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Using an Extended Technology Acceptance Model to Uncover Variables Influencing Physicians' Use Of EHR in Jordan: Insights from Alberta, Canada

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Abstract: Adoption rates for electronic health records (EHR) remain low in developing nations, even though health information technologies undoubtedly enhance the quality of service delivery and healthcare institutions' overall efficiency. In this research, researchers employed a technology acceptance integrated model to analyze what factors are most important in encouraging physicians in Jordan to adopt EHR. This framework was created after a thorough review of the relevant literature and with input from physicians in Alberta, Canada, a province with an openly disclosed high rate of electronic health record adoption. To achieve its aim, the present study used a quantitative correlational research strategy. Data were acquired from a convenient sample size of 413 web-based survey participants recruited from the target population of physicians practicing in the public and private healthcare sectors in Jordan. The study's hypotheses were tested with structural equation modeling. Physicians' behavioral intentions were shown to be strongly predicted by factors including perceived usefulness, perceived ease of use, perceived 'privacy and security,' financial incentives, and self-efficacy, which collectively accounted for 57.8% of the total variance in behavioral intention. Perceived usefulness had the highest influence on intentions, followed by self-efficacy, perceived "privacy and security," and perceived ease of use, with financial incentives having the smallest impact on intentions. Accordingly, healthcare practitioners must consider these variables while developing and validating interpretations about HER adoption. This study concludes with several implications for healthcare directors, policymakers, and providers of health information systems, in addition to suggestions for future research areas.

Keywords: Technology acceptance Model, electronic health records (EHR), Jordan

1 Introduction

As of the beginning of 2020, the new coronavirus SARS-CoV-2 (also known as COVID-19) has become an urgent and serious threat to humanity, posing a wide range of medical problems for healthcare systems around the world. As with the ongoing COVID-19 epidemic, responding to a public health emergency requires quick access to huge amounts of data for policymakers, helping them to keep the general public healthy and safe by making necessary health resources accessible wherever and whenever they are needed. It also involves conducting empirical research in order to enhance our collective understanding of such pandemics for better future readiness [1]. In this respect, Electronic Health Records (EHR) accommodates large amounts of important and relevant data components that can help with such pandemic reaction plans [2, 3].

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Patients' medical records would be accessible to doctors and other medical staff across the country thanks to an electronic health records system implemented by the country's central health authority. Patients would also have easier access to a wide range of healthcare options, including pharmacies, hospitals, labs, imaging centers, and doctors [4]. Undeniably, EHR systems have transformed the medical and health-care industries by converting paper-based records to electronic formats. According to recent World Health Organization (WHO) research, the usage of EHR technology in healthcare is rapidly expanding worldwide, and EHR will become the core component of e-health internationally. The study further recommends that the successful introduction of nationwide EHR solutions would empower healthcare professionals as well as patients through the utilization of extensive and well-timed patient information, leading to readily available and better healthcare services—a precondition in the WHO mission towards worldwide health coverage. In addition, Liang et al. (2021) assert that the rate of EHR adoption in hospitals is a good way to measure how digitalized medical care is in a country, since EHR is now the most important part of health information technology (HIT) [5].

Previous empirical research shows that HIT regarding healthcare configurations demands proper and thorough planning of workplace procedures and operations, in which there's really no effect on the flow of work, and healthcare professionals tend to be proficient in the technology's functionality as well as its applications [6,7,8,9,10,11]. Limited accessibility to HIT may additionally obstruct health practitioner treatment times or even their productivity, which may hinder medical care availability [12,13,14,15]. Access to medical care is exorbitant for many clinically under served individuals in sparsely populated locations at their convenience [16,17]. HIT systems are most likely the most vulnerable and open, as well as the integrity of data, which is governed by personal privacy regulations and regular reviews caused by extensive use [18]. Zhanpeng and Chen (2015) declare that the adoption of health information technology (HIT), the need for resources, system quality, fairness, and cost-effectiveness are important health issues that most countries face on a global scale [19].

A properly operating EHR system improves the patient data's appropriateness, quality, correctness, and reliability at the point of service. EHR systems may provide information on the costs, benefits, and usage of medical care. They can also support high-quality care, save expenses, let patients move around more easily, and provide multiple medical service providers access to patient data [4]. When integrated with other HIS data, information from EHR systems may quickly highlight issues with health care delivery, national health, and socioeconomic factors [8].

Healthcare expenditures in the United States accounted for around 16.89% of GDP in 2018, according to the World Health Organization Global Health Expenditure database. In the Euro zone, health expenditures accounted for 10.14% of GDP in 2018, while in Canada, they accounted for 10.79% of GDP. Healthcare spending in poor nations, on the other hand, varies. According to the same database, 4.95% of Egypt's GDP was allocated to healthcare, while in Jordan, healthcare expenditure accounted for 7.79% of the country's GDP. In the same manner, the percentage of healthcare expenditure in the national GDP for India, Pakistan, Nigeria, and Malaysia was 3.54%, 3.2%, 3.89%, and 3.76%, respectively [20].

Accordingly, it may be important for nations worldwide to launch critical action plans in order to manage and control the growing expenses in healthcare. For example, [21,22,23] suggest patient-centered healthcare programs, getting rid of preventable medical mistakes, improving public-health interventions, using medical care in a more cost-effective way, and making more use of health information technologies in and between healthcare institutions. EHR adoption rates in emerging countries are still low [24,25], even though Al-Azzam and Alazzam (2019) found that health information technologies can improve healthcare procedures and overall efficiency [26]. The WHO (2016) survey's findings showed that EHR system use increased significantly between 2011 and 2016, and that developed countries tend to be more advanced in their adoption and utilization of EHR systems than less developed ones [4]. This was expected because the widespread use of EHR systems often depends on the availability of qualified people, a reliable technical infrastructure, government policies that support them, and enough money.

Jordan, a developing country, is among those making concerted efforts to reform its healthcare system by incorporating EHR into its healthcare facilities. Hakeem (which means physician in Arabic) is the national EHR system in the country that was introduced in 2010 [23]. The system was made to automate all parts of Jordan's public health care system. At first, it was based on the Veterans Health Information Systems and Technology Architecture (VistA). The primary Hakeem components resemble other HERs [27]. This system requires a management information system, a laboratory information system, a radiology information system, a pharmacy information system, computerized physician order entry, medical documentation, and electronic health records [28]. Since March 2016, 97 healthcare establishments, including sixteen hospitals, in Jordan have used Hakeem, and the movement strategy is still in place [29]. Jordan has made significant efforts to implement EHR, but there are concerns about how slowly healthcare professionals, particularly doctors, are adopting this technology [27]. This is seen as a key to the success of HIT in healthcare facilities.

Evidence from previous research suggests that EHR adoption rates among physicians could improve healthcare service delivery and efficiency [30]. However, many countries have reported a low adoption rate of EHR among physicians [24,25]. Heisey-Grove and Patel (2015), for instance, found that while 49% of all US doctors do not demonstrate significant use of such technology, over 97% of all non-federal acute care hospitals in the US did so in 2015 [31]. Although the notion of EHR is conceptually acceptable, the low adoption rates among physicians may suggest that many healthcare professionals are still hesitant about their actual implementation. In Canada, more than 30% of

physicians in some Canadian provinces, including New Brunswick and Quebec, were still solely using paper-based medical records in 2015, despite high adoption rates of EHR among physicians in some of those provinces (such as Alberta, Ontario, and British Columbia). This shows that doctors still do not use the technology because they do not want to and because there are technical barriers [32]. On the other hand, users' readiness to utilize the system is seen as crucial in order to realize the full benefit of a certain health information system. Simply expressed, it is crucial to concentrate on the users' experiences with and usage of the technology, considering their opinions in this respect largely influence how the technology is implemented [33].

As physicians are the major users of HIT, their acceptance of EHR affects the overall deployment effectiveness and highlights adoption challenges. Also, because doctors are the main people who use EHR, it is believed that their usage will have a significant impact on other system users. (nurses, pharmacists, and administrative staff) in a particular hospital [34].

Prior studies, however, suggested that doctors would not be drawn to use a system that interferes with their everyday tasks [35]. In order to support its optimal integration and gauge its advantages to the healthcare system, it is thus believed that recognizing the factors that physicians face in deciding whether to embrace EHR is essential. The present study's objective is to investigate and assess any possible obstacles to EHR adoption that Jordanian doctors may perceive. We are confident that the important aspects of EHR that the present research will recognize will assist policymakers in creating appropriate and useful national policies regarding the adoption of EHR by doctors and other user groups in the future. Also, it is hoped that studying what makes doctors use EHRs will help the government and health institutions figure out how to deal with the bad effects of low adoption, which would lead to better health services and a higher quality of public healthcare in general.

The purpose of this research, which is based on a comprehensive literature analysis, is to identify the aspects most likely to influence physicians' intentions to use EHR in Jordan. The results of this study could help practitioners focus their strategies for implementing HER on the most important factors that lead to its acceptance. More significantly, this research project aims to ascertain what may be learned from the implementation experience of EHR in another developed country (particularly, Alberta, Canada) in order to promote Jordan's acceptance of this technology. Adoption of EHR by Canadian primary care doctors has increased significantly over a seven-year period, reaching 85% in 2017 compared to a national average of 41% in 2010. Despite the fact that EHR use has increased in other places since 2014, Alberta remains the leader in the Canada, with 91% physician adoption.

It is reasonable to assume that such a successful technology diffusion experience might help Jordanian healthcare decision-makers in their attempts to expand EHR adoption throughout the country's diverse user groups. In addition, the results of this portion of the proposed study are intended to help technology acceptance researchers as well as Jordanian interested parties in any technology diffusion program.In many aspects, Jordan is seen to be comparable to other emerging nations in the region and throughout the globe. This makes it likely that the results of this research could be used to spread a wider range of smart healthcare technologies to other Middle Eastern countries and emerging economies in general.

Also, the goal of this research study is to add both theory and practice to the existing body of knowledge, which could be helpful to participants and researchers in any program to spread information systems in developing economies. Using Jordan as an example, this study will evaluate the applicability of an expanded TAM research paradigm for understanding physicians' intentions in emerging economies. Moreover, the results of this research will enrich the existing body of knowledge by resolving this primary knowledge gap via a theory-based objective scientific analysis of the factors influencing physicians' adoption of EHR in developing nations. Furthermore, in order to ensure the effective adoption of EHR, decision-makers must have a thorough understanding of the user's proclivity to accept this HIT. It is thought that this information would help healthcare organizations use their resources more wisely, especially since implementing EHR costs a lot of money.

In addition, the purpose of this study is to create and verify a suggested technology acceptance model in the context of a developing nation that identifies the most influential elements influencing users' intentions to embrace EHR. The notion might be adapted to several developing nations with comparable cultural foundations, presenting policymakers with a potent instrument for boosting the adoption of IT technologies and EHR in these nations. The study's description of a set of specific strategies designed to address the core research issue, the poor rate of EHR adoption by physicians in developing countries, is also an essential addition. These proposed strategies will be presented as suggestions.

2 Literature Review and Hypotheses Development

2.1 Electronic health records (EHR)

Patient healthcare records can be traced back to Hippocrates, who proposed standardizing a patient's health history in order to accurately show illness progression and identify disease cause. The patient's healthcare record documents the

patient's story, obtained from the patient and other patient's relatives, to offer the consecutive order of occasions prior to the particular check-out visit. This type of medical record is called "time-oriented," and it is still used today [32]. EHR, a key component of an integrated HIT for managing chronic health issues and health records, are a game-changing invention in the field of health information technology (HIT) [36, 37].

EHR is defined by the World Health Organization (WHO) as "timely, patient-related records that offer instant and protected information to approved users." They typically hold the patient's medical history, diagnoses and treatments, prescribed medications, any allergy concerns, radiology images, laboratory results, and vaccinations [4].

EHR, Medication Administration Records (MARs), Computerized Provider Order Entry (CPOE), e-prescriptions, Clinical Decision Support Systems (CDSS), Picture Archiving and Communication Systems (PACS), Pathology Solutions, Telemedicine apps, and many more HIT modules have been developed [38]. These HIT modules may include video conferencing technologies for normal medical checkups and exams as well as feedback to healthcare professionals on patient-generated data for improved services and better patient healthcare choices [39].

2.2 EHR adoption and TAM

According to Sadoughi et al. (2019), the majority of research pertaining to the acceptance of EHR among users were undertaken in developed countries, and the modified version of TAM was the most prevalent technological acceptance theory [40]. Based on two previous theories, the Theory of Planned Behavior (TPB) and the Theory of Reasoned Action (TRA), the TAM has been shown in many empirical studies to be a better predictor of behavioral intention than many other technology acceptance theories [41, 42, 43, 44, 45].

The TAM postulates that two beliefs, perceived usefulness, and perceived ease of use, are the primary drivers of a user's adoption of a certain information system. Davis (1989) defines perceived usefulness as the degree to which a person feels that a new information system will improve his or her work performance [41]. The degree to which a person feels that the system will require little effort and will be straightforward to operate is referred to as "perceived ease of use." In addition, he argues that, in addition to the basic two TAM variables, external factors should be integrated since they may enhance the TAM's capacity to predict technology users' adoption behavior. In response to these recommendations, various EHR adoption researchers have extended the TAM by incorporating additional factors from several other theoretical models and by investigating influencing factors and mediating regarding perceived ease of use and perceived usefulness in an effort to improve the model's prediction performance [46, 47].

The TAM's explanatory power has been observed to fluctuate depending on the study context. Several empirical investigations have shown a fair variety in technology usage (ranging from 31% to 52%) [48, 49, 50, 51, 52]. Rahimi et al. (2018) performed a systematic review of 134 publications published in 72 scientific journals between 1999 and 2016 that provided unique empirical research on the application of the TAM within healthcare services [53]. The papers were examined in 30 nations, including 29 from the United States, 28 from Taiwan, and 14 from Spain, while the rest came from Asia, Africa, and Europe.

While the TAM was first utilized in EHR, the majority of the examined studies used an expanded variant of the original TAM, indicating that no ideal TAM version for use in healthcare has been determined. According to the findings, in addition to perceived ease of use and perceived usefulness, self-efficacy, security and privacy concerns, information quality, compatibility, subjective norm, experience, training and support, system quality, and physicians' autonomy were identified as important incidents for EHR technology adoption. However, the authors state that, although the findings revealed a constant improvement in expanding TAM in studying EHR adoption, there are still areas that may be broadened and enhanced in order to strengthen the predictive ability of the original TAM.

Sadoughi et al. (2019) carried out a thorough analysis of the prior literature in order to determine the adoption theories that were used and their key components in relation to the adoption of EHR [40]. 18 scholarly articles from conferences and 17 academic publications from 2005 to 2017 were examined. The review's conclusions showed that nine different models and theories, including TAM, the Unified Theory of Acceptance and Use of Technology (UTAUT), Technology, Organization, and Environment (TOE), Diffusion of Innovations (DOI), the Theory of Planned Behavior (TPB), the Theory of Interpersonal Behavior (TIB), stakeholder theory, institutional theory, and social network theory, have been applied to the adoption of electronic health records. The extended TAM, however, was the most popular model out of all of them. They also concluded that EHR adoption is a multifaceted, complicated process influenced by a variety of different factors within healthcare organizations. According to the study, perceived usefulness and perceived ease of use were the most important factors in EHR adoption settings. The systematic review's findings also imply that future empirical research on the use of EHR should consider other external variables and moderators, such as privacy concerns, computer proficiency, gender, experience, and the physician's specialty.

2.3 Factors influencing HER adoption

EHR is still not widely used and adopted by doctors, even though they are an important HIT tool for improving patient care, reducing medical errors, linking clinical data and medical decision support systems, giving timely access to patient data from multiple sources, improving communication, and making data more secure [1,35]. Consequently, research into the behavioral, social, and organizational aspects that drive and are influenced by EHR adoption in healthcare organizations is crucial. Many themes in the literature on healthcare informatics have either positive or negative implications for clinicians' use of EHR.This section delves into a few of them.

2.3.1 Perceived usefulness (PU) and perceived ease of use (PEOU)

When assessing healthcare technology adoption, Zhao et al. (2018) proposed that perceived usefulness (PU) and perceived ease of use (PEOU) are important indicators to consider [54]. Previous research has shown that PU and PEOU may successfully build favorable attitudes about EHR usage as well as a behavioral desire to embrace it. PU and PEOU have a good influence on physicians' desires to utilize EHR as well as their actual utilization [55,56,57,58,59]. Ossoff et al. (2010), on the other hand, argue that doctors are resistant to changing their specific work habits due to their job accuracy and sensitivity [60]. They conclude that since doctors are creatures of habit and prefer not to disrupt their normal usage of paper-based medical records, they are often resistant to using the new EHR technology.

According to Liu and Chen (2015), physicians' PEOU of mobile EHR had a positive impact on their PU, and PU and PEOU significantly increased the desire to use the system [61]. Furthermore, Johnson et al. (2014) state that a physician's PEOU influences PU and that PU and PEOU have a direct effect on the desire to employ evidence-adaptive clinical decision support systems [62]. Furthermore, Gagnon et al. (2014) investigated doctor acceptance of EHR using four technological acceptance models (TAM, expanded TAM, psychosocial model, and integrated model) [63]. According to their findings, PEOU influenced PU, and both PU and PEOU influenced doctors' willingness to use EHR.

Similar findings have been documented by other studies examining the spread of EHR. For example, Ilie et al. (2009) indicated that the two elements (PU and PEOU) might greatly affect the intention to utilize EHR [58]; Aggelidis and Chatzoglou (2009) similarly showed that PEOU and PU were favorably associated with behavioral intention [56]. Sykes et al. (2011) said that PU has a big but indirect effect on how EHR is used [64]. The preceding discussion showed that PU and PEOU might have a significant effect on physicians' behavioral intention to use EHR. As a result, the associated hypotheses are suggested:

H1: Perceived usefulness (PU) has a significant effect on physicians' behavioral intentions to use EHR in Jordan.
H2: Perceived ease of use (PEOU) has a significant effect on physicians' behavioral intentions to use EHR in Jordan.
H3: Perceived ease of use (PEOU) has a significant effect on the perceived usefulness (PU) of EHR in Jordan.

2.3.2 Perceived privacy and security (PPS)

The degree to which an individual thinks that utilizing a certain information system is effective and secure for conveying and preserving personal and/or sensitive information is referred to as privacy and security [65,66,67,68,69,70]. Privacy and security are important parts of every information system [71,72,73], since users can't fully appreciate and use a technology if they're not sure about its privacy and security [74,75,76]. While using EHR, healthcare professionals should be aware of their responsibilities, be aware of their patients' rights, and protect the privacy and security of sensitive medical data [77,78]. Given that data security is a crucial issue in a complex setting like the healthcare business, recent empirical research has verified security concerns as a substantial obstacle to HIT deployment [79,80,81].

Health data, like financial data, is critical and must be protected by constructing multiple security layers and appropriate firewalls. In this situation, privacy and security are seen as essential needs when working with EHR, especially when exchanging data through health information interchange systems inside and outside of a healthcare institution [82]. To motivate healthcare professionals to use EHR, it is necessary to address concerns about the confidentiality of EHR deployments. Even though concerns about confidentiality have a substantial impact on the adoption of e-health systems, such as EHR; they have not received much attention in prior studies [83,84]. In addition to privacy, confidentiality, and security issues [85], developing nations lack the appropriate integration of medical data across multiple healthcare institutions due to the absence of relevant legislation governing privacy and security policies [83,86].

Previous research has shown that perceived privacy and security are both important in encouraging users to embrace various information system technologies (e.g., in cloud computing [87]; in e-markets [88]; in B2C e-commerce [89]; and in healthcare [47]). Prior research has also recognized the direct effect of perceived privacy and security on EHR adoption; for example, Hsieh (2015) stated that perceived privacy and security issues result in sluggish adoption by doctors in Taiwan

[90]. Furthermore, EHR researchers have shown that perceived privacy and security might have a detrimental influence on the PU and PEOU of a certain information technology [91]. Similarly, Liu and Chen (2015) noted that doctors' perceived loss of autonomy influenced EHR PU. He concluded that doctors who are concerned about the risks of using EHR have low PU [61].As a result, the following hypotheses emerged from the above discussion:

H4: Perceived privacy and security (PPS) has a significant effect on physicians' behavioral intentions to use EHR in Jordan.

H5: Perceived privacy and security (PPS) has a significant effect on the perceived usefulness (PU) ofEHR in Jordan.

H6: Perceived privacyand security (PPS) has a significant effect on the perceived ease of use (PEOU) ofEHR in Jordan.

2.3.3 Self-efficacy (SE)

Despite government policies, physicians prefer to use the EHR on a voluntary basis. Therefore, physicians' self-efficacy in using EHR may play a critical role in adopting the technology [92,93]. Furthermore, physicians are usually confident that they have the needed capability to use the EHR system independently [94]. In the context of information systems, several previous studies have proven that self-efficacy [95] and computer self-efficacy [96] are significant antecedents affecting the adoption rates of a particular technology.

Self-efficacy signifies the self-assessment by an individual of her or his ability to use a specific technology [96]. Likewise, while lack of familiarity with EHR has been identified by many previous studies as a major barrier to EHR adoption by physicians [97], few prior studies have examined the influence of self-efficacy on physicians' acceptance of EHR [63]. They reported an increased explanatory power of TAM when it was extended by computer-self efficacy. Physicians who are comfortable with technology have an easier time using the EHR. In a recent study by Tsai et al. (2019), computer-self efficacy remained a significant factor influencing physicians' acceptance of EHR, suggesting that physicians with a high level of computer self-efficacy are more inclined to use EHR [98].

More recent research has also confirmed that self-efficacy has a significant influence on EHR adoption among physicians [93,99]. Likewise, Jha et al. (2009) indicated that approximately 60% of physicians believe that computer skills are among the major barriers to EHR adoption [99]. In this research, "self-efficacy" relates to the physician's perception of one's ability to utilize EHR to manage processes inside a healthcare facility. Prior experimental research acknowledged that self-efficacy could have a considerable impact on PEOU [35,63,93]. Thus, we propose that:

H7: Self-efficacy (SE)has a significant influence on physicians' behaviouralintentions to adopt EHR in Jordan.

H8: Self-efficacy (SE) of physicians has a significant influence on perceived ease of use (PEOU)of EHR in Jordan.

2.3.4 Financial incentives (FI)

Financial incentives are a well-known strategy for increasing an individual's effectiveness and performance in most work settings, including the healthcare industry [101,102,103]. Due to their central role in managing patients' care, any specific influence practiced on physicians' performance provides a significant outcome for the whole healthcare system [104,105, 106,107]. Employing compensation and reward plans is gradually being accepted as having an impact on healthcare efficiency. Though using financial incentives is one method through which healthcare institutions attempt to influence physicians' behavior, Yet, to date, the literature has offered limited information concerning the impact of such incentives on the quality of healthcare treatment [84]. Roski et al. (2003) have supported the assertion that financial incentives undoubtedly lead to intended behavior enhancements [108]. Similarly, Baron et al. (2005) pointed out that the insufficient financial incentives created a critical obstacle to HER adoption among physicians in their study [109].

Miller et al. (2003) revealed that the absence of financial incentives was among the factors contributing to the low adoption rate of EHR despite the increased interest among physicians [110]. Programs like "Ontario MD's EMR Adoption Program" offered financial support for family and primary care physicians to help them switch from paper records and charts to EHR, and this increased EHR adoption rates among physicians' in Canada. Furthermore, physicians reported continuous improvement over years of practice, believing that the longer they use EHR, the better patient care they provide [58]. Conrad and Perry (2009) advised that group- and individual-level financial incentives have a significant influence on the quality of medical services [111]. Other researchers have stated that EHR adoption would not reach the required level unless physicians received personal financial incentives for implementing the technology [112]. Despite the fact that the EHR has the potential to improve the quality of healthcare services, physicians are unlikely to change unless they see personal benefits from using the new system [113].

Patel et al. (2011) reported that personal financial issues were the main hurdle for implementing or using HIT by physicians [114]. Also, Yarbrough and Smith (2007), in their systematic review of the literature on physician acceptance of information technology, noted that the lack of proper financial incentives was an important obstacle to the adoption and

use of EHR by physicians [115]. Because such financial incentive plans will probably influence the healthcare industry's development through their impact on technology adoption, this research investigates their impact on physicians' intentions to adopt EHR. Thus, based on the above discussion, the following hypothesis is proposed in this study:

H9: Financial incentives (FI)has a significant influence on physicians' behavioural intentions to adopt EHR in Jordan.

3 The Research model

After considering the related previous literature, this study adopted an extended version of the TAM to validate the potential causal relationships among the independent variables (PU, PEOU, PPS, SE, and FI) as well as the response variable (physicians' behavioral intention to use EHR). The suggested model describes the behavioral intention to use EHR by postulating five immediate determinants: PU, PEOU, PPS, SE, and FI see Figure 1. Also, it indicates four indirect effects on behavioral intention: PEOU through PU, PPS through PU, PPS through PEOU, and SE through PEOU.

It is worthwhile to mention here that the proposed model below has been revised to consider results from semi-structured interviews with Alberta's physicians. After conducting semi-structured interviews to collect the most significant variables in Albertan physicians' adoption of the EHR, the results were used to refine the initial proposed model. This is especially important given Alberta's current high rate of EHR adoption among physicians. These belief elicitation approaches improved our understanding of Jordanian physicians' attitudes toward EHR and facilitated future strategies for increasing their acceptance among this user group.
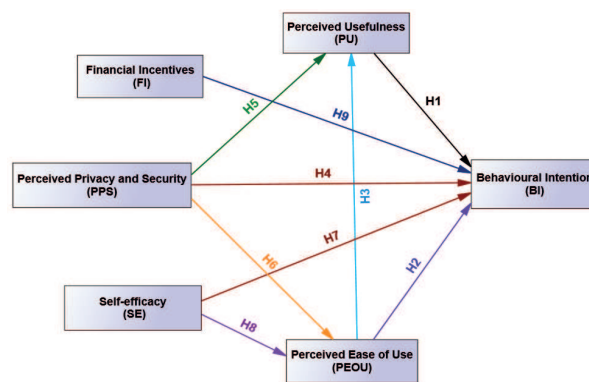

Fig. 1: The Research proposed Model with Hypotheses

4 Methodology

4.1 Research design

The purpose of this research demonstrates the presence of both exploratory and explanatory motivations. The primary purpose of this exploratory research is to solicit the opinions of Jordanian physicians on a somewhat novel topic (EHR). Considering this, previous literature in this area has emphasized the absence of a coherent theory unifying all of the research subjects [23, 116, 117]. Furthermore, twelve semi-structured interviews were conducted with physicians in Alberta, Canada, in order to gain a deeper knowledge of the key variables and obstacles related to EHR adoption, thereby enhancing the explanatory performance of the suggested research model for predicting EHR adoption rates among Jordanian physicians.

For this exploratory phase, the deductive research approach (from the previous literature review) and the inductive approach (from semi-structured interviews with physicians in Alberta) were used. The interviews used an interview guide. The development of the guide included consulting with experts in qualitative research and technology adoption. Participants were informed of the purpose of the research and the interviews, and their verbal agreement was obtained. Every interview began with an open-ended inquiry on the interviewee's perspective on the critical factors for EHR adoption. The subsequent questions were based on his or her responses to the first question as well as the interview

protocol. Probing inquiries such as "What do you mean by this?" and "Can you offer more comprehensive interpretations?" How did you feel about the subject? were asked as necessary. In addition, at the conclusion of each interview, the interviewee was given the opportunity to address any missing issues. Throughout interviews, nonverbal indications from subjects were recorded. Furthermore, semi-structured interviews and a literature analysis were conducted to explain the idea and dimensions of EHR adoption success criteria.

In the study's explanatory phase, a conceptual framework of the essential determinants driving the adoption of EHR in Jordan was built using literature and physician feedback from Alberta. This proposed integrated framework was assessed in order to comprehend the essence of its components' interrelationships and to establish causal relationships so as to better knowledge of the main research topic. A quantitative correlation study design was applied to determine whether PU, PEOU, PPS, SE, and FI would influence the behavioral intention of physicians to use EHR in Jordan. A correlation study approach was used since such an approach allows the researcher to predict the value of one variable based on changes in other variables.

The data collection phase involved completing a web-based survey that assessed participants' beliefs about the current study's parameters. The questionnaire was developed based on the results of the first exploratory phase (literature review and semi-structured interviews). Later, confirmatory factor analysis (CFA) using IBM AMOS software was employed to check correlations between dependent and independent variables and evaluate the measurement model's goodness-of-fit in the current investigation. In addition, structural equation modeling (SEM) (IBM AMOS) was applied to test the hypothesized correlations between the various components in the research model and to evaluate the structural model's goodness-of-fit [118, 119].

4.2 Target population and sample

4.2.1 Interviews

Semi-structured interviews were determined to be the most effective method of gathering qualitative data for the exploratory phase of this study, which is compatible with the current research objective.They thus utilized it as a means of enhancing the theoretical information gleaned from the literature review and of presenting a deeper narrative of the respondents' motivations and assumptions behind their high adoption rates of EHR in other contexts (Alberta physicians). The information gleaned from the interviews provided a comprehensive understanding of both the research topic and the factors influencing Jordanian doctors' adoption of EHR.

In this stage, candidates were chosen for interviews based on three criteria: first, they must be frequent EHR users; second, they must be acquainted with the different EHR ideas and applications; and third, they must have five years of EHR usage experience in Alberta. Based on these criteria, twelve participants were interviewed in Alberta in August 2022.

4.2.2 Questionnaire

The target population for this study includes all doctors working in Jordanian hospitals whose EHR is in use at the time of data collection for the present study. When it comes to sample size, several factors, such as sample size appropriateness for statistical procedures, frequently impact the sample size choice [118, 119].

Due to the study's use of several multivariate data analysis, the researchers guaranteed that the sample size was enough to conduct two advanced statistical procedures for data processing: the confirmatory factor analysis and structural equation modeling. According to [119], the minimum sample size required to perform CFA and SEM requires a larger sample than other multivariate techniques, and they suggest a sample of 100 to 400 observations as being adequate for these techniques of any quantitative data set.

In light of the fact that there are now more than 35,000 Jordanian physicians working in the Kingdom according to [118], the sample size was determined to be 380 based on recommendations from [120]. As a result, a web-based version of the survey for the current study was created and distributed using Google Forms invites. More than a thousand invites were extended to Jordanian physicians through different web channels such as email, WhatsApp, Facebook Messenger, ResearchGate, and LinkedIn.

5 Results and analysis

Table 1 summarizes the demographic data pertaining to gender, age, work experience, work department, and job title, revealing that the majority of participants (n = 302, or 73.1%) were males. Table 1 also shows that respondents aged

31 to 60 years old (86.7%) participated the most in the survey, while those aged 20 to 30 (6.5%) and over 60 years old (6.8%) participated the least. Details of the work experience of the respondents show that most have 10 to 30 years of professional experience, representing 75.6% of the overall sample. Among other specialties, surgeons (n = 63), internal medicine physicians (n = 54), and obstetrics and gynecology physicians (n = 51) were the most common participant groups. According to the respondents' work experience details, the majority had 10 to 30 years of professional experience, accounting for 75.6% of the whole sample. Surgeons (n = 63), internal medicine doctors (n = 54), and obstetrics and gynecology doctors (n = 51) were the most prevalent participating groups. The majority of the participants in the research were specialists and first-time specialists, accounting for 37.8% and 23.5% of the overall sample, whereas just 12 (2.9%) senior consultants responded to the web-based questionnaire.

Table 1: Demographic data of the study participants

Variable	Category	N (%)
Gender	Male	302 (73.1%)
	Female	111 (26.9%)
Age	20-30	27 (6.5%)
	31-40	146 (35.4%)
	41-50	110 (26.6%)
	51-60	102 (24.7%)
	Over 60	28 (6.8%)
Work Experience	Less than 10	67 (16.2%)
	10-20 years	165 (40 %)
	21-30 years	147 (35.6%)
	Over 30 years	34 (8.2%)
Work Department	Anesthesiology	37 (9%)
	Dermatology	23 (5.6%)
	Emergency	36 (8.6%)
	Internal Medicine	54 (13%)
	Neurology	12 (2.9%)
	Nuclear Medicine	14 (3.4%)
	Obstetrics and Gynecology	51 (12.4%)
	Ophthalmology	37 (9%)
	Orthopedics	22 (5.3%)
	Otorhinolaryngology	43 (10.4%)
	Pediatrics	18 (4.4%)
	Psychiatry and Addiction	3 (0.7%)
	Surgery	63 (15.3%)
Job Title	Joiner Resident	53 (12.8%)
	Senior Resident	42 (10.2%)
	Specialist	156 (37.8%)
	First Specialist	97 (23.5%)
	Consultant	53 (12.8%)
	Senior Consultant	12 (2.9%)

5.1 Inferential analysis

Confirmatory factor analysis (CFA) and structural equation modelling (SEM) are two techniques used in inferential analysis. On the basis of the collected data and the research model shown in Figure 1, measurement and structural models were constructed and validated using AMOS IBM software. After confirming the fit quality of both models, hypotheses testing was carried out. The following sections describe this approach to analysis.

5.1.1 Goodness-of-fit

A confirmatory factor analysis was utilized to examine the internal structure of the study's primary variables, evaluate the reliability of the scales, and verify the validity of the scale of the theoretical assumptions. AMOS Using IBM software,

the measurement model shown in Figure 2 was developed and tested using the gathered data. Estimates of goodness-of-fit are shown in Table 2. Examining Figure 2 and Table 2 indicates that all model indices are above the acceptability levels set by previous research, showing that the measurement model displayed a significant correlation with the empirically collected data.
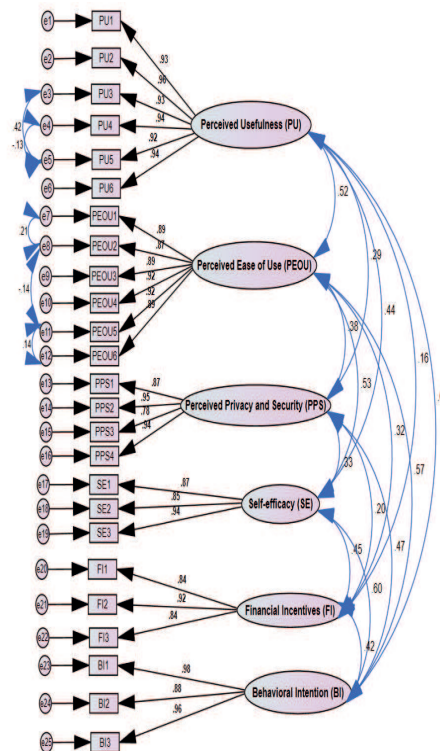

Fig. 2: The measurement model

Table 2: Goodness-of-Fit indices for the measurement model

Index*	Cut-Off value**	Reached
Normed Chi-square	<2	1.170
GFI	>0.90	0.946
AGFI	>0.90	0.932
CFI	>0.95	0.995
NFI	>0.90	0.977
SRMR	<0.05	0.026
RMSEA	<0.05	0.020
NNFI (TLI)	>0.95	0.996

*GFI: Goodness-of-Fit Index, AGFI: Adjusted Goodness-of-Fit Index,
CFI: Comparative Fit Index, NFI: Normed Fit Index,
SRMR: Standardized Root Mean Square Residual,
RMSEA: Root Mean Square Error of Approximation,
NNFI: Non-Normed Fit Index, TLI: Tucker-Lewis Index.
** Values based on recommendations of Schermelleh-Engel et al.
(2003); Hooper et al. (2008); and Hair et al. (2018).

Table 3: Composite reliability and AVE findings

Construct	Items	CR	AVE
Perceived Usefulness (PU)	6	0.977	0.878
Perceived Ease of Use (PEOU)	6	0.961	0.806
Perceived Privacy and Security (PPS)	4	0.937	0.788
Financial Incentives (FI)	3	0.901	0.753
Self-Efficacy (SE)	3	0.918	0.790
Behavioural Intention (BI)	3	0.960	0.888

5.1.2 Reliability and validity

The composite reliability (CR) findings for all research constructs are shown in Table 3, and they reveal that all constructs had high reliability coefficients that were all over the threshold of 0.7 [119], suggesting good internal consistency. According to [119], construct validity may be evaluated using two different types of measures: convergent validity and discriminant validity. In CFA, composite reliability (CR), standardized regression weights (SRW), and average variance extracted (AVE) are used to evaluate convergent validity. The recommended values for each of them should be CR > 0.7, SRW > 0.7, and AVE > 0.5. Table 3 shows the calculated CR and AVE for all constructs, and Table 4 shows the SWR for observed variables, demonstrating a high degree of convergent validity for all latent variables in the study's measurement model.

If the inter-construct correlations are less than 0.85 and the AVE values are higher than the squared inter-construct correlations for the same construct, the construct is said to have discriminant validity [119]. To examine discriminant validity, Table 5 was developed with diagonal components representing AVE values for each construct, below-diagonal elements representing inter-construct correlations, and above-diagonal elements showing squared inter-construct correlation. According to the data shown in Table 5, the inter-construct correlation coefficients were all less than 0.85. In addition, all AVE values exceeded the associated squared inter-construct correlations. Consequently, the findings of the CFA give evidence of discriminant validity for all research constructs.

Table 4: SRW for observed variables

Observed Variable	SRW	Observed Variable	SRW	Observed Variable	SRW
PU1	0.933	PEOU4	0.915	PPS4	0.937
PU2	0.957	PEOU5	0.919	FI1	0.835
PU3	0.925	PEOU6	0.891	FI2	0.925
PU4	0.944	BI1	0.983	FI3	0.841
PU5	0.924	BI2	0.883	SE1	0.872
PU6	0.937	BI3	0.958	SE2	0.854
PEOU1	0.892	PPS1	0.872	SE3	0.938
PEOU2	0.874	PPS2	0.954		
PEOU3	0.890	PPS3	0.777		

Table 5: Discriminant validity results

Construct	PU	PEOU	BI	PPS	SE	FI
PU	**0.878**	0.275	0.373	0.082	0.197	0.027
PEOU	0.524	**0.806**	0.330	0.141	0.108	0.100
BI	0.611	0.575	**0.888**	0.226	0.354	0.017
PPS	0.287	0.376	0.475	**0.788**	0.108	0.038
SE	0.444	0.328	0.595	0.328	**0.790**	0.271
FI	0.165	0.317	0.416	0.196	0.521	**0.753**

5.2 The Structural model

After confirming the composite reliability and construct validity of all relevant constructs, the emphasis of the study shifted to evaluating the proposed relationships between these constructs. As a result, IBM SPSS Amos was used to create and test the structural model seen in Figure 3 with empirical data.
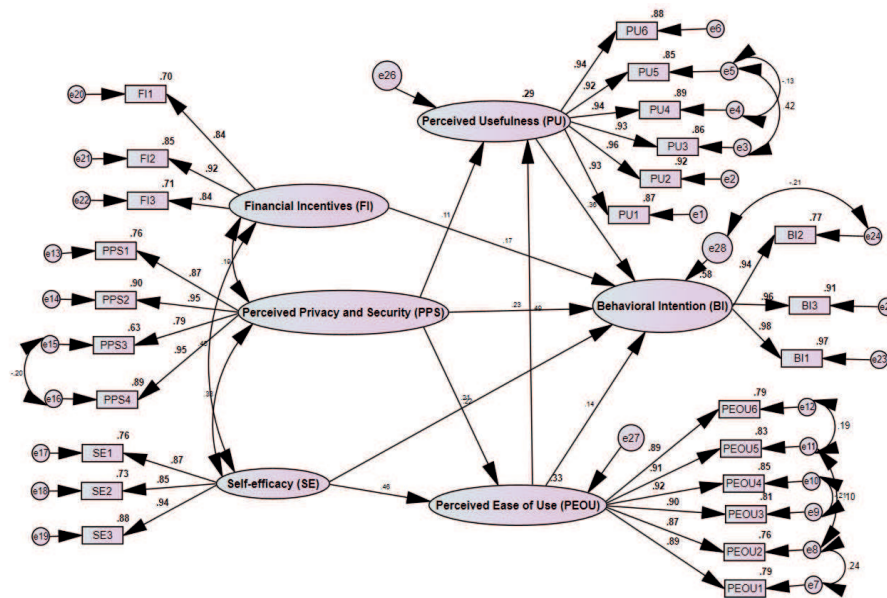

Fig. 3: The measurement model

5.2.1 Goodness-of-fit

It can be seen from Figure 3 that the structural model consists of three endogenous variables (perceived usefulness, perceived ease of use, and behavioral intention) and three exogenous variables (perceived privacy and security, self-efficacy, and financial incentives). The structural model's output was then evaluated for goodness-of-fit with respect to the data obtained. As seen in Table 6 below, the findings reveal that the structural model provides a good overall fit with the data.

5.2.2 Hypothesis Testing

Following the initial validation of the structural model's fit, the research hypotheses were tested utilizing the path coefficients (regression weights and critical ratios) from the SEM analysis output report. All the hypothesized causal routes in the structural model were statistically significant at the 0.001 level, as seen in Figure 3 and Table 7.

The five constructs PU, PEOU, PPS, SE, and FI, which together account for 57.8% of the variation in behavioral intention, are strong predictors of BI, according to Tables 8 and Figure 3. Moreover, when the total effects of the research constructs on the main research dependent variable BI are examined, it is apparent that PU has the greatest impact (0.360), followed by SE (0.351), where 0.206 represents the direct effect and 0.145 the indirect effect through PEOU, PPS (0.336), where 0.277 signifies the direct effect and 0.109 the indirect effect by PU and PEOU, and PEOU (0.313), where 0.137 denotes the direct effect and 0.176 the indirect effect through PPS and SE, the direct effect of FI (0.172) on BIhas the least overall effect.

Additionally, the SMC results imply that PEOU (total direct effect = 0.488), PPS (total effect = 0.217, 0.109 directly and 0.108 indirectly via PEOU), and SE (.266 indirectly by PEOU) together explain 28.9% of the variation in PU. PPS (0.464) and SE (0.221), likewise, strongly predict PEOU. These variables account for 33.1% of the variation in PEOU.

Table 6: Goodness-of-Fit indices for the structural model

Index*	Cut-Off value**	Reached
Normed Chi-square	<2	1.156
GFI	>0.90	0.947
AGFI	>0.90	0.933
CFI	>0.95	0.997
NFI	>0.90	0.976
SRMR	<0.05	0.044
RMSEA	<0.05	0.019
NNFI (TLI)	>0.95	0.996

*GFI: Goodness-of-Fit Index, AGFI: Adjusted Goodness-of-Fit Index,
CFI: Comparative Fit Index, NFI: Normed Fit Index,
SRMR: Standardized Root Mean Square Residual,
RMSEA: Root Mean Square Error of Approximation,
NNFI: Non-Normed Fit Index, TLI: Tucker-Lewis Index.
** Values based on recommendations of Schermelleh-Engel et al.
(2003); Hooper et al. (2008); and Hair et al. (2018).

Table 7: Path Coefficient results for the Structural Model

Code	Path	Estimate	CR*	p-value	Comment
H1	PU –>BI	0.371	9.173	**	Accepted
H2	PEOU –>BI	0.141	3.007	0.003	Accepted
H3	PEOU –>PU	0.487	10.009	**	Accepted
H4	PPS –>BI	0.254	6.157	**	Accepted
H5	PPS –>PU	0.118	2.312	0.021	Accepted
H6	PPS –>PEOU	0.239	4.760	**	Accepted
H7	SE –>BI	0.214	4.575	**	Accepted
H8	SE –>PEOU	0.469	9.424	**	Accepted
H9	FI –>BI	0.182	4.442	**	Accepted

*Cut off (CR >±1.96) (Hair et al., 2018)

Table 8: Squared Multiple Correlations and Standardised Effects

SMC	Construct	PU	PEOU	PPS	SE	FI
0.289	**Perceived Usefulness**					
	Indirect	0	0	0.108	0.266	0
	Direct	0	0.488	0.109	0	0
	Total	0	0.488	0.217	0.226	0
0.331	**Perceived Ease of Use**					
	Indirect	0	0	0	0	0
	Direct	0	0	0.221	0.464	0
	Total	0	0	0.221	0.464	0
0.578	**Behavioural Intention**					
	Indirect	0	0.176	0.109	0.145	0
	Direct	0.360	0.137	0.277	0.206	0.172
	Total	0.360	0.313	0.336	0.351	0.172

6 Discussion

This study investigated the determinants influencing doctors' behavioral intent to embrace EHR in the Jordanian health sector and uncovered the cause-and-effect relationships between these variables. It was primarily based on the TAM developed by [41], a widely used model in the literature on technology acceptance. Considered a dependent variable, the behavioral intention to use electronic health records was determined using three measures(BI1, BI2, and BI3). The findings of the CFA validated the hypothesized underlying structure of this factor and offered statistical proof of the construct's validity and composite reliability.

Furthermore, the CFA results indicated that the perceived usefulness construct has acceptable composite reliability and construct validity. Concerning the impact of PU on BI, the testing of hypotheses indicated that the causal relationship

between the two variables was statistically significant (p = 0.001). As a result, the hypothesis that perceived usefulness influences physicians' behavioral intentions to adopt EHR in Jordan is supported. Similarly, any increase in perceived usefulness will positively influence physicians' behavioral intentions to use EHR in Jordan.Therefore, PU is seen as a significant factor in physicians' intentions to use EHR. As a result, in order for physicians to use EHR, their belief in its ability to improve performance, effectiveness, and productivity must be reinforced.

The findings of this study are consistent with those of prior studies [58,61,62,63,107]. They demonstrate the significance of training and education initiatives for EHR users to enhance system approval and use. The more the users' (physicians') awareness of the system's value to their performance, the more likely they are to adopt the technology.

The findings of the SEM hypothesis test provide support for the second and third hypotheses (PEOU significantly influences BI directly and indirectly through PU). Thereby, empirical data is presented on the effect of PEOU on the behavioral intention of physicians to use EHR.This indicates that individuals are more likely to adopt EHR if they believe it to be stress-free and easy to use [61]. Furthermore, these results highlight the significance of designing EHR to be user-friendly and simple to use [63,98]. Employers in the health industry should thus search for EHR systems that are simple to use and manage to guarantee that they give enough training to physicians on how to effectively use relevant new technology.

Hypothesis testing further showed those physicians' concerns about security and privacy had an influence on BI. This research shows that physicians' behavioral intentions toward adopting EHR are likely to be higher the more highly they perceive the privacy and security of EHR. This relationship between EHR use, privacy, and security indicated the growing security concerns of healthcare professionals. To properly protect patients' medical data, it is essential to ensure the confidentiality of data in compliance with security and privacy requirements [58]. The research also found that physicians' perceptions of privacy and security had a significant positive influence on their perceptions of the usefulness and ease of use of the EHR in Jordan. Increased privacy and security concerns predict that the EHR system will be poorly accepted and used by physicians. When physicians are concerned about their privacy and security, they are less likely to perceive the EHR as useful and easy to use, which, according to the data, inhibits their intentions to use it. These findings are consistent with previous results from [63,90] in Taiwan.

Finally, data analysis shows support for the alternate hypothesis (FI positively influences BI). According to this study, physicians' behavioral intentions for adopting EHR are likely to be greater the more they perceive that using this technology will benefit them in terms of personal financial gains. In other words, the findings revealed that physicians highly valued the financial incentives provided by their employers as a form of reward and compensation, which influenced their behavioral intentions to use EHR. These results are comparable with prior study findings, such as those of [110], who found that the lack of a financial incentive was one of the reasons that contributed to the poor rate of adoption of EHR regardless of physicians' growing interest; [112], who claimed that the adoption of EHR would not reach the requisite level until doctors witnessed some personal financial incentives via the deployment of the technology; and [114], who indicated that personal financial concerns were the key obstacle to adopting or using Health Information Technologies.

7 Implications

Based on the experience of another well-established EHR deployment region (Alberta/Canada), the empirical data identifying the factors that influence EHR adoption among physicians in Jordan provided a better understanding of the existing low adoption rate in the developing country. The current study makes significant contributions to theory and practice. The integrated model used in this study addressed the TAM's limited relevance to studying physicians' intention to adopt EHR by combining aspects of the TAM with external variables such as financial incentives, self-efficacy, and perceived privacy and security. As a resource for infrastructure requirements and system specifications, healthcare organizations like the Ministry of Health, public and private hospitals, and EHR software developers could use this research.

During the introduction of the EHR, a physician was seen by healthcare management as having a significant influence. Managers can comprehend how a physician's intention might affect how well an EHR is accepted, which is essential for a successful, widespread adoption. Here, managers might benefit from the following recommendations: First, it's important to stress and promote effective and efficient EHR as well as other elements like user-friendly interfaces, properly protected privacy of EHR, highly secured protection of EHR systems, and the offer of financial incentives to encourage system usage. Second, by expanding training by creating online resources to enhance physicians' self-efficacy, medical professionals are often busy with responsibilities including patient care, medical education, clinical research, and even management roles. In order to enhance their computer literacy and their acceptance of EHR systems, physicians may make effective use of their time by participating in relevant online classes or EHR courses.

Additionally, the Jordanian Ministry of Health actively encourages hospitals to implement EHR systems where physicians represent the majority users. To ensure that the EHR is used effectively, it is crucial to understand how various

circumstances affect physicians' intentions to use the system. The findings of the current research revealed that perceived usefulness, perceived ease of use, financial incentives, self-efficacy, and perceived privacy and security are the main features and variables that could help government policymakers gain a deeper understanding of current practices as well as future strategies. Therefore, it is important to pay close attention to system requirements and physician input in order to improve the system's diffusion and efficiency, which in turn affect the success of any national healthcare insurance programs in the country.

Evidence suggests that physicians' adoption and use of EHR systems will lead to a decrease in medication poor decisions, an improvement in the quality of provided healthcare services, and a reduction in time spent on administrative tasks. The results may thus be used as a guide for hospitals in the private sector to enhance current medical professional procedures, therefore enhancing their competitiveness and enabling them to expand and compete in the global market. In conclusion, the findings of the current research may lead to better technology usage and may also help health-care practitioners and policymakers in Jordan and other emerging nations (considering that these nations have certain contextual characteristics in common) make more informed decisions about future expenditures on the implementation of new health information technologies.

8 Directions for future research

This study gives several insights and suggestions for future research, beginning with the fact that it was performed with Jordanian physicians to offer a window into attitudes in a developing country. Other insights and directions that this study provides include that, as a result, carrying out a comparison examination of the intention to use EHR in other countries that are comparable might yield some insightful conclusions.

Due to the time limitations of the current research, it was not possible to investigate all variables that might be pertinent to determining the level of acceptability of EHR systems among physicians. As a result, any future study's theoretical foundation may be expanded to include physician attitudes toward the use of EHR. Research might be carried out entirely using the TAM constructs and integrating the attitudes of physicians. It is possible that examining the attitudes of physicians may reveal them to be crucial, given that some physicians may have a favourable propensity toward adopting EHR but choose not to do so. It would be worthwhile to investigate the relationship between attitudes and intentions, both from a theoretical and a practical point of view.

There is room for follow-up qualitative research by interviewing Jordanian doctors and health care administrators. More nuanced reasons for adopting or refusing to use the HER system could be discovered if such research were conducted. For instance, we may learn more about the perceived impediments to implementing the EHR system in Jordan by combining the findings of this quantitative research with those of qualitative studies. Finally, the current research relied on cross-sectional settings, which limited the evaluation of the consistency of respondents' responses; this problem should be addressed in a longitudinal setting to enhance the overall contributions to scientific understanding.

Conflicts of Interest Statement

The authors certify that they have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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