support processes was not done. These steps would motivate nurses to engage better in system usage and reinforce their continued use of the system.

Unfortunately, Jordanian top management did not consider these steps. Top management ignored the role of nurse's involvement in decisions about workflow in creating the programs in Jordanian hospitals or contributing to system design to meet their needs to perform their work efficiently, which accordingly reflected negatively on their perceptions about TMS. Finally, the absence of incentives and compensation, which are essential tactics to motivate nurses, provided negative perceptions about the role of top management in their hospitals.

Also, the results indicated that performance expectancy was the most salient belief driving intention to continue using the system among nurses, which aligns with the findings of Bhattacherjee and Premkumar's (2004), and Venkatesh et al. (2011a). An explanation is that nurse's performance expectancy and attitudinal perceptions are dynamic over time especially with respect to technological and usage contexts and that such changes are more dominant in the initial stages of IT usage than in the later stages (Bhattacherjee and Premkumar, 2004).

Another possible explanation for this result is that nurse's capability to view the clinical history of a patient throughout the whole period of care is necessary. This enables nurses to perceive that they have authority at their fingertips that will boost their eagerness for the system. A nurse's capability to observe the total picture is directly relative to the level of information that is placed online. If healthcare facilities only place clinical records online, nurses will fail to derive the benefits of seeing complete patient documentation such as reviewing a radiology report, or any other care that is being offered by others.

Complete patient documentation means that if nurses find inpatient backdrop occurrences in an outpatient clinic, they can have a complete outlook on a patient. The capacity to recognise a patient's medical history over the entire patient care process leads to an improvement in the quality of care provided and, by extension, decreases medical errors, which allows a nurse to perform better and have increased productivity. In turn, this positive outcome will reinforce the usage of the system.

Also, another important feature in EHRs is the creation of expert rules, which permits EHRs to better coordinate with clinicians in the process of patient care, providing warning messages vis-à-vis patient safety and excellence in care. This better coordination increase healthcare services quality by reducing medical errors. Also, the system can lead to updates on best nursing practices and other information supporting nursing workflow without being excessively obtrusive. The expansion, as well as the improvement of expert rules, permits EHRs to exponentially enhance the capabilities of nurses.

Furthermore, the results indicate that effort expectancy has a significant positive effect on the continuance intention to use EHRs. This agrees with the findings of Venkatesh et al. (2011a). One explanation for this result is that nurses spend most of their time in face-to-face patient care activities like drug administration, nursing evaluations and different patient treatments.

Nurses also oppose information systems if they must spend additional time on long and unimportant computer-recording jobs through their busy caring period (Kirkley and Stein, 2004). Therefore, designing simple-to-use EHRs is critical for nurses. Nurses must find an EHRs simple to use because this simplification will allow them to become familiar with the contents and the functions EHRs offered. Consequently, they will find that EHRs are helpful to them. That is, the level of effortlessness of use affects nurses' awareness of EHRs. As a result, user-friendly interfaces for EHRs and network connectivity are mutually critical characteristics in developing EHRs. In addition, when EHRs are easy to use, nurses will certainly have a better intent to use EHRs.

Furthermore, social influence positively influenced continuance intention to use EHRs. This result agrees with the findings Venkatesh et al. (2011a). One explanation for this result is that, during system use, nurses may adjust their pre-usage social influence perceptions because of their observations of the performance by others of the behaviour, the availability of new information and/or changes in the opinions of their peers (Venkatesh et al., 2011a).

Also, the research suggests that, after nurses use a HER, they will have their own perceptions and convictions about it based on their productivity, performance and ease of use. After usage, then, the opinion role of others in nurse's decisions to adopt and use new system become either more or less important.

Facilitating conditions were also found to affect continuance intention to use EHRs. This result is consistent with previous studies (Zhou, 2011). That is, nurses believe that their hospital supports and provides the necessary resources to continue using EHR. One explanation for this result is that the training and resources provided enhanced the instant access to centralised information, particularly information submitted by other clinicians. This information has an important effect on streamlining the workflow of nurses in addition to promoting eagerness for using the system. Given the necessary adequate resources, nurses formed positive attitudes for engaging in system usage. Nurses could evaluate the appropriateness of resources (relevant knowledge and assistance) during the use of the system. For example, when nurses had access to better adequate resources and

assistance than expected after usage, they exhibited positive beliefs of facilitating conditions, which will, in turn, leads to continuance intention.

Another important finding of this study is that nurses working in special units and ward (Floor) department differed in the relationship between effort expectancy and continuance intention to use EHRs. Consistent with expectations, effort expectancy considerations are more important for nurses working in special units. The schedules of most nurses are already overloaded, and they must care for an inordinate number of patients on any given shift often within impossible time frames accompanied by more complex documentation requirements. Thus, the mere thought of adding one more task to an already frantic day can justifiably seem daunting. This work overload is even more visible in busy special units, Nurses in special-unit settings engage in even more activities. They feel that they do not have the time to deal with computers because their patients are in a more critical condition. Added to this is the pressure to use clinical technology, which is not always user-friendly. Thus, when burdened with this technology, nurses understandably feel that they are drawn away from their primary role as a nurse for yet more administrative duties (Kirley and Stein, 2004). Therefore, designing simple-to-use EHRs is vital for nurses in special units.

7 Limitations and future research

Future research should consider including an examination of the UTAUT in relationship to other technologies. TMS was found to significantly predict continuance intention, hence the need for further tests of this relationship in other health institutions and among related healthcare service providers. More interesting would be to test how TMS, in line with the UTAUT, can predict continuance intention in different organisational and socio-demographic settings. This would further expand the UTAUT model and related literature.

This study has several limitations. One is that this study used a cross-sectional design. This impeded causal inferences to be made from the population. Therefore, future studies should consider a longitudinal design when measuring theoretical constructs at different points in time. This study can be the foundation for future longitudinal research at the 10 hospitals utilised for a deeper understanding of the adoption characteristics of this population. Moreover, the qualitative methodological approach can be used for future studies to further understand the constructs examined in this study.

Another limitation to this research is that the hospitals that had fully implemented EHRs in the public sector comprised 10 of 35 possible hospitals. Future research may include other hospitals after complete implementation of a HER system. Moreover, examining EHR continuance intention in the private sector work setting would be worthwhile. This would pave the way for making a comparative analysis of results between the public and private sectors.

8 Managerial implications

Information technology tools like Electronic Health Records can be powerful means of improving the efficiency and effectiveness of service delivery in healthcare organisations (Kluge, 2011; Lee et al., 2012). The proper use of an Electronic Health Record system is

critical because proper usage can reduce waiting time for patients, manage the side effects of drugs and help reduce mortality rates. Other improvements can be seen in decreasing medical and diagnosis errors, optimal use of resources, increased data quality, the electronic interchange of data and general administration of the healthcare system, which, in the long-run, leads to increased user satisfaction and support in decision making (Boswell, 2013).

The study's findings have several vital implications for healthcare system leaders and managers, government agencies, health information system consultants or vendors, and the hospitals. The findings of this study may also contribute to technology uptake in the health industry at individual and organisational levels and lead to improvements in the healthcare system (Goldzweig et al., 2009; Herricck et al., 2010; Buntin et al., 2011).

Unfortunately, the fact that TMS on continuance intention was found to be negative in the present study has some critical implications. To ensure the adoption of EHRs by nurses, top management in the healthcare industry needs to be actively involved in the planning and the implementation of technological systems within hospitals (Thong et al., 1996). If top management does not support and eventually motivate employees to continuance use the HIS, the adoption and use of EHRs might become challenging (Terry et al., 2008; Thakur et al., 2012). A lack of management support can lead to a lack of fulfilment of the realistic needs and requirements of their staff and the job-tasks and lead to the discontinuance use of technological systems (Davidson and Heslinga, 2006; Ludwick and Doucette, 2009).

A key issue that managers in charge of implementing IS innovations face is developing successful and well-organised strategies for effective implementation (Sharma and Yetton, 2003; Markus and Keil, 1994; Sauer, 1993). Top manager's behaviours have a direct effect on EHR implementation. That is, actions speak louder than words. The findings of this study offered a fundamental understanding for choosing efficient and effective interventions to fit the needs of EHRs implementation, which could include, among others, organisational bulletins to communicate more effectively.

However, actual transformation and vision sharing were certainly affected by the practical, active relational behaviour of managers. Top managers must energetically display helpful actions (for example, encouraging feedback and addressing nurse's concerns and questions) to ensure that strategic visions are internalised. The results also revealed that effective implementation was expected to take place as soon as top managers energetically sought out and paid attention to feedback from end users via middle managers. Because significant system implementations have a propensity to introduce predictable as well as unforeseeable organisational transformation (Davenport, 1998; Markus and Tanis, 2000), top managers must adjust their levels and content of support to match what is required, instead of depending exclusively on standardised training and technical assistance programs.

The nursing staff must be involved in decisions concerning workflow in developing programs. This would build staff loyalty and, by extension, bridge the gap between nurses and IT use. Furthermore, establishing a documentation committee comprising volunteers, which can be used to build nursing EHRs team to run front-line contact with all clinical staff, would be helpful. This can be done from the on-set of system design to training, to implementation and to the IT-support processes. These steps will motivate nurses to engage better in system usage and reinforce their continued use of the system.

Thus, designing a user-friendly system that does not consume nurse's time and helping them to perform better and increase their productivity is critical. If nurses note that using EHRs enhances their performance, this perceived enhancement will eventually increase their productivity and decrease medical errors without adding new work burdens, and, by extension, reinforce their continued use of the system.

Top managers should not presume that employees understand their support. Thus, top managers should openly show their will-power, vision, and positive reception through the stable implementation of tangible actions and communication (Fox and Amichai-Hamburger, 2001). Also, management should offer incentives for a job well-done, which is often lacking in public sectors in Jordan. This would further enhance the image of top management among the nurses.

Another key point of this study is that solid training and support are key tactics as well. The study showed the significance of information systems and their capabilities over the entire continuum of care for nurses to have a comprehensive view of how the use of the electronic health records adds value in addition to the bigger picture of patient's care. Nursing supervisors and management personnel must build a functional system that will offer practical help and improve nursing workflow, unlock means of communication, and open doors for functional information. Besides, this study offers sufficient justification to engage nurses in the design as well as development process, gathering their responses on how to guarantee that the interface sustains the workflow.

The research demonstrated that management should utilise methods to handle users who are at divergent stages of readiness (Roberts et al., 2003). For instance, users who were positive about implementation beforehand require top management to offer needed resources (such as information technology support and training) for them to successfully master the new technology and to relate it to their jobs. Potential users who are currently unwilling require better support in terms of the resource from top managers. They should likewise perceive their leaders as being extremely helpful to the execution, and leaders must successfully disseminate their vision and the advantages of the system.

Hence, for top management to garner nurses' continuance intention to use of technology, the difficulties that nurses face must be distinguished and tackled to assist them in identifying the advantages of undertaking such a huge transformation. Leaders must enhance the collective awareness of contributing factors and create more effective plans to earn the sustained continuance intentions of nurses to use the system.

In summary, the findings of the present research affirm that understanding the significance of EHRs by top management and the level of their participation in EHRs execution will boost the possibility of nurses to continue using EHRs. Managers must work intimately with end users to direct, discuss, win them over, inspire, and help them in implementing EHRs. Management support is recognised as important for reconceptualising work processes in addition to transforming existing routines and processes that are important in strengthening nurses' constant usage of EHRs.

Putting into practice important steps of a major transformational management program smoothens the process for nurses. It also makes EHRs more attractive and stimulates nurses to identify the value that a system can provide. Because the system is a critical purpose of organisations, managements must offer nurses reasons to embrace EHR besides strengthening communication throughout training processes and incentives and compensation for a job well-done.

Furthermore, some nurse's resistance to continue using the EHRs begin from the basic disparity between the documentation of information on a piece of paper and entering that information by electronic means. Most seasoned nurses are knowledgeable on the use of paper charts, and the ease of carrying them could also be a prominent issue. Nurses are addicted to the affordances of paper because paper is suitable, tactile, touchable, and easily moveable.

Nonetheless, the use of computers in nurses' routine tasks can be a welcome development. Therefore, designing suitable, discreet, tangible, and movable devices that helps nurses in using EHRs is critical and will strengthen the continuance use the system by nurses. Moreover, moveable small devices will result in the enlargement of a nurse's capability to access the system, which remains a significant issue, and immobile devices should be in convenient locations. Similarly, a need exists to offer different choices of devices. Some individuals desire to sit down, others desire a laptop, and, at the same time, and still others desire a notepad or tablet. Therefore, designing a suitable workspace at which it is simple to access EHRs is significant for nurses. When nurses feel uncomfortable using the systems, their productivity is adversely affected. If EHRs allow nurses to perform their jobs efficiently and increase their productivity in a convenient and comfortable manner, nurses will develop higher continuance intentions to use EHRs.

EHRs vendors like Jordan's Electronic Health Solution company should create of libraries of expert rules, with formularies. These libraries will act as an information base that can be referred to by the nurses on a routine basis in handling various cases in their work places. EHR systems might encompass machine learning abilities that permit nurses to enhance their performance based on experience. Data mining can be carried out to investigate a patient's medical history together with crucial clinical studies. Such examinations may assist in predicting possible events, which can range from drug interactions to disease symptoms. Mini-programmed modules can assist in attaining evidence-based practices within functioning EHRs (Brokel et al., 2006).

Libraries of expert rules can be shared between healthcare organisations to help strengthen their functionality in providing clinicians access to online clinical resources through the EHRs. These types of plans will reverberate with nurses in search of more information in the environment of care delivery. In addition to building expert rules, electronic health solution corporations should develop algorithms capable of describing intervals for interventions, subject to the precise circumstances of a patient. The capabilities of rules will provide more a comfortable work environment for nurses and increase the quality of health services, thus reflecting in a positive manner on nursing performance and lead nurses to keep using the system.

9   Conclusions

This research was conducted to gain a better understanding of the adoption characteristics and perceptions of nurses at Jordanian public hospitals after an EHR system implementation. The Jordanian healthcare system is encountering challenges related to inappropriate health information systems and poor management. Despite having implemented EHR systems Jordan continues to face challenges such as poor usability. In addition, utilising misapplied managerial tactics to facilitate adoption behaviour across various stages may result in unpleasant consequences, which may, in turn, may lead to an overall reduction in IS effectiveness or even the discontinued use of a system.

Considering these problems and building on Venkatesh et al. (2011a), this study examined the continuance intention (CI) of nurses to use EHRs by incorporating the theory of the UTAUT and adding TMS as an exogenous factor. The study can serve as a foundation for additional theory-based research in this and related settings. As EHR systems will be commonplace and required in the future of healthcare, taking note of the impact of the use of these systems on the structure of communication and dissemination of perceptions and attitudes is essential. Improved implementations and deployments of EHRs may lead to faster realisations of better health outcomes and lowered health costs.

Unfortunately, TMS on continuance intention was found to be negative in the present study. Top management in the Jordanian healthcare industry must be actively involved in the planning and the implementation of technological systems within hospitals to ensure the adoption of the EHRs by the nurses. The findings presented here are complimentary to these observations, and the hope is that they can be another piece in managing this momentous shift in healthcare delivery.

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Appendix 1: Research instrument

Item number	*Intention to use adapted from Basri (2012) and Davis (1989)*
1	I intend to continue using EHRs in my work in the future
2	I plan to continue using EHRs to accomplish my work duties
3	I will encourage other nurses to continue using EHRs
4	I will encourage other healthcare providers (physicians, pharmacist, lab technicians) in my hospital to continue using EHRs
5	I will continue using EHRs

Appendix 1: Research instrument (continued)

| Item number	Intention to use adapted from Basri (2012) and Davis (1989)
	Performance expectancy adapted from Holtz and Krein (2011)
1	Using EHRs would be useful in my job
2	Using EHRs would make me accomplish my tasks quickly
3	Using the EHRs would enhance my productivity
4	Using the EHRs would increase my chances of getting higher salary
5	Using the EHRs would increase my chances of getting a promotion
	Effort expectancy adapted from Holtz and Krein (2011)
1	It would be easy for me to become skilful at using EHRs at work
2	I would find EHRs is easy to use at work
3	Learning to use EHRs at work would be easy for me
4	I understand how much effort I would have to expend to use the EHRs
5	I would be able to understand how to accomplish my tasks using the EHRs
	Social influence adapted from Holtz and Krein (2011)
1	People who influence my behaviour think that I should use EHRs
2	People who are important to me think that I should use EHRs
3	Nurses who are in my department think that I should use EHRs
4	The other Nurses in the hospital think that I should use EHRs
5	Doctors in the hospital think that I should use EHRs
6	The management in the hospital think that I should use EHRs
7	The senior management of the hospital has been helpful in the use of EHRs
8	People who influence my behaviour think that I should use EHRs
	Facilitating condition adapted from Holtz and Krein (2011)
1	I would have the knowledge necessary to use EHRs
2	I would have the resources necessary to use EHRs
3	A specific person would be available for assistance with difficulties using EHRs
	Top management support (Igbaria, 1990)
1	I am convinced that management is sure as to what benefits can be achieved with the use of EHRs
2	There is always a person in the organisation whom we can turn to for help in solving problems with the EHRs
3	A central support (e.g., information centre) is available to help with problems
4	Training courses are readily available for Nurses to improve themselves in the use of EHRs
5	I am always supported and encouraged by my boss to use the EHRs in the performance of my job
6	Management has provided most of the necessary help and resources to get nurses used to the EHR quickly
7	Nurses are constantly updated on new software that can help them to use the EHRs more effectively
8	Management is really keen to see that we are happy with using EHRs

Appendix 2: Normality test

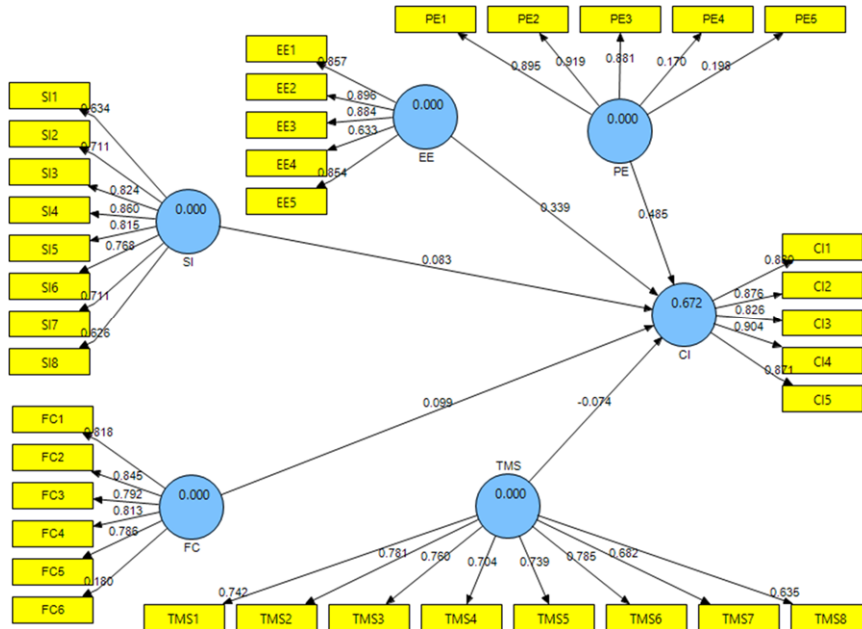**Figure A1** Normality histogram (see online version for colours)
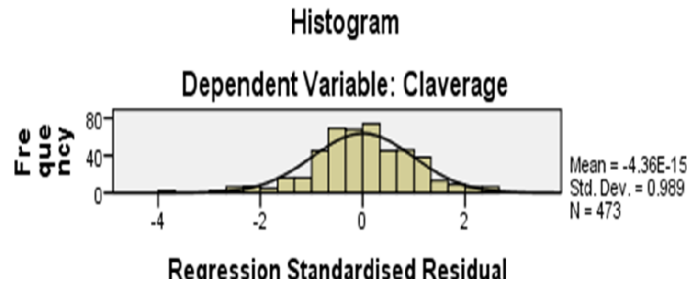
Appendix 3: Linearity test
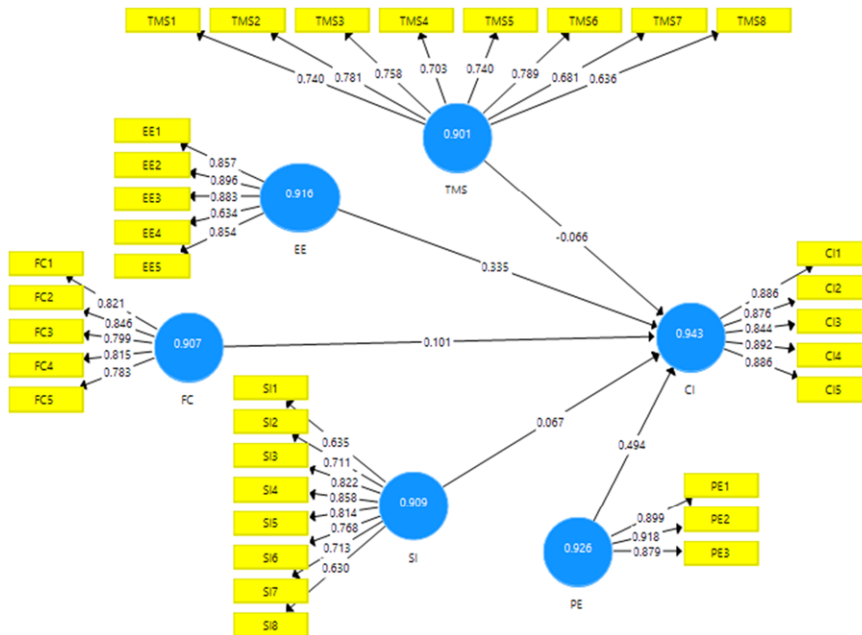
Figure A2 Linearity histogram
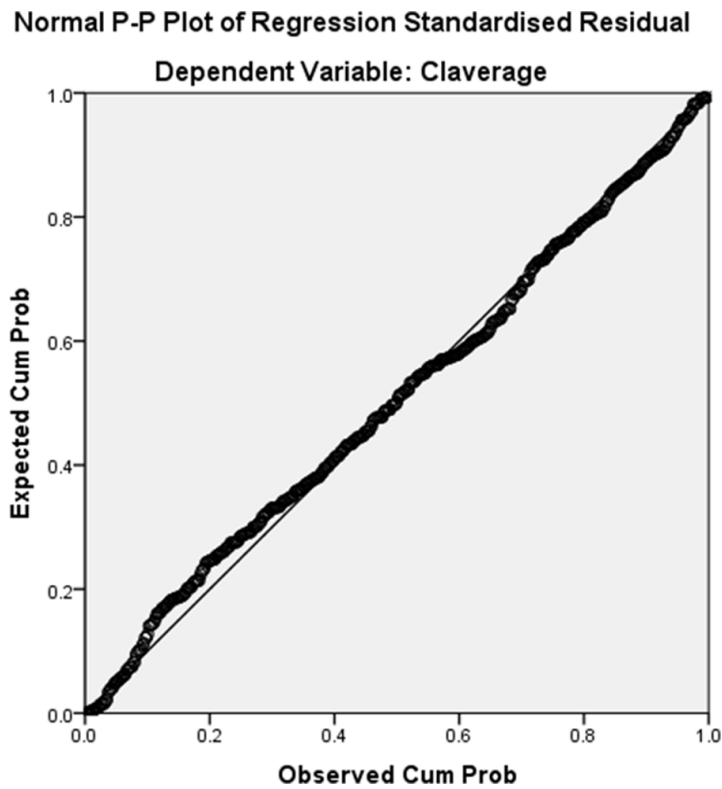
Appendix 4: Research model before deletion

Figure A3 Research model before deletion (see online version for colours)

Appendix 5: Measurement model after deletion

Figure A4 Measurement model after deletion (see online version for colours)

Appendix 6: Cross loading table (see online version for colours)

	CI	EE	FC	PE	SI	TMS
CI1	**0.886**	0.617	0.459	0.683	0.473	0.387
CI2	**0.876**	0.615	0.469	0.672	0.464	0.409
CI3	**0.844**	0.583	0.395	0.587	0.426	0.331
CI4	**0.892**	0.635	0.454	0.690	0.471	0.389
CI5	**0.886**	0.654	0.473	0.694	0.491	0.403
EE1	0.586	**0.857**	0.474	0.535	0.430	0.382
EE2	0.648	**0.896**	0.506	0.605	0.458	0.418
EE3	0.618	**0.883**	0.490	0.572	0.437	0.386
EE4	0.410	**0.634**	0.335	0.338	0.426	0.338
EE5	0.642	**0.854**	0.479	0.544	0.508	0.501
FC1	0.405	0.437	**0.821**	0.388	0.455	0.545
FC2	0.422	0.447	**0.846**	0.383	0.428	0.549
FC3	0.396	0.366	**0.799**	0.319	0.372	0.524
FC4	0.381	0.389	**0.815**	0.399	0.425	0.560
FC5	0.471	0.589	**0.783**	0.437	0.421	0.470
PE1	0.758	0.625	0.468	**0.899**	0.521	0.434
PE2	0.651	0.548	0.407	**0.918**	0.498	0.443
PE3	0.626	0.529	0.402	**0.879**	0.450	0.401
SI1	0.363	0.379	0.323	0.357	**0.635**	0.384
SI2	0.356	0.388	0.343	0.338	**0.711**	0.406
SI3	0.448	0.484	0.398	0.472	**0.822**	0.467
SI4	0.447	0.448	0.393	0.503	**0.858**	0.487
SI5	0.401	0.398	0.343	0.456	**0.814**	0.424
SI6	0.402	0.387	0.325	0.371	**0.768**	0.387
SI7	0.390	0.375	0.475	0.375	**0.713**	0.510
SI8	0.351	0.368	0.509	0.378	**0.630**	0.603
TMS1	0.426	0.481	0.512	0.489	0.500	**0.740**
TMS2	0.363	0.425	0.455	0.368	0.466	**0.781**
TMS3	0.381	0.413	0.487	0.370	0.474	**0.758**
TMS4	0.168	0.247	0.486	0.223	0.387	**0.703**
TMS5	0.276	0.314	0.419	0.306	0.461	**0.740**
TMS6	0.336	0.338	0.596	0.339	0.481	**0.789**
TMS7	0.238	0.276	0.440	0.278	0.374	**0.681**
TMS8	0.212	0.207	0.377	0.269	0.360	**0.636**

Appendix 7: Structural model (see online version for colours)