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Factors Determining the Intention to Use Electronic Health Records: An Extension of the Technology Acceptance Model

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Authors' contributions

This work was collaborative effort of all the authors. All the authors did the collation of the data obtained via the administered questionnaire. Author OOO developed the extended TAM model and statistical analysis. Authors WBW and MOO carried out a thorough literature search all catered for all the reference materials used. All the authors were involved in the empirical testing of the model. Finally, all the authors read and approved the final manuscript.

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ABSTRACT

This paper details an empirical investigation of the factors that determine the intention of adopting and using electronic health records (EHR). The paper's goal is a study aimed at examining the possibilities and intents towards EHR amongst healthcare professionals in Nigeria. In this study, an extended Technology Acceptance Model (TAM) that incorporates Subjective norm, Social influence, Result demonstrability, Computer self-efficacy and System quality to the original TAM constructs was proposed. The proposed model was empirically tested using data collected from a sample of 126 healthcare professionals across 14 healthcare delivery institutions in Oyo State, Southwestern, Nigeria by applying structural equation modeling (SEM). These data were collected by administering a questionnaire containing 30 items. The results of the evaluation showed that all constructs have significant effect on healthcare professionals' behavioural intention to use EHR.

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Keywords: Electronic health records; technology acceptance model; subjective norm; social influence; result demonstrability; computer self-efficacy; system quality.

1. INTRODUCTION

In modern healthcare delivery, one of the essentials of diagnostics is patient medical or heath records. A comprehensive healthcare system relies upon the capacity of the healthcare providers to promptly access a patient's test outcomes, earlier treatment notes, current medicines and so on. The absence of access to such data may postpone diagnosis and result in uncalled for treatment and in due turn, expanded expenses [1,2]. From another view point, health data stored over time can be a reflection of the progress of patients, resistance and adoptability of human to drugs over time and genetic links to causes of diseases in the process of time. The geographical profiling of such data can reflect a lot of information on progress of health, outbreaks and effectiveness of healthcare delivery and so on [3].

Customarily, medical records have comprised of information scattered among paper-based files in different sections of a healthcare delivery facility, referenced utilizing conflicting identifiers. A great part of the data in these records has a tendency to be out of date, repetitive, or garbled to the degree that it doesn't help the patient at the purpose of care [2]. The sharing of data among various stakeholders in health institutions using this manual method has generally been troublesome and tedious, regularly requiring the physical duplication of paper-based material. Furthermore, this manual method is characterized by non-scalability in terms of storage, proneness to error, unsecured, susceptibility to damage and degradation over time, high unavailability, time-consuming in accessing, no visible audit trail and version history amongst other attendant shortcomings. Considering these challenges, the advent of the applications of ICT in the health sector is a timely response.

Today, almost every facet of human life has felt the impact of the widespread accessibility, adaptability and applications of ICT. The health sector is not an exemption. One of the developmental innovations that came by the way of ICT in the health sector is the Health Information System (HIS). HIS most times refers to the interaction between people, process and technology to support operations, management in delivering essential information in order to improve the quality of healthcare services. HIS are systems that process data and provide information and knowledge in healthcare environments [4]. HIS majorly manages and maintains three categories of health and medical records which are Personal Heath Record (PHR), Electronic Medical Record (EMR) and Electronic Health Record (EHR). PHR, which contains the history of health information about individuals, is normally maintained by the patients themselves. Previously, PHRs are maintained manually by individuals. Nowadays, there are host of cloud applications developed to maintain PHR. The modern day healthcare providers usually host their HIS at their private data centres, or with cloud service providers. Usually, records such as EMR and EHR are maintained by the healthcare provider's HIS. Thus EMR and EHR of HIS hosted in these cloud applications (which could be a private, public or hybrid cloud) can be accessed from anywhere in the world by authenticated persons and can be shared with desired healthcare providers. With evolution from conventional or centralize HIS architectures to HIS on distributed network infrastructures, medical image data and other EHR can be cross-exchanged in the right time facilitating a boost in the potentials of telemedicine applications ranging from teleconsulting, telediagnosis to mention but a few to cooperative working session and telesurgery.

In Nigeria like many other developing countries however, most healthcare institution still relies on paper-based files as the method for patients' medical record documentation. In this method, patients' medical records are stored on paper-based files and registers. If for any reason a patient needs to visit a new healthcare facility, the patient would need to provide his/her health information to the new facility without reference to the previous medical records of such a patient. Aside this limitation, this method also suffers from many attendant shortcomings earlier mentioned in this section of the paper. Furthermore, in few healthcare institutions that uses automated health records, various units or departments in these healthcare institutions operate as independent entities and they suffer from the inability to transfer patient health information and records amongst themselves.

With the emergence of EHR as a significant alternative to paper-based health records and in

most countries of the developed world and its adoption by the health sector of these countries by a substantial number of health institutions, there is a need dire for the consideration of its adoption and usage by developing countries. However, explicit literature search showed that a fundamental criterion to ensure successful implementation of EHR with its value-added advantages is its acceptance by healthcare professionals [5,6]. It may also be noted that among diverse health professionals/ health professionals groups, the opinion towards the usage of EHR is divergent thereby complicating its implementation in a multilateral healthcare system [7,8,9]. Therefore, having an apt knowledge of the determining factors that influence the acceptance of EHR is a vital component of guaranteeing its best possible integration and most importantly, the considerable advantages within the health system and population. In this paper, an empirical investigation of factors that might influence the adoption decision of EHR by healthcare professionals in Southwestern Nigeria was carried out.

2. LITERATURE REVIEW

2.1 Overview of EHR

EHR are documentations of health-related information about an individual with the primary aim of being a reference for consultation by healthcare professionals for patient care. More technically defined, an EHR is an electronic version of a patient's medical history, that is maintained by the provider over time, and may include all the key administrative and clinical data relevant to that person's care under a particular provider, including demographics, progress notes, medications, vital signs, past medical history, immunizations, laboratory data, and radiology reports [10]. The benefits of this include improved medical documentation and patient service, enhanced efficient and effective clinical workflows, improved medication management and reduced transcription and labour costs [11]. EHR is now increasingly being deployed within healthcare institutions to improve the safety and quality of healthcare delivery. In [12], Poissant et al. highlighted some factors that are influencing the realization of these objectives while Zhang and Patel (2006) enumerated the major advantages EHR would offer if well implemented.

2.2 Technology Acceptance Model (TAM)

In this paper, the Technology Acceptance Model (TAM) which was developed by [14] was applied to investigate the factors influencing the adoption decision to use EHR. Davis in [14] founded his model on the psychological model, the Theory of Reasoned Action (TRA). TRA is based on the theory that the individual attitude has a significant function in determining the behaviour towards adopting a particular technology [15]. Nevertheless, TAM is widely regarded as a more flexible technique due to its ability to permit the capturing of a number of essential psychological elements that influence producers in adopting or not adopting the technology. The model has been appraised to be not only an authoritative model for denoting the determinants of system usage, but it is a helpful tool for system planning, in view of the fact that system designers have to an extent, control over easiness and usefulness [16].

Fig. 1 depicts the original TAM. It's an information system acceptance theory, whose core rationale is basically to predict and explicate the user acceptance of information technology. TAM is built from a number of indicators that include Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Attitudes Towards Using (ATU), Behavioural Intention (BI) and Actual Usage (AU). These indicators are defined as follows: Perceived Usefulness (PU) refers to the extent to which an individual believes that his/her job performance could be improved by utilizing an IT system [14,17,18]. Perceived Ease of Use (PEOU) is the degree of belief of an individual that the usage of an information technology would be effort- free [19]. Attitudes Towards Using (ATU) is defined as a function of beliefs, positively or adversely towards the behaviour [18,20-22]. Behavioural Intention (BI) is defined as target objectives and anticipated reaction to the attitude object [18,20,21]. Actual Usage (AU) is defined by [23] as the rate of utilizing a new technology system, for example, electronic health records and the estimated frequency the user uses it over a specific duration [18,20,21].

It was suggested by a number of researchers that TAM needs to be supplemented by additional constructs in order to realize a sturdier model [24]. TAM2 was proposed as an expansion of TAM by [25]. The authors integrated social influence and cognitive instrumental processes, but left out ATU owing to

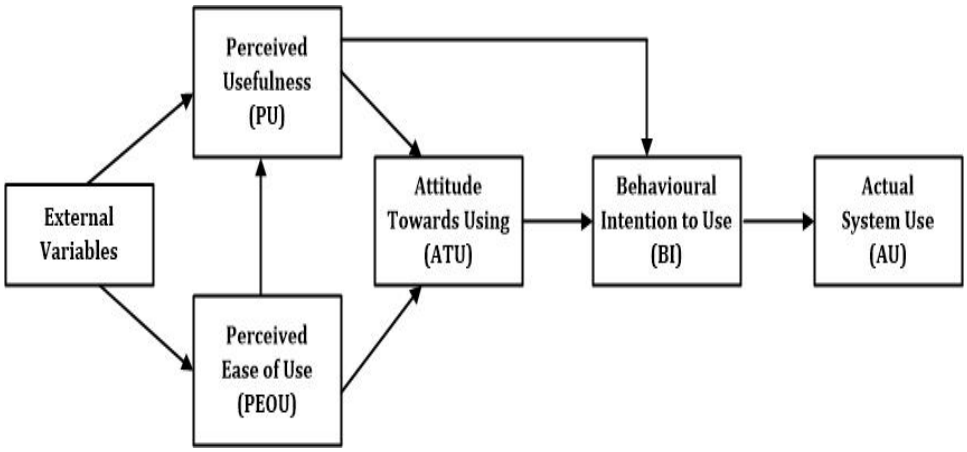

Fig. 1. The original technology acceptance model [13]

weak predictors of either AU or BI. Their proposition aligns with the previous work of [16] which specified that both social influence processes and cognitive instrumental processes extensively determined user acceptance and that PEOU and PU indirectly determined AU through BI.

The focus of this paper is on the investigation of the factors that determine the acceptance of an information and communications technology application, electronic health records; consequently, an appraisal of previous studies suggested the theoretical basics of used in the formulated hypotheses of this work. Furthermore, it was highlighted in most researches, that it is of significant importance, to incorporate additional construct(s) to TAM so as to enhance its prediction of system use [26,27]. Towards this end, the following external constructs were introduced to TAM in this study to investigating the factors that have effects on the adoption decision of electronic health records amongst healthcare professionals in Oyo State, Southwestern, Nigeria: Subjective norm, Social influence, Result demonstrability, Computer self-efficacy and System quality. These constructs are defined as follows:

i. Subjective Norm: was proposed in [20] by Fishbein and Ajzen in the Theory of Reasoned Action (TRA). The authors defined it as a person's perception that majority of the people who are important to him approve or disapprove his performing a given behaviour. Furthermore, this construct was posed as a direct factor determining to behavioural intention to use in the Theory of Planned Behaviour (TPB) proposed in [28] by Ajzen. In [29], Dillon and Morris defined subjective norm as 'the person's perception that most people who are important to him think he should or should not perform the behavior in question'.

ii. Social influence: In [20], Fishbein and Ajzen defined this construct as the perceived external pressure that is felt by individuals in the course of being in the knowing of an innovation and the decision to utilize it, and the degree in which an individual perceives that important others believe he or she should use the new system.

iii. Result Demostrability: In [30], Moore and Benbasat defined it as the "tangibility of the results of using the innovation," which will consequently have a direct influence on perceived usefulness. Consequently, users will have more constructive opinions of the usefulness of a technological innovation if positive results are readily perceptible. In other words, if a system has low values of result demonstrability, users 'achievement may be attributed to work effort and behaviour instead of the system usage.

iv. Computer Self-efficacy: In [31], Bandura's social cognitive theory (SCT), self-efficacy is one of the principal concepts. Self-efficacy is defined as people's conclusion regarding their competence to systematize and carry out courses of actions required to execute a particular task. It is a determinant of the type of behaviours people decided to carry out, the amount of effort they are willing to exert and the length of their perseverance to surmount

obstacles [31,32]. People who are characterized with sturdy efficacy beliefs tends to apply more effort and are inclined to be more unrelenting in their efforts than people lower efficacy beliefs. Coined from the general idea of self-efficacy, computer self-efficacy was defined in [33] by Compeau and Higgins as peoples' opinion about their capability to use a computer system effectively. A literature survey showed that perceptions of computer self-efficacy influence a variety of computer-related behaviours and results. As instances, Hung and Liang in [34]; Ong, Lai, and Wang in [35] established positive relations between computer self-efficacy and perceived usefulness while in [36], Chau, stated a negative and insignificant relationship between these two constructs.

v. System Quality: We defined system quality in the context of this study as a construct that measures the degree to which healthcare professionals believe the functions and usability embedded in the electronic health records system will facilitate healthcare delivery activities. The few studies that examined the function of system quality produced mixed outcomes regarding this construct's effect on perceived usefulness. For example, the study carried out by DeLone and McLean's in [37] showed that system quality has a positive and significant effect on perceived usefulness while system quality has no significant effect on perceived usefulness in the study conducted by Wang and Wang, in [38].

3. RESEARCH METHODOLOGY

3.1 Proposed Research Model and Hypotheses Formulation

The proposed research model of this study is depicted in Fig. 2. The model incorporated external constructs that include Subjective Norm (SN), Social Influence (SI), Result Demonstrability (RD), Computer Self Efficacy (CSE) and System Quality (SQ) to the original TAM.

After evolving the research model of this study, the following hypotheses were formulated and then later tested to establish the effects of the introduced external variables and their corresponding relationship with the original TAM:

i. H_1: Behavioural intention to use EHR has a significant positive effect on the future actual use.
ii. H_2: Perceived ease of use has a significant positive effect on behavioural intention to use EHR.
iii. H_3: Perceived usefulness has a significant positive effect on behavioural intention to use EHR.
iv. H_4: Perceived ease of use has a significant positive effect on perceived usefulness of EHR.
v. H_5: Subjective norm has a significant positive effect on behavioural intention to use EHR.
vi. H_6: Subjective norm has a significant positive effect on perceived ease of use of EHR.
vii. H_7: Subjective norm has a significant positive effect on the perceived usefulness of EHR.
viii. H_8: Social influence has a significant positive effect on the perceived usefulness of EHR.
ix. H_9: Result demonstrability has a significant positive effect on the perceived usefulness of EHR.
x. H_{10}: Computer self efficacy has a significant positive effect on the perceived ease of use of EHR.
xi. H_{11}: System quality has a significant positive effect on the perceived usefulness of EHR.

The proposed research model with hypothesized paths for determining the factors influencing the adoption decision of EHR among healthcare professionals in the selected case study is depicted in Fig. 3.

3.2 Data Collection and Measurement Scales Utilized

The participants used for this study were selected from two University teaching hospitals, five State government hospitals, four private clinics and three Primary healthcare centres. A questionnaire consisting of 30 items was administered to interview 160 healthcare professionals. The items which describe the nine constructs presented a graduation following the Likert-type scale from 1 (Strongly disagree) to 5 (Strongly agree) or 1 (Strongly disapprove) to 5 (Strongly approve) or 1 (Never) to 5 (Always) or 1 (None) to 5 (Severe) depending on the item. The data collected were then analysed using Analysis of Moment Structures (AMOS 18).

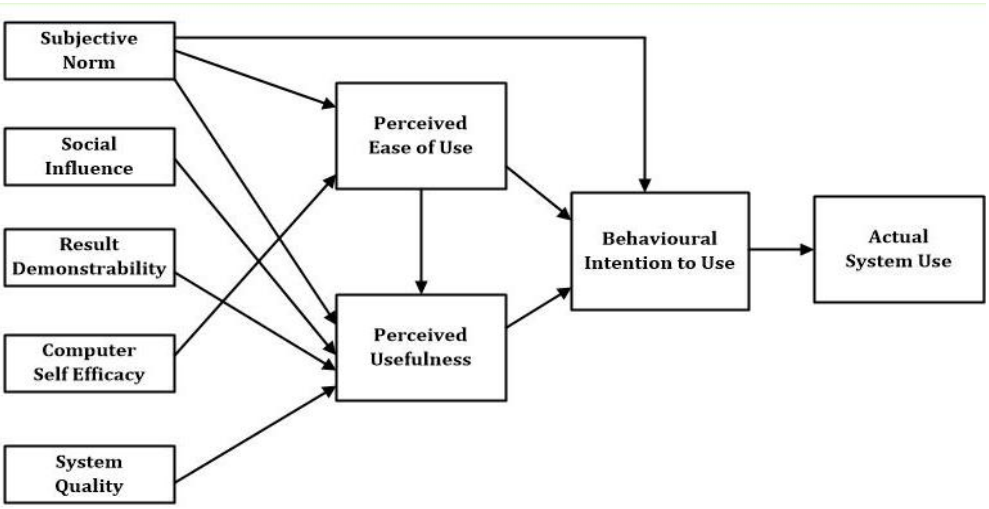

Fig. 2. The proposed research model

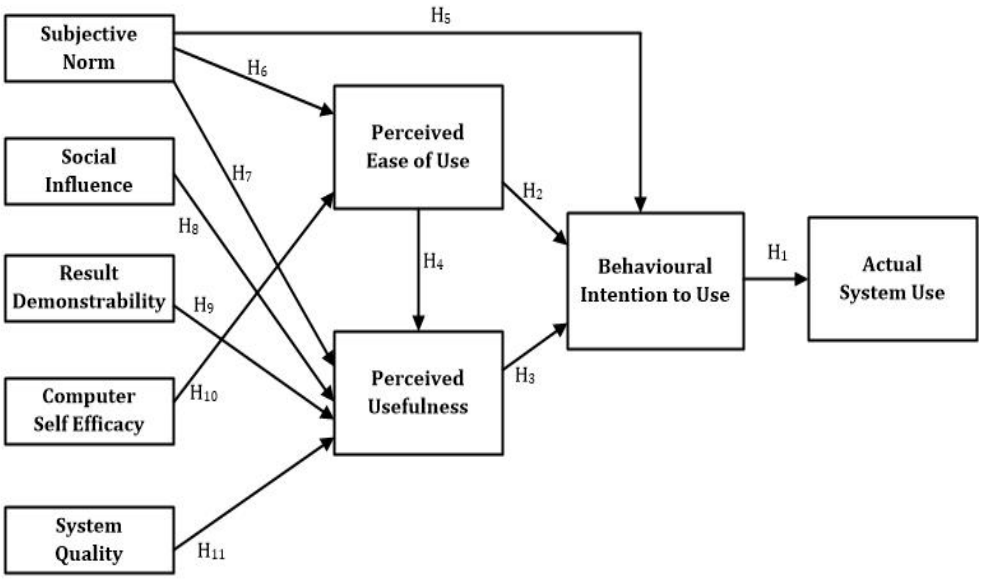

Fig. 3. The proposed model with hypothesized paths

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistical Analysis of Respondents

A questionnaire consisting of 30 items on a five-point Likert rating scale was employed to collect the data used in this study. The items which is depicted by questions on the questionnaire describes the nine constructs which are AU, BI, PEOU, PU, SN, SI, RD, CSE and SQ. Out of the 160 healthcare professionals interviewed, 126 of them gave complete responses. The respondents' profile is detailed in Table 1.

Table 2 details the descriptive statistics related to the constructs utilized in the model. The mean of every construct is greater than the average value, 3, which therefore translates that the respondents strongly agreed or agreed that the measured constructs will be determinants in their consideration of the adoption and eventual use of EHR.

Table 1. Profile of respondents

Attributes	Category	N	%
Gender	Male	74	58.73
	Female	52	41.27
Age (years)	30 or less	10	7.89
	31-40	42	32.90
	41-50	53	42.11
	51-60	18	14.47
	61 and over	3	2.63
Type of Healthcare Institution	University teaching hospital	33	26.19
	State government hospital	48	38.10
	Private clinic	25	19.84
	Primary healthcare centre	20	15.87
Designation	Doctor/Surgeon	32	25.40
	Pharmacist	18	14.29
	Nurse	60	47.62
	Laboratory Scientist	12	9.52
	Radiologist	4	3.17
Years of working experience	≤ 10	30	23.68
	11 – 20	58	46.05
	21 - 30	28	22.37
	31 – 40	8	6.58
	> 41	2	1.32

Table 2. Descriptive statistical analysis of model variables

Construct	N	Range	Mean	Standard Deviation
Subjective Nom	126	5	3.89	0.97
Social Influence	126	5	3.72	1.04
Result Demonstrability	126	5	3.95	1.01
Computer Self Efficacy	126	5	3.84	1.13
System Quality	126	5	3.71	0.78
Perceived Ease of Use	126	5	3.87	0.95
Perceived Usefulness	126	5	4.03	0.81
Behavioural Intention to Use	126	5	3.74	1.09
Actual System Use	126	5	3.68	0.93

4.2 Analysis of Internal Consistency, Reliability and Validity of Variables

The Likert scale items were group separately into nine to form the nine constructs used in the model. A test for the internal consistency of the Likert rating scale items on the questionnaire was carried out using Cronbach's alpha reliability coefficient. This was done as a post-data collection analysis. The values of the alpha reliability which is presented in Table 3 ranged between 0.7219 and 0.8915, an indication that the data collected through the rating scale have satisfactory reliability, with values above 0.7 which are considered as adequate benchmark for survey items [39].

A confirmatory factor analysis (CFA) was carried out to differentiate between the convergent and divergent validity of the scales. This analysis involves the extraction of the variance of all measurement scales and also the correlations between constructs and their respective confidence intervals. Factor loadings of the indicators were employed as the means of assessing convergent validity. Results indicated that the coefficients significantly differ from zero. Further, the loads between the latent and observed variables were high in all cases that is, $\lambda > 0$. On discriminant validity, results showed that the variances were significantly different from zero and furthermore, the correlation between each pair of scales did not exceed 0.9 [40].

In addition, a series of indicators deduced from the confirmatory analysis can be employed as bases for the evaluation of the reliability of the scales used. According to Thompson et al*.,* in [41], a value of 0.7 or higher is acceptable for composite reliability. The other reliability measure that is, Average Variance Extracted (AVE) indicates the total amount of variance in the items catered for by the underlying construct [42]. When compared with composite reliability, the AVE is a more conservative reliability measure, hence, an acceptable value of 0.5 or higher is suggested for AVE by Fornell and Larcker, in [43]. All the constructs surpassed these criteria as depicted in Table 3.

4.3 Hypotheses Testing

The check for the adaptation of the proposed structural equation model was done as pre-hypotheses testing task to ascertain that it is at an acceptable level within the benchmarked range: less than 0.08 for root mean square error of approximation (RMSEA); greater than 0.85 for normed fit index (NFI) and comparative goodness of fit (CFI) [44,45]; less than or equal to 0.97 for Tucker-Lewis index (TLI); less or equal to 0.95 for goodness-of-fit statistic (GFI) [46]; 0.90 or higher for adjusted goodness-of-fit statistic (AGFI) [47]. This is presented in Table 4.

To be able to evaluate SEM, there is the requirement of analysing the statistical significance of its structural loads. The results of the analysis of the applied structural equation and the hypotheses proposed in this research are detailed in Table 5 and Fig. 4. Essentially, the column containing the p-value corresponding to each construct should be taken into cognizance. A value of less than 0.05 indicates

Table 3. Convergent validity, reliability and internal consistency analysis

Construct	Item	Standard Coefficient	Cronbach's α	Composite Reliability	AVE
Subjective Nom	SN1	0.8246	0. 7638	0.8512	0.7683
	SN2	0.7215			
	SN3	0.9121			
Social Influence	SI1	0.9013	0.8212	0.9293	0.8986
	SI2	0.9612			
	SI3	0.8815			
	SI4	0.8124			
Result Demonstrability	RD1	0.9113	0.7721	0.8681	0.8003
	RD2	0.8180			
	RD3	0.8416			
Computer Self Efficacy	CSE1	0.8719	0.8316	0.8544	0.7682
	CSE2	0.8421			
	CSE3	0.9008			
System Quality	SQ1	0.8912	0.7219	0.9059	0.8625
	SQ2	0.7996			
	SQ3	0.8445			
Perceived Ease of Use	PEOU1	0.8873	0.8915	0.9101	0.8737
	PEOU2	0.8513			
	PEOU3	0.8915			
Perceived Usefulness	PU1	0.8718	0.8713	0.8247	0.7134
	PU2	0.9623			
	PU3	0.9526			
	PU4	0.8610			
	PU5	0.8924			
Behavioural Intention to Use	BI1	0.8817	0.8824	0.8916	0.8603
	BI2	0.9194			
	BI3	0.9031			
	BI4	0.8740			
Actual System Use	AU1	0.8411	0.8137	0.8614	0.7998
	AU2	0.7913			

an associated significant relationship. In this study, aside from the relationships between subjective norm and perceived usefulness (H_7) and social influence and perceived usefulness (H_8) every other relationship is significant.

Table 4. Indicators of goodness-of-fit in the model

Indicator	Value
CFI	0.9105
RMSEA	0.0782
NFI	0.8671
TLI	0.9554
GFI	0.8713
AGFI	0.9147
NFI	0.9232

Table 5 discusses the results of the hypotheses test and the standardized β coefficient of the paths in the proposed model of this study. Through the standardized β coefficient, the significance of the hypothesis was tested. The expected variation in the dependent construct for a unit variation in the independent construct (s) is indicated by β value. The β value was computed for each path in the model. It may be noted that the higher the value of β, the better the significant effect on the latent construct.

a) Hypothesis H_1
The result obtained showed that behavioural intention has a significant positive effect on the future actual use (H_1: β = 0.692, p < 0.001). This hypothesis is therefore retained. This hypothesis supports previous TAM research findings of: Wang and Wang, in [38]; Ulrich and Karvonen, in [48]; Jaradat, in [49].

b) Hypothesis H_2
The findings of this study showed that perceived ease of use does not have a significant positive effect on behavioural intention (H_2: β = 0.127, p = 0.223). Hence, this hypothesis is rejected. This is in consonance with the research findings of Ma et al., in [50]; Yuen and Ma, in [51]; Wang and Wang, in [38]; Pynoo et al., in [52].

c) Hypothesis H_3
The result showed that perceived usefulness has a significant positive effect on behavioural intention to use (H_3: β = 0.349, p < 0.001). Therefore the hypothesis is retained. This implies that perceived usefulness is an essential factor that influences the behavioural intention to use EHR. This result is supported by previous research findings of Al-Fahim in [53]; Kesharwani and Radhakrishna in [54]; Kumar and Madhumohan in [55]; Bashir and Madhavaiah in [56]; Rawashdeh in [57].

d) Hypothesis H_4
The results of this study showed that perceived ease of use has a significant positive effect on perceived usefulness (H_4: β = 0.193, p < 0.003). Since the path coefficient indicated that perceived ease of use is a predicator for perceived usefulness, the hypothesis is retained. This finding is in line with many other TAM type of researches that include: Davis, in [14]; Igbaria and Iivari, in [58]; Szajna, in [59]; Venkatesh and Davis, in [25]; Dasgupta et al., in [60]; Ma and Liu, in [61]; Walker and Johnson, in [62]; Alenezi, Abdul Karim and Veloo, in [63]; Ulrich and Karvonen, in [48].

e) Hypothesis H_5
The obtained result after testing this hypothesis indicated that subjective norm has a significant positive effect on behavioural intention (H_5: β = 0.401, p < 0.001). This path coefficient indicated subjective norm is predicator for behavioural intention, hence the hypothesis is retained. This is supported by the results from other similar researches as can be seen in the works of Fishbein and Ajzen in [20], and Davis, in [25], Khalifa and Ning shen in [64]; Nor and Pearson in [65]; Jaradat in [66]; Al-Majali in [67].

f) Hypothesis H_6
The results obtained showed that subjective norm has a significant positive effect on perceived ease of use (H_6: β = 0.239, p < 0.001). This result is supported by previous research findings of Lee, Kozar and Larsen, in [68]; Pituch and Lee, in [69]; Yuen and Ma, in [51]. The hypothesis is therefore retained.

g) Hypothesis H_7
After testing this hypothesis, the result obtained showed that subjective norms do not have a significant effect on perceived usefulness (H_7: β = − 0.008, p = 0.324). This path coefficient indicated subjective norm is not a predicator for perceived usefulness, hence the hypothesis is

rejected. This result is similar to research findings of: Hu et al., in [70]; Schepers and Wetzels, in [71]; Venkatesh and Davis, in [25]; Wang and Wang, in [38]; Yuen and Ma, in [51].

h) Hypothesis H_8
The results obtained proved that social influence has a significant positive effect on perceived usefulness (H_8: β = 0.647, p < 0.001). The hypothesis is retained because the path coefficient indicated that social influence is a predicator for perceived usefulness. Previous researches similar to this study such as those of Venkatesh and Davis in [35], Lu et al. in [72], Jaradat in [66] and Sathye, in [73] validated this result.

i) Hypothesis H_9
The results of this hypothesis testing indicated that result demonstrability has a significant positive effect on perceived usefulness (H_9: β = 0.562, p < 0.001). The hypothesis is retained. This result is supported by the previous findings of Venkatesh and Bala, in [74]; Gagnon et al., in [75]; Shihaba et al. in [76].

j) Hypothesis H_{10}
The findings of this study showed that computer self efficacy has a significant positive effect on perceived ease of use (H_{10}: β = 0.529, p < 0.001). This path coefficient indicated that computer self efficacy is a predicator for perceived ease of use, hence the hypothesis is retained. This finding is consistent with previous research establishing a positive relationship between these constructs. This result is in line with previous research outcomes of: Hong, et al., in [77]; Hu et al., in [70]; Kwon et al., in [78]; Pituch and Lee, in [69]; Toral et al., in [79]; Wang and Wang, in [38]; Yuen and Ma, in [51].

k) Hypothesis H_{11}
After testing of this hypothesis, the result obtained showed that system quality has a significant positive effect on perceived usefulness (H_{11}: β = 0.254, p < 0.001), hence the hypothesis is retained. This result agrees with the research findings of Russell, Bebell and O'Connor, in [80]; Pituch and Lee in [69]; Condie and Livingston, in [81]; Park, Nam, and Cha, in [82]; Fathema and Sutton, in [83]; Salajan et al., in [84].

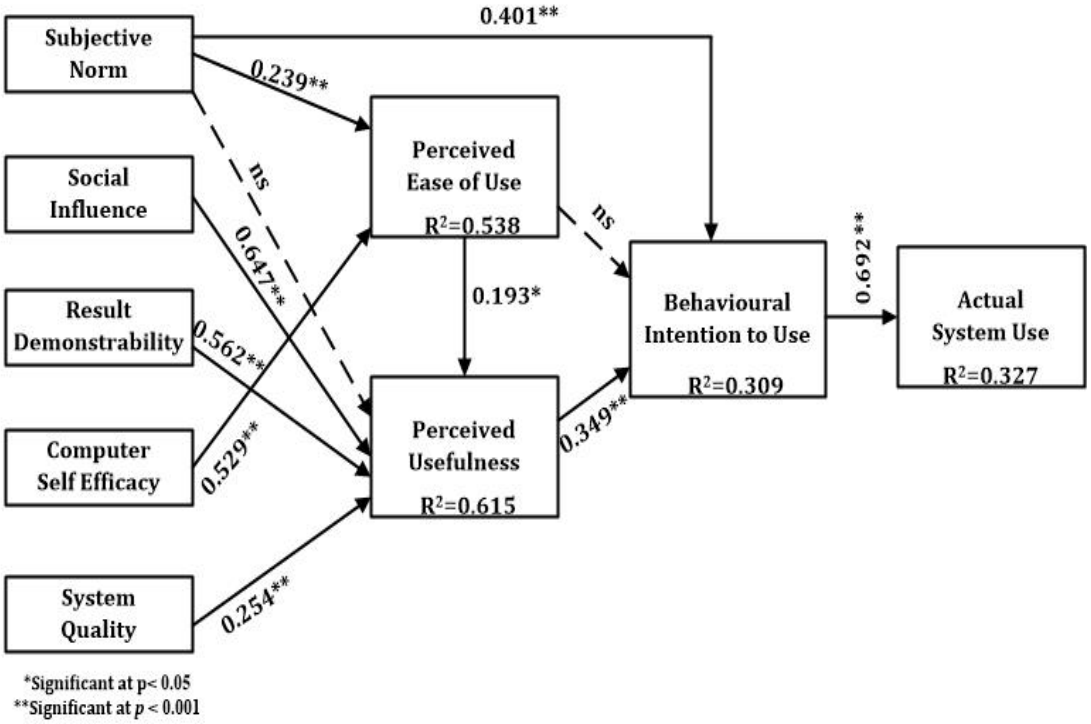

Fig. 4. Extended TAM path analysis for EHR

Table 5. Hypothesis testing results

Hypothesis	Path	β	p-value	Results
H_1	BI → AU	0.692	0.001	Supported
H_2	PEOU → BI	0.127	0.223	Not Supported
H_3	PU → BI	0.349	0.001	Supported
H_4	PEOU → PU	0.193	0.003	Supported
H_5	SN → BI	0.401	0.001	Supported
H_6	SN → PEOU	0.239	0.001	Supported
H_7	SN → PU	−0.008	0.324	Not Supported
H_8	SI → PU	0.647	0.001	Supported
H_9	RD → PU	0.562	0.001	Supported
H_{10}	CSE→ PEOU	0.529	0.001	Supported
H_{11}	SQ → PU	0.254	0.001	Supported

5. CONCLUSION

This study detailed an empirical investigation of factors that determines the adoption decision of electronic health records. Consequently, the TAM was extended. The findings of this study indicated that the extended TAM employed is apposite for identifying the factors that determine the adoption decision of EHR by healthcare professionals. Five external variables that include Subjective norm, Social influence, Result demonstrability, Computer self-efficacy and System quality were incorporated to extend the original TAM model, with the PEOU and PU being the mediating constructs for the introduced external variables.

In all, nine constructs were proposed as significant determinants that influence the healthcare professionals' decision of adopting EHR. With these constructs, eleven hypotheses were formulated to analyze the relationships between the constructs. The results obtained showed that all hypotheses were supported except for hypothesis H_2 (Perceived ease of use has a significant positive effect on behavioural intention to use EHR) and H_7 (Subjective norm has a significant positive effect on perceived usefulness of EHR). Also, most of the significant assumptions have been proven empirically and statistically significant. Thus, research and data analysis make several theoretical and practical contributions.

In conclusion, this study can serve as a guide to information systems designers and developers at the requirements definition stage when designing electronic health record systems as factors that include Perceived ease of use, perceived usefulness, Subjective norm, Social influence, Result demonstrability, Computer self-efficacy and System quality should be prioritized to fulfill its implementation as obtained from the results of this study. The direction of future research may be tuned towards investigating other factors such as Effort expectancy, Facilitating condition, Job relevance and so on that may influence the adoption decision of EHR.

CONSENT AND ETHICAL APPROVAL

As per international standard or university standard guideline participant consent and ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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