Research Article

Evaluation Of Acceptance Of Hospital Information Management System Among Nurses Through Technology Acceptance Model

Aydan Kayserili [1], ***Behire Sançar***[2]

Abstract

Hospital Information Management System (HIMS) has widely been used by healthcare professionals, especially nurses working in hospitals. The aim of this study is to evaluate the factors affecting the adoption of HIMS. The external factors included in this conceptual model were taken from the Information System Success Model (ISSM) and incorporated into updated Technology Acceptance Model (TAM). A total of 401 nurses from public and private hospitals in Türkiye participated in this cross-sectional study. Statistical Package for the Social Sciences (SPSS) 25software package was used for data analysis. In this study, descriptive statistics, correlation and path analysis and structure equation modeling using AMOS were used. Among all the external factors included in this study model, only system quality was found to have a positive and significant effect on perceived ease of use and perceived usefulness. Service quality has a positive and significant effect only on perceived usefulness, while information quality does not have any positive and significant effect on perceived ease of use and perceived usefulness. Perceived ease of use and perceived usefulness have a positive and significant effect on usage intention. Perceived ease of use has a positive and significant effect on perceived usefulness. This research model helped identify the factors that influence hospital information management system acceptance among nurses and how these factors can be improved to influence users' intention to use in the future. In conclusion, there is always room for improvement regarding HIMS to improve patient care.

Keywords: *Hospital information management system, nurses, information system success model, technology acceptance model*

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Araştırma Makalesi

Teknoloji Kabul Modeli Aracılığıyla Hemşireler Arasında Hastane Bilgi Yönetim Sisteminin Kabulünün Değerlendirilmesi

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Öz

Hastane Bilgi Yönetim Sistemi (HBYS), özellikle hastanelerde çalışan hemşireler tarafından yaygın olarak kullanılmaktadır. Bu çalışmanın amacı, HBYS'nin benimsenmesini etkileyen faktörleri değerlendirmektir. Bu kavramsal modelde yer alan dışsal faktörler, Bilgi Sistemleri Başarı Modeli'nden (ISSM) alınmış ve güncellenmiş Teknoloji Kabul Modeli'ne (TAM) entegre edilmiştir. Türkiye'deki kamu ve özel hastanelerden toplam 401 hemşire bu kesitsel çalışmaya katılmıştır. Veri analizi için İstatistiksel Paket Sosyal Bilimler (SPSS) 25 yazılımı kullanılmıştır. Çalışmada tanımlayıcı istatistikler, korelasyon ve yol analizi ile AMOS kullanılarak yapısal eşitlik modellemesi uygulanmıştır. Bu çalışmada incelenen modeldeki tüm dışsal faktörler arasında yalnızca sistem kalitesinin algılanan kullanım kolaylığı ve algılanan fayda üzerinde pozitif ve anlamlı bir etkisi belirlenmiştir. Hizmet kalitesinin yalnızca algılanan fayda üzerinde pozitif ve anlamlı bir etkisi varken, bilgi kalitesinin algılanan kullanım kolaylığı ve algılanan fayda üzerinde pozitif ve anlamlı bir etkisi belirlenememiştir. Algılanan kullanım kolaylığı ve algılanan fayda, kullanım niyeti üzerinde pozitif ve anlamlı bir etkiye sahiptir. Ayrıca, algılanan kullanım kolaylığının algılanan fayda üzerinde pozitif ve anlamlı bir etkisi olduğu tespit edilmiştir. Bu araştırma modeli, hemşireler arasında hastane bilgi yönetim sisteminin kabulünü etkileyen faktörleri ve bu faktörlerin kullanıcıların gelecekteki kullanım niyetlerini nasıl etkileyebileceğini belirlemeye yardımcı olmuştur. Sonuç olarak, HBYS'nin hasta bakımını iyileştirmek için sürekli geliştirilmesine yönelik alanlar bulunmaktadır.

Anahtar Kelimeler*: Hastane bilgi yönetim sistemi, hemşireler, bilgi sistemi başarı modeli, teknoloji kabul modeli*

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1. Introduction

Advancements in technology bring many benefits to the healthcare sector by enhancing technological capabilities in diagnosis, treatment and patient care (Aggarwal, 2017). To be a key player in the healthcare sector many hospitals have started using state-of-the-art health technologies. Innovative technologies improve the quality of care and decrease malpractice (Lei et al., 2021). To increase the quality of care in hospitals in Türkiye, Hospital Information Management System (HIMS) is developed for hospitals. HIMS is a group of software that covers many areas including laboratory, radiology, operating room, hospital pharmacy and human resources (Republic of Türkiye Ministry of Health, 2015). HIMS is a process to providing some kind of control on decision making process, ensuring the effective daily routine work in the hospitals with the participation of employees at all levels (Chuttur, 2009). The aim of HIMS is to provide full support to key areas including medical, nursing care, laboratory and pharmacy as well as teaching, research, and business management analysis (Reichertz, 2006).

Nurses are the largest group who use HIMS on a daily practice at the hospitals (Kowitlawakul, 2011). According to the study done by Barchielli, nurses are more likely to open and ready to adopt when dealing with new technologies that provide minimum risks for the nurses and patients, they take care of (Barchielli et al., 2021). Private and public hospitals are in the process of becoming fully equipped digital hospitals where HIMS is efficiently used. Previous studies suggest that behaviors of healthcare professionals' regarding information management systems are influenced by perception of users and technological functionality through theoretical perspectives, such as the Technology Acceptance Model (TAM) (Davis,1989) and Information Systems Success Model (ISSM) (DeLone and McLean, 2003). TAM is proposed by Davis in 1989, based on the Theory of Reasoned Action (TRA) developed by Fishbein and Ajzen (Fishbein and Ajzen, 1975), to identify the reasons behind the individuals' preference towards accepting or rejecting new technologies. A number of researchers suggest that the ISSM proposed by Delone and McLean is not complete as it is. Therefore, they suggest that more dimensions should be included in the model, or present alternative success models (e.g. Ballantine et al., 1996; Seddon, 1997; Seddon and Kiew, 1996). In response to the criticism made by the researchers previously mentioned, the service quality dimension was added to an updated ISSM developed by Delone and McLean (DeLone and McLean, 1992). The purpose of the study is to determine the factors affecting adoption of HIMS from the perspective of nurses by using a conceptual research model.

2. Literature Review

Literature review covers 3 areas, namely, HIMS, TAM and ISSM. The reasons for HIMS, the purpose of the study is to determine the factors affecting the adoption of HIMS by nurses using a proposed conceptual model developed based on constructs are taken from TAM and ISSM.

2.1. Hospital Information Management System

HIMS offers several benefits including an increase in speed of getting information from anywhere as well as reduced costs and increased employee and patient satisfaction (Özbek et al., 2007). HIMS is an integrated information management system that is used in hospitals by utilizing health information technology (IT). Moreover, HIMS is a comprehensive and integrated system that is developed to manage both administrative and financial aspects of hospitals, especially it is designed to meet the specific needs of a hospital (İmir and İlhan,

2022). Nowadays, hospitals are increasingly becoming more dependent on the use of HIMS in many areas, especially administrative, diagnostics, and training to improve the quality and performances of services (Hsiao et al., 2011). Additionally, the ability of nurses in contributing to medical decisions is an important factor influencing the quality of patient care (Hagbaghery et al., 2004). Additionally, the attitudes of nurses' toward and their perception and understanding of HIMS have a direct impact on electronic patient records (Moody et al., 2004). Research suggests that the adoption of information technologies can be accepted by increasing attitude levels of users (Mendez et al., 2017). It is suggested that factors affecting the acceptance of HIMS by users will positively affect the performance of relevant technologies (Tarcan and Çelik, 2016). HIMS can store patient data as well as other medical data including laboratory, diagnostic, treatment; follow-up reports as well as critical decisions (Prakash, 2010). Previous research has shown that nurses play an important role in HIMS adoption (Marin, 2007; Kowitlawakul, 2011). Previous studies have shown that HIMS can lead to user resistance and decreased satisfaction, especially if nurses perceive the HIMS to have a difficult interface or to be inconvenient, or if it is difficult at all (Alquraini et al., 2007; Timmons, 2003).

Developers of HIMS should understand the factors affecting acceptance of HIMS in clinical practice to increase the efficiency of healthcare services. It is important to get commitment of all clinicians and nurses along with other staff by providing sufficient IT support to successfully operate HIMS in the hospitals. These strategies can reduce significant resistance and negative attitudes while increasing the acceptance level of HIMS among healthcare professionals. Because of this, it is very important to measure the level of HIMS acceptance among healthcare professionals and explore the factors of HIMS, resulting in acceptance among all users (Collins, 2008). Several models have been proposed to identify the factors affecting individual reactions toward IT. For example, the user acceptance of TAM is the most preferred model to evaluate information systems (Chuttur, 2009).

2.2. Technology Acceptance Model (TAM)

Past research shows that the acceptance of IT has more than 30 years of history. In these years, many theoretical models are developed and used to evaluate the acceptance of recent technologies by users. The TAM is one of those approaches (Schaper and Pervan, 2007). TAM is particularly developed for IT, because it mainly focuses on two factors, particularly perceived usefulness and perceived ease of use that affect the acceptance of new technologies (Wilkins, 2009).

The original TAM consists of factors that are perceived ease of use, perceived usefulness, attitude to use, intention to use and actual use of the system (Wu et al., 2008). The TAM is designed to explain the behavior of end users who use computer or IT products in a broad perspective. In fact, the model focuses on the impact of external factors that affect intentions, attitudes and beliefs (Davis, 1989). In the TAM model, perceived usefulness and perceived ease of use are the major factors impacting IT acceptance, which are open to be influenced by many external variables (Zhang et al., 2010). Because exogenous variables can directly cause a change in perceived usefulness and perceived ease of use and those variables may affect user attitudes and behavioral intentions and indirectly affect actual system use. TAM explains that a person's attitude toward technology affects the adoption and use of this technology, and the benefits provided by technology are the main factors to influence behavioral intention according to users. In the model, the user's acceptance of technology; It is measured based on 4 basic constructions: Perceived Ease of Use, Perceived usefulness, Attitude and Intention (King and He, 2006; Lee et al., 2003; Davis, 1985; Davis et al., 1989). Basically, Perceived Ease of Use indirectly influences Perceived Usefulness (Alsyouf et al., 2021; Alsyouf et al.,

2022). Studies have shown that TAM can effectively show differences in use of technology and behavior occurring in many areas within the health context, for eHealth records (EHRs) (Al-Otaibi et al., 2022), telehealth (Hsieh et al., 2022), mobile health technologies (Alsyouf et al., 2021; Alsyouf et al., 2022), cloud-based services (Gupta et al., 2022), medical devices and tele-monitoring tools (Maskeliūnas et al., 2019; Infarinato et al., 2020), and assistive technology (Chimento- Diaz, et al., 2022). According to the study proposed by Taylor and Todd, Perceived Ease of Use and Usefulness affects attitudes, and because of these attitudes influence intention (Taylor and Todd, 1995). Intention is under the joint influence of both attitude and perceived usefulness, when other constructs are considered equal, ease of use and perception of benefits have a positive relationship (Venkatesh, 2000).

2.3. Information System Success Model (ISSM)

DeLone and McLean put efforts towards measuring Information System **(**IS) performance. Research suggests that the IS Success Model can explain as well as predict the factors that contribute to the success of IS. However, there is a still need to find out the relationship between variables. According to Mc Lean et al. (2014) there aren't enough studies in the IS field to show the associations between success factors and outcome regarding organizational effects (McLean et al. 2014). The IS Success Model was developed by DeLone and McLean (1992) as a comprehensive framework to evaluate the performance of information systems (DeLone and McLean, 1992). This model consists of six constructs: System Quality, Information Quality, Use, User Satisfaction, Individual Impact, and Organizational Impact. The model can be explained as the following ways: "Systems Quality and Information Quality jointly affect both use and user satisfaction. Additionally, use can impact the degree of user satisfaction – positively or negatively - as well as the reverse being true. Usage and user satisfaction are direct predecessors of individual impact; and finally, this impact on individual performance can turn into organizational impact" (Delone and Mclean, 1992).

Many researchers suggest that DeLone and McLean (2003) had to update the model and made several modifications to capture the nature of IS changes (DeLone and McLean, 2003). The IS success model is modified by including service quality (SERVQUAL) in the model (Parasuraman et al., 1988) for the intention to use and user satisfaction; and individual impact and organizational impact are replaced by net benefits (Mardiana et al., 2015). In this study, IS characteristics namely, system quality, service quality and information quality included in the TAM model as external factors.

3. Methods

The purpose of the study is to determine the factors influencing the adoption of HIMS among nurses who work in public and private hospitals using a proposed conceptual model explaining the effects of variables to adopt a new technology. The study is designed as a cross-sectional study.

3.1. Research Model

The proposed research model shown in Fig. 1 is developed by incorporating the constructions of IS Success model and revised TAM model. External factors used in this model are Information Quality, System Quality and Service Quality. Other dimensions in the model such as Perceived Ease of Use, Perceived Usefulness and Intention to use are taken from the updated TAM model proposed by Vankatesh and Davis (Venkatesh and Davis, 2000). Prior to the study the extensive literature review in this field were done regarding the proposed conceptual model.

There are a variety of models in terms of the implementation of HIS depending upon the characteristics of users who work either public or private hospitals (Handayani et al., 2016). Therefore, it is essential to better find out the acceptance factors affecting the acceptance of the HIMS used in each type of hospital. There are several models showing the acceptance of technologies that explain the user acceptance in the healthcare sector. Pai and Huang suggest the TAM is still one of the frequently discussed models in IS literature and can be used for many information technologies (Pai and Huang, 2011). Considering the purpose of the study, as well as the relevant articles, the factors that may affect the health information management system are illustrated in Fig. 1. The study is mainly based on the external variables from the IS Success model proposed by DeLone and McLean that are System Quality, Information Quality and Service Quality along with Perceived Usefulness, Perceived Ease of Use and Intention to use as research factors proposed by Vankatesh and Davis in the updated TAM.

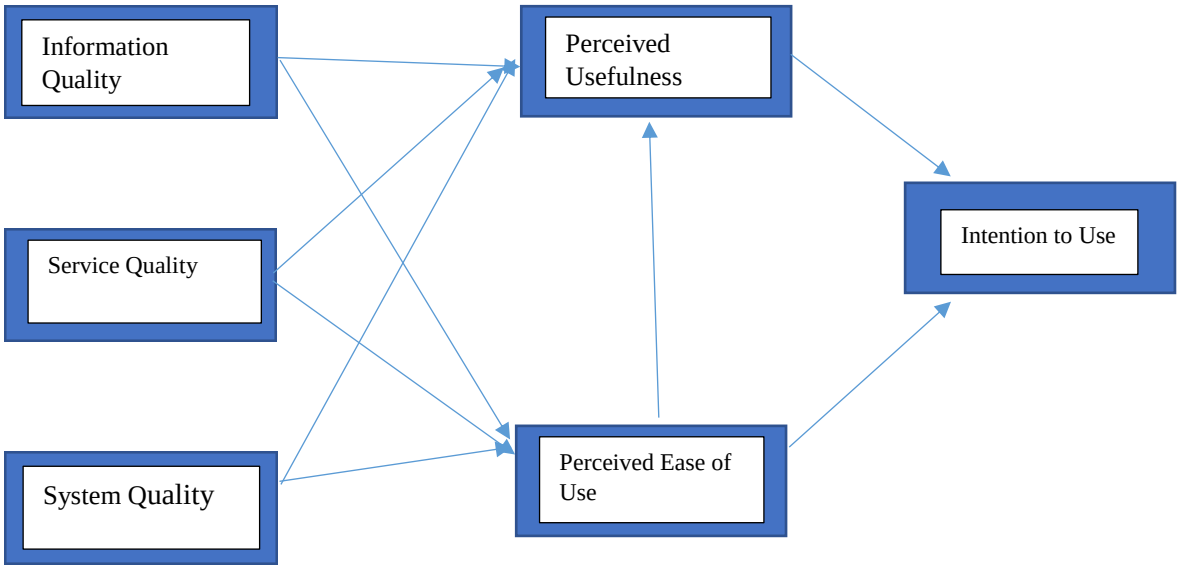

Figure 1: Proposed research model

3.2. Research Hypotheses

Research hypotheses were developed based on extensive literature review regarding TAM for HIMS. The following constructs were taken from updated TAM. Perceived usefulness explains an individual decision whether to use IT systems when doing a series of tasks to do work (Goodhue and Thomson, 1995). Davis et al. (1989) defined the Perception of Usefulness as the degree to which individuals believe that by using a particular system can improve user performance. "Perceived Usefulness" refers to the user's subjective beliefs of the effectiveness of a hospital information system to enhance his/her job performance in a healthcare facility (Hsiao et al., 2011). Perception of Usefulness according to Seddon and Kiew (1996) as a perception of usage about system usefulness with an effort to maximize user performance achievement. Istianingsih and Wijanto (2008) suggest that the Information Quality positively affects the perception of usefulness. The higher the quality of information used, the higher the perception rate of usefulness is. Research suggests that information quality positively affects the perception of ease of users (Ali and Younes, 2013). Considering these assumptions, the following hypotheses are developed.

H1: Information quality has an effect on perceived usefulness.

H2: Information quality has an effect on perceived ease of use.

The use of advanced technology in services will lead to company objectives such as increasing employee productivity, profitability, saving employee time in serving customers, and increasing the accuracy of service results (Lovelock and Wirtz, 2011). Quality is a strong factor of a customer's expectations for any type of product or service (Chen et al., 2008). Quality is an important consideration for organizations driven by services. The perceived usefulness means that the IT system used by users do not require a lot of efforts (Susilo et al., 2017). The perceived ease of use is the level where someone feels that the use of technology is easy to use without huge efforts (Susilo et al., 2017). The following hypotheses are proposed.

H3: Service quality has an effect on perceived usefulness.
H4: Service quality has an effect on perceived ease of use.

The high cost of establishing an HIMS requires measuring and carefully evaluating the value and effectiveness of the system. Measuring IS effectiveness is an important process, and system quality and information quality are critical factors affecting user satisfaction (DeLone and McLean, 2003).

System quality means the performance of technology systems as well as customer evaluation of the level of user-friendliness of technology when service is used. System quality indicates the level of assistance offered to a user that is expected of IT (Jeong, 2011; Prasetyo et al., 2021). Ease of use, acceptance, and accessibility of an information system is an indicator of the quality of that system. Perceived ease of use is defined as "the degree to which a person believes that using technology would be free from effort." A digital library is explained as an information system that is developed on the web. Quality of services provided by this web-based system has a significant impact on behavioral intention of students (Chang et al., 2015). According to Rafique et al. (2020) and Hawash et al. (2021), system quality has a positive and significant effect on perceived ease of use and perceived usefulness. Therefore, the following hypotheses are developed:

H5: System quality has an effect on perceived usefulness.
H6: System quality has an effect on perceived ease of use.

Adam et al. (1992) suggest that the perception of usefulness is a significant factor for system usage. Perceptions of usage and perception of ease of use are the major variables influencing the use of the system (Davis, 1989; Adams et al., 1992). Mao and Palvia (2006) suggest that perceptions of ease-of-use system positively affects the perception of usefulness. Furthermore, Perceived Ease-of-use significantly influences perceived usefulness and intention to use (Cheng, 2012; Premchaiswadi et al., 2012). Based on information provided above, the following hypothesis is developed.

H7: Perceived ease of use has an effect on perceived usefulness.
As indicated by several studies perceived ease of use and usefulness influence purchase intention in doing online shopping (Ling et al., 2011; Heijden et al., 2003; Gefen et al., 2003). Considering these studies, the following hypotheses are developed.

H8: Perceived usefulness has an effect on intention to use.
H9: Perceived ease of use has an effect on intention to use.

3.3. Population and Sample

The study was conducted with nurses from private and public hospitals between May 31 and July 6, 2023. in Türkiye. There are 572 private and 983 public hospitals in Türkiye. The

sample of the study was selected by using a convenience sampling method, meaning a non-probability sampling method where respondents are selected for inclusion in the sample due to convenience. An acceptable sample size for a study in this context would be 384. Therefore, 401 respondents for this study met the requirement. We distributed 10 surveys to 50 hospitals. In the end the total of 401 surveys were returned with a high return rate of 80%. The only requirement to participate in this study was the level of experience of nurses with HIMS.

3.4. Data Collection

The data were collected using an online, and it took almost 3 months to reach out 401 respondents. In the beginning of the survey the purpose as well as ethical aspect of the study were explained and nurses who were willing to participate in this study had to confirm his or her participation by clicking on button to proceed to survey. Nurses who accepted to participate in this study allocated 5-8 minutes of their time to fill out the online survey.

3.5. Ethical Aspect of the Study

The ethics of the study was approved by the Toros University Scientific Research and Publication Ethics Committee on 26.04.2023 with decree no 54. Although it was planned to make a "Türkiye and Croatia Comparison" at the beginning of this research, only data from Türkiye was used since no data was obtained from Croatia. For this reason, the title of the article was changed from "Examination of Nurses' Hospital Information System Usage Using Technology Acceptance Model: Türkiye and Croatia Comparison" to "Evaluation of Acceptance of Hospital Information Management System Among Nurses Through Technology Acceptance Model".

3.5. Statistical Analysis

The questionnaire included 2 sections. In the first section the demographic questions were asked. In the second section respondents were asked to evaluate each statement of each construct used in the model using a five-point Likert scale (from 1: strongly disagree to 5: strongly agree) was used to rate each statement under each dimension. The data obtained in the research were analyzed using SPSS (Statistical Package for Social Sciences) for Windows 25.0 and AMOS 21 program. Descriptive statistical methods (number, percentage, mean, standard deviation) were used when evaluating the data. SPSS 25 package and AMOS 21 programs were used to analyze the data. The validity of the scale was tested with confirmatory factor analysis (CFA). Factor loading is used to verify the reliability of the items and is presented in Table 2 with the Cronbach alpha (α) coefficient. The results of the correlation between all variables are shown in Table 3. The Pearson correlation showed significantly positive relationships among the investigated variables (Table 4).

4. Results

Socio- demographic variables are reported in Table 1 in frequencies and percentages.

Table 1. Socio-Demographic Variables of The Respondents (n=401).

Variables			Frequency	Percentage (%)
Gender	Female		319	79,6
	Male		82	20.4
Age	Mean age 30.9+/- 8.48 Min: 20 Max: 58 <=30 31-40 41>		 251 84 66	 62.6 20.9 16.5
Education level	High school		91	22.7
	Associate degree		83	20.7
	University		190	47.4
	Master or PhD		37	9.2
Type of institution	Public		114	28.4
	Private		229	57.1
	City Training and Research Hospital		58	14.5
Years of experience in that institution	0- 1		135	33.7
	2-5		142	35.4
	6-9		62	15.5
	10-13		30	7.5
	14-17		12	3.0
	18 -20		7	1.7
	21 and above		13	3.2
Number of respondents received computer training		Yes	338	84.3
		No	63	15.7
HIMS training at the hospital where respondents work		Yes	335	83.5
		No	66	16.5
Duration of training of HIMS	less than 1 week		246	61.4
	1 week		77	19.2
	2 weeks		27	6.7
	3 weeks		9	2.2
	4 weeks and more		42	10.5
Total			401	100
Duration of use of HIMS in general	less than 1 month		49	12.3
	1-3 months		30	7.5
	4-6 months		19	4.7
	6-8 months		17	4.2
	9-12 months		28	7.0
	more than 12 months		258	64.3
Total			401	100

Most of the respondents were women (79.6%). More than half of the respondents (56.6%) had a bachelor's degree. The mean age of the respondents was 30.9+/- 8.48. Nearly 63% of the respondents were 30 years of age or below. More than half (57%) reported working at the private hospitals. More than half of the respondents (69.1%) had less than 5 years of experience in that institution. Most respondents (84%) received computer as well as health information management training, respectively. More than half (61%) received less than 1week training on HIMS while only 10.5% received 4 weeks or more than 4 weeks. Most respondents (64.3%) reported using HIMS for more than 12 months. Table 2 illustrates the validity and reliability of the scale. Socio- demographic factors regarding the use of HIMS were taken the study done by Kayserili and Tefiroğlu (2023).

Table 2. The Results of Validity and Reliability Analysis.

Factors	**Items**	**Factor loading**	**Fit Indices**	**Cronbach α**
Information Quality	IQ1 IQ2 IQ3 IQ4 IQ5 IQ6	0.909 0.910 0.925 0.933 0.939 0.914	χ^2/df: 4.104 RMSEA: 0.088 CFI: 0.991; TLI: 0.985 IFI: 0.991; RFI: 0.981 NFI: 0.988; SRMR:0.010	0.971
Service Quality	SVQ1 SVQ2 SVQ3 SVQ4 SVQ5	0.907 0.920 0.907 0.909 0.885	χ^2/df: 1.901 RMSEA: 0.047 CFI: 0.998; TLI: 0.996 IFI: 0.998; RFI: 0.992 NFI: 0.997; SRMR:0.006	0.958
System Quality	SQ1 SQ2 SQ3 SQ4 SQ5	0.894 0.888 0.872 0.853 0.874	χ^2/df: 1.670 RMSEA: 0.041 CFI: 0.999; TLI: 0.996 IFI: 0.999; RFI: 0.991 NFI: 0.996; SRMR:0.007	0.943
Perceived Usefulness	PU1 PU2 PU3 PU4 PU5 PU6	0.842 0.922 0.938 0.945 0.908 0.908	χ^2/df = 3.723 RMSEA=0.081 CFI=0.994; TLI=0.987; IFI=0.994; RFI=0.982; NFI=0.991; SRMR=0.012	0.967
Perceived Ease of Use	PEOU1 PEOU2 PEOU3 PEOU4 PEOU5 PEOU6	0.802 0.845 0.871 0.859 0.841 0.870	χ^2/df:3.097 RMSEA:0.072 CFI:0.992; TLI:0.984 IFI:0.992; RFI:0.977 NFI:0.988; SRMR:0.015	0.939
Intention to Use	ITU 1 ITU2 ITU3 ITU4 ITU5 ITU6 ITU7	0.921 0.945 0.900< 0.926 0.922 0.898 0.882	χ^2/df: 3.142 RMSEA: 0.073 CFI: 0.992; TLI: 0.988 IFI: 0.992; RFI: 0.982 NFI: 0.988; SRMR:0.009	0.972

Absolute Fit Indices		
Index	**Excellent fit measures**	**Acceptable fit measures**
X^2/df	$0 \leq \chi^2/df \leq 3$	$3 \leq \chi^2/df \leq 5$
RMSEA	0.00≤ RMSEA ≤0.05	0.05≤ RMSEA ≤ 0.08
SRMR	0.00≤ SRMR ≤0.05	0.05≤ SRMR ≤ 0.08
CFI	0.95≤CFI	0.85≤CFI
RFI	0.90≤RFI	0.85≤RFI
IFI	0.90≤ IFI ≤1.00	0.80≤ IFI
TLI	0.90≤TLI	0.80≤TLI
NFI	0.90≤NFI	0.80≤NFI

References: Wong and Carlbäck (2018); Bentler(1990).

The questionnaire was validated by reviewing the literature and using experts' opinions as well as confirmatory factor analysis, and the reliability analysis that is calculated by using a Cronbach α coefficient analysis. High levels of Cronbach α value suggest that the reliability of the scale is ideal. In this study, all Cronbach α values for all variables exceed 0.7, meaning

the reliability of the data are met. The reliability analysis is carried out to test whether the statements in the scales were consistent among themselves (Ural and Kılıç, 2006). For the tests and results, the measurements must be reliable. In this context, the reliability of the scale is examined by using Cronbach α. In the reliability analysis, the Cronbach α coefficient value varies between 0-1; If it is between 0.00-0.40, the scale is not reliable; the low reliability scale values should be in between 0.40 and 0.60, reliable between 0.60 and 0.80, and highly reliable is in between 0.80 and 1.00 (Tavşancıl, 2005). When the results are examined, it is determined that the reliability of all measurement variables were above 0.80, in other words, the scale is highly reliable.

In terms of confirmatory factor analysis, if the factor load values are above 0.30, it can be concluded that the items are suitable for the structure and the structure is confirmed. It is concluded that the factor loadings of all items are between 0.802-0.954 (Seçer, 2018). When the fit index value for the measurement tools is examined, it is seen that the $\chi 2$ (Cmin/df) value provides acceptable fit limits for all structures including RMSEA, CFI, TLI, IFI and RFI. It is determined that the NFI fit index value shows perfect fit for all measurement analysis. Table 3 demonstrates an average value of every construct variable.

Table 3. Descriptive Statistics of Variables.

	Minimum	Maximum	Mean	SD
Information Quality	1.00	5.00	3.96	1.09
Service Quality	1.00	5.00	3.87	1.02
System Quality	1.00	5.00	3.94	1.05
Perceived Usefulness	1.00	5.00	3.96	1.01
Perceived Ease of Use	1.00	5.00	3.84	1.02
Intention to Use	1.00	5.00	4.00	1.06

Table 3 demonstrates the mean scores for every construct obtained in order, for Information Quality was 3.96, for Service Quality was 3.87, for System Quality was 3.94, for Perceived Usefulness was 3.96, for the Perceived Ease of Use was 3.84, and for Intention to Use was 4.01. The range width of the measurement tools can be calculated by dividing the difference between the largest value and the smallest value in the measurement results series of the group range coefficient by the number of determined groups (Kan, 2009). Accordingly, Score range = (5-1)/5 = 4/ 5 = 0.80). According to this calculation, the score averages are "1.00-1.80 range", "1.81-2.60 range", "2.61-3.40 range", "3.41-4.20 range" and "4.21-5.00 range". Accordingly, it was determined that the score range of all measurement tools was at a high level (Kan, 2009). Table 4 illustrates the results of the relationships between variables using Pearson correlation analysis.

Table 4. Correlation Between Variables

	1	2	3	4	5	6
Information Quality	1					
Service Quality	0.913**	1				
System Quality	0.916**	0.860**	1			
Perceived Usefulness	0.792**	0.788**	0.803**	1		
Perceived Ease of Use	0.828**	0.812**	0.874**	0.825**	1	
Intention to Use	0.858**	0.807**	0.876**	0.846**	0.858**	1

**p<0.01

Table 4 displays the factors of healthcare management information systems that are correlated with each other positively, with each Pearson correlation coefficient ranging from 0.792 to 0.916. To test the relationships between variables, the Pearson Correlation Analysis is used.

As a result, there appears to be significant positive relationships between Perceived Usefulness and Perceived Ease of Use (r=0.825, p<0.05), between Intention to Use (r=0.846, p<0.05), between System Quality (r=0.803, p<0.05), and between Information Quality (r=0.792, p<0.05), between Service Quality (r=0.788, p<0.05). There appears to be statistically significant positive relationships between Perceived Ease of Use and Intention to Use (r=0.858, p<0.05), between System Quality (r=0.874, p<0.05), between Information Quality (r=0.828, p<0.05) and between Service Quality (r=0.812), p<0.05). There is a statistically significant positive relationship between Intention to Use and System Quality (r=0.876, p<0.05), Information Quality (r=0.858, p<0.05) and Service Quality (r=0.807, p<0.05). There is a statistically significant positive relationship between System Quality and Information Quality (r=0.916, p<0.05) and Service Quality (r=0.860, p<0.05). There is a statistically significant positive relationship between Information Quality and Service Quality (r=0.913, p<0.05). Figure 2 shows variables affecting the adoption of HIMS among nurses. Model path coefficients and model fits to test the research hypotheses are given in Table 5.

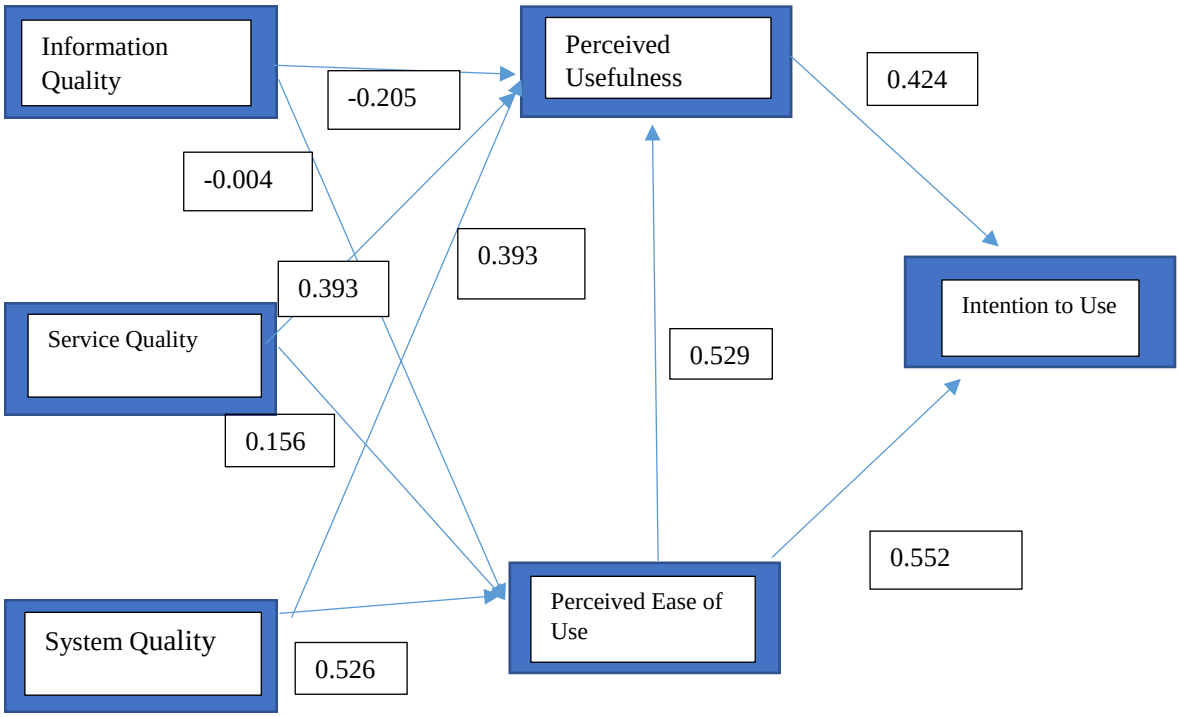

Figure 2: Research Model Path Analysis

Table 5. Results of Hypotheses.

Hypothesis	**Estimated (β)**	**SD**	**t**	**p**	**Result**
1. Information Quality → Perceived Usefulness	-0.205	0.196	-1.069	0.285	Not supported
2. Information Quality → Perceived Ease of Use	-0.004	0.386	-0.014	0.989	Not supported
3. Service Quality → Perceived Usefulness	0.393	0.150	2.727	**0.006***	Supported
4. Service Quality → Perceived Ease of Use	0.156	0.294	0.766	0.444	Not supported
5. System Quality → Perceived Usefulness	0.259	0.137	2.034	**0.042***	Supported
6. System Quality → Perceived Ease of Use	0.576	0.265	3.238	**0.001***	Supported
7. Perceived Ease of Use → Perceived Usefulness	0.526	0.031	12.295	***	Supported
8. Perceived Usefulness → Intention to Use	0.424	0.049	9.742	***	Supported
9. Perceived Ease of Use → Intention to Use	0.552	0.035	12.794	***	Supported
Excellent Fit Measures	**Acceptable Fit Measures**			**Model Fit Values**	
$0 \leq \chi^2/df \leq 3$	$3 \leq \chi^2/df \leq 5$			3.461	
$0.00 \leq$ RMSEA ≤ 0.05	$0.05 \leq$ RMSE$---$A ≤ 0.08			0.078	
$0.00 \leq$ SRMR ≤ 0.05	$0.05 \leq$ SRMR ≤ 0.08			0.077	
$0.95 \leq$CFI	$0.85 \leq$CFI			0.934	
$0.90 \leq$RFI	$0.85 \leq$RFI			0.901	
$0.90 \leq$ IFI ≤ 1.00	$0.80 \leq$ IFI			0.934	
$0.90 \leq$TLI	$0.80 \leq$TLI			0.927	
$0.90 \leq$NFI	$0.80 \leq$NFI			0.909	

*P<0.05 ***P<0.001

As a result, it is seen that the relevant model provided acceptable fit limits for the fit values χ2 (Cmin/df), RMSEA and CFI value. TLI, IFI, RFI it was determined that the NFI fit index value showed perfect fit for. When the results of the research model are examined, it is seen that System Quality has a statistically significant effect on Perceived Ease of Use (β=0.576, p<0.05). It is seen that System Quality (β=0.259, p<0.05), Service Quality (β=0.393, p<0.05) and Perceived Ease of Use (β=0.526, p<0.05) have a statistically significant effect on Perceived Usefulness. It appears that Perceived Usefulness (β=0.424, p<0.05) and Perceived Ease of Use (β=0.552, p<0.05) have a statistically significant effect on Intention to Use. It is seen that Information Quality does not have a statistically significant effect on Perceived Ease of Use (β=-0.004, p>0.05) and Perceived Usefulness (β=-0.205, p>0.0). It also appears that Service Quality does not have a statistically significant effect on Perceived Ease of Use (β=0.156, p>0.05).

5. Discussion

Previous research studies suggest that the adoption of Hospital Information Management Systems by nurses will result in a positive impact on the quality of hospital services as well as patient care. By proposing a conceptual model, this study examines the factors influencing the adoption of HIMS among nurses. Findings of this study may help hospital administrators to consider factors that are positively influencing the development and utilization of HIMS. According to the findings of our research study, all components included in this model are reviewed positively concerning mean scores of each statement. All participants reported receiving training on HIMS, and most have over 12 months of experience with HIMS.

Therefore, it is expected that the proposed model to be sufficient to show the factors influencing Intention to Use. The study conducted by Pai and Huang suggests that Information Quality positively affects Perceived Usefulness (Pai and Huang, 2011). However, this study indicates that Information Quality does not have a positive and significant effect on Perceived Usefulness. Therefore, H1 is rejected. The other study suggests that Information Quality positively affects the Perceived Ease of Use (Ali and Younes, 2013). However, this study is not in line with the findings of Ali and Younes, therefore H2 is rejected. Although all study participants have some level of experience with HIMS, Information Quality does not have a positive and significant effect on Perceived Usefulness as well as Perceived Ease of Use in this study. The reason for this discrepancy between two studies is a result of the difference in statements asked for under the dimension of Information Quality. The statements used under Information Quality in this study include accuracy, sufficiency, usefulness, and clarity of the information provided by HIMS. While developing healthcare information systems, hospital administrators should consider the following aspects for Information Quality: available of sufficient information, using a good interface design and ensuring timely update of the information. In terms of Service Quality, according to research done by Pai and Huang, this factor has a significant positive impact on Perceived usefulness and Perceived Ease of use (Pai and Huang, 2011). According to the article by Barzekar et., al. (2019) the availability of technical service support for IT system has a positive and significant direct effect on Perceived Usefulness and Ease of Use of HIS and finally on nurses' satisfaction of HIS (Barzekar et al., 2019). Based on the findings from the study conducted by Alnawafleh et al. (2018) Service Quality, has a positive and significant effect on Perceived Usefulness and Perceived Ease of Use of service and Intention to Use (Alnawafleh et al., 2018). Our research findings suggest that –Service Quality has a positive and significant effect on Perceived Usefulness. Therefore, H3 is accepted. However, this study does not support the impact of Service Quality on Perceived Ease of Use. Based on this finding, H4 is not accepted. When it comes to Service Quality, it is important to provide users with sufficient, reliable information and help users when needed. In our research the statements used under dimension of Service Quality include that HIMS is reliable, and its hardware and software are up to date, IT employees provide services in a timely manner and requested manner, IT employees are knowledgeable to do their jobs and satisfies the users' heart desires regarding the system. Therefore, hospital administrators should pay attention to Service Quality to increase satisfaction and its effect on Perceived Ease of Use. Based on the results of the study conducted by Rezvani et al. (2022), System Quality has a positive and significant effect on Perceived Ease of Use. Therefore, if System Quality increases, Perceived Ease of Use will increase as well. This is in line with the findings of Jeong (2011) and Rafique et al. (2020). The results of our research support these findings. Therefore, H4 is accepted. Another finding of Rezvani et al. (2022) suggests that System Quality increases Perceived Usefulness and this finding is consistent with the findings of Jeong (2011) and Rafique et al. (2020). Our results are in line with the findings of Rezvani et al. (2022), Jeong (2011) and Rafique et al. (2020). Therefore, H5 is accepted. Another finding of this study is that Perceived Ease of Use has a positive and significant effect on Perceived Usefulness. Thus, Perceived Ease of Use may increase the Perceived Usefulness (Rezvani et al., 2022). This is consistent with the results of Rafique et al. (2020), Ünal and Uzun (2020), Walker et al. (2020). In our study, Perceived Ease of Use has a positive and significant impact on Perceived Usefulness and therefore H7 is accepted.

In summary, the users' Intention to Use the system would be affected positively and directly by their Perceived Usefulness and Perceived Ease of Use, which in turns to display the absolute importance of Perceived Ease of Use. Therefore, while introducing healthcare information system into hospital, it is necessary to prompt users to use the system by making operation faster and interface of the systems easy to learn. Research suggests that several

factors of the TAM, particularly Perceived Ease of Use and Perceived Use significantly influence individual's intention to adopt technology during the pandemic period (Chayomchai et al., 2020; Pai and Vanijja, 2020). In this study the following statements regarding System Quality include easy to use of HIMS, directing users with warnings, can be adopted according to new demands and conditions, is easy to learn and reliable. Our study is in line with the findings of other studies. Thus, Perceived Ease of Use and Perceived Usefulness have positive and significant effects on Intention to Use and therefore H8 and H9 are accepted.

6. Conclusion

The purpose of this study is to determine the factors that were displayed in the conceptual model affecting the adoption of HIMS by nurses. Among all the theories, TAM is considered the most influential and commonly employed theory for describing an individual's acceptance of information systems. Individual information systems acceptance is determined by two major variables: Perceived Usefulness and Perceived Ease of Use. Our study shows that both variables played a role in adopting HIMS among nurses. In our model among the external factors the System Quality is the most influential one affecting Perceived Usefulness and Perceived Ease of Use, leading to the adoption of HIMS. Although other studies mentioned in or discussion section suggest that both Information and Service Quality are the influential determinants affecting Perceived Usefulness and Perceived Ease of use, our study suggests that Service Quality has a significant and positive effect on Perceived Usefulness, not on Perceived Ease of Use. Based on our study, we recommend that Information Quality and Service Quality factors can be improved to facilitate the adoption of HIMS. For this purpose, further research is needed to determine variables in terms of hierarchy. Additionally, the model can be improved by incorporating a variety of external factors to find out the ones affecting the adoption of HIMS and future new technologies.

There is always room to improve the level of Information and Service Quality for the adoption of HIMS. In general, it can be concluded that the results of this study can help system developers and hospital administrators to identify the needs and concerns of nurses to develop user-friendly HIMS. This study reveals that nurses are the group who see benefits in the HIMS and some aspects of the HIMS can be improved.

Research Limitations

This study has some limitations such as it is the only one that was conducted in Türkiye using a conceptual model approach to determine the factors helping nurses to adopt HIMS. Therefore, we have no direct comparison opportunity with studies designed similar to our model in Türkiye. The questionnaire is the tool to collect information from individuals based on their own perceptions. Although our research covered many geographical areas with the sample size of 401 nurses in Türkiye, it cannot be projected to the whole nurse population unless all geographical areas are included with the larger sample size.

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