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New technology adoption of Internet of Things in Iranian Healthcare centers

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Abstract

The Electronic Health Care Record is one of the IoT systems in the Iranian health care system. Electronic health care records ' usefulness is becoming more apparent in the face of a critical condition such as the Covid-19 pandemic. Potential benefits, implementation limitations, and adaption barriers are expected from E-health, especially in Electronic Health Care Record. Therefore, it is essential to study the factors influencing Electronic Health Care Record adoption. Accordingly, this study evaluated the factors influencing the Electronic Health Care Record adaptation in primary healthcare services.

This thesis was conducted in three stages(studies). In first stage, the opportunities were created to improve qualitative skills and conduct semi-structured interviews. Then, factors affecting the adoption of IoT technology in health systems (the electronic healthcare information record system in Iran) were discovered and created a model based on the qualitative data collected from the interviewee and the focus group. Finally, the model was run in a quantitative study.

The results indicated nine determinants and 20 mechanisms affecting each determinant. In addition, a modified UTAUT2 model was proposed for Electronic Health Care Record in IoT, which could be used in other researchs.

Key words

Electronic Health Care Record, Technology Acceptance, UTAUT 2, IOT

The title of the dissertation in Polish

Akceptacja nowej technologii z obszaru Internetu Rzeczy w irańskich placówkach opieki zdrowotnej

Abstract in Polish

Elektroniczna forma dokumentacji medycznej i prowadzenie elektronicznych kartotek w Opiece Zdrowotnej jest jednym z elementów Internetu rzeczy (w skrócie: IoT – Internet of Things), w irańskim systemie opieki zdrowotnej. Przydatność elektronicznych kart zdrowia staje się coraz bardziej widoczna w obliczu krytycznego stanu, takiego jak pandemia Covid-19. W odniesieniu do obszaru e-zdrowia, szczególnie elektronicznej dokumentacji medycznej dostrzec można szereg korzyści, jak również ograniczenia wdrożenia i bariery adaptacyjne. Konieczne jest zbadanie czynników wpływających na przyjęcie elektronicznej dokumentacji medycznej. Dlatego w niniejszym badaniu oceniono czynniki wpływające na adaptację elektronicznej dokumentacji prowadzonej w Opiece Zdrowotnej w podstawowej opiece zdrowotnej.

Praca ta została przeprowadzona w trzech etapach. Po pierwsze, przeprowadzono częściowo ustrukturyzowane wywiady indywidualne. Dzięki temu odkryto czynniki wpływające na adaptowanie w praktyce technologii IoT w systemach opieki zdrowotnej (system elektronicznej dokumentacji medycznej w Iranie) i stworzono model oparty na danych jakościowych zebranych od osób ankietowanych jak i wśród członków grupy fokusowej. Ostatecznie model został zweryfikowany w badaniu ilościowym.

Wyniki badania posłużyły do wskazania dziewięciu determinant i 20 szczegółowych elementów wpływających na każdą determinantę. Dodatkowo zaproponowano zmodyfikowany model UTAUT2 w odniesieniu do Elektronicznej Dokumentacji Opieki Zdrowotnej w IoT, który został wykorzystany w innych badaniach.

Key words in Polish

Elektroniczna dokumentacja w opiece zdrowotnej, Teorie akceptacji technologii, UTAUT2, Internet rzeczy

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Introduction

Technology resembles a Trojan horse pulled in cities, like a victory trophy, but the worriers silently crept out of the horse during the night and future with opening the gates for the rest of the warriors, they captured the city and shaped our lifestyle. Indeed, the future belongs to those who carefully scrutinize the advantages and disadvantages of new technology. New communication technology has caused tremendous and complex transformations in human relationships. Computers, data, and new technology usage is also dramatically increasing in organizations, and approximately 50% of investment spend on new technologies (Venkatesh et al., 2003). Among the growing technologies, the Internet of Things (IoT) has the most innovative range that includes a wide range of new products and services. Nowadays, the number of mobile phones are higher than people and approximately more than 50 billion objects are connected to the Internet (Al-Fuqaha et al., 2015). In this regard, IoT has been welcomed due to its extensive services in smartification, transportation, health, and energy management. IoT is one of the communication technologies that causes connecting anything (Miorandi et al., 2012). IoT is beneficial in many fields, including the health systems, personal and community environments, transportation and smart city, and so on (Atzori et al., 2010; Miorandi et al., 2012). The health sector has the most promising prospects (Turcu & Turcu, 2019).

According to forecasts, IoT will be the dominant market segment in health care systems by 2025 (Figure 1). The economic impact of IoT will be between $ 3.9 and $ 11 trillion a year, or about 11% of the global economy (Turcu & Turcu, 2019). Moreover, forecasts show that IoT-based services and health-related technologies will affect the global economy by 2025 and grow by $ 1.1 to $ 2.5 trillion annually (Turcu & Turcu, 2019).

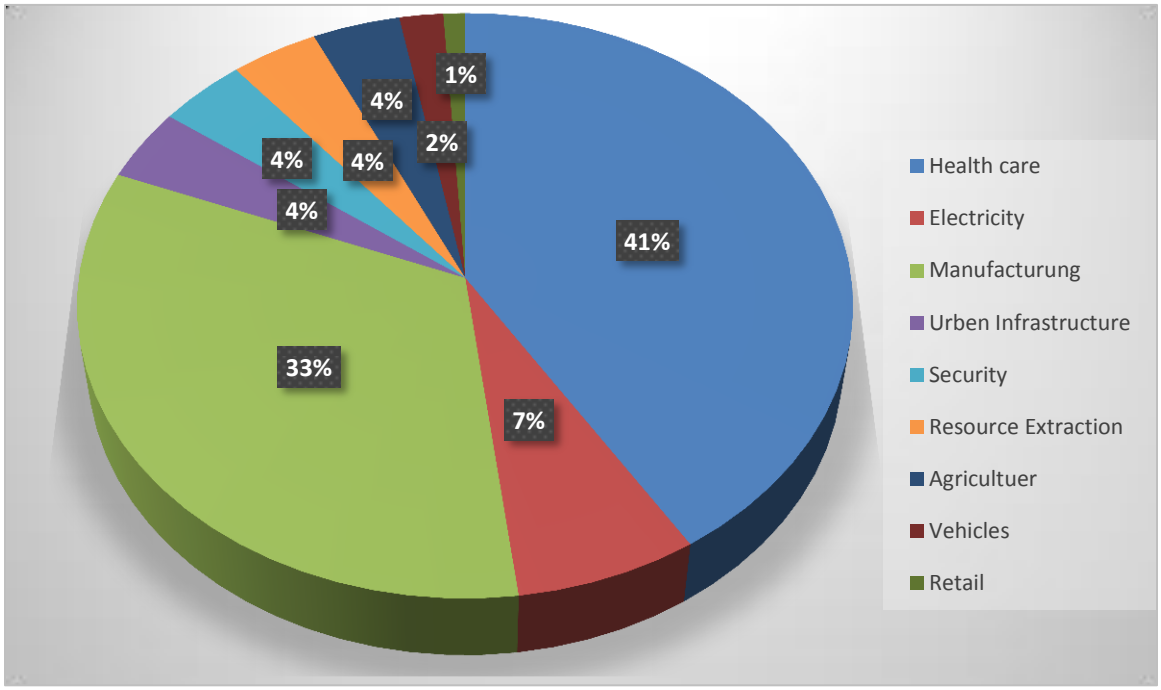
In spite of all these benefits, adopting new technology is still challenging (Shaukat & Zafar, 2010). Cisco (2017) highlighted a challenging image of IoT Adaption and discovered that only 26% of IoT projects are entirely successful. Moreover, approximately 1/3 of respondents deemed their finished projects unsuccessful and about 60% encounter problems on the establishing stage or using (Index, 2017). More than 40% of developments in various sectors, including the health area, failed in information

technology (Beynon-Davies, 1999; Heeks, 2002; Kaplan & Shaw, 2004; Littlejohns et al., 2003).

New technology adaption sometimes fails because of hardware malfunctions, software bugs, power shortages, or environmental factors. One of the essential factors in a new project failures is insufficient understanding of users' behavior intention in technology adoption (Aarts & Gorman, 2007; Giuse & Kuhn, 2003). One of the significant problems of using a new technology is human's resistance and adaptation to change (Backer, 1995; Terry et al., 2008b; Wager et al., 2017).

Therefore, understanding people's behaviors and attitudes is critical for predicting the technology adaption, which is critical for a successful product, marketing, and technology management (Von Hippel, 1986). **A question that has always occupied managers' minds is whether the technology has been selected correctly and accepted with a positive outlook and attitude and whether it is possible to localize and adapt the selected technology to its users?**

Figure 1. Projected market of IOT sector by 2025



Source: (Al-Fuqaha et al., 2015)

The electronic healthcare record is one of the IoT systems in the Iranian health care system, and it has been mentioned as a third vertex of the health services triangle among the new health technology services (Baker, 2001; Chaudhry et al., 2006; Valdes et al., 2004; Wilson & Lankton, 2004). The main purpose of EHR is to advance the quality of services by reducing medical errors, providing effective communication methods, sharing data among health service providers, and improving health information management for educational and research purposes (Miller & Sim, 2004; Valdes et al., 2004). Electronic healthcare record is finding the most important technology to improve healthcare services. However, creating and using an electronic healthcare record is not easy, and it cannot achieve its predetermined objectives in most cases. Studies have illustrated that the use of electronic healthcare record in today's complex health system, faces challenges and requires organizational and human resource preparedness. Studies have shown that only 5.1% of public acute care hospitals in the United States have a comprehensive electronic healthcare record system (Staroselsky et al., 2006). This value is 9.11% in Austria, 5.7% in Germany (Jha et al., 2009), and 10% in Japan (Erstad, 2003). The establishment of Iranian electronic healthcare records has also been emphasized in Iran's Fifth Development Plan but it is challenging establishment in the Iranians healthcare system (Abdekhoda, Ahmadi, Gohari, et al., 2016). The Internet of Things and health technologies have not yet grown in Iran. Practical experience in the healthcare sector is limited and its acceptance by health system users is low (Ghasemi et al., 2016). For example, health providers try to resist using electronic healthcare records (Abdekhoda, Ahmadi, Gohari, et al., 2016).

Studies have indicated that the adoption of IoT technology, including the electronic healthcare record, is discussed as one of the significant challenges in the global health systems(Piette et al., 2008; Savolainen et al., 2008; Steele et al., 2009; Topacan et al., 2009; Whetton, 2005). Studies have shown that attitude and behavioral factors play a central role in new technology adaption (Backer, 1995; Terry et al., 2008b; Wager et al., 2005). Identifying behavioral factors is essential to remove human-social barriers, especially user resistance (Alanazy, 2006; Morton, 2008; Nair, 2011; Wilkins, 2009). *A*

survey of 375 organizations worldwide showed that users' resistance to technology adoption is the first reason for the failure of IT projects. Users' resistance to accept a new technology is significant because it depends on social factors, individual norms, and behavioral factors. Users' resistance is one of the critical reasons for systems failure in response to the change (Kim & Kankanhalli, 2009; Littlejohns et al., 2003; Martínez-Caro et al., 2018). User rejection and context are important factors in institutionalizing various types of health technology(Chang, 2015; Rahimi et al., 2018).

Therefore, understanding users' behaviors and attitudes is the essential in predicting the adaption of technology, such as electronic healthcare record (Anderson et al., 2006; Morton & Wiedenbeck, 2009). The studies indicated that technology acceptance models have different functions in different context(Kim & Kim, 2018; Martínez-Caro et al., 2018). Pioneering studies on the acceptance of technology in healthcare is limited, and some fundamental factors have only been conceptualized in existing studies *(Steele et al., 2009).* There are still areas that can be improved and expanded to increase the predictive performance of technology acceptance models(Rahimi et al., 2018).

By filling this research gap and given the importance of technology in improving the health system and the lack of studies and specific models for detecting factors affecting Health technology acceptance, the purpose of this study is to assess the factors influence in behavioral intention to use IoT technology in healthcare context. Specifically, the main research problem is to understand what factors can affect the behavioral intention to use health IoT technology, such as electronic healthcare records?

This thesis was conducted in three study. First, study aimed to investigate factors affecting the acceptance of IoT technology among physicians, using the UTAUT2 model. Second study were conduct qualitative study for discovering, factors affecting the adoption of IoT technology in health systems (the electronic healthcare information record system in Iran) and created a model. Finally, in third study the new model was run in a quantitative study.

According to the research literature, most studies that have evaluated the acceptance of health technology have used IT acceptance models such as the developed TAM or TAM. Recently, the use of UTAUT2 has also been used in the adoption of health technology(Ahadzadeh et al., 2015a; Hoque et al., 2017; Kim & Park, 2012). Because this model includes specific structures, it can be considered as an adaption model for health care users. Literature has suggested using the UTAUT2 model to examine the acceptance of health technology(Hoque et al., 2017; Peek et al., 2014; J. Tavares & T. J. J. o. m. I. r. Oliveira, 2016; Yuan et al., 2015). Therefore, in this study, the theoretical foundation is UTAUT2. Basically, the UTAUT2 model evaluates behavioral intent for the use of technology, which is determined by seven explanatory variables, including performance expectancy, effort expectancy, social impact, facilitating conditions, pleasure-related motivation, and value for money and habit(Venkatesh et al., 2012*).*

This thesis is organized as follows. The first chapter presents an overview of the extant literature on technology adaption theories. The first section of the first chapter lays the theoretical foundations Technology Acceptance Models. All of the theories in this context are summarized and, in this section, the development of the technology acceptance model that was examined over the past years categorized in four sections as follows: model introduction, validation, development, and evolution.

The second section is The Effect of Culture on the Acceptance of New Information Technologies. Studies indicated that cultural values are shaping cognitive processes and thus affect people's beliefs and behaviours toward technology (Srite et al., 2008). Nowadays, cultural values play a significant role in technology acceptance (Srite & Karahanna, 2006). The role of culture in information and communication technology has been of interest for researchers for a while (Leidner & Kayworth, 2006). Many investigations have highlighted the essential role of culture on technology popularity, diffusion, and development (Keil et al., 2000; Sia et al., 2009). Most technology firms have culturally embedded assumptions, which could conflict with the organization's values, beliefs, and norms; such embedded assumptions influence technologies as culture-bound (Nazir & Smucker, 2015). In conclusion, most culture-related technology acceptance studies focused on the cross-cultural comparison (Tarhini et al., 2017).

The third section is focused on Technology changes in healthcare industry. Healthcare in IoT industry is being considered one of the key industries and a special conception. Internet of Health Things (IOHT) can support many medical areas, including child and elderly care, chronic disease monitoring, and private health and fitness management. The subsection purposes to provide a comprehensive taxonomy of the factors influencing the EHR acceptance. This Systematic Literature Review, summarising multiple studies on adopting new technologies to identify related scientific publications. The last section of the first chapter highlights the research gap that this study aims to address.

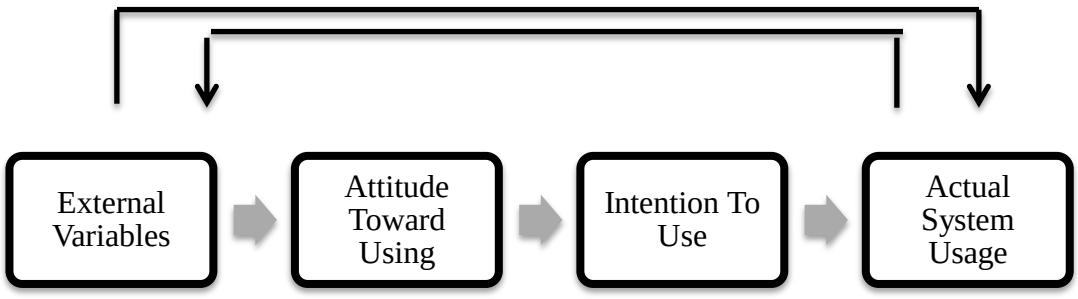
The second chapter outlines the research. As mentioned earlier, this thesis was conducted in three studies. First study aimed to investigate factors affecting the acceptance of IoT technology in the Iranian health system using the UTAUT2 model. This study helped to find factors affecting the acceptance of IoT technology among physicians based UTAUT2 model. For gain an in-depth understanding of other factors affecting to the adoption of EHRs. Second study were conduct semi-structured interviews. Depth interview, and taking advantage of exploration and follow-up opportunities provide items that arise in the interview (Nunes et al., 2010). Then, factors affecting the adoption of IoT technology in health systems (the electronic healthcare information record system in Iran) were extend UTAUT2 model based on the qualitative data collected from the interviewee and the focus group. Finally in third study, the model was run in a quantitative study.

In the third chapter empirical results are described and discussed. This chapter aims to describe the qualitative results of interviews and statistical analysis of the quantitative data. In this chapter, the collected data were categorized and analyzed using appropriate statistical techniques. The first section was UTAUT2 model running results. In this section describes the research hypotheses testing (study1 results), and then the results of collecting qualitative data from semi-structured interviews and focus groups were presented (study2 results). Finally, the obtained model was tested in last section and as well as the examination of influence effects in adaption (study3 results). The results are discussed in another section of the chapter. Finally, the last section of this study provides conclusion, theoretical and practical implications, limitations and directions for future research.

CHAPTER 1.
THEORETICAL BACKGROUND FOR THESIS

Research on IS (information systems) has been looking for how and why users adopt new technology. Several research fields have been found in this vast range of research and investigation. One of the research fields emphasizes the individual acceptance of technology using purpose or application as a dependent variable. Other research fields refer to the success of implementation at the organizational level and the appropriateness of technology with work in groups. Subsequently, each of these disciplines has a unique contribution in adopting by information technology users. The theoretical model should be included in the current review, and the intention to use should be understood as a dependent variable. The role of the intention to use is essential as a behavior predictor. Figure 2 illustrates the basic concept of a subset of a group of models that describe the individual acceptance of information technology and form the basis of this research. This research identifies eight key competitive theoretical models.

Figure 2. **Basic Concept of User Acceptance Models**



Source: Own elaboration

1.1. Technology Acceptance Models- Literature Review

The most often discussed contemporary literature is about the acceptance and using technology by users. All of the theories in this context are summarized in (Table1).

(1) Innovation Diffusion Theory (IDT), is developed by Rogers's (1962). Diffusion of Innovation Theory focuses on understanding how, why, and at what rate progressive ideas and technology spread in a cultural structure (Rogers, 1995). Rather than emphasizing and convincing persons to change, diffusion of innovation theory considered the change in the development or "reinvention" of goods and behaviors (Robinson, 2009). Fichman (2000) identifies diffusion as the process wherein a technology spreads across a society of organizations. The diffusion of innovation strategy generally describes the spread of ideas from society or the institution within a society (Rogers, 1995). Innovators are always looking for new information, are eager to try new ideas, and are interested in risk as to the first adopters. Young and educated people are more inclined to innovate, and most business companies in the aggressive corporate innovators have a risk-taking perspective and are willing to take the risk of doing something new and different (McCarthy, 2012).

Influential factors in diffusion

Studying the acceptance of new products is essential for marketers, and a company should continually improve existing products and develop new products for a changing market for growth. The study of product acceptance is essential because of the relatively low success rate of new products (Moon et al., 2013).

The innovation diffusion rate in a market segment is a function of the following 10 factors(Mothersbaugh et al., 2020):

a) **Type of group**: Some groups are more receptive to change than others are, and generally, young, wealthy, and educated people are rapidly embracing change and, consequently, new market products. Therefore, the target market for innovation and new products determines their diffusion and expansion.

b) **Type of decision-making**: refers to individual or group decision-making, and the fewer people involved in purchasing decision-making, the faster the diffusion of innovation.
c) **Marketing efforts**: The community's expansion rate of new products is strongly influenced by the number of marketing efforts made in that sector. Accordingly, the innovation diffusion rate is controlled by the company to some extent.
d) **Satisfaction of needs**: The more obvious the need for innovation in a product or service, the faster the diffusion of innovation.
e) **Adaptation**: Purchasing and using innovation in line with individual and group values and beliefs leads to faster diffusion of a new service or product.
f) **Comparative advantage**: better perception of innovation or new product regarding satisfaction of the relevant need increase the diffusion speed compared to existing methods. The performance and the cost of the new product are recognized as comparative advantages.

The innovation success requires a functional or price advantage to the consumer, and the combination of the two is known as a comparative advantage.

g) **Complexity**: Low understanding and brutal use of the innovation of a new product or service will slow it down. The critical point in this dimension, in principle, is the simplicity of using the product rather than its complexity.
h) **Visibility**: Understanding the positive effects of consumers choosing a product in their lives increases the diffusion of innovation.
i) **Test capability**: Less cost to use and test a new product and innovation makes it spread faster in the target market.
j) **Sense of risk in people**: the diffusion speed of innovation in target markets is related to the risk associated with its use or testing. In other words, the higher the risk or test of innovation, the slower its diffusion. This risk includes financial, physical, and social risk, and individuals' perception of risk is a function of the following criteria:
   A. The probability that innovation will lead to people's favorite performance.
   B. The results and effects caused by the performance failure of the product depending on individuals' interests and desires.

C. Ability to reverse and eliminate the negative consequences and related costs(Mothersbaugh et al., 2020)

(2) Theory of Reasoned Action (TRA) is developed by Martin Fishbein and IcekAjzen (1977) who believe that a person's behavior is determined by their intention to perform that behavior. According to this theory, two factors play a significant role in making sure whether a person would perform a specific behavior: 1) personal attitudinal judgments; being one's attitude toward that behavior, and 2) social-normative considerations or what beliefs others consider when performing the same action or before somebody acts (Fishbein & Ajzen, 1977).

(3) Social cognitive theory (SCT), is used as psychology, education, and communication, meaning that people's knowledge acquisition is proportional for seeing others while experiencing the circumstances of social interactions, encounters, and outside media effect. Albert Bandura (1986) advanced this theory as the action plan of his social learning theory, stating that any time people notice a behavior model and noting its outcomes, they will consider the sequence of the occasions and use this information to steer the following manners. Individuals do not learn new activities only by trying and either succeeding or failing. Instead, the survival of societies relies on following the replication of others' actions. Rewarding or punishing a person for a specific behavior require replicating the patterned behavior. Media fits the behavioral patterns for many of societies, generally in the most different environmental locations (Campbell & Fiske, 1959).

(4) Model Release and Implementation IT: used an IT implementation research model, which was established based on the organizational change, innovation, and technological diffusion literature (Kwon & Zmud, 1987). IT implementation is identified as a substantial effort directed toward comforting the appropriate IT within a user community.

(5) The Theory of Planned Behavior (TPB). TPB is an expansion of the TRA developed by Ajzen (1988) to consider behaviors, which are not totally under the volitional control of individuals. The realization of several behaviors depends on external factors (Ajzen & processes, 1991). Both models are structured for the essential rationale

wherein others make logical, reasoned decisions to become familiar with specific behaviors by assessing the already available knowledge. The performance of any behavior will depend on an individual's intention to go forward with it as influenced by the value that the person places on the behavior, the ease with which it can be performed, and other people's views.

The theory of planned behavior guides human behavior by three categories of beliefs about the consequences of behavior and evaluation of these consequences (information technology beliefs), normative expectations of others and the motivation to fulfill those expectations (normative beliefs), and finally, the factors that may facilitate or impair performance and understanding these factors (control beliefs). Normative beliefs create a favorable or unfavorable attitude about behavior, whose results are reflected in the mental norm, and control beliefs increase the perception of information technology control. Generally, attitudes about behavior, subjective norms, and perceptions of information technology control lead to intent to perform the behavior. As a general rule, a more desirable attitude and mental norm, and a greater understanding of information technology control, reinforce a person's intention to do practical behavior. When people have enough control over their actual behavior, the opportunities to put their intentions into action increase. Therefore, the intention to do the behavior is always before performing the behavior, and these two issues are interconnected(Ajzen, 2006).

(6) The Technology Acceptance Model (TAM). This model was developed by Davis (1989) whose primary purpose was to provide a basis for examining the effect of external factors on internal beliefs, attitudes, and intentions of use. In addition to the predictive aspect, this model also has a descriptive approach; therefore, managers can identify why a particular technology may not be acceptable (DAVIS ET AL., 1992).

The value of the technology acceptance model (TAM) is a practical framework for explaining the acceptance of information systems by users (Davis et al., 1989). Information systems researchers re-examine the validity of TAM and seek the acceptance of various information systems by individuals(Doll et al., 1998). TAM is widely used by researchers and those involved to help predict and conceptualize user acceptance of

information systems. TAM can describe the individual beliefs of the customer, and the primary value of its proposition explains the attitude towards the IT system with other modern banking services, including telephone banking, and whether or not they are inclined to use the system (Yiu et al., 2007).

According to TAM, information technology acceptance is determined by the tendency to use the system, and the orientation is determined by the perceived ease and perceived usefulness of the system. Davis stated that two factors affect people's attitudes that lead to the acceptance of technology (Davis et al., 1989), the individual's perceptions of the technology ease of use and usefulness. Research in information systems showed that perceived usefulness has a significant effect on the intended use of the technology. The main reason for using information technologies in modern banking, including telephone banking, is the usefulness of these systems to perform the desired operations. People's perception of ease of use refers to the degree to which a person believes that learning to use and work with a particular system requires little mental effort (Davis et al., 1989). These two factors affect a person's attitude toward using a particular system, which affects a person's desire for information technology to use the system. Attitude towards the system is the individual's evaluation of the desirability of using an information system, and the tendency of information technology or the user's intention is the degree of probability of using the system by the individual.

(7) The Model of Personal Computer Utilization (MPCU). MPCU was developed by Thompson et al. (1991) based on the Triadic Interpersonal Patterns Model (1980) as a counterweight for utilizing TRA in technology acceptance research. The determinants of PC Utilization in this particular model are 1- job-fit "The extent to which someone believes that using a technology can increase the performance and shape of their job "(Thompson et al., 1991), 2- the affect towards the emotion, feelings of joy, elation, or pleasure, or depression, outrage, displeasure, or hate associated by any person with a critical act" (Thompson et al., 1991), 3- facilitating conditions "Provision of support for users of PCs may perhaps be one type of assisting condition that can affect system utilization" (Thompson et al., 1991), 4- complexity "Their knowledge to which an innovation is regarded as relatively difficult to grasp and use" (Thompson et al., 1991), 5-

long-term implications "Outcomes that have a payoff later in life" (Thompson et al., 1991), and 6- social factors "Individual's internalization of the guide group's subjective culture, and particularly interpersonal agreements that anyone made with other people, in specific social situations" (Thompson et al., 1991).

(8) The Motivational Model (MM). This model was proposed by Davis et al. (1992) to explain that "people use computers at the workplace because they are beneficial or because they are pleasant to use" (DAVIS ET AL., 1992). The authors adjusted motivational theories to the technology acceptance and service field in this model, concentrating on extrinsic and intrinsic motivations that point to a commanding individual's behavior. Extrinsic motivation is characterized by performing instrumental in obtaining valued outcomes, which might be distinct from the activity itself, including superior job performance, pay, or promotions (Davis et al., 1992).

(9) TAM2 was developed by Venkatesh & Davis (2000), indicating that the direct compliance-based effect of subjective norm on intention other than perceived use (PU) and perceived simplicity of usage (PEOU) will appear in imperative, not voluntary system consumption settings in computer working context(Venkatesh & Davis, 2000).

(10) TAM3. Venkatesh and Bala (2008) concentrated on the perceived usefulness and usability of technology and paid attention to perceived usefulness and ease of use(Venkatesh & Bala, 2008).

(11) The Unified Theory of Acceptance and Usage of Technology (UTAUT1): Analysis and synthesis of eight theories/models of technology use proposed the unified theory of acceptance and usage of technology (Venkatesh et al., 2003). UTAUT detailed the critical factors and contingencies related to predicting personality, intention to use technology in organizations. Studies have shown that UTAUT explained about 70% of the actual technology use in behavioral intention, resulting in 50% of the variance in technology use(Dwivedi et al., 2019; Venkatesh et al., 2012).

(12) The Unified Theory of Acceptance and Usage of Technology 2. UTAUT2 is based on the UTAUT model whose parameters are supplemented with hedonic

motivation. "The fun or pleasure developed from simply using a technology" (Venkatesh et al., 2012), price value "The users' cognitive trade-off involving the perceived benefits and therefore the monetary price of behavior " (Venkatesh et al., 2012), and habit "The extent to which people usually tend to perform behavior automatically caused by learning" (Venkatesh et al., 2012) accomplished to modify the model better. Age, gender, and experience are the moderating variables of the UTAUT2 model.

Table 1. Theories related to technology acceptance

Theory	**First authors and year of publication**	**Acceptance level**	
		Individual	**Organizational**
Diffusion of Innovations Theory	Rogers (1962)	*	*
Theory of Reasoned Action (TRA)	Fishbein and Ajzen (1975)	*	
Social Cognitive Theory (SCT)	Bandura (1986)	*	
Model Release and Implementation IT	Kwon and. Zmud (1987)		*
Theory of Planned Behavior (TPB)	Ajzen (1988)	*	
Technology Acceptance Model (TAM)	Davis (1989)	*	
The framework of technology, organization, environment	Despite et al. (1990)		*
The Model of Personal Computer Utilization (MPCU)	Thompson et al. (1991)	*	
The Motivational Model (MM)	Davis et al. (1992)	*	
Combining Three-core models(C-TAM-TPB)	Taylor and Todd (1995)		*
Secondary Technology Acceptance Model TAM 2	Venkatesh et al. (2000)	*	
Technology Acceptance Model TAM 3	Venkatesh and Bala (2008)	*	
The Unified Theory of Acceptance	Venkatesh et al. (2003)	*	*

and Use of Technology			
The Unified Theory of Acceptance and Use of Technology2	Venkatesh et al. (2012)	*	*

Source: Own elaboration

1.2. Technology acceptance model development:

The technology acceptance model does not retain its original form and constantly evolves as an organic and dynamic being. In this section, the development of the technology acceptance model that was examined over the past years categorized in four sections as follows: model introduction, validation, development, and evolution.

1.2.1. Model introduction period

Acceptance of technology by users has attracted the attention of many researchers after introducing information systems to organizations. Information system researchers have tried to determine the factors that influence users' beliefs and attitudes about the decision to use information technology and the acceptance of information systems. As a result of this research, the technology acceptance model evolved from Fishbein and Ajzen's model of reasoned action. This model was presented to explain the factors that determine the acceptance of computer technology. This theory is the most effective development of logical action theory, which can describe user behavior in a wide range of different technologies and users. Many studies were conducted after the introduction of this model, which is divided into two categories:

1. Studies seek to validate this model in different technologies by copying the technology acceptance model in different technologies, situations, and research environments. Several studies were performed regarding the use of the technology acceptance model. Adams (1992) evaluated the technology adoption model in five areas of words, graphics, spreadsheets, IT posts, and voicemail. The result showed

that this model is valid and useful in describing users' acceptance behavior of information systems. Davis (1993) re-examined his previous study using post-IT and text editing. This study was performed on 112 professional employees as samples, and the result showed that TAM is valid and useful in describing the acceptance behavior of information systems by users (Davis, 1993).

2. The research of this period sought to compare TAM and the theory of rational action to examine the distinction between the two theories and to find out which of these theories is superior to each other. Davis et al. (1989) compared the two theories on 107 full-time MBA students regarding the word processing system. The results were evaluated in two time periods immediately and 14 weeks after the introduction of the system (Davis, 1989). This research showed that the technology acceptance model describes the willingness to use and accept users better than the rational action theory. Hubona and Cheney (1994) compared these two theories and concluded that technology acceptance theory had a practical and empirical advantage over rational action theory, which was easier to use and a more robust model for describing technology usage behavior (Hubona & Cheney, 1994). Conducted studies during the model introduction period showed that the technology acceptance model could successfully increase the acceptance behavior of information systems on different technologies and situations. In addition, using the technology acceptance model is easier, which is a more robust model for describing the technology use behavior than the theory of rational action.

1.2.2. Model validation period

The researchers sought to confirm using accurate and correct measurement tools to predict people's behavior accepting different technologies, situations, and tasks by the technology acceptance model. Adams et al. (1992) examined Davis's study and found that the validity and reliability of the two tools of perceived ease of use and perceived usefulness are maintained in different environments and different information systems(Adams et al., 1992). Hendrickson et al. (1993) investigated the reliability of perceived ease of use and perceived usefulness scales and found that the TAM tool is

valid and reliable (Hendrickson et al., 1993). Overall, studies in this period examined the validity and reliability of the technology acceptance model and its tools and confirmed the validity of this model in predicting technology acceptance behavior.

1.2.3. Model development period

Several studies on model validation developed the model, introduced new variables, and examined the various relationships between research structures to assess external variables that have little effect on TAM's main structures and variables. The distinguishing aspect of the studies of this period was the attempt to understand the effect of external variables such as individual, organizational variables and the characteristics of the task. For example, Agraval & Prasad (1999) stated that variables of individual differences, such as participation in education, previous experience in computer use, and level of education, affect an individual's perceptions of ease of use and perceived usefulness(Agarwal & Prasad, 1999). Karahanna (2000) evaluated two technologies of information letter technology and voice letter and concluded that the factors affecting the use of the system are different among different technologies(Karahanna et al., 2000). This study showed that perceived usefulness does not affect information technology posts, which was inverse for using voice mail despite social influence. Another attempt made in the model development phase to investigate the effect of external variables by Adams et al. (1992) examined the effect of variables such as culture, gender, task type, user type, and information system type (Adams et al., 1992). Straub (1994) tested the technology adoption model in two different countries with two different cultural contexts and found that culture plays an essential role in people’s thinking about media and the choice of communication media (Straub, 1994). In this study, Japanese employees considered fax a more helpful tool than American workers, but their perception of the IT letter is the opposite. Gefen and Straub (1997) examined the effect of gender differences on the acceptance of information systems, concluded that gender effectively affects perceived ease of use and perceived usefulness (Gefen & Straub, 1997). Accordingly, perceived usefulness is more affected by men's behavior, while perceived ease of use and mental norms are more effective on women's behavior. Karahanna et al. (1999) found a

significant difference between potential users of information systems and current users (Karahanna et al., 1999). Mental norms greatly influence the intentions of potential users, while it is the mindset of current users that influences their behavior or continued use of information systems. Gefen (2000) applied the technology acceptance model in which the old information system and the new information system were used in parallel (Gefen & Straub, 2000). The results indicated that people's perceptions of the usefulness of using the new system increase their preference for using the new system. The same variable reduces the use of the old system, and on the other hand, people's perceptions about the ease of use of the new system and the old system are the primary determinant of usefulness. In general, the studies of this period helped to better understand the factors affecting the main variables of the technology acceptance model.

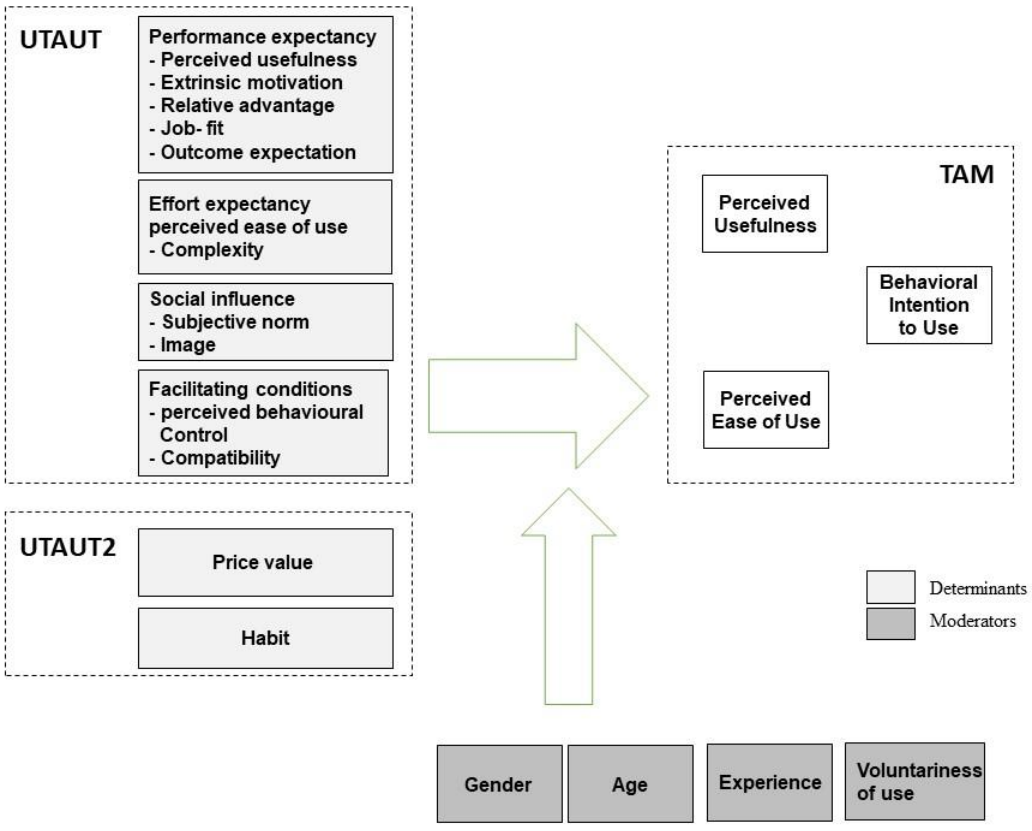
1.2.4. Model evolution period

The research conducted in this course was to remove the previous limitations of the technology acceptance model. Davis and Venkatesh (2000) introduced the secondary technology acceptance model, a new version of the original technology acceptance model(Venkatesh & Davis, 2000). They combined previous studies to form the more advanced TAM model. External variables that affect perceived usefulness and perceived ease of use were studied in this model. For example, external variables such as social influence (mental norms) and cognitive tools (technology related to job, mental image, quality, and visibility of results) were studied. Venkatesh defined external variables, which affect perceived ease of use, such as self-efficacy of computer use, individual perceptions of external control of behavior, fear, and cheerfulness of computer use. Other studies were conducted during this period to address the drawbacks of the technology acceptance model. For example, Venkatesh (2000) conducted a longitudinal study using this model, considering mandatory and optional situations, including mental norms defined by Davis (1989). In this study, employees were examined in the workplace, and their actual use was studied instead of self-reporting system usage(Venkatesh & Davis, 2000). Overall, the studies conducted during this period helped identify the factors that affect perceived ease of use and usefulness. The developed TAM model is a prominent

and vital theory for further studies and research. In general, the TAM model constantly been evolving due to its development over time.

Studies using the technology acceptance model have examined more than 30 different types of information systems in four categories, including communication and media systems, general-purpose systems, office systems, and specialized business systems. General-purpose systems include Windows, PCs, microcomputers, the Internet, and other computing capabilities. Communication systems include information technology letters, voice mail, fax, and other communication systems. Office systems include word processors, spreadsheets, and word processing systems, and specialized business systems include corporate-specific systems developed by DSS, MRP, and expert systems. Fig 3) shows the extending of Technology Acceptance Models.

Figure 3. Illustrations of the Technology Acceptance Model (TAM) as the "core" of a broader evolutionary structure, extending the UTAUT



Source: Own elaboration based on Venkatesch, 2012

1.3. The Effect of Culture on the Acceptance of New Information Technologies

As an open system, culture and technology have components systematically interconnected. Researchers often make the statement that culture influences technology adoption, but only a few research studies have investigated how, or to what extent cultural dimensions influence technology adoption. Of all of the factors that should be considered in technology adoption, culture is probably the most challenging to separate, define, and measure. Culture clarifies the important rules, norms and rituals that society cultivates, believes, and values (Liu et al., 2014). Accelerating of cultural change has been associated with the rate of technological change during history. New communication technology has caused tremendous and complex transformations in human relationships. The establishment of new forms of communication has created new concepts of identity. Technology use in organizations has dramatically increased. Multinational organizations use new technology strategically to increase efficacy, coordinate and accomplish multicultural companies across locations and cultures (Al-Gahtani et al., 2007).

However, new technology adoption is challenging in most countries (Shaukat & Zafar, 2010). Among the various problems for organizational change during new technology adoption, the cultural dimension is one of the main factors of resistance and the most challenging factor to define, measure and evaluate (Gallivan et al., 2005). Guo and Ambera (2010) studied the impact of national and organizational culture on the use of technology in multinational contexts. These researchers consider that the global corporate culture of multinational organizations might explain the consistency of media use between headquarters and branches (Guo & D'Ambra, 2010). In 2010, Shukat and Zafar examined cultural, human, social, political, and economic factors in 48 companies, 24 banks (12 local banks and 12 foreign banks), and 24 factories (12 local and 12 foreign factories) in Pakistan. The results show that in today's multinational global business community, management often faces cultural differences that can prevent the successful installation of any new technology (Shaukat & Zafar, 2010). Therefore, considering

culture in new technology adoption is one of the main issues and needs consideration (Shaeidi, 2020).

Both organizational culture and national culture could have an effect on the use of technology. Therefore the proper knowledge of cultural context is essential to the workplace (Geissler, 2006). Organizational culture is considered as a bridge gap between technology adoption and organizational progress, and for the success of the development and execution of technology in organizations and societies is one of the critical elements. Therefore, identifying and understanding the meanings, norms, values, and power of organizations in adopting and implementing technology is essential and useful (Indeje & Zheng, 2010). Studies indicated that cultural values are shaping cognitive processes and thus affect people's beliefs and behaviours toward technology (Srite et al., 2008). Nowadays, cultural values play a significant role in technology acceptance (Srite & Karahanna, 2006). The role of culture in information and communication technology has been of interest for researchers for a while (Leidner & Kayworth, 2006). Many investigations have highlighted the essential role of culture on technology popularity, diffusion, and development (Keil et al., 2000; Sia et al., 2009).

1.4. Technology adoption and Hofstede's cultural dimensions

According to researches, cultural dimensions are essential to incorporate in technology models (Baptista & Oliveira, 2015; Khan, 2017; Michaelidou et al., 2015). Intention to use technology and actual use are significantly moderated by cultural values (Baptista & Oliveira, 2015). Several studies have developed cultural frameworks to study user behavior and customer preferences in technology adaption models (Smith & Seyfang, 2013). One of the most commonly used frameworks is that of Hofstede's cultural dimensions (Engelen & Brettel, 2011). Hofstede's work on national culture defines four major proportions: Power Distance (PD), Individualism vs. Collectivism (IDV), Masculinity compared to femininity (MAS), Uncertainty Avoidance (UAI) (Hofstede et al., 1980). A fifth dimension, long/short Orientation (LTO), was added in 1988 by Hofstede and Bond(Hofstede & Bond, 1988).

Power Distance (PDI): The extent to which the less powerful members belonging to the society agree and expect unequal power distributions. Power distance refers back to the range to which people within the society accept inequities in power distribution (Hofstede, 2011). In high power distance cultures, people often show respect for authority, which commonly affects their decision-making (Hofstede, 2011).

Individualism vs. Collectivism (IDV): The extent to which individuals look after themselves and integrate into the groups. People in individualistic countries tend to make their individual choices, but people in collective countries tend to conform to a group or society's norms. In highly individualistic people, individuals often make decisions independently and are more progressive (Hofstede et al., 2010).

Masculinity vs. Femininity (MAS): The extent to which masculine values dominate culture as compared to female values. Masculine cultures have emerged as competition, ambition, and focusing on performance and material values. Feminine civilizations are characterized by unification, equality, consensus-seeking, and worrying about social associations. Masculinity represents a preference for achievement, gallantry, assertiveness, and material rewards for fulfillment; conversely, stages of cooperation, modesty, and excellence of life (Hofstede & culture, 2011).

Uncertainty Avoidance (UAI): The amount to which the members of a society feel uncomfortable in uncertain situations. Uncertainty avoidance captures the level to which people in a society feel uneasy with uncertainty and double entendre (Hofstede & culture, 2011), which is associated with people's risk perceptions regarding financial decisions(Frijns et al., 2013; Kim et al., 2016).

Long-Term vs. Short-Term Orientation (LTO): The level in which the members of a society are future-focused. This dimension shows amounting cultural deals with the degree of cultural values in the amount of focusing on the past and future. Long-term orientation (LTO) is related to the extent of agreement people in thrift or determination to create and look to the future; furthermore, individuals with short-term orientation often show respect for the norms while being dubious of societal change (Hofstede et al., 2010). In long-term orientation, people tend to move along the future rewards(Lu et al.,

2017; Zhao & Technology, 2013). Wang and Bansal (2012) suggested that long-term orientation has an optimistic influence on financial performance because it provides possible for long-term investments, which can perform greater benefits(Wang & Bansal, 2012). Future success requires investing additional time and resources. Therefore long-term processes may involve potential threats (Krishnan, 2017; Lai et al., 2016).

There are different opinions about the impact of culture on technology acceptance (Teo et al., 2018). Some researchers have used the individual level of culture (Kirkman et al., 2006); they believe that the individual level could be preserved essentially (Srite & Karahanna, 2006). Other studies have been dedicated to studying the extent to which cultural dimensions, like individualism or power distance in technology acceptance, study cultural values as moderators' roles in technology acceptance (Tarhini et al., 2017). Most technology firms have culturally embedded assumptions, which could conflict with the organization's values, beliefs, and norms; such embedded assumptions influence technologies as culture-bound (Nazir & Smucker, 2015). In conclusion, most culture-related technology acceptance studies focused on the cross-cultural comparison (Tarhini et al., 2017)or considered culture as moderators (Tarhini et al., 2017).

Consequently, the recognized risk is likely to be a barrier to technology acceptance in peoples. In high uncertainty avoidance societies, rates of innovations are low and resisted. The study of 10 organizations in Africa, the Middle East, and Australia showed that information technology is less willingly adopted in risk-averse cultures (Hasan and Ditsa, 1999); other researches reflect similar results (Straub 1984; Straub, Keil, and Brenner 1997; Jarvenpaa and Leidner 1998).

Another dimension that plays a significant role in adopting technology was power distance. Specifically, people from high power distance cultures prefer to rely much more upon opinions from guide groups (Daniels & Greguras, 2014); correspondingly, before adopting new systems, users seem to consider others' responses. (Lai, Wang, Li, & Hu, 2016; Lu, Yu, Liu, & Wei, 2017; Tarhini, Hone, Liu, & Tarhini, 2017). The high-power distance society is more voluntarily to accept extensive differences in power comparing with low-power distance cultures. In low-power distance cultures, decision makings are

decentralized and more participative. Subsequently, technology access can be a symbol of power and to maintain centralized control used. It is expected in high-power distance societies to be in high demand. Subsequently, high PDI has less need for technology, and low PDI has more need for technology.

People in individualistic countries prefer to give attention to the groundbreaking characteristics (e. g., Usefulness and simplicity of use) of new systems instead of negative feedback and subjective convention when adopting new technology (Abbasi, Tarhini, Elyas, & Shah, 2015; Lee et al., 2013). Moreover, people from individualistic courtiers could be concerned about probable threats of new systems, while they should keep the possible adverse outcomes from their decisions. (Ashraf et al., 2014). Subsequently, in Low Individualism, infliction of limit on opportunities of transferring technologies, Useless personal computers, or telephone answering machines (face-to-face interaction typically is more significant and necessity) expected.

In high masculinity cultures, technology is more important because it is one of the sources of power. People who are more likely to have a high physical presence in society are less likely to use technology as in femininity society can be expected. In high masculinity cultures, people define their identity in the character of primacy and domination over the people. People who dominate are also afraid of new technology and see it as complex. Individuals from feminine cultures prefer to build long-term commercial relationships with providers, saving time and energy, thereby increasing human judgment in their lives (Schumann et al., 2010). Considering the critical role of accountability upon building interpersonal and commercial relationships (Hallikainen & Laukkanen, 2018), trust provides a more significant influence on users' technology adaption in highly feminine cultures. Individuals from feminine cultures often pay more focus on maintaining personal relationships (Hoehle, Zhang, & Venkatesh, 2015; Magnusson et al., 2014), so they can be more inclined to rely on the recommendations from reference point groups when realization decisions on accepting technologies (Lin, 2014; Lu et approach. 2017). Tarhini et al. (2017) found that subjective best practice rules affect behavioural intentions relying on E-learning tools in highly feminine cultures. The perceived performance played an important role in people's decisions on accepting

new technology in highly masculine nationalities (Kaba & Osei-Bryson, 2013; Lin, 2014).

Conversely, expectancy reflection, the amount of effort is necessary to take advantage of the technology, which concerns the standard of living (Srite & Karahanna, 2006). People from feminine countries pay more concentrate to the availability of technologies (Tarhini et al., 2017). In an IT adaption study, Yoon (2009) suggested that the perceived ease of usage was naturally an added crucial thing about feminine cultures' decisions compared with masculine cultures. In feminine cultures, people pursue stability and comfort of life (Hofstede, 2011), which drives those to be a little more sensitive on the uncertainty in new-technology adaption (Lin, 2014). In contrast, people with more assertive attributes (e. g., assertiveness, and competitiveness) would love to take more hazards with their financial decision-making behaviours (Meier-Pesti & Penz, 2008).

Cultures that contain high LTO score focus more on traditional values, but low LTO cultures credit less importance to tradition, it may be more discovered new ideas; therefore, in such countries, the monthly interest of adaption of new technologies is anticipated to be longer than in countries with cultures which are more long-term oriented. Additionally, since people could be more engaged with risks in Short-term orientation cultures, thrift, determination, and trust are prompted to cut back uncertainty and secure future rewards (Yoon, 2009). Particularly, in long-term orientation cultures, trust as being a long-lasting basis takes on of important role in building business relationships by decreasing the probabilities of opportunistic behavior (Hallikainen & Laukkanen, 2018; Wang et al., 2015). In contrast, since short-term orientation identifies past and present, people during this context often place a high emphasis on obtaining fast results (Hofstede, 2011). In short-term orientation, people pay more focus on the usefulness and simplicity of new technology as ways to enhance their performance quickly (Lu et al., 2017).

Accordingly, Hoffman and Klepper (2000) found that organizations high in solidarity (mercenary cultures) and low sociability experienced more positive outcomes with technology assimilation, comparing organizations with high sociability and low solidarity

cultures. The study by Huang et al. (2003) examined the relationship between organization subculture inconsistencies and the acceptance of component-based software expansion approaches. They suggested that incompatible values between organizational subcultures hindered the information sharing and collaboration needed to integrate technology efficiently. The results provide evidence that value in orientations in national, organizational, or subculture could predispose certain social groups concerning either favorable or unfavorable technology adaption (Galliers et al. 1998; Hasan and Ditsa 1999). Furthermore, individuals from cultures with short-term orientation understand social trends (Hofstede & Minkov, 2010). However, this approach may be challenging, as Hofstede's data was not designed to measure culture on an individual level.

Table 2. Summary of main technology adaption researches based on the Theory and Hofstede cultural dimensions

Years	**Countries**	**Type of Technology**	**Level**	**Theory**	**Culture Dimensions***
2018	Taiwan	M-commerce	National Level	UTAUT	PDI, UAI
	China and Pakistan - Portugal	Mobile banking	Organizational Level	Task-technology fit (TTF)	IDV, UAI
	Indonesia	Internet Banking	National Level	UTAUT	IDV, UAI, PDI, MAS
2017	German and Australian	Sensor-based systems	National Level	Technology anxiety	LTO, UAI, IDV

	South Africa	ICT	National Level	UTAUT	IDV, UAI, PDI, MAS
	Vietnam	E-government	National Level	UTAUT	PDI
2016	Bangladesh	M-Banking	National Level	UTAUT2	IDV, UAI, PDI, MAS, LTO
2015	Pakistan and Turkey	Academics' internet acceptance	National Level	UTAUT	IDV
	The United States and Malaysia	Internet banking	National Level	UTAUT	IDV, UAI, PDI, MAS, LTO
	Africa	Mobile banking	National Level	UTAUT2	IDV, UAI, PDI, MAS, LTO
	Nigeria	E-parliament	National Level	UTAUT	IDV, UAI, PDI, MAS, LTO
	Germany and Romania	Educational Technology	National Level	UTAUT	IDV, UAI, PDI, MAS, LTO
2013	Italy	E- commerce	National Level	TAM	IDV, UAI, PDI, MAS, LTO
	Bangladesh	ICT	National Level	TAM	IDV, UAI, PDI

2012	Indonesia	ICT	National Level	UTAUT	PDI, IDV, MAS, UAI, LTO
	Finland and Portugal	Mobile Banking	National Level	Innovation adoption	PDI, IDV, MAS, UAI, LTO
2011	Jordan	E-government	National Level	TAM	PDI, UAI
	Nigeria	Mobile banking	National Level	TAM	PDI, IDV, MAS, UAI
2009	United States	Telemedicine	Organizational Level	UTAUT	PDI, IDV, MAS, UAI
2008	China	E-commerce	National Level	TAM	PDI, IDV, MAS, UAI, LTO
2000	24 Countries	IT	Organizational Level	IT Infrastructure	PDI, IDV, MAS, UAI, LTO
1995	International firms	-	Organizational Level	Innovation adoption	MAS, UAI, LTO
1994	Japan and the U.S.	Email and Fax	National Level	Diffusion theory	UAI

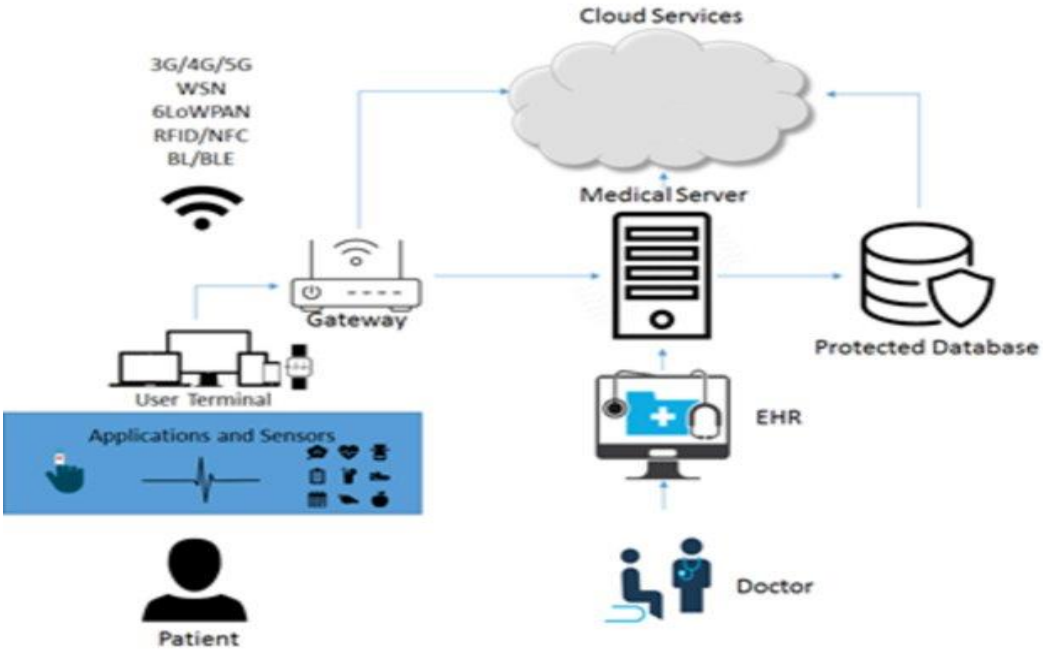
Source: Own elaboration

**Power Distance (PDI), Individualism versus Collectivism (IDV), Uncertainty Avoidance (UAI), Masculinity versus Femininity (MAS), Long-Term vs. Short-Term Orientation (LTO)*

1.5. Evolution of IOT Technology in Healthcare industry

Healthcare in IoT industry such as e-Health, otherwise known as Internet of Health Things (IOHT) is being considered one of the key industries. IOHT is an IoT based includes a network architecture that countenances the connection between a patient and healthcare facilities as, for example, IoT based e-Health for heart rate(Li et al., 2017), electrocardiography (Khairuddin et al., 2017), diabetes, electroencephalogram, pulse, oxygen in blood, body temperature, airflow, glucometer, blood pressure, galvanic skin response, electromyography, patient position and other different kinds of monitoring of body signs based on biomedical sensors(Firouzi et al., 2018). Data from patients can be collected through sensors and by applications developed for an IEEE 802.15.4 standard terminal via short-range communication protocols, such as low-power Bluetooth user BLE such as PC, smartphone, smart watch or even process a special embedded device. The user terminal is connected to Bluetooth or (IPv6) LoWPAN6, to Low Power Wireless Personal Area Networks. This gateway connects to a (clinical) server service or cloud service for data processing and storage. On the other hand, patient data can be stored in a health information system using Electronic Health Records, and when the patient visits the physician, he or she can easily access the patient's clinical history. Figure (4) Illustrate IOT architecture in healthcare.

Figure 4. IOT architecture in healthcare



Source: (Rodrigues et al., 2018)

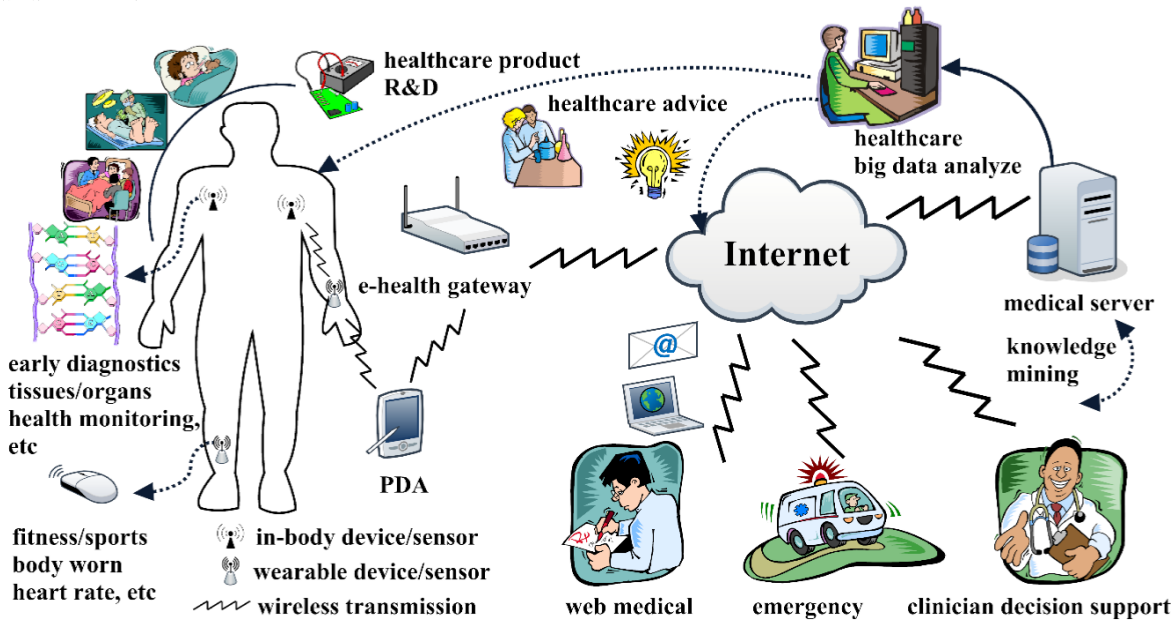
The IOHT can support many medical areas, including child and elderly care, chronic disease monitoring, and private health and fitness management. To better study this broad topic, this review categorizes the IOHT into four general types:

1) Remote health care monitoring; 2) Health solutions based on smart phones 3) living with mobility limitations; And 4) Wearable devices. The following is an explanation of each;

1: Remote health care monitoring are routinely used by households, physicians, and hospital environments to monitor vital signs of remote patients, possible parent-physician disturbances, reduce visit time, reduce hospital costs, and improve quality. Remote health care monitoring is performed by applications that have access to remotely obtained patient physiological data. Basically, these programs have a user interface of smartphones, tablets and computers and data, collectors (biosensors) and internet connection. This can be complete by integrating IoT with mobile computing and cloud storage and data communications (Machado et al., 2016; Rodrigues et al., 2018). This

approach aims to record, transmit, store and visualize biomedical signals in real time (in the shortest time). Developed in this context, which brings patients, healthcare providers and devices together IoT is an intermediate platform for this web-based platform that allows data management and connects its purpose simply(Maia et al., 2014). The infrastructure built by the body wireless network, personal server using intelligent digital assistant, and medical server classes for the remote care system is shown in Figure 5.

Figure 5. Architectural image of remote health care monitoring system



Source: (Rodrigues et al., 2018)

Health solutions based on smart phones

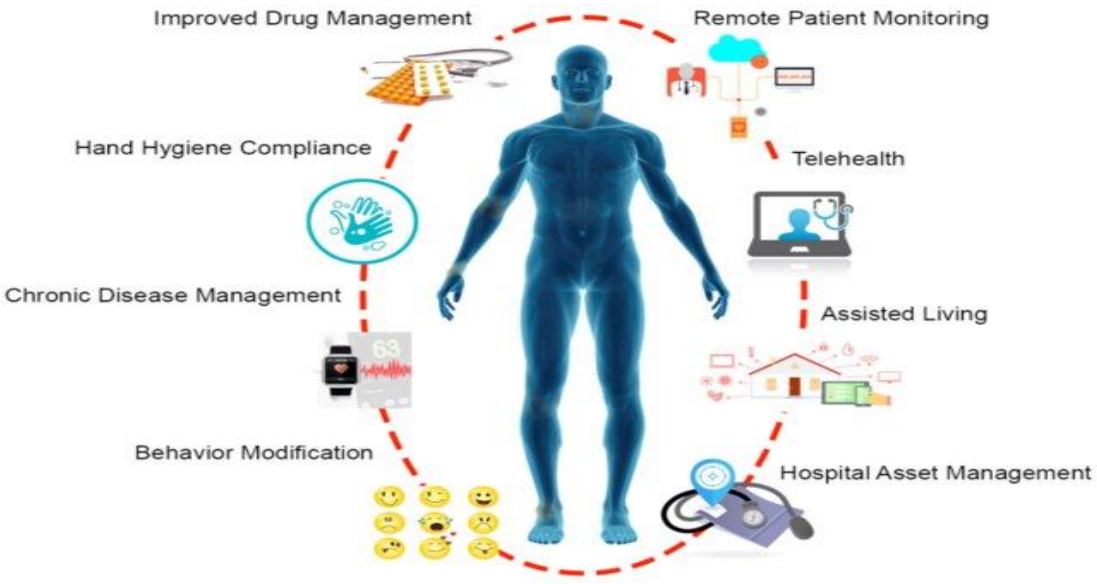
Crema et al. in their study proposed local biosensor virtualization based on wearable simplification, for example, by relying on simple analog communication and communication interfaces, and utilizing the computing capabilities of the smartphone, not only to implement the transmission features, but also to process the raw bio signal, the ability of health programs is increased. The virtual sensor is analyzed in electrocardiogram signals and monitors the rate of respiration and gas(Crema et al., 2017). Aranki et al. have designed a smartphone-based system for immediate monitoring of vital signs and all cardiovascular symptoms as physical activity in patients with heart

disease, which has been one of the major challenges in diabetes and hypertension and other chronic diseases(Aranki et al., 2016). Another study explore the possibilities that smartphones and the Internet of medical devices can use for improving drugs, because smartphones have a direct impact on a person's daily life, which can be of great help to healthcare industry(Rodrigues et al., 2018)

Life with the help of movement restriction systems

The Ambient Assisted Living System (AAL) is an IoT-based service that supports the elderly care or disabled. These solutions aim to increase the independence of individuals in individual life in their homes by providing more security (Rodrigues et al., 2018). Connecting users to smart objects such as blood pressure sensors and motion sensors is a common use of this service. AAL not only provides a more secure environment, it is also help increasing autonomy and enables the user to live a more active life. Figure 6 shows a general system of physical life using the AAL system.

Figure 6. An image of a system designed for people with mobility limitations

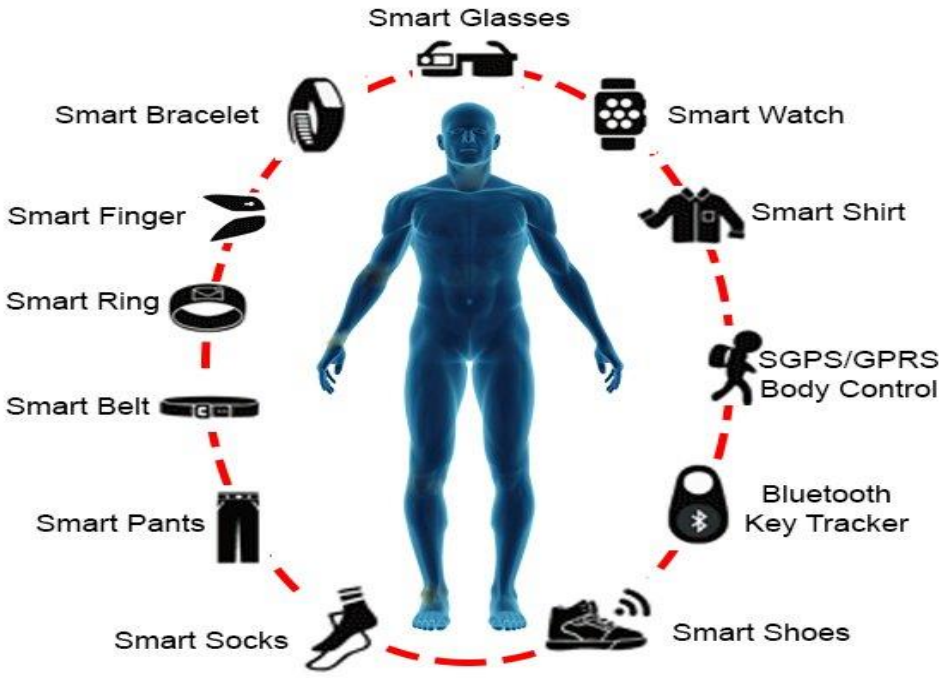


Source: *(Rodrigues et al., 2018)*

Wearable devices

Wearable devices are smart devices that are wearable, for example watch, shoe, or body sensor, as shown in Figure 7. These devices should be able to be connected to physiological transducers to show patient signals such as body temperature, heart rate, blood pressure, etc. Wearable devices are commonly used to monitor the user's physical activity. Wearable devices are also used to care for the elderly. In this context, a system developed to monitor the vital signs of the elderly. The sensors in the patient's clothing collect the information used to monitor health parameters. Also, a comprehensive system has been established to monitor elderly with Alzheimer disease. If needed, the patient presses a button and important information such as oxygen level, blood pressure and heart rate is sent to health care professionals for analysis (Rodrigues et al., 2018).

Figure 7. Different types of wearable technology



Source:*(Rodrigues et al., 2018)*

1.6. Systematic Review on EHR Adoption

This subsection purposes to provide a comprehensive taxonomy of the factors influencing the user acceptance of EHR. This section is a Systematic Literature Review, summarising multiple studies on adopting new technologies to identify related scientific publications. The structured approach was followed by Webster and Watson (2002) method managed on four-steps: 1) search on the specific keywords in the leading journal databases; 2) selection of publications after matching criteria; 3) quickly scan of the identified publications by reading their titles, abstracts and full text to choose those relevant to TAM 1-3, UTAUT1-2, EHR research; 4) detailed procedure of reading and analyzing a selected full text of the publication

1.6.1. Search strategy and key terms

Five databases, including PubMed, Web of Science, Scopus, ProQuest, and, The Science Direct were used for the present review. Keywords such as “physician,” “doctor,” “electronic medical record (EMR), “electronic health record” (EHR),” “adoption,” “acceptance,” “factor,” and “barrier” were used for search paper in different combinations in Boolean AND/OR.

1.6.2. Eligibility criteria

papers explored based on the above strategies with the following eligibility criteria: written in English language and published between 2005 and 2020; be focused only on EHR / EMR usage, not included articles about other health technologies; imitate original articles published in the peer-reviewed journal, thus studies exhibited in the conference, dissertation, were not eligible.

1.6.3. Included studies

By exploitation the differing database search strategies, 7718 primary papers were identified for initial screening. Afterward, articles excluded on the basis of titles (7718 papers excluded=1073).

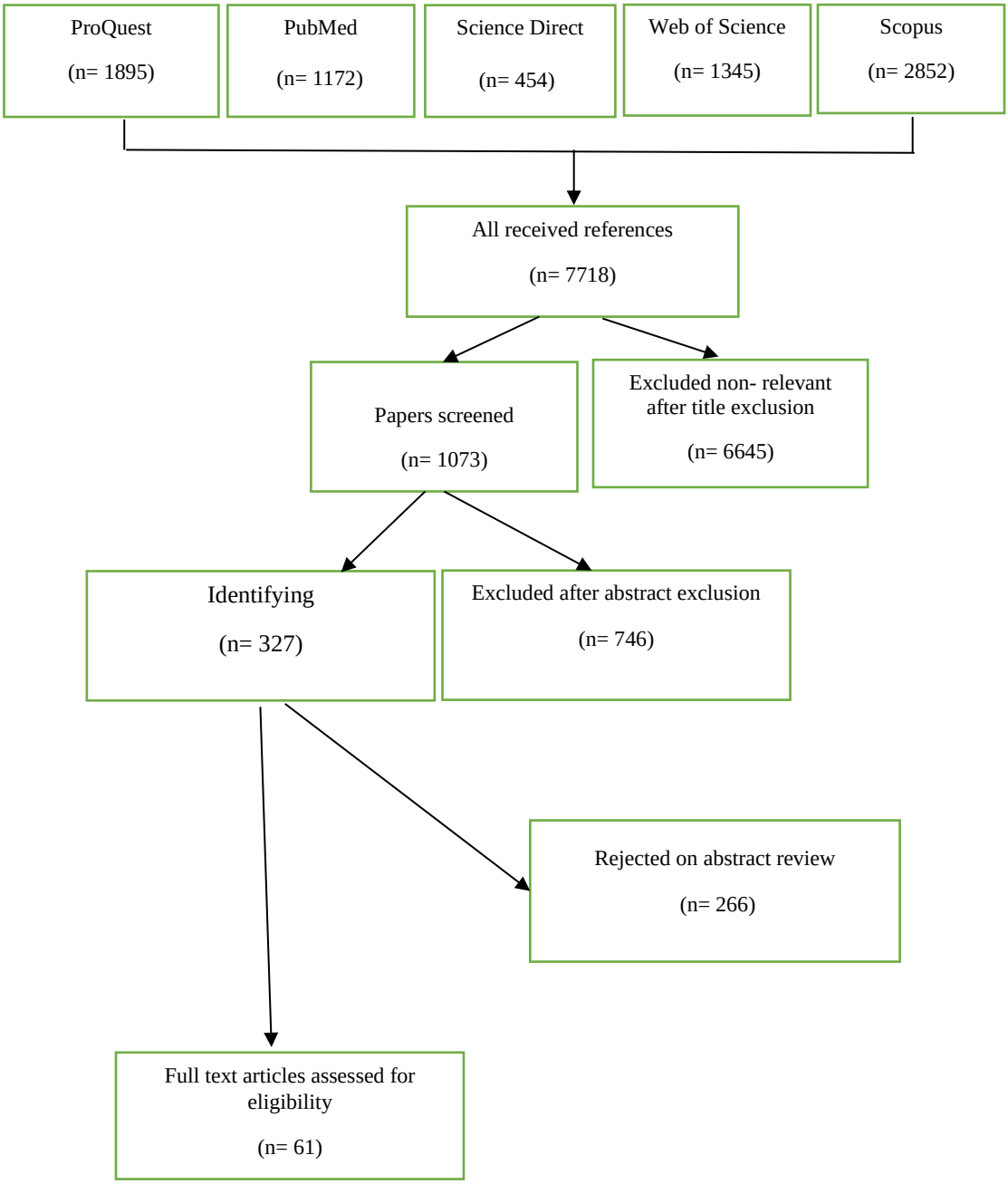
1073 potential articles were identified. After the abstract screening, 746 were excluded as they did not meet the selection criteria. Of the remaining 327 articles, 260 were eliminated after reviewing study context, literature review, and design. Thus, 67 articles that met the inclusion criteria were selected for the final analysis. The number of studies included at various stages of the review process is described in a study selection flow diagram (Figure 8).

Table 3. Number of papers in different stages of study selection process

Database	**Initial number of papers**	**Remaining papers after title exclusion**	**Remaining papers after abstract exclusion**	**Remaining papers after full-paper exclusion and removing duplicated papers**
PubMed	1172	274	95	21
Science Direct	454	35	18	3
Scopus	2852	298	88	16
ProQuest	1895	215	52	8
ISI Web of Science	1345	251	74	19
Total	7718	1073	327	67

Source: Own elaboration

Figure 8. Flow diagram for the selection of studies included in the qualitative synthesis



Source: Own elaboration

1.6.4. Research review in EHR Acceptance

As a mentioned earlier, many technologies acceptance models have been discussed in different domains, healthcare industry is including too. In Table 4, classified the studies based on the theories used in EHR adaption. As seen in Table 4, the TAM, its extensions, and modifications are leading the research of technology acceptance in healthcare. The theories that used in the electronic healthcare record adoption studies are from four main disciplines, namely, organization and management science, information systems, psychology, and multidisciplinary science. The most frequently used theories are related to IS[1] disciplines (23 papers). From the four theories in the IS discipline: UTAUT, TAM, human, organization and technology-fit model, information system post-acceptance model, Nolan's stages of growth model and information system post-acceptance model, there are some identified factors that effected to the electronic healthcare record adoption such as perceived ease of use, perceived usefulness, subjective norms, experience, usability, self-efficacy, system quality, facilitating conditions, emotions, effort expectancy, performance expectancy, computer literacy, social influence, user satisfaction, and system use. Moreover, 18 papers have used theories from psychology, including theory of reasoned action, theory of planned behavior, expectation confirmation theory, and theory of interpersonal behavior. Moreover, 17 papers used organization and management science theories and nine papers that have used multidisciplinary science theories.

[1] Information systems

Table 4. List of theories used in EHR adoption research

Discipline	**Theory**	**Antecedents to EMR adoption (based on the theory)**
Information systems	Information system post acceptance model	Emotions, expected benefits, computer literacy, facilitating condition, task fit
	TAM	Perceived ease of use, perceived usefulness, experience, subjective norms, usability, computer self-efficacy, job relevance
	Unified theory of acceptance and use of technology	Performance expectancy, social influence, effort expectancy, facilitating conditions
	Human, organization and technology-fit model	Organizational factors (structure), user satisfaction, system use, system quality
	Nolan's Stages of Growth Model	Organization features
Organization and Management	Institutional theory	Environmental uncertainty, organizational factors, competition
	Social contagion theory	Image, experience from co-workers, self-efficacy

Science	Institutional theory	Competition
Psychology	Theory of reasoned action	Motivation, normative belief
	Theory of interpersonal behavior	Facilitating condition, social normative belief, perceived consequences, affect, personal normative belief
	Theory of planned behavior	Perceived behavioral control (self-efficacy), subjective norm, attitude toward the behavior
	Expectation confirmation theory	System expectation, confirmation
Multidisciplinary Science	General systems theory	Communication mechanisms, communication tools, facilitating a learning environment, level of physician involvement, cultural change
	Innovation diffusion theory	Image (cues to action), Motivation
	Elaboration likelihood model	Privacy, experience, prior Knowledge

Source: Own elaboration

Furthermore table 5 presents the distribution of papers according to the participants. In With 55% of the total participants, physicians (N = 26), 17% nurses (N = 8), and other healthcare professionals (N = 13) concerned of researchers to understand EHR acceptance.

Table 5. Distribution of studies in terms of participants

User Group	Number of Study
Physician	26
Nurses	8
Stakeholders	4
Health Providers	4
Patients	5
Macro level (Organization level)	20

Source: Own elaboration

1.6.5. Distribution of Studies across Regions and Countries

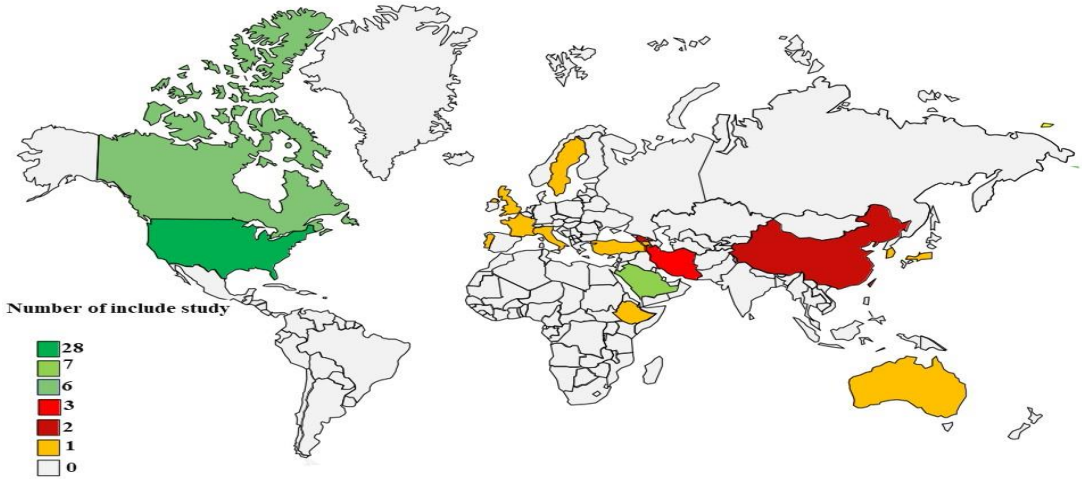
This review also determined the origin country for each analyzed study. As per Table 6 and Figures 9, the majority of publications were conducted in USA (N = 28), with 44 % of the whole analyzed studies and respectively, Saudi Arabia 11 % (N = 7), Canada 9.5% (N=6), Iran, Portugal, UK 4.7% (3 Publications in each country). As seen in Table 6. Further, the USA as a first runner-up is doing well, to assess technology acceptance in healthcare. As shown in Figure 8, the geographic heat map indicates that there are no publications conducted in the most of countries. Although there is researches in electronic health and a considerable expansion of healthcare related technologies in developing countries, there is limited study emerging from these countries.

Table 6. Top countries by EHR Adaption publication frequency

Country	Frequency	Percentage (%)
USA	28	44%
Saudi Arabia	7	11%
Canada	6	%9.5
Iran	3	4.7%
Portugal	3	4.7%
United Kingdom	3	4.7%
China	2	3.1%
Jordan	2	3.1%
France-Armenia- Turkey- Austria- Sweden- Korea-Ethiopia-Taiwan- Italy	1 (each)	14.2%

Source: Own elaboration

Figure 9. Geographic chart for the studies included in the EHR adaption review

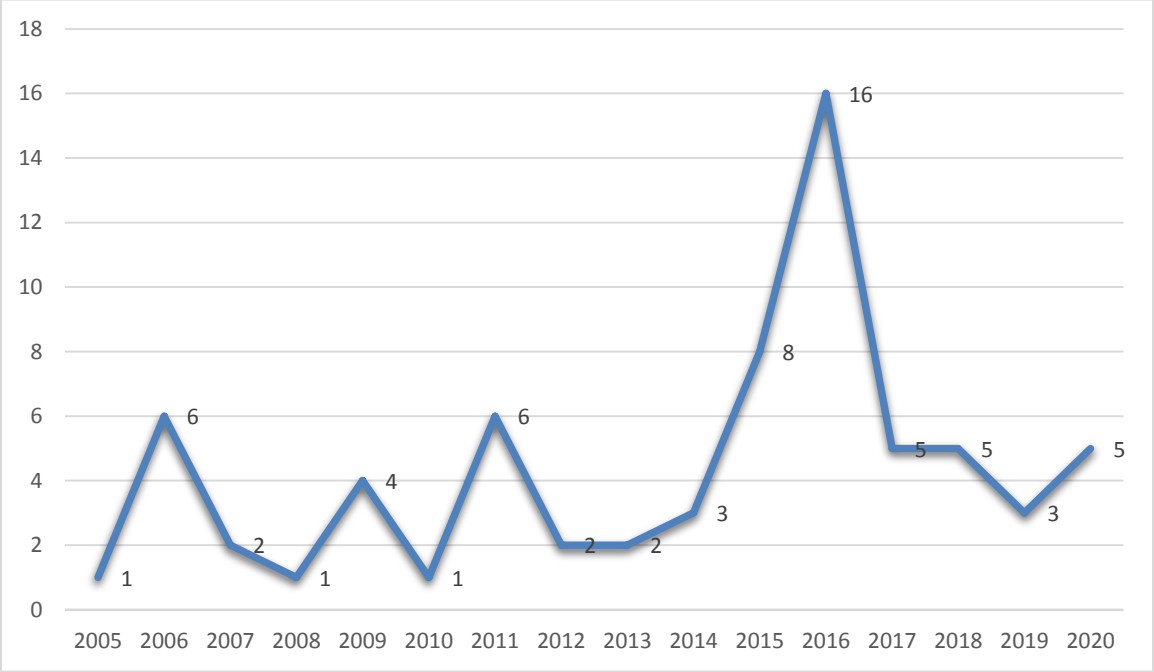


Source: Own elaboration

1.6.6. Progress of EHR Acceptance Studies

The analyzed studies in the inspected period were categorized according to the year of publication, as presented in Figure 10. The studies are reflected through more or less constant frequency in the last decade, with peaks in 2005, 2011, 2015 and 2016. There is a remarkable peak in the number of studies in 2016, and then drop from 2016 which can maximize the gap in the EHR acceptance literature.

Figure 10. Publications addressing the EHR Adaption



Source: Own elaboration

Table 7. Research review of EHR Adaption Source

Author(s)	Objective	Year	Sample	Country	Main findings	Method
Bier (Bier et al., 2004)	"Acceptance of an Electronic Health Record"	2005	330 Faculty and house Staff Physicians	USA	Acceptance of an EHR was high because of physician time conservation.	Survey
Joos (Joos et al., 2006)	"An Electronic Medical Record in Primary Care"	2006	46 Physicians	USA	Improvements in communication efficiency and speed and information synthesis capabilities	Survey
Wibe (Wibe et al., 2006)	"Implementation of nursing care plan in the Electronic Patient Record"	2006	22 Head nurses and key persons	Korea	The most important success factors in the EPR implementation process were using computers, training by colleagues, and documenting admitted patients	Survey
Liu and Ma (Liu & Ma, 2006)	"A test of an extended technology acceptance model"	2006	77 Medical Professionals	USA	46% of the variation in ease of use explained by PSP	Survey

Ovretveit (Øvretveit et al., 2007)	“Implementation Electronic Health care”	2007	30 Senior clinicians, managers, project team members, doctors et nurses	Sweden	The most important success factors in the implementation, was Importance of organizational, a user-friendly EMR, as well as leadership and cultural factors	Survey
Puffer (Puffer et al., 2007)	“Partnering with clinical providers to enhance the efficiency of an EMR”	2007	101 Physicians	USA	Important success factor was Managing physicians’ expectations for resolution of issues identified	Survey
Pourasghar (Pourasghar et al., 2008)	“Factors influencing the electronic medical records system accepting”	2008	10 Physicians, 10 Nurses	Iran	low physician acceptance	Phenomenology
Ilie et al (Ilie et al., 2009)	"Paper Versus Electronic Medical Records: The Effects of Access on Physicians' Decisions to Use Complex Information Technologies"	2009	199 Physicians	USA	Both dimensions of accessibility act as barriers to EMR use	Survey
Terry (Terry et al., 2009)	"Adoption of Electronic Medical Records”	2009	30 Health providers	Canada	Factors influence adoption include: Dedicated time for adoption, computer literacy, training activities, supporting problem	Semi structured interviews

Wilkins (Wilkins., 2009)	"Factors Influencing Acceptance of Electronic Health Records "	2009	94 healthcare facilities/managers	USA	55 % of the facilities with 100 beds or less had not adopted EHR. On the other hand, 100 % of hospitals with 300 beds or more had adopted.	Survey
Whittaker (Whittaker et al., 2009)	"Barriers and Facilitators to EHR"	2009	11 Nurses	USA	Personal, contextual characteristics computer-related and facilitated as barriers to the EHR acceptance.	Semi structured interview
Morton and Susan (Morton & Susan, 2010)	"EHR acceptance factors "	2010	802 Physicians	USA	Years in practice, age, clinical specialty, and prior computer experience and health system relationship were not predictors of EHR acceptance.	Survey
Sheikh (Sheikh et al., 2011)	"Implementation and adoption of EHR"	2011	431key stakeholders	UK	Sites proved time consuming and challenging, with as yet limited discernible benefits for clinicians and no clear advantages for patients	Semi structured interview
Egea and González1 (Egea & González, 2011)	" Acceptance of electronic health care records (EHCR) systems"	2011	254 Physicians	Spain	Perceptions of trust exerted direct effects on physicians' perceived usefulness, of EHCR	Survey

Cherry (Cherry, 2011)	"Assessing organizational readiness for electronic health record adoption "	2011	600 Participants	USA	Regulatory support the lowest and physical plant requirements receiving the highest mean	Survey
Bah et al (Bah et al., 2011)	"Assessing the level electronic health records implementation in Saudi Arabia"	2011	Physicians and Nurses	Saudi Arabia	The level of EHR implemented in the Eastern Was province 15.8 percent.	Survey
Grabenbauer (Grabenbauer et al., 2011)	"Electronic Health Record Adoption"	2011	20 Physicians	USA	Physicians are cumbersome data searches of EHRs and frustrated with the non-intuitive interfaces	Qualitative study
Larry Wolf (Wolf et al., 2012)	"Adoption Of Electronic Health Records"	2011	3653 American Hospital	USA	Low EHR adoption rates.	Survey
Wang (Wang & Biedermann, 2012)	"Adoption of Electronic Health Record Systems "	2012	264 long-term care providers care	USA	In Texas, 39.5 % have partially or fully implemented EHR.	Survey

El-Mahalli (El-Mahalli et al., 2012)	"Implementation and Application of Telemedicine and EHR"	2012	252 Healthcare professionals	Saudi Arabia	The most commonly cited benefits among adopters were improving the enhancing access to healthcare, quality of care, and providing patient care.	Cross sectional descriptive study
Tavakoli (Tavakoli et al., 2013)	"Investigating the TAM using EMR"	2013	Users of EMR	USA	The top 2 barriers included the amount of the cost for hardware and infrastructure and capital needed.	Survey
Al-Adwan (Al-Adwan & Berger, 2013)	"Adoption of EMR "	2013	500 Physicians	Jordan	Validate the model	Mix method
Gagnon (Gagnon et al., 2014)	"Identifying determinants of physician acceptance of EHR "	2014	157 Physicians	Canada	The Integrated model performed to use the EHR	Survey
Alasmary (Alasmary et al., 2014)	"User satisfaction in using the electronic medical record "	2014	12 healthcare providers, 65 Nurses and 47 physicians	Saudi Arabia	EMR users with high computer literacy skills were more satisfied with using the EMR than users with low computer literacy skills.	Survey
Aldosari (Aldosari, 2014)	"Electronic health record system adoption"	2014	22 Hospitals	Saudi Arabia	Adoption rates in macro level was high, but wide variations exist in the individual levels	Survey

Steininger (Steininger et al., 2015)	"Examining influence EHR acceptance levels among Physicians "	2015	204 Physicians	Austria	Social influence, HIT experience, and privacy concerns had a significant effect on the perceived usefulness of EHR systems	Survey
Shen (Shen et al., 2015)	"EHR Adoption "	2015	366 Hospitals	USA	The high level of EHR implementation was moderately associated with low cost of care.	Cross sectional
Al-Adwan (Al-Adwan et al., 2015)	"Understanding Physicians' Adoption of EMR: An Extended Technology Acceptance Model"	2015	227 Physicians	Jordan	The theoretical significance of this work is evidenced by utilizing a rigorously constructed research model to extend technology acceptance research into the health sector.	Survey
Abdekhoda (Michel-Verkerke et al., 2015)	"Attitude toward adoption of Electronic Medical Records"	2015	330 Physicians	Iran	Modified model explains about 56% of the variance of EMRs' adoption.	Survey
Alrawabdeh (Alrawabdeh et al., 2015)	"Factors affecting the implementation of information technology"	2015	6 Participants	UK	Improve an extended TAM model	Qualitative research

Kruse (Kruse et al., 2015)	"Adoption factors affecting of electronic health record "	2015	N= 22 long-term care facilities	-	Barriers of adaption include user perceptions, initial costs, and implementation problems	Systematic review
El Mahalli (El Mahalli, 2015)	"Use and barriers Electronic health records"	2015	555 Physicians	Saudi Arabia	Lack in EHR adoption (63.6%)	Cross sectional
Hasanain (HASANAIN et al., 2015)	" Electronic Medical Record Systems Using and barriers in Saudi Arabia"	2015	Jeddah, Makkah and Taif cities, Saudi Arabia	Saudi Arabia	The main barriers to EMR implementation are lack of knowledge or experience	Survey
Abdekhoda (Abdekhoda, Ahmadi, Dehnad, et al., 2016)	"Applying Electronic Medical Records in health care"	2016	330 Physicians	Iran	Identified six factors that affect using EMRs	Survey
Mennemeyer (Mennemeyer et al., 2016)	"Impact of the HITECH Act on physicians' adoption of electronic health records"	2016	Using consistent data series	USA	Reports that numerous current EHR, lack data sharing capabilities, reduce physician productivity	Using consistent data series
Strudwick (Strudwick & Hardiker, 2016)	"Understanding the use of standardized nursing terminology and classification systems in published research "	2016	-	Canada	Most studies have focused on the classification system, and a lesser study have focused on the nursing practice.	Systematic review

Gheorghiu (Gheorghiu et al., 2016)	"Measuring interoperable EHR adoption and maturity"	2016	10191 Physicians, 1690 Nurses, 447 Pharmacists	Canada	There is strong interest in to continued growth in EHR adoption in Canada.	Survey
Gagnon (Gagnon et al., 2016)	"Factors influencing the adoption of health information technologies"	2016	-	Canada	Ease of use, social impact, usefulness, attitudes, facilitating conditions are effective in the adoption.	Survey
Gagnon (Gagnon et al., 2016)	"Factors influencing electronic health record adoption by physicians"	2016	278 Physicians	Canada	Six of the individual level constructs had a positive significant impact on physician intention to use EHR	Survey
Beasley (Beasley & Girard, 2016)	"Physician EHR Adaption"	2016	10032 office-based physicians	USA	There were statistically significant differences in EHR adoption between two consecutive year pairs	Survey
Kruse (Kruse, Kristof, et al., 2016)	"Barriers to Electronic Health Record Adoption"	2016	-	USA	The most frequently barriers were, technical concerns, regarding cost technical support, and resistance to change.	Review

Tavares (J. Tavares & T. J. J. o. m. I. r. Oliveira, 2016)	"Electronic Health Record Patient Portal Adoption"	2016	360 responses	Portugal	The statistically significant drivers of behavioral intention are effort expectancy, performance expectancy, habit, and self-perception.	Survey
Sherer (Sherer et al., 2016)	"Applying institutional theory to the adoption of electronic health"	2016	4500 Respondents	USA	This study determines the impact of the institutional effect of industry norms and government policies on adoption.	Survey
Kruse (Kruse, Kothman, et al., 2016)	"Adoption Factors of the Electronic Health Record"	2016	-	USA	This study determines the 25 facilitators and 23 barriers to the EHR adoption.	Systematic Review
Mack (Mack et al., 2016)	"Disparities in Primary Care EHR Adoption Rates"	2016	100,000 providers	USA	Large practices and community health centers were more likely to EHR adoption (>80%) than rural health clinics (53%).	CRM software
Wang (Wang et al., 2016)	"Exploring physicians' extended use of electronic health records"	2016	205 Physicians	China	This study showed significant relationships between physicians' responses on the social influence measures and intentions to extend use of EHRs	Survey

Kök (Kök et al., 2016)	"Adoption factors of electronic health record systems"	2016	300 Practitioners	Turkey	Developed models	Semi structured interviews
Dinev (Dinev et al., 2016)	"Individuals' Attitudes Towards Electronic Health Records"	2016	217 Responses from USA and 188 from Italy	USA and Italy	This study showed that perceived effectiveness of regulatory mechanisms positively impact trust	Survey
Burke (Burke et al., 2016)	"The adoption of an electronic health record"	2016	537 Type 2 diabetic patients	USA	Found that EHRs did not improve the clinical quality of diabetic care after EHR adoption.	Multicenter longitudinal retrospective study
Frogner (Frogner et al., 2017)	"The Association of Electronic Health Record Adoption"	2017	330 Federal grant recipients	USA	EHRs appeared to influence staffing allocation in CHCs such that other health provider might be used to support EHRs adoption.	Using primary source of data
Beglaryan (Beglaryan et al., 2017)	"Development of a tripolar model of EHR acceptance "	2017	233 Physicians	Armenia	Tripolar Model of Technology Acceptance, bringing together three key pillars of the healthcare: practitioners, patients, and provider organizations.	Cross sectional survey

Odekunle (Odekunle et al., 2017)	"Why sub-Saharan Africa lags in electronic health record adoption"	2017	15 Papers	Sub-Saharan Africa	Strategies such as financial supports, implementation planning, training of primary users, appropriate EHR system selection, and the adoption of the phased implementation process have been identified to EHR Adaption.	Systematic Review
Adler-Milstein (Adler-Milstein et al., 2017)	"Electronic health record adoption"	2017	3538 Responses	USA	Use of EHR lags and a digital divide appear	Survey
Tavares (Tavares et al., 2017)	"Electronic Health Record Portal Adoption"	2017	597 Administrated	USA and Portugal	Identified critical factors for the EHR adoption and compared to Portugal adaption was significantly higher in USA	Survey
Tubaishat (Tubaishat & Care, 2018)	"Perceived usefulness and perceived ease of use of electronic health records"	2018	1539 Nurses	Jordan	The variables that predict usefulness were the professional rank, gender, computer skills, and EHR experience.	Survey

Vitari (Vitari & Ologeanu-Taddei, 2018)	“The intention to use an electronic health record”	2018	1741 Clinical employees	France	Self-efficacy, anxiety, trust influence ease of use; self-efficacy, ease of use, misfit, data security impact usefulness; ease of use contributes and usefulness to intention to use the EHR.	Survey
Sadoughi (Sadoughi et al., 2019)	"The used theories for the adoption of electronic health record "	2018	18 Papers	-	The EHR adoption have been executed in the developed countries by quantitative methods. Adoption of EHR is multi-dimensional, and in healthcare organizations affected by different types of factors.	Systematic review
Stephen (Odom & Willeumier, 2018)	“Attitudes and Perceptions of Behavioral Health Clinicians on Electronic Health Record Adoption”	2018	95 Physician	USA	The study Found that older clinicians are less likely to perceive EHRs as useful and perceived ease of use and usefulness of EHRs are positively associated with attitudes toward EHRs adoption.	Survey
Tavares (Tavares et al., 2018)	“Electronic Health Record Portals adoption: Empirical model based on UTAUT2”	2018	386 Patients	Portugal	The model explains 52% of the variance in behavioral intention (performance expectancy, effort expectancy, social influence, and habit)	Survey

Thit WM (Thit et al., 2020)	“User Acceptance of Electronic Medical Record System”	2019	112 Participants	USA	Electronic Medical Record System usage and network availability were low.	Cross sectional survey
Tsai (Tsai et al., 2019)	"Understanding physicians’ adoption of electronic medical records"	2019	217 Physicians	Taiwan and USA	perceived risk, Healthcare technology self-efficacy, and perceived service level are important antecedents of perceived ease of use EHR	Survey
Kanakubo (Kanakubo & Kharrazi, 2019)	"Comparing the Trends of Electronic Health Record Adoption "	2019	-	USA and Japan	Large hospitals tend to have higher EHR adoption rates whereas small hospitals have lower EHR adoption.	Cross sectional survey
Rasmi M (Rasmi et al., 2020)	“Healthcare professionals’ acceptance Electronic Health Records system”	2020	-	-	Founded on trust factors combined with the UTAUT2 model	Review
Williams (Williams et al., 2020)	“Adoption of an Electronic Medical Record”	2020	60 Providers	USA	Usefulness scores and Perceived usability correlated with provider intention to use the technology	Survey

Dutta (Dutta & Hwang, 2020)	"The adoption of electronic medical record by physicians"	2020	26 Articles	-	The top five barriers are as follows: "high start-up cost," "privacy and security concerns," "workflow changes," "lack of reliability," "system complexity," and "interoperability"	Systematic review
Wong (Wong et al., 2020)	"The Perceptions of and Factors Associated with the Adoption of the Electronic Health Record "	2020	762 Physicians	Hong Kong	Most participants were satisfied with the performance of the EHRS.	Survey
Ahmed (Ahmed et al., 2020)	"Intention to use electronic medical record: using unified theory of acceptance and use technology (UTAUT2) model"	2020	420 Health care providers	Ethiopia	40 % of participants were scored above the mean of intention to use EMRs. Performance expectancy played a major role in determining intention to use EMRs.	Cross sectional

Source: Own elaboration

1.6.7. Attribution in EHR Theoretical background

Adopting an EHR relies deeply on the finishing of the implementation process. Numerous papers considered to having a strategic plan that accounts for the costs size, governance, facility needs, and internal and external environments (Bezboruah et al., 2014; Cherry, 2011; Hamid, 2013). Review of the literature determines that user acceptance of EHRs is crucial to their success (Abdekhoda, Ahmadi, Dehnad, et al., 2016; Al-Adwan et al., 2015; Sadoughi et al., 2019; Williams et al., 2020). Lack of physician EHR acceptance has lead to termination of some previously implemented EHRs systems(Dutta & Hwang, 2020; Gagnon et al., 2016; Odom & Willeumier, 2018; Tsai et al., 2019; Wong et al., 2020). It is recommended that physicians differ from other types of technology users in their adoption attitudes. Understanding physicians' unique needs prior to Health technology system implementation such as EHR can help a healthcare facility to choose the best system and handle the implementation in a suitable way. Health care industry must be arranged to manage and anticipate the changes that will attend the EHR implementation. The analysis of papers shown that behavioral intention (BI) to use EHR is the most used factor in evaluating the acceptance. Consequently, healthcare providers and managers have to concentration on the users' intention to increase the level of acceptance, regardless of whether they are health providers or patients. Apart from the factors of UTAUT/TAM acceptance models, the analysis of studies showed that to understand the EHR acceptance other effective factors had been extensively utilized. Other factors include self-efficacy from the social cognitive theory(Bandura, 1977; Taherdoost, 2018), Trust(Rasmi et al., 2020), anxiety and computer, innovativeness(Tsai et al., 2019).

1.7. Research gap

Literature review on Health IOT technology, and EHRs systems shows some important research gaps that this study aims to address:

1: Adoption of Health IOT and EHR is challenging despite its benefits and it is international problem.

Studies show that the adoption of new technology has its challenges (Shaukat & Zafar, 2010). Some of the barriers has been identified for IOT acceptance and arrangement in Cisco (2017) study only 26% of projects in this area are completely successful and almost a third of respondents consider their completed projects unsuccessful. Healthcare IoT systems such as telemedicine and electronic healthcare systems have been used to monitor information and communication to enable remote care for patients at home or another place. Most of the projects (60%) faced trouble in the deployment stage or after this stage(Index, 2017). Most of the available studies showed that it is the problem of acceptance and use of IoT systems in healthcare(Alansari et al., 2017; Chakraborty, Bhatt, Chakravorty, et al., 2019; Chakraborty, Bhatt, & Management, 2019; Sivathanu, 2018; Umair et al., 2021; Zou et al., 2020).

According to the Jordan study, the physicians showed resistance to the new health technology acceptance(Al-Adwan & Berger, 2013). Just 37% of Canadian physicians use EHR system, position Canada last between the eleven countries surveyed Comparison of EHR users' perceptions of barriers and facilitators to implementing EHRs(Gagnon et al., 2016). Regardless of the quick access to the patient records, information that are available in the EHRs need the improvement of user skills of the system by nurses, pharmacists, doctors, and others. It is essential to ensure successful EHR acceptance between health providers But Researches showed that the level of acceptance of EHR systems is, low(Adler-Milstein et al., 2015; Alrawabdeh et al., 2015; Nakamura et al., 2010; Rasmi et al., 2020; Steininger et al., 2014; Wilkins, 2009). For example, the EHR acceptance in Saudi Arabian hospitals has a low ratio of less than 16%(Al-Adwan & Berger, 2013).

2: Technology adaption model (UTAUT2) need to be modified for more accurate and specific for different contexts such as electronic healthcare record.

The literature shows that the effect of different explanatory variables on the model in different studies is very heterogeneous, and there is still a need for regular research to

make the UTAUT2 model more accurate and specific for different contexts(Herrero & San Martín, 2017). The literature indicated that the effect of different explanatory variables on the model is very heterogeneous in different studies, and more research is still needed to make the UTAUT2 model more accurate and specific for different contexts (Herrero & San Martín, 2017). Only a few studies have entirely focused on Venkatesh's UTAUT2 model (Slade et al., 2013) and few studies have used UTAUT2 model in healthcare. A Literature Review of UTAUT2 shows that 17% of UTAUT2 articles were in the field of marketing, such as m-commerce, e-commerce, and social commerce, of which 13% were in social media, 13% in government service adaption, 13% in public sector context, and only 9% were in the health sector (Kułak et al., 2019).

3: There is a lake of studies on the adoption of the Internet of Things in healthcare systems and EHRs systems.

There is limited study in Health IOT (Tavakoli et al., 2017). while technology acceptance model have been showed in relative to other aspects of healthcare technology, still EHRs needs more consideration and study due to the limited number of researches reported in the literature (Angst & Agarwal, 2009; Lai et al., 2015; Or & Karsh, 2009; J. Tavares & T. J. J. o. m. I. r. Oliveira, 2016). As it showed in the popular of the reviewed papers comes from the United State and Canada and Saudi Arabia. Although there is researches in electronic health and a considerable expansion of healthcare related technologies in developing countries, there is limited study emerging from these countries. As shown in Figure 8, the geographic heat map indicates that there are no publications conducted in the most of countries.

4: Most studies have been quantitative and hypothetical while qualitative study is important to discover more factors and deeper investigation.

As shown in Table (**7)** In 67 papers that selected for analysis just 9 papers (13%) have been qualitative study. Qualitative research aims to "understand and explain beliefs and behaviors in the context in which they occur" and to characterize them as an "interpretive and realistic" (Draper, 2004). Qualitative research is suitable to discover more factors and deeper investigation.

5: Due to its complexity and differences in the type of technology application, the health system requires different factors in the admission models for example: patient-physician relationship be one of the effective factors in technology acceptance.

Kim et al. stated that various social and cultural contexts lead to differences in adaption function in health technologies (Kim & Kim, 2018). Mittal et al. also stated that studies are needed to identify factors affecting technology acceptance in various sectors, such as health care (Mital et al., 2018). Additional study is needed to development an evidence base to inform the development of health technology's (Bath, 2008) including EHRs, specifically to study the influence of external variables in technology acceptance of EHRs(Bath, 2008; Romano & Stafford, 2011; Walter & Lopez, 2008). If researches in these areas are expected, for the reason that this will appearance the variables that can be directed in educational campaigns and researches aimed to increase healthcare related technology acceptance in specific professional groups. Furthermore, based on Zheng and colleagues (2010) study, professional network such as the doctor-patient relationship, friendship networks based on personal intimacy, and a person's perception are the most important antecedents to electronic healthcare adoption(Zheng et al., 2010). Previous studies of systematic review have considered at individual factors affecting physician EHR acceptance (Burt & Sisk, 2005; Ford et al., 2006; Loomis et al., 2002; Menachemi, 2006), but just few employed a theoretical model. For the reason that physicians may perhaps differ from other forms of users in terms of technology acceptance, some researchers have recommended additional constructs to the model (Ayers et al., 2009; Succi & Walter, 1999; Yarbrough et al., 2007).

CHAPTER 2. RESEARCH OVERVIEW

2.1. Research problem

The acquisition factor of technology users is an essential principle in innovation dissemination methods. Nowadays, users' demand is prominent in terms of innovation (Edquist & Development, 2010). Innovation is not limited to the production of specific and advanced products. In the early stages of research and development, understanding and accepting consumer demand can be considered as innovation. Ignoring the concerns and expectations of consumers can lead to the problem of acceptance as an obstacle to the establishment of technology (ITU, 2005).

Many studies have indicated technology acceptance theory and proved it as an effective tool in predicting technology acceptance (Venkatesh et al., 2012). Consequently, studies on the acceptance of technology attempt to explain how new technologies are adopted using distinct theoretical approaches. The technology acceptance model is a modified form of the theory of action and recognizes factors affecting technology adaption. One of the newest and the most efficient technology acceptance theories is the Unified Theory of Acceptance and Use of Technology2 (UTAUT2), which is explained 73% variance of behavioral intention to use technology and 52% for user behavior (Kułak et al., 2019). UTAUT2 is designed to provide a rigorous framework specifically to explain the adoption and use of technology (Venkatesh et al., 2012) based on UTAUT theory (Venkatesh et al., 2003). The UTAUT2 model evaluates behavioral intent for the use of technology that is determined by seven explanatory variables, including performance expectancy, effort expectancy, social impact, facilitating conditions, pleasure-related motivation, and value for money and habit (Venkatesh et al., 2012). UTUAT2 has been used by numerous studies to examine the effective factors that influence technology intention to use besides acceptance (Alalwan et al., 2014; Arenas Gaitán et al., 2013; Baabdullah et al., 2014; Krishnaraju et al., 2013; Rasmi et al., 2020; Vinodh & Mathew, 2012; Xu, 2014; Yoo et al., 2015).

However, the literature indicated that the effect of different explanatory variables on the model is very heterogeneous in different studies, and more research is still needed to make the UTAUT2 model more accurate and specific for different contexts (Herrero & San Martín, 2017). Only a few studies have entirely focused on Venkatesh's UTAUT2 model (Slade et al., 2013) and few studies have used UTAUT2 model in healthcare. A Literature Review of UTAUT2 shows that 17% of UTAUT2 articles were in the field of marketing, such as m-commerce, e-commerce, and social commerce, of which 13% were in social media, 13% in government service adaption, 13% in public sector context, and only 9% were in the health sector (Kułak et al., 2019). Additionally, Kim et al. stated that various social and cultural contexts lead to differences in adaption function in health technologies (Kim & Kim, 2018). Mittal et al. also stated that studies are needed to identify factors affecting technology acceptance in various sectors, such as health care (Mital et al., 2018).

Moreover, one of the less considered factors in the design and deployment of health technologies is interpersonal communication, emotions, and feelings that are not used in technology adaption models. When doctors listen directly to patients, patients feel more relaxed and this leads to better treatment. Moreover, effective communication and empathy between doctor and patient positively affect reducing patient anxiety and depression as well as specific symptoms (Neumann et al., 2011). The relationship between physician and patient is very important in medicine, which has been described a one of the good activity in the health system (Lynch et al., 2007). Specifically, health care personnel have more usefulness and effectiveness health care by paying attention to the patient's feelings and symptoms (Van Dulmen et al., 2002).

Some studies showed that using computers in the checkup room as EHR system is a barrier to the efficiency of the patient -physician relationship and cause to neglect of patients (Gadd & Penrod, 2000; Hsu et al., 2005; Huber, 2001). However, some other studies recommended that EHR technology must be improved for impact at the patient -physician relationship, and some patients are even eager to use EHR (Baron et al., 2005; Huber, 2001). Nevertheless, some studies that examine patients' attitudes toward using

computers by physicians suggest that more studies are needed in this regard (Hsu et al., 2005; Wager et al., 2005).

Therefore, the main research problem of this study is to understanding health care technology Adaption while considering the:

- Acceptance of Health IOT
- Discover effective factors in EHR acceptance and modified UTAUT2 model for more accurate and specific for electronic healthcare record.
- Test new modified model

2.2. Research questions:

1. What are the factors affecting the acceptance of IOT technology among physicians in health centers based on UTAUT2 model?
2. Have do potential user perceive the adaption of IOT technology (Electronic Healthcare Records) among physicians in health centers?
3. Is the proposed model for the adoption of electronic healthcare record valid?

2.3. Research objectives:

1. Determinants of Physicians' Technology Acceptance for IOT in Healthcare Settings.
2. Finding new factors affecting Electronic Healthcare Records adoption in primary health care Settings.
3. Modified and validating a UTAUT2 model for Healthcare Settings.

2.4. Research hypotheses

In this section, appropriate hypotheses are assigned based on questions and research goals. The following hypothesis was proposed for First questions but second and third

question was answered after qualitative method. Following hypothesis is based on UTAUT2 models.

2.5. Determinants

According to UTAUT2 model and its determinants, the research hypotheses are as follows:

Performance expectancy

Performance Expectation (PE) is about the user's consideration. Using technology helps users improve their performance, and PE is the strongest predictor of technology intent (Wills et al., 2008). The authors described this behavioral intention as "the degree to which a person believes that the use of technology helps him/her to perform certain behaviors or tasks, which are beneficial for practical achievements, such as health care" (Wills et al., 2008). General performance is expected as a significant factor, which directly affects the intention to accept. Generally, healthcare providers choose technologies offering benefits in health-related tasks online (Alpay et al., 2010; Årsand et al., 2008; Keselman et al., 2008). Literature review shows that health care users tend more to adopt Health technologies that offer clear benefits, such as getting an electronic medical prescription by EHR systems(Alpay et al., 2010; Årsand et al., 2008). Therefore:

Hypothesis 1: Performance expectation (PE) have a positive effect on the behavior intention to adopt IOHT.

Effort expectancy (EE)

Effort expectancy (EF) is the extent of the facility regarding users' communication with a particular technology. The easier to use and understandable technology in healthcare , cause to patients more likely to use it (Alpay et al., 2010). Therefore:

Hypothesis 2: Effort expectancy (EF) have a positive effect on the behavior intention to adopt IOHT.

Facilitating conditions

Facilitating conditions refers to consumers' perception of the resources and support available to perform a particular behavior (Venkatesh et al., 2003). A possible barrier to use of health technologies is the lack of resources or support services that allow users to properly access and use these types of technologies (Higgins, 2006). Our literature review reveals that patients with chronic illness or disability are more likely to use health related technologies if they have the resources and support available(Millard et al., 2002; Thackeray et al., 2013). Therefore:

Hypothesis 3: Facilitating conditions (FC) have a positive effect on the behavior intention to adopt IOHT.

Price value (PV)

The Price value (PV) in the UTAUT2 model is defined as the technology user's perception of the proportion of technology's perceived benefits and the monetary cost of using it. Using remote services of health technologies can save time and money by preventing unnecessary travel to the clinic or hospital. Accordingly, it can be argued that the value of the price can be a strong determinant factor in the acceptance of technology for healthcare technologies**.** If patients could save costs by avoiding a trip to hospital or health center, they more likely to adopt it(Alpay et al., 2010); elder persons tend to give more importance to price in health related technologies(Peek et al., 2014)**.** Therefore:

Hypothesis 4: Price value (PV) has a positive effect on the behavior intention to adopt IOHT.

Hedonic motivation (HM)

Hedonic motivation (HM), is associated with the motivational principle that people pursue pleasure and avoid pain(Higgins, 2006; O'Brien, 2010). Extensive analysis has been done in physiology and cognitive behaviors on Hedonic motivation(Higgins, 2006; Venkatesh et al., 2012). Health care research literature shows that people who use more health and e-health services have more serious health problems than their health. In fact, the motivation for using health technologies is often to avoid pain (Carron-Arthur et al., 2016; Higgins, 2006; Lee et al., 2010; Menec et al., 1999; Wilson & Lankton, 2004; Ybarra & Suman, 2006).

Hypothesis 5: Hedonic motivation (HM), Habit has a positive effect on the behavior intention to adopt IOHT.

Habit

Habit can be considered a concept that people tend to do behaviors automatically due to learning (Chang & Tseng, 2013). Recent studies have shown a positive effect on acceptance regarding habits in health technologies, such as e-Health and electronic healthcare information records (J. Tavares & T. Oliveira, 2016; Yuan et al., 2015). Therefore:

Hypothesis 6: Habit has a positive effect on the behavior intention to adopt IOHT.

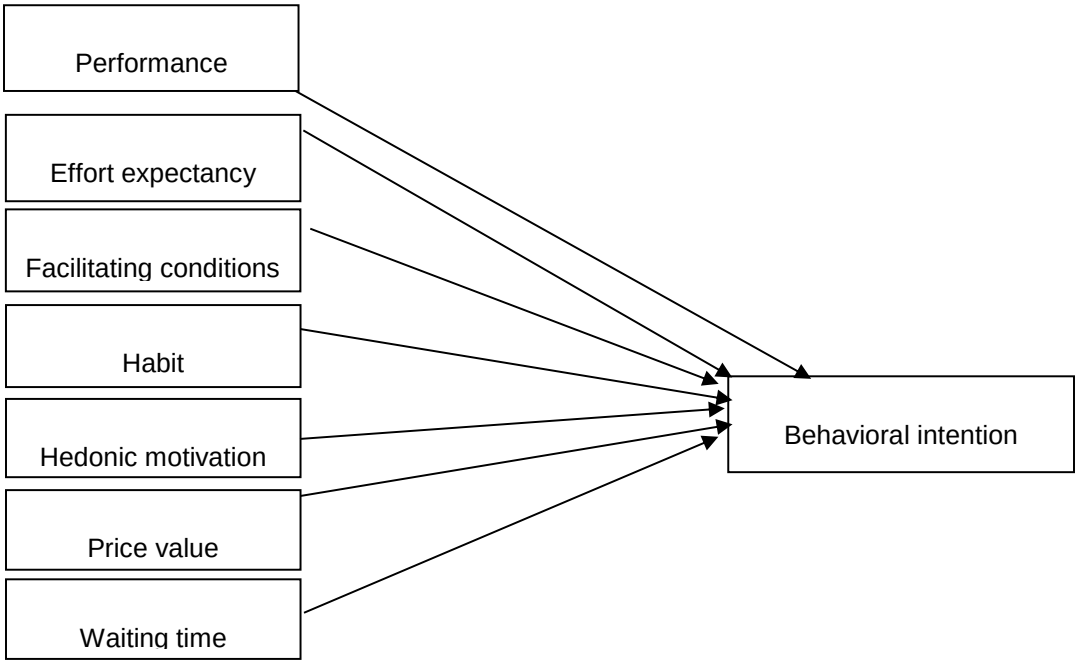
Waiting time (WT)

Resistance is more likely to occur when technology negatively affects job roles, professional status, and independence *(Abdekhoda et al., 2015; Walter & Lopez, 2008).* Fundamental changes in consumed time by technology affect health providers' intention to use *(Abdekhoda et al., 2015).* Therefore:

Hypothesis 7: Waiting time has a positive effect on the behavior intention to adopt IOHT.

Figure 11 illustrates the initial conceptual model including the independent variables (Performance, Effort expectancy, Facilitating conditions, Habit, Hedonic motivation, Waiting time, and Price value) and the dependent variable (Behavioral intention).

Figure 11. Initial conceptual model is illustrated



Source: Own elaboration

2.6. Research setting

This research employed a mixed method as the research strategy using quantitative and qualitative methods. Johnson & Onogbozi (2004) refer to it as "a type of research in which the researcher mixes quantitative and qualitative research methods, techniques, approaches, concepts, and language" (Johnson & Onwuegbuzie, 2004).

This thesis was conducted in three studies. First study aimed to investigate factors affecting the acceptance of IoT technology in the Iranian health system using the UTAUT2 model.

Second study were conduct semi-structured interviews. Depth interview, and taking advantage of exploration and follow-up opportunities provide items that arise in the interview (Nunes et al., 2010). Then, factors affecting the adoption of IoT technology in health systems (the electronic healthcare information record system in Iran) were discovered and created a model based on the qualitative data collected from the interviewee and the focus group. Finally, the model was run in a quantitative study.

The strategy of mixed methods has been used in various organization and management research studies. The discovery of phenomena in more detail and the testing of emerging theories (Creswell & Creswell, 2017) are used to identify significant variables entirely consistent with the research purpose. Figure 12 showed the implementation of the research algorithm.

Figure 12. The implementation of the research algorithm

Source: Own elaboration

Research domain

Time domain: In terms of time, the research started in 2019 with a library review and has continued until 2021.

Place domain: The location study was conducted in in the Iranian health system and the results of data analysis belong to this field, which is can be generalized and can be the source of future research.

2.7. Definition of research terms

Technology acceptance: There are two basic theories for accepting any technology. In the first theory, the behavioral intention of individuals is discussed regarding the use of that technology. The second theory explores the individuals' attitude, mental norms, and behavior control regarding the new technology. Views and attitudes about new technology and norms lead to use or not to use in using this technology for a person. These theories form the basis of the technology acceptance model, which has been used by different people for many years. This model determines to what extent technology can be accepted by society. Thus, the user understands that the new technology is useful, which can change person's attitude to start using it and eventually lead to using that technology in user behavior (Karahanna et al., 2006).

IoT: The IoT is a network that connects various objects to humans with the help of communication and wireless technology (Ali et al., 2015).

Electronic healthcare record: is one of the IoT systems in health care used in Iran, which provides remote health services. Information related to a person's physical or mental health or condition is recorded in electronic systems to obtain, transmit, receive, store, retrieve, connect, and manipulate multimedia data to provide primary health care and related health services (Häyrinen et al., 2008). The classification for the EHRs widely varies: computerized patient record, digital medical record, electronic medical record, etc. it is important that before definition of EHR have a clear insight of the technologies that support EHRs. First one is patient portal. Its health related application that help patients to communication and interact with health care workers (Ancker et al., 2011; Weingart et al., 2006). Source of patient data in digital form, exchanged securely and stored is the second one which is named EHR portal. EHR is the specific platform the doctors and health providers use it to create, update, store and keep EHRs for patients (Angst & Agarwal, 2009). EHR portal is a Web-based technology that syndicates a patient portal and EHR system not just for interact patients and health care providers, but as well to access patient's medical exam results and medical records(Ancker et al., 2011; Angst &

Agarwal, 2009; Knaup & Schöpe, 2014; J. Tavares & T. J. J. o. m. I. r. Oliveira, 2016; Weingart et al., 2006).

Some other definition of Electronic Health Record (EHR)

- "The concept of EHR comprised a wide range of information systems, from files compiled in single departments to longitudinal collections of patient data"(Häyrinen et al., 2008).
- "An **electronic health record** (**EHR**) is the systematized collection of patient and population electronically stored health information in a digital format"(Gunter & Terry, 2005).

Types of electronic health records

- *Electronic Medical Record (EMR)*

"EMR has been in evolution for several decades now but continues to grossly miss the intended mark of efficient and personalized patient care"(Honavar, 2020)

"Electronic Medical Records (EMRs) are defined as computerized medical information systems and in advance seems to change the existing, often paper based, medical practice"(Abdekhoda, Ahmadi, Dehnad, et al., 2016).
"Collecting, sharing and having access to patients' clinical information are attainable by EMRs as they are acknowledged as the tools to create legible and structured records of patients' information" (Boonstra & Broekhuis, 2010b).

- *Electronic Patient Record (EPR)*

"EPR is a place where patients' medical notes are recorded"(Swinglehurst & Medicine, 2014).

2.8. Practical contribution

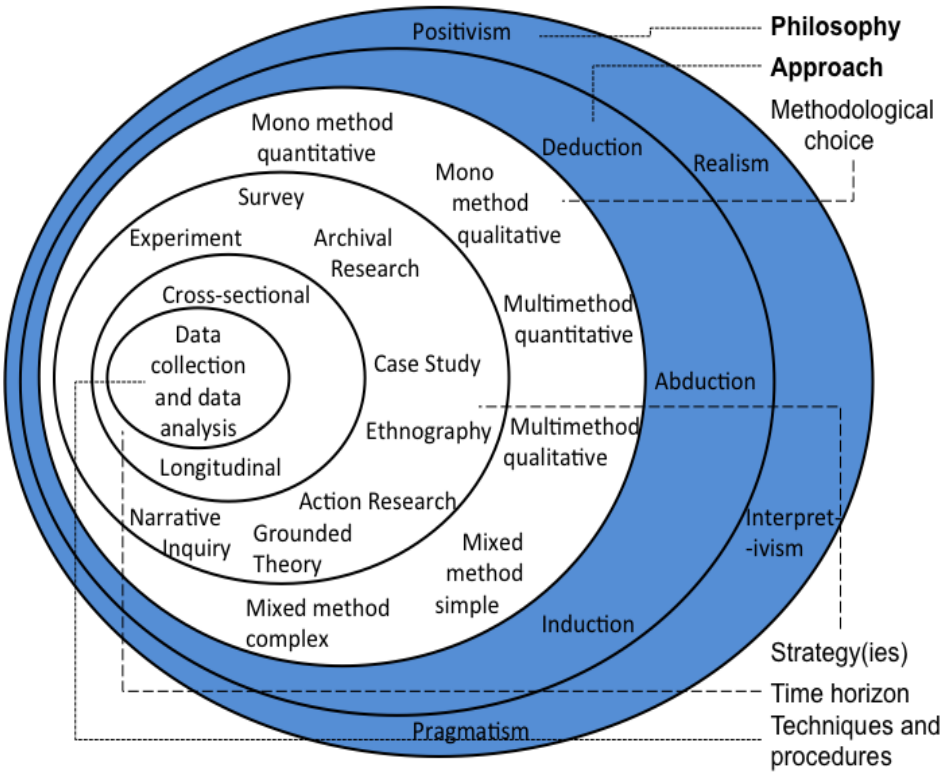
Theoretical findings, development, and validation in this dissertation provide a framework, including factors affecting the adoption of health technologies, theoretical foundations for designing and selecting appropriate technology in future health care before entering the market, or fixing the following acceptance problems. The practical contribution to this dissertation is tripartite:

- Investigating and informing the effective factors in adopting the appropriate technology of users in health care systems to help manufacturing companies,
- Help marketers and,
- Guiding public health managers and planners to implement better policies or strategies to improve the compatibility of health technologies and evaluate the efficiency of technology allocation in the health care sector.

2.9. Research Methodology

Research is a systematic approach with questions that can be answered. A research method is also a set of valid, reliable, and systematic rules, tools, and methods for examining facts, identifying ambiguities, and finding solutions to problems. The methodology makes the research results valuable and cited is a structural, purposeful, and scientific research method. Adoption of improper method leads to useless results for researchers and users. Therefore, it is necessary to adopt a logical method to achieve optimal results. This section begins with a selection of research methods, description of those methods. The researcher should choose the research strategy according to the research approach and then, collect and analyze the appropriate data. The onion model is used in this research, which will briefly refer to each loop of this model and determine the position of the present research in each loop. The onion model considers several aspects, including data analysis, data collection, time horizon, research objectives, research strategies, research philosophy, and research orientations to explain the research (Saunders et al., 2012).

Figure 13. Onion model



Source: Saunders, N, Lewis & Thornhill, a (2012) Research Methods for Business Students, 6th Edn, Pearson

2.10. Research Philosophy

Different sciences and disciplines can answer the same question, but each discipline has a specific perspective. For example, problems, such as unemployment, addiction, inflation, dropout, sales decline, customer drop, study decline, illness, water crisis, etc. can be studied by sociology, psychology, medicine, social sciences, political science, management, the environment, information science, and so on, and each science, can provide different and practical solutions to these problems based on its principles and theories. For example, psychologists, social sciences, information science, management, and even political science can study the unemployment problem.

The four research philosophies/paradigms are positivism, realism, interpretivism, and pragmatist. These philosophies differ in terms of answering three basic questions about ontology, epistemology, and methodology, including "What is the reality of a phenomenon? What is the nature of cognition about the reality of this phenomenon? And, how does this come about? Thus, the researcher implicitly reveals which of the paradigm perspectives has the basis for acquiring knowledge. In addition, the research design reveals the required skills and other relevant research assumptions. The present research is based on the interpretive paradigm in the qualitative phase and the positivist paradigm in the quantitative phase.

2.11. Research orientation

Each research is purposefully divided into one of the basic and applied type.

1. Basic research is a kind of theoretical research for developing knowledge based on the scientific purposes, which is a kind of Knowledge Utilization. Therefore, basic research is a kind of theoretical study (Kumar et al., 2013). This type of research is widely used because it paves the way for other studies. Thus, fundamental research is a type of theoretical study.
2. Applied research is conducted to solve an essential problem in a community and an industrial, or administrative organization. The problem here is not essentially a defect, but an addition to the body of knowledge (Kumar et al., 2013). This research has the characteristics of basic research, such as sampling techniques and their subsequent inference in the general public. However, the research objective is to produce a product or process to test and explain concepts in the true sense. The basic research is more critical than applied research because it forms the basis of an applied research. In other words, applied research cannot be processed without a proper foundation in basic research. According to policymakers, practical research, even partial, is carried out due to its ability to respond to community's current social and economic problems (Kumar et al., 2013). Most of the students use this method for their dissertations in the form of applied studies.

3. The case study is a contemporary (simultaneous) phenomenon within its contexts (concepts), especially when the boundary is not visible between the phenomenon and its contexts (Woodside, 2010). Therefore, the case study is an experimental study that examines a particular case.

IoT technology has not yet been developed in Iran, and its practical experience in the healthcare sector is limited, and the IoT acceptance rate in Iran is low (Ghasemi et al., 2016). The present study tried to identify the factors affecting the adoption of IoT technology in healthcare systems, such as electronic healthcare information record systems in Iran. Therefore, the compatibility of users with the electronic healthcare record helps in health care and knowledge development in this regard. Since the present study aimed to identify the factors affecting the adoption of technology in health, it can help explain why and how health technology users adapt to health care and develop the related knowledge. Moreover, this research can be a good guide for healthcare technology manufacturers and decision-makers to select or correct the appropriate and efficient technology. Therefore, the present study is both basic and applied research.

Table 8. The main differences between of Applied and Basic research

Applied research	Basic research
It deals with the production of knowledge for act	It deals with the production of knowledge for greater understanding.
Deals with social or practical issues.	Deals with theoretical issues.
The main goal is to deliver practical results and use results.	The main purpose is to contribute to theoretical and fundamental knowledge.
The results are urgently needed.	Using those results has a long-time frame.
Researchers are more pragmatic and look	

for reform and change. Research is part of the work and is judged by those outside the field of sociology. Research topics are confined to the demands of managers and agents. Scientific criteria and criteria depend on the use of results. Research can be expeditious or may meet high scientific standards The main interest lies in the possibility of generalizing the findings to the areas of interest of the custodians.	Scholars are more academically motivated. The research is satisfying in itself and is being judged by other sociologists. Research issues and topics are selected freely and open-handed. Judgments about research are based on the absolute norms of scientific logic and the highest scientific standards are considered. The main interest is in the internal logic and coherence of the research design.

Source: Own elaboration

2.12. Research approach

Scientific theories should be tested to see whether it is conformed or rejected. If a theory can be confirmed and known as a fact, many other facts could be concluded. Selecting a research method is a crucial decision because the advancement of knowledge in social sciences is possible only with these approaches. There are two research approaches in the social sciences:

1- **Inductive approach**: It starts with collecting data and then, generalizations based on inductive logic. The purpose of this approach is to determine the nature of orderly sequences in social life to answer what and why questions (mostly what).
2- **Deductive approach**: It begins with a particular orderly sequence, which has been discovered to be explained. In other words, a theoretical argument for social behavior or phenomena has been observed. This approach is especially appropriate for

answering why questions, and developing and testing hypotheses are based on existing theory.

In summary, the deductive method of one or more theories is developed and a strategy is employed to test it. In the inductive method of collecting information and data, a theory is developed based on the analysis of this data (Saunders et al., 2012). Both research approaches have been used in this study. Thus, the inductive approach was used in the qualitative phase and the hypothetical-deductive approach in the quantitative phase.

Research from the perspective of the target

The four research objectives of discovery, description, explanation, and prediction can be intertwined. Discovery is usually preceded by description, which needs to be explained or predicted. The importance of description in research is often underestimated, and the explanation of the ultimate objective is known, but there will be nothing to explain without sufficient description. It is essential to know what they are before trying to explain regular patterns or sequences (Saunders et al., 2012). The following questions are related to research objectives:

- Discovery: What could be happening? Who is involved in it? In what way?

- Description: What happens? Who is involved in it? In what way?

- Understand: Why does it happen?

- Explanation: Why does it happen?

- Prediction: What will probably happen?

- Change: How to put it in a different direction?

- Evaluation: What Happened? Why did it happen?

Impact Assessment: What were or could be the social, environmental and individual consequences? Why have these consequences happened?

Understanding, explaining, and evaluating impacts are the only objectives that require questions like why. Change is the only purpose that requires questions like how. Prediction, description, and discovery are also questioning that require questions. As explained in previous section, the stages of this research include exploratory, descriptive, and hypothesis testing.

2.13. Selection of research method

There are three main options in the types of research data, including qualitative method, quantitative method, and mixed method.

In the quantitative method, the data is converted into numerical data, usually collected through questionnaires using scales, such as Likert, Bogardus, Thurston, etc. The audience chooses the researcher's sentences and questions to select through the numbers.

In the qualitative method, data is collected in sentences, signs, colors, facial expressions, and behaviors such as interviews and data observation. These data have less ability to be converted to numbers, so they are analyzed in the same way they were collected.

The proponents of quantitative and qualitative research have a long-standing challenge. The idea of combining quantitative and qualitative methods in a single method was proposed in the 1990s in different ways (Creswell et al., 2003). In mixed methods, both qualitative and quantitative methods may be used depending on the subject and research. There are many reasons to use mixed methods. Qualitative or quantitative methods are sometimes insufficient for effective study due to the complex nature of social and health research problems (Creswell & Creswell, 2017). In this dissertation, a mixed method was conducted (in studies 2 and 3) to find factors, modify the model, validate, and test, using a series of qualitative and quantitative research methods. The results of the qualitative stage provide an experimental base and research model that has been tested and validated by a quantitative study (Venkatesh et al., 2003). In qualitative methods, the researcher tries to find answers to questions such as "what," "how," and "why" phenomenon, while quantitative methods allow him to access questions related to "how many" or "how" (Palinkas & Psychology, 2014).

Reasons for using the mixed method

Overall, the reasons for using mixed research methods can be summarized as follows:

Triangulation: The research results increase reliability by linking quantitative and qualitative data.

Complementarity: To enhance the interpretability and meaningfulness of research results by reinforcing research strengths and neutralizing possible biases.

Development: To enhance the validity of results by reinforcing the inherent strengths of the research method.

Initiation: To increase the depth and breadth of research results and interpretations by analyzing various aspects.

Expansion: To increase the scope of research by choosing methods that are best suited for conducting research that has various aspects.

Integrity: Combining both quantitative and qualitative approaches make for more research, and a more comprehensive picture of the phenomena under study.

Provide a stronger conclusion: Many researchers believe that using a hybrid approach eliminates the limitations of each of the quantitative and qualitative approaches and strengthens their strengths and results in more accurate inference.

Answering different research questions: Using mixed method answers questions that qualitative and quantitative methods cannot answer, and also provides a range of tools to achieve research goals.

Explanation and Description of research findings: Users of qualitative method uses one approach (quantitative or qualitative) to explain findings obtained through another (quantitative or qualitative) approach.

Developing a Hypothesis and Testing: Using a qualitative approach may generate hypotheses, and can be tested and studied using a quantitative approach.

Developing and testing tools: Qualitative study may produce items that can be included in the questionnaire and used in quantitative research.

2.14. Research Design: select the type of mixed method

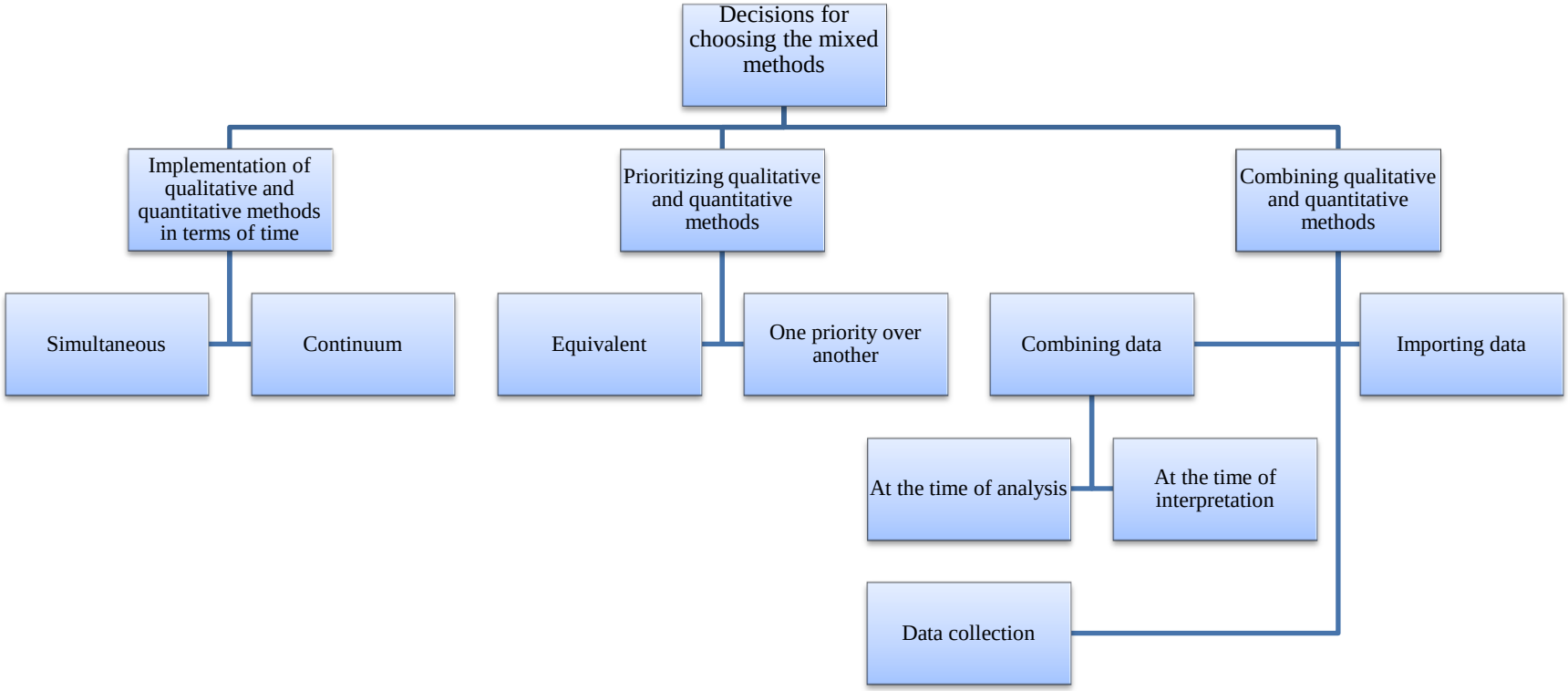
Decisions for choosing the mixed methods

As mentioned, the heuristic method is used in this dissertation in studies 2 and 3, which is one of the main methods of hybrid studies. other mixed method designs are explained as follows before explaining this method (Creswell et al., 2007).

Making three important decisions before choosing one of the methods of mixed research

- The first decision is whether the steps in the quantitative and qualitative methods coincide or in chains;
- The following critical decision is whether both methods (quantitative and qualitative) have equal priority and importance;
- The third key decision is to determine where each of the quantitative and qualitative methods combine.
- The results of one study have shown that two-thirds of the studies are carried out in chains, in the majority of them with little methodology priority, and the combination of these two often occurs at the interpretation stage rather than at the analysis stage.

Figure 14. Choosing a particular type of mixed method



Source: Own elaboration

Typology of mixed methods

Generally, four main designs are presented for mixed methods (Creswell & Creswell, 2017), including the Triangulation Design, Embedded Design, Explanatory Design, and Exploratory Design.

1- The Triangulation Design: this design is the most common and most popular combination of methods (Creswell et al., 2003) to obtain different, but complementary data on a similar subject with a better understanding of the research problem (Morse, 1991). In this design, the researcher gives equal weight and importance to each quantitative and qualitative data, collects and analyzes them, and finally uses the results and findings to interpret (Patton, 1990). This design is used when the researcher intends to support and reinforce the simultaneous results and findings of two different quantitative and qualitative methods in a single study (Morgan, 1998).

2- The Embedded (Nested) Design

One of the two quantitative or qualitative methods in this plan takes precedence over the other. This means that less priority is given to the previous method and failed to answer the question. The role of the secondary data is complementary.

3- Explanatory Design

In this design, the researcher prioritizes the collection and analysis of quantitative data and uses qualitative data to describe and interpret various aspects of what is quantitatively explained. This project will be useful when unexpected results in the first stage or certain participants are worried (Morse, 1991). The two-step implementation of explanatory plans has several advantages. The researcher has the advantage of collecting only one type of data, which simplifies the research.

4- Exploratory Design

In this design, the researcher prioritizes collecting and analyzing qualitative data and combines qualitative findings and quantitative results in the interpretation phase. The

main purpose of this project is to discover the phenomenon (Creswell & Creswell, 2017). According to Morgan, this strategy is appropriate when the researcher seeks to test emerging theoretical components, which are derived from the first phase of the research. According to Morse, one of the purposes of using this project in theory based on research methods in doctoral dissertations is to determine the distribution of specific phenomena in a given community, which can also develop and test a tool for measuring phenomena (Creswell, 1999).

The qualitative stage in this dissertation led to the discovery of factors affecting the improvement and impact of health technology user acceptance in the health care system (electronic healthcare record) that were not mentioned in the existing extraction models. This is one of the first attempts to mix cognitive and emotional factors to explain healthcare system technology. According to the critical themes in the reports of the interviews and focus groups, a research model was designed and tested, which was obtained using surveys to confirm the factors influencing the acceptance of electronic health records. This type of mixed-method, which includes stages 2 and 3 in this dissertation, is an exploratory method.

Using exploratory design - typology model in the second and third study

According to the final purpose of this research, it was appropriate to use the exploratory method of typology modeling. The use of exploratory design has strategic strengths. Since this project is done in two separate phases, each phase is run independently and reported. Despite the emphasis on research in the qualitative dimension of the project, the quantitative stage makes it acceptable to a quantitative-oriented audience. This design can easily be used for multi-stage research studies in doctoral dissertation management, which is time-consuming due to the multi-stage design. The strategy of hybrid methods or heuristic methods has been used in various organization and management research studies. This design is used to identify critical variables, explore the phenomenon in more detail, and test emerging theories (Creswell & Creswell, 2017), which is entirely consistent with the purpose of this research in detail in the literature review.

2.15. Statistical population

One of the IoT systems in Iran's health care is the electronic health care information record system, which has not been accepted and implemented to date. Therefore, the statistical population was health system employees who provide health services to the people, including all physicians, psychologists, nutritionists, midwives, health experts, and caregivers. Statistical samples in the qualitative stage were between health system experts, including those directly or indirectly associated with the electronic health care information record (which is known as the Apple system in Iran). These participants included officials and professionals in various service groups and levels who had at least ten years of work experience and a master's degree. In the quantitative the statistical population was all physicians who engage directly with EHR; therefore, the statistical population was 15000 physicians. The sample size was determined using Cochran's formula. Considering that the statistical population, the sample size that was obtained with an error of 0.05 volume equal to 375 Sample, finally the number of questionnaires answered was 417.

2.16. Data collection and analysis

2.16.1 In qualitative

Interviews

Thus qualitative investigation aimed to "understand and explain beliefs and behaviors they occur," and its characteristics are "interpretive and naturalistic" (Draper, 2004). A qualitative method was used to understand the factors affecting users' intention to electronic health care information records.

Qualitative data collection was performed using semi-structured interviews and focus groups on realizing electronic health care information records from users' perceptions and identifying their specific determinants. Qualitative research aimed to "understand and explain beliefs and behaviors in the context in which they occur" and to characterize

them as "interpretive and realistic". The statistical sample was 24 health providers, included eight physicians, three specialists (Pediatricians, Gynecologists, and Psychiatrists), four nutritionists, five health care providers, and four chief executive officers (CEO) who purposefully selected.

At the first of each meeting, the study topic was fully explained to the participants with an introduction. All participants had used the electronic health care information record. Interestingly, participants also provided feedback on their patients' experience during using electronic health care information record. Interview locations were based on participants' workplaces or their required location. At the beginning of the interview, conscious consent was confirmed confidentiality, and privacy. The interviews took about 30 to 60 minutes in which participants were asked about additional information or related topics that were not discussed. Seven steps were used, including Topic, Design, Interview, Transcription, Analysis, Confirmation, and Report to collect and analyze the interview data.

Finally, the interview results were used as a basis for FGD questions to guide the Focus group discussion.

Data were collected from October to December 2019. In addition, additional information was collected through virtual communication with some participants to collect more data about the Covid-19 pandemic impact on electronic healthcare record after the Coronavirus pandemic in March 2020.

2.16.2 Qualitative Analysis

In this study, the content analysis method was used, and the analysis process was in six following steps:

Step 1: Introduction of the data. Researchers must immerse in data to understand their depth and scope. Data immersion involves "repeatedly updating data" and actively reading data (searching for meanings and patterns).

Step 2: Create an initial code. The second step begins when the researcher reads the data to become more familiar. This step involves generating basic data codes, which show a data attribute on the analyst's opinion. Encrypted data differs from analysis units (themes), which are analyzed by taking notes on the text and using coloring. The codes were first identified and then, matched to the summary of the data presenting the code. The critical point at this stage is data summaries and classified in codes.

Step 3: Search for themes. This step involves sorting different codes into potential themes and sorting all the data encoded in the specified contents. The researcher begins by analyzing code and considering how to combine different codes to create a general theme. Second, the validity of the themes concerning the data set was considered.

Step 4: Review the themes. The fourth step begins when the researcher creates a set of themes and reviews them. This step consists of two stages of reviewing and refining the themes. Secondly, the validity of the themes was considered concerning the dataset. When the map of the themes fits in well, the research goes forward to the next step. However, the researcher must return and continue coding until a fitting map is created when the map does not fit the dataset well. At the end of this phase, the researcher must have sufficient knowledge of the different themes, how they fit together, and the whole story they tell about data.

Step 5: Defining themes. The fifth step begins when there is a fitting map of the themes. At this step, the researcher defines, redefines, and reviews the themes presented for analysis, which is specified by defining and reviewing the nature of a theme to determine its data.

Step 6: Reporting. This stage begins when the researcher has a set of fully prepared themes, including final analysis and reports writing. Then, two different researchers controlled the coding and analysis to ensure the validity of the results.

2.16.3 Validity and Reliability

The validity and reliability were measured by the participants' control methods and controlled by researchers who were familiar with qualitative research. A part of the text and the initial codes were shown in control by the participants. The degree of homogeneity of the researcher's ideas was compared with the participants' opinions. In the researchers' control method, the concepts and themes created from the data were presented to researchers familiar with qualitative research. Researchers control the proportion, and re-analyze and conceptualize the data in the case of disagreement between colleagues and the researcher return it to colleagues until their approval. Furthermore, focus groups have been used to validate and finalize the extracted themes and model development.

2.16.4 Focus Group Conduction

A Focus group is a qualitative interview technique to create interaction between group members to stimulate deeper discussion and expose different and new aspects of the topic. One of the characteristics of focus group interviews is the interaction between group members (interviewers) that strengthens the desire to think and exchange attitudes and ideas. However, they may not be readily apparent during a person's direct interview sessions (Kitzinger & Barbour, 1999). Focus groups are different from nominal, Delphi, and brainstorming groups. In this way, researchers do not meet members of an organization individually, such as nominal groups. Unlike Delphi groups, focal groups do not usually consist of trained experts. The focus group researcher can obtain more information in less time than the face-to-face interview. Focus groups can be used as an independent approach or as a way to complement other approaches, especially for data adaptation of different approaches and data validation (Morgan, 1998).

The purpose of conducting focus groups:

• Analyzing products, services or processes to improve or identify, clarify, describe and correct the problem.

• Assessing and evaluating a process to correctly identify it.

• Providing real information as a guide to decision making, replacing ideas and focusing on existing data.

• Building a shared knowledge base on a problem or topic, consumers and other target groups in relation to a wide variety of different topics and issues.

• reflect knowledge expanded from one group to another group.

Number of focus groups members

Researchers do not have the same opinion about the number of participants in the focus groups. Some believe the group should be between 12-4 people when homogeneous and between 6 – 12 people for heterogeneous groups (Brown, 1999). Determining the number of focus groups required for a survey is more complicated than selecting the number of participants in each group, and no one outside the research group can make a decision. Perhaps the best way is sequential execution, focus groups as long as the participants' topics are not duplicated and no newer information is obtained.

Implementation of FGD

Preparing relevant questions. Questions must be carefully designed. About 5 to 6 questions are enough for a focus group session (the number of questions should be less than 10). The results of the first interview were used as a basis for FGD questions. A question guide was developed to guide the focus groups, each related to the seven determinants of UTAUT 2. The two researchers divided the roles when the focus group action began. One of them played the role of the presenter, listened carefully, and managed the dynamics of the group. The assistant supervisor was responsible for recording the session, taking notes, observing body language, and other notable aspects during the discussion. The executer assistant did not interrupt the discussion during the group and allowed the discussion to continue freely. The executer assistant also assigned numbers to participants (P1, P2, etc.) used during transcription and analysis to ensure

anonymity. At the end of each session, participants were asked if they had any problems following up to complete the required information. This method ensured that more information could be collected even after the FGD, and a report was prepared after the first session. At this stage, the factors that attracted 50% of the positive opinion of experts were selected using the voting method from the sum of extracted factors and domains extracted from the previous steps. Once determinants have been identified, additional determinants may be added or removed from the model in the analysis process.

Focus group analysis and report

After the first session, qualitative data were classified based on the content provided by the participants in the focus group. Duplicate categories were removed, new items were added, and participants were presented with the initial conceptual model and final dimensions extracted. At this stage, the data are analyzed, and the answers are categorized and used.

At the beginning of the second session of the focus groups, the researcher showed the modified model in interview results and the first session to the participants for exploitation purposes. The purposes were:

1. Confirming the mentioned concepts by the respondents,
2. Exchanging ideas about conceptualization - the sequence and links between the former and the latter, if applicable;
3. Discussion of new factors presented by respondents can be added to the proposed conceptual model.

Both FGD sessions were transcribed and analyzed after recording. Incomplete sentences and colloquial sentences and words are transcribed so that the original meaning of what the participant said does not change. The next step was to classify the responses after the focus group transcription was completed. Both researchers went through this process separately to ensure that bias was prevented. Each question was related to a category that was related to a specific determinant. Then, the categories were examined in more detail, and their relationship with the relevant general determinant was examined. In addition, the assistant's mentioned observations during the focus group discussions included

aspects such as participants responding, hesitating or laughing, or shaking their heads in response. Zero categories were given to eight people to categorize each response. The ranking began with the importance of the answers to the individual questions at the end of the categorization. This ranking has been used as a mechanism for coding and sorting the final dimensions.

2.17 Quantitative Analysis

The UTAUT2 questionnaire was used for collecting data in the first quantitative study, which was used and confirmed by previous studies. This questionnaire was used with minor changes appropriate to health technology. In the third stage, a researcher-made questionnaire was used based on qualitative phase results. The validity and reliability of the questionnaire were assessed. At the beginning of the questionnaire, explanations about health technologies and their applications and healthcare examples were pointed out. The Likert scale was used for measurement. The inclusion criteria were having the experience working with one of the IoT technologies, especially electronic health care information record, being a physician, having informed consent, and incomplete completion of the questionnaire as exit criteria. Moreover, the structural equation modeling test (SEM) was used for data analysis and testing of research hypotheses. Cronbach's alpha was applied to evaluate the model reliability of coefficient. The fit of the proposed model and the validity of the theoretical studies model questionnaire was measured using PLS 3.0 software. The PLS method is commonly used to explain the variance of the research model and to identify critical structures (Götz et al., 2010). The content validity of the questionnaire was assessed by university professors and experts, and then, the construct validity of the questionnaire was assessed using confirmatory factor analysis. All standard factor load values of items are greater than 0.4. therefore, the questions have good explanatory power. Cronbach's alpha of each variable was greater than 0.7, indicating high reliability.

Summary

This thesis organized firstly the theoretical framework, mainly in health technology's adaption specially UTAUT2. Second, describing the methodology and research design. Third, presents finding and discussed and modified the research model as explored in qualitative step. Third run a model in healthcare systems. finally, Conclusion up the finding. Furthermore, the methodology and identified the research method were introduced. The researcher used a qualitative study to confirm the factors influencing adaption. New structures were used in the final model, which became the basis for modifying the final research model. We used the quantitative phase to present the existing hypotheses and survey the research model development presented in the qualitative stage. The method of collecting information to start the research, as well as qualitative and quantitative data to advance the research, types of statistical tests to use to achieve the best and most accurate result, introduction of data collection tools, and review of data collection tools were explained. In the next chapter, the results of the activities of this chapter were presented.

CHAPTER 3. FINDINGS

Information analysis is one of the crucial stages of research to judge the accuracy of research questions. Therefore, the researcher must use different statistical methods to answer the questions. For this purpose, the methods described in Chapter 3 were used to analyze the results of descriptive, analytical, and inferential data. This chapter aims to describe the qualitative results of interviews and statistical analysis of the quantitative data. In this chapter, the collected data were categorized and analyzed using appropriate statistical techniques. The first stage was conducted using UTAUT2 model, and then the results of collecting qualitative data from semi-structured interviews and focus groups were presented. Finally, the obtained model was tested in the target community, mentioning below.

3.1. Results

For answer research objective for first study (Determinants of Physicians' Technology Acceptance for IOT in Healthcare Settings) the primary data collection instrument in this survey study is the UTAUT2 questionnaire, which was already used by the adoption of health technology studies (Ahadzadeh et al., 2015b; Hoque et al., 2017; Kim & Park, 2012; J. Tavares & T. Oliveira, 2016).

A total of 127 correct questionnaires in 20 cities of Iran were collected. The inclusion criteria are the working experience with one of the IoT technologies, being a physician, and conscious consent to participate in the study. Incomplete completion of the questionnaire was considered as an exclusion criterion. The Structural Equation Modeling (SEM) testing was used to analyze the data and test the research hypotheses. Cronbach's alpha coefficient was used to evaluate the reliability of the model. The theoretical study model, along with PLS, was used to measure the proposed model and the validity of the questionnaire. The PLS method is commonly used to explain the research model's variance and identify critical structures (Götz et al., 2010). The PLS

method is commonly used to explain the variance of the research model and to identify critical structures (Götz et al., 2010). University professors and experts assessed the content validity of the questionnaire, and then the construct validity of the questionnaire was assessed using confirmatory factor analysis. All Factor loads values higher than 0.4 were obtained. The considered questionnaire has good explanatory power and Cronbach's alpha of each variable was higher than 0.8 (Table 9), indicating high reliability.

A study of the demographic status of the participants in the study showed that 64.3% of the respondents were female, and the rest (35.7%) were male. Therefore, the majority of respondents in this study were female. The average age of the participants was 35.84 ± 8.94 years old, which indicates that the human resources of health centers are young. Also, the participants in the study had an average work experience of 14.58 years with a standard deviation as much as 6.2.

Model was evaluated at two levels of the measurement model and the structural model. In the first step, the relationship between factors and dimensions was measured. Then, the structural model of the relationship between dimensions was examined using the SmartPLS3 software, partial least squares analysis method, and the partial least square analysis method.

Table 9. Results of the questionnaire reliability

Reliability and AVE	
Variable	**Cronbach's alpha**
PE	870/0
EE	789/0
SI	707/0
FC	941/0
HT	722/0

PV	883/0
HM	795/0
BI	711/0

Source: Own elaboration

Results of factor loads: The factor load of all items is more than 0.5, which indicates the accuracy of all the questions in the questionnaire. The weight of the questions also indicates the balanced distribution of questions in each structure (Table 10).

Table 10. Factor loads

Item	SD	Mean	Factor load	Weight	Factor
PE1	1.079	2.378	0.838	0.298	**PE**
PE2	1.03	2.299	0.892	0.311	
PE3	0.99	2.26	0.886	0.304	
PE4	0.868	2.102	0.778	0.261	
EE1	1.147	2.425	0.799	0.326	**EE**
EE2	1.135	2.37	0.849	0.348	
EE3	1.111	2.268	0.848	0.345	
EE4	0.888	1.913	0.610	0.247	
SI1	0.893	2.787	0.765	0.326	**SI**
SI2	1.162	2.858	0.835	0.452	
SI3	1.115	2.252	0.820	0.455	
FC1	1.007	2.346	0.913	0.271	**FC**
FC2	0.971	2.323	0.926	0.273	
FC3	1.01	2.244	0.931	0.272	
FC4	0.948	2.197	0.916	0.268	
HT1	1.105	2.575	0.544	0.166	**HT**

HT2	1.122	2.748	0.840	0.526	
HT3	1.092	2.835	0.810	0.388	
HT4	0.931	2.197	0.641	0.239	
PV1	1.09	3.417	0.942	0.530	**PV**
PV2	1.19	3.323	0.699	-0.037	
PV3	1.093	3.512	0.948	0.555	
HM1	1.261	2.78	0.865	0.395	**HM**
HM2	1.386	3.031	0.798	0.381	
HM3	1.272	2.835	0.867	0.408	
BI1	1.496	3.087	0.812	0.417	**BI**
BI2	1.503	3.094	0.792	0.415	
BI3	1.455	2.732	0.798	0.417	

Source: Own elaboration

3.1.1. Evaluation of the measurement model

The one-dimensionality of the model indicators is the first factor to evaluate the measurement models. Each index among the set of indicators must be loaded with only one dimension or latent variable with a considerable factor load value. The amount of factor loads less than 0.4 is removed (Gefen & Straub, 2005). Cornbrash's alpha (CA) coefficient is used to assess the reliability of internal consistency reliability, which varies from 0 to 1, where values higher than 0.7 are considered appropriate, and values less than 0.6 are inappropriate (Cronbach, 1951). Another factor called Composite Reliability (CR) can assess the internal compatibility of measurement models. The value of this coefficient also varies from 0 to 1, the values higher than 0.7 are considered appropriate, and values higher less than .6 are inappropriate (Gefen & Straub, 2005). As shown in Table 4, this value is above 0.7 in all cases.

Convergence validity shows the high correlation of the indicators of one structure compared to the correlation of other indicators. AVE is used to evaluate it in SmartPLS3,

which is between 0 and 1, where values above 0.5 are *accepted* (C. Fornell & D. F. Larcker, 1981).

Individual validity indicates the existence of minor correlations between the indicators of one structure and the indicators of other structures that should be evaluated in the measurement models. The mentioned criteria refer to the fact that the second root of the described values of each structure (AVE) is higher than the correlation values of that structure with other structures. As shown in Table 11, the reliability for all structures is between 0.5 and 0.8, which indicates the appropriateness of convergence, and structures (latent variables) have a high validity for the goodness of fit.

Table 11. Cronbach's Alpha, Composite Reliability, and AVE

Variance	Cronbach's Alpha	rho_A	Composite Reliability	Average Extracted (AVE)
BI	0.721	0.721	0.843	0.642
EE	0.784	0.805	0.862	0.613
FC	0.941	0.941	0.958	0.849
HM	0.798	0.800	0.881	0.713
HT	0.702	0.805	0.806	0.517
PE	0.871	0.876	0.912	0.722
PV	0.883	0.818	0.903	0.759
SI	0.736	0.751	0.849	0.652

Source: Own elaboration

3.1.2. Evaluation of the Structural Model

Evaluation of the structural model is performed after the evaluation of measurement models. To this end, the R^2 coefficient of determination is used to measure the relationship between the described variance value of a latent variable and its total variance value. In this evaluation, values close to 0.67, 0.33 , and 0.19 is are desired, usual (normal), and weak, respectively (Chin, 1998).

In the following, the path coefficients between the latent variables in the structural equations is evaluated. At this stage, the algebraic sign, the size coefficient, and the significance level are examined. The size of the path coefficient indicates the strength of the relationship between the two variables, and route coefficients must be significant at least at 0.05 confidence level.

Table 12. The amount of loading of the latent dimensions' indicators in the model.

	BI	**EE**	**FC**	**HM**	**HT**	**PE**	**PV**	**SI**
BI1	0.814							
BI2	0.791							
BI3	0.798							
EE1		0.799						
EE2		0.849						
EE3		0.848						
EE4		0.610						
FC1			0.913					
FC2			0.926					
FC3			0.931					
FC4			0.913					

HM1				0.865				
HM2				0.798				
HM3				0.867				
HT1					0.544			
HT2					0.840			
HT3					0.810			
HT4					0.641			
PE1						0.838		
PE2						0.892		
PE3						0.886		
PE4						0.778		
PV1							0.942	
PV2							0.699	
PV3							0.948	
SI1								0.765
SI2								0.835
SI3								0.820

Source: Own elaboration

3.1.3. Analysis of the measurement model

The results of loading the indicators of the latent dimensions of the model are shown in Table (13). Indicators with a factor load less than 0.4 are removed and indicators with a factor load higher than 0.4 are remained, indicating that the metrics and questions in the questionnaire measure their dimensions well that are good metrics for evaluation. The results show that Cronbach's alpha coefficient and structural reliability are higher than 0.7 and the AVE value is higher than 0.5 for all model dimensions. The coefficient of determination (R^2), which describes the relationship between the value of variance and a latent variable, measures the total value of variance, ranging between 0 and 1.

The next step is to evaluate the diagnostic validity of the model using the Fornell-Larcker criterion. According to this criterion, the second root of the described variance values of any structure called AVE must necessarily be higher than the correlation values of that structure with other structures. The results indicate that all values on the primary diameter of Table (13) are higher than the mentioned values, which means that the diagnostic validity of the model is supplied.

The elements of the primary diameter, the sum of variance described in each structure, and the elements of the original diameter are the correlation values between the structures. The diameter elements must be larger than the non-diameter elements for diagnostic validity.

Table 13. validated diagnostic constructs to model

	BI	**EE**	**FC**	**HM**	**HT**	**PE**	**PV**	**SI**
BI	**0. 974**							
EE	0.874	**0. 952**						
FC	0.968	0.783	**0.922**					

HM	0.784	0.776	0.735	**0.844**				
HT	0.598	0.581	0.575	0.558	**0.719**			
PE	0.959	0.945	0.946	0.746	0.593	**0.85**		
PV	-0.125	-0.121	-0.13	0.059	0.063	-0.12	**0.871**	
SI	0.371	0.379	0.297	0.373	0.205	0.344	0.123	**0.807**

Source: Own elaboration

3.1.4. Structural model analysis

At this stage, the coefficient sign, the size, and the significance level are examined. The path coefficient size indicates the strength of the relationship between the two latent variables. The path coefficient greater than 0.1 indicates a certain amount of effect of the model. If t-values are higher than 1.96, its significance level would be 0.05. Moreover, the significance level is 0.01 for t-values higher than 2.57 and 0.001 for values greater than 3.29. The results of the path coefficients and the significance level are shown in Table (14).

According to the table, the expectation of hypotheses performance and effort, pleasure-related motivation, and facilitating conditions were accepted among the examined hypotheses because the absolute value of the significant number obtained from the T-statistic is higher than 1.96in these four hypotheses.

Table 14. Determinant test result

	Original Sample (O)	**Sample Mean (M)**	**Standard Deviation (STDEV)**	**T Statistics (|O/STDEV|)**	**P Values**
EE -> BI	0.383	0.382	0.106	3.620	**0.000**

FC -> BI	0.353	0.356	0.093	3.787	**0.000**
HM -> BI	0.066	0.066	0.030	2.168	**0.030**
HT -> BI	0.018	0.019	0.018	0.992	**0.321**
PE -> BI	0.190	0.188	0.064	2.996	**0.003**
PV -> BI	-0.019	-0.016	0.018	1.072	**0.284**
SI -> BI	0.030	0.028	0.020	1.509	**0.132**

Source: Own elaboration

3.2. Qualitative phase

Objective for study 2 was finding new factors affecting Electronic Healthcare Records adoption in primary health care Settings. Qualitative data were collected using semi-structured interviews and focus groups to realize electronic healthcare record users' perceptions and identify specific determinants. Qualitative research aims to "understand and explain beliefs and behaviors in the context in which they occur" and to characterize them as "interpretive and realistic" (21). The statistical sample involved 24 health providers, including eight physicians, three specialists (Pediatricians, Gynecologists, and Psychiatrists), four nutritionists, five health care providers, and four chief executive officers (CEO) purposefully selected until data saturation.

The inclusion criteria were:

(1) Having experience of using electronic healthcare record in the health care system for at least three years;

(2) Having a clinical experience with patients at least three years;

(3) Age between 28 to 60 years old;

(4) Consent to participate in the study.

The exclusion criteria were:

(1) Dissatisfaction with participation in continued research;

(2) Lack of proper expression.

In qualitative research, researchers often challenge participants to respond more to their own opinions without providing rich information to the researcher. For this reason, general questions were used in the first interview (Hawkins, 2018*)*. In this regard, the first, second, and third interviews were conducted by the first author without a clearly defined structure and question, which only asked to talk about their experience with patient care and working with electronic health records. The unstructured interviews in qualitative research provide a more comprehensive range and allow participants to tell their stories in more detail (Denzin & Lincoln, 2008). However, subsequent interviews were conducted in a semi-structured manner with more guiding questions about the conditions involved in physician-patient communication through technology, physician-patient needs alongside technology such as electronic health records, and the type of communication content after analyzing the first and second interviews according to the concepts extracted from the analysis process. Interestingly, participants also provided feedback on their patients' experience in using technology and electronic healthcare record.

3.3. Categories

Category 1- Performance Expectation

The performance expectation in the technology acceptance model is the strongest predictor for the tendency to use, and its measurement remains significant in all contexts, both in the compulsory and optional situations of the technology use. Mostly, healthcare providers use more healthcare technologies that lead to health-related work tasks (Alpay et al., 2010; Årsand et al., 2008; Keselman et al., 2008).

In this study, both optional and compulsory analytical status of the interviews were obtained. However, the compulsory situation was mainly used to refer to indirectly or directly the induced demand. Examples of quotes*:*

"The performance evaluation of the employees is based on the electronic health record. Employees who provide most of their services through an electronic health care record are comparable to other employees. Employees do it and do not consider it as an extra task. Of course, this problem also leads to the false record of services so that employees falsely record services for people in the system to show their high performance or pretend to deliver more services provided through them" (1) (2). "We expect our workload technology to be almost reduced" (3). "We provide a full-service evaluation based on the system" (12) (13).

"The system makes better organization of information and health services" (1). "There is much work in the health care system. The electronic system helps organize" (2). The system has merely integrated the services" (12). "The convenience that came with it was the coherence of the information" (3) (2). "Our workload is almost reduced" (3). "We provide a full-service evaluation based on the system" (12) (13).

Category 2- Effort Expectation or Ease to use

The effort expectation is defined as the ease of using technology derived from the perceptual ease of technology acceptance model. The expectation of effort determines the level of effort with which a person understands a particular technology or system that will require less effort (Venkatesh et al., 2003).

The acceptance of new technology or systems will be successful when people consider it easy to learn how to use it (Lai et al., 2015). The system is acceptable when there are fewer barriers to use the new technology. In this regard, ease of use will be a vital factor in strengthening consumers' behaviors intention.

Examples of quotes:

"It has made our job easier, as long as some issues are addressed (1). "It has helped our work a lot and is easy to use" (2). "The first time we used it, we expected our work to be easier and our workload to be reduced (3). It made our work easier. At first, it was vague, but it became easier over time" (6). "The first time I wanted to work with the system, I was stressed, and I was afraid it would be difficult, but then, I found that it was straightforward" (13). "It's just boring, meaning that too much multiplicity makes patients tired" (2). "If the care is properly defined and designed according to the needs and circumstances of the people, it will be more useful and effective" (4). "A system is appropriate when it is proportional to the educational and positional levels of employees at all organizational levels" (5). "Health technologies should be appropriate for any physical condition, such as a disability or low vision. For example, my eyes are weak, and I need a large screen size" (5). "(Personally, the monitor screen bothers my eyes (it's better to be audio or for the physically handicapped)" (13).

Category 3- Facilitator Conditions

Facilitator conditions are defined as people who believe in an organizational and technical foundation to support using this system. This issue refers to the degree to which a person believes that there is a technical and organizational infrastructure to support the use of the system (Venkatesh et al., 2003). When users believe in the availability of technical facilities and resources to support the system, they will be expected more to accept it. For example, the Internet infrastructure, the knowledge required for online access, compatibility between technologies and systems, and assistance from others, i.e., sufficient hardware and software resources, information technology knowledge, and access to technical knowledge will reduce barriers to the use of new technology (Lai et al., 2015). A potential barrier to using health care services is the lack of resources or support services that allow users to access and use these health technologies properly, such as electronic health care record (Keselman et al., 2008).

Examples of quotes related to this main category:

"I use the system as long as we don't have a problem with the Internet connection. We often have an Internet problem" (2). "The number of computers should be the same as the number of personnel" (2). "We have internet problems" (3). "People don't like the system, and there's a reason they don't like the service provider because we don't have the right infrastructure and the Internet" (4).

"Facilitating and infrastructure such as the Internet (6) and systematic work was difficult at first, especially in the first year, and some departments still have problems due to the Internet disconnection, and there are problems at various levels in some areas, including patient care reporting" (7).

"I saw that slowing down, or Internet disconnection was an important challenge for e-services. For example, there was a system that I was answering when I reached the last question, or the Internet disconnected. I stopped (laughing). I had to wait for the Internet to be connected, and the service receiver looked at me in surprise for what I was waiting for (by shaking head)" (8). "There is no necessary infrastructure, at least for technology in Iran, including the Internet and its low speed" (7).

"I often wonder why they don't check and fix deployment problems before announcing a system or program. Sometimes there are audio or video problems, inappropriate seats, and I wish I had checked them before. Unfortunately, I see that it only takes a few months and sometimes years after the electronic system is installed to complete the equipment (laughs and shakes its head)" (8).

Category 4- Price Value

The cost and price structure may have a significant effect on the use of technology. The cost value is obtained from the value perceived by the technology use that can effectively select and use technology (Chang & Tseng, 2013; Wang & Wang, 2010). Cost value was emphasized by researchers in information technology and electronics-related markets. This concept was adopted by accepting smartphone users. The findings suggest that the cost value concept is critical in technology acceptance (Kuo et al., 2009; Soltani et al.,

1970; Zhao et al., 2012). The cost value is positive when the benefits of using technology outweigh the material costs. Such a price value positively affects the intention to use (Venkatesh & Bala, 2008). According to these beliefs, Venkatesh et al. (2008) described the value of prices as consumers' cognitive exchanges between perceived benefits of services and monetary costs for their use (Limayem et al., 2007). Non-monetary costs have been estimated at a cost such as time and effort. In this study, price value is monetary and non-monetary values is health promotion to examine the factors affecting the acceptance of electronic health record technology.

Examples of quotes related to this main category:

"The new system cost is much higher than the previous system, and it is traditional. Most of the costs have already been related to paper consumption, but the costs of Internet and telecommunications, servers, and computer purchases, etc., have been added in the new system" (7).

"It has not affected costs. It may continue to reduce costs. For example, it does not require physical presence and then distance, and services and monitoring are only remote" (6).

Category 5- Habit

The habit of technology was the last factor added to the UTAUT model. Limayem et al. (2007) defined habit as the degree to which individuals tend to engage in automatic behavior that results from learning (Limayem et al., 2007), while Kim et al. (2005) equate habit with self-efficacy. Habits are organized in two separate ways, although they are relatively similar in concept. First, the habit is considered a repetition of the previous behavior (Kim & Malhotra, 2005). Second, the habit is measured to the extent that the person believes a behavior is done automatically. Previous experience in information technology has also predicted the use of information technology, the intention to use the system, and the facilitation of conditions. Making a habit has been widely discussed in various fields, including psychology, consumer purchasing behaviors, education, health sciences, and management (Limayem et al., 2007). Venkatesh et al. (2012) defined habit

as the degree to which consumers learn, use technology or technology product behaviors automatically (Venkatesh et al., 2012).

The habit structure includes three criteria, including past behavior, habitual behavior, and personal experience. Past behavior is described as previous user behavior. Reflex behavior refers to user behavior's sequence or customs that are part of everyday life *(Limayem et al., 2007)*. Personal experience refers to accumulating everyday experiences, norms, and enduring habits created by users to use technology products. Such experience reduce the need for discussion, coordination, or complex decision-making *(Limayem et al., 2007)*. Studies on habit objectives and behaviors caused by habit have shown that habit predicts the intensity of the use of technology in promoting behavioral changes (Kim et al., 2007; Venkatesh et al., 2012; Wang & Wang, 2010; Webb et al., 2009).

Examples of quotes related to this main category*:*

"*There are many workloads, we have many services, and we are used to the electrical system" (2,3). "As long as we want to get used to it, it will be updated (8). I'm used to it now, and I don't like to work traditionally and manually*." (14).

Category 6- Waiting Time

One of the factors that affects the acceptance of technology is the benefits that arise from independent interactions of time and space to prevent waiting times (Mallat, 2007). This conceptual definition includes personal choice over an old system in terms of time and space benefits. Dwivedi et al. (2016) also considered the waiting time to effectively accept mobile health technology among users (Dwivedi et al., 2016).

Examples of quotes related to this main category:

"*Because some services take time for people"* (1). "*Provided programs are modified. Options and links become more advanced and more convenient and concise, and less time consuming"* (2). *"Because people's waiting time has increased, they are not satisfied with this" (3). "In terms of time, if structural problems are solved, it also affects time and saves time* (4). *Time is also important because the time made the service providing service superior"* (6). "*But people were more satisfied when the doctor just stamped the*

form and responded quickly, rather than when the doctor took more time, and people expressed dissatisfaction because they didn't like the long process and said the doctor was bragging about us." (5) "*Patients expect their problems to be resolved in one session, and they often complain that I am just going to see a doctor again and they will not solve my problem in one session"* (4). *"When services are provided to people because the process is long and patients are asked many questions, they interrupt in the middle of the process and do not continue the process"* (2).

Category 7- Trust and Confidentiality

Concerns about confidentiality refer to the extent to which a doctor believes that the use of EHR can pose a risk of patient information confidentiality. Many studies have identified patient information confidentiality as a significant barrier to physicians and other health care workers, EHR acceptance, and electronic health (Boonstra & Broekhuis, 2010b; Davis; De Grood et al., 2016).

Doctors are concerned that patient data will be available in the EHR system for those who cannot access it. According to (Boonstra & Broekhuis, 2010b), physicians are more concerned about patients' confidentiality of information than the patients themselves. Disclosure of patient information may lead to legal problems for doctors (Boonstra & Broekhuis, 2010b). Threats to patient confidentiality are usually due to poor legal regulations or a less careful technical system (De Grood et al., 2016). Doctors who use EHR believe that the security and confidentiality risks are more significant than in the EHR paper system (Boonstra & Broekhuis, 2010). In addition, the possibility of exchanging medical information between health care providers, security threats, and patient health information privacy is increased in the EHR system because the data meets the protection standards applied by the health system when sent to another institution. Therefore, the appropriate policies and regulations and conscious satisfaction of patients can be a factor in protecting against the challenge of confidentiality (De Grood et al., 2016).

Examples of quotes related to this main category:

"Information security in data storage is somewhat available, but if someone wants may be able to access it (1). "It is somewhat secure, but it is still possible for others to access the data (2). General access is not easy, but if a professional or hacker can definitely" (6). "Since the account is personal, it is somewhat secure. However, I'm also worried that the information will be erased or hacked (12). Information security is fundamental, and access should be very limited. It's important to store information" (14). "Most educated people are sensitive and curious about the security and confidentiality of information, and we tell them not to worry that the information is confidential and not accessible to anyone (4). The confidentiality of the information is ensured to patients."

Category 8- Authority

EHR creates fundamental changes that can affect positions or power relationships in medical procedures (Abdekhoda et al., 2015). When technology negatively affects job roles, professional status, and independence, resistance is likely to occur (Abdekhoda et al., 2015). (Walter & Lopez, 2008) have suggested that doctors' concerns about the loss of independence should be investigated in studies to understand doctors' acceptance of information technology. The perceived threat to doctors' independence is "a degree to which a person believes that the use of a particular system, such as health technologies, reduces their control over working conditions, trends, stages, or content" (Walter & Lopez, 2008). Many studies have shown that the perceived threat to professional independence negatively affects doctors' decision to accept HER (Abdekhoda et al., 2015; Esmaeilzadeh & Sambasivan, 2012; Hamid, 2013; Morton, 2008; Walter & Lopez, 2008).

According to the previous studies, three dimensions were proposed to assess the effect of the perceived threat to professional independence on doctors' acceptance of HER, including increased management control, loss of professional privacy, and limited understanding of independence, trust, and data security (De Grood et al., 2016).

Examples of quotes related to this main category:

"The way of getting familiar with the system was the health and planning system of the ministry itself, and its implementation was mandatory without asking our opinion and choice" (7). "We provide all services based on the system" (13). "100% selection and use of systems and technology in health care is the result of rents and the benefits of some individuals or companies" (4). "I have been in this place for many years; for example, I visit a pregnant woman whom I know has already had a dead child, and her sister has raised one of her children. I know she can't take good care of her baby. We have to give her husband some advice to keep in mind. I have to pay special attention to the period of caring for high-risk pregnant women, but if I don't know my population before and I just content with those courses, there would be some problems that the system can't help." (8)

"The e-system made good solutions for hypertension. In hypertensive patients, I used to take pressure from one arm. After reading the book introduced for hypertension, I realized that when a patient refers because of high blood pressure, it is better to press on both arms. Because the difference in pressure between the two arms was greater than the limit, we should advise the patient to give the arm with the higher pressure." (11).

Category 9- Health Provider-Patient Relationship (Empathy and Sympathy)

One of the main factors affecting the efficiency of health technologies is interpersonal communication, emotions, and feelings. Studies show that empathy and emotion are crucial in health care. Establishing effective communication and empathy between physician and patient has a positive effect on reducing the patient's anxiety and depression, associated with reducing specific symptoms (Neumann et al., 2011). The relationship between physician and patient in medicine is significant, and the basic axis of clinical measures and the foundation stone of good activity in the health system were *described* (Lynch et al., 2007).

In this regard, the relationship between physician and patient with an interface technology, such as a computer can be considered an obstacle, preventing workflow, and harassment efficiency for patients and service recipients (Hsu et al., 2005).

Examples of quotes related to this main category:

"There's a problem. Since I've been working with the system, the intimacy with people has decreased, and I'm more focused on the system." "Heart and emotional connection with people is reduced by people (2). Individual communication is important because the technology and the system do not consider individual differences, but when I feel there is a need for training in some cases, I try to give the patients the necessary training to help them" (11). "Human relationship and intimacy between them cannot be compensated by technology. Technology cannot do what the human does. Patients are more comfortable with humans because technology and electronic services are computerized and programmatic" (11). "Emotional communication and patients' trust in the care and attention of doctors and health providers is vital." For example, it is not enjoyable when we enter a doctor's office, and the doctor prescribes visiting us and eye contact because we feel like they're not listening, and their attention is elsewhere." "When we go to the doctor, we prefer that the doctor have a direct connection with us and be present. I think we are rather emotional. It is better for me the doctor gives his/her feedback based on my history and open-ended questions rather than a series of standard and closed questions and steps such as specific and closed questions, which do not pay attention to the fact that it is grateful that the patient or recipient of the service has other questions beyond it, and we do not give this opportunity to it. Emotion is important to me." (16).

Each question was related to a category that was related to a specific determinant. Then, the categories were examined in more detail, and their relationship with the relevant general determinant was examined. Based on the analysis of interviews and classification of categories, 20 separate mechanisms affect the nine structures of the UTAUT2 model and show the factors influencing the acceptance of technology in a health care system (Diagram 15 and Table 15).

Table 15. Determinants and related factors extracted from the content analysis results

Determinants	**Category (Themes)**	**Interviews containing semantic codes**	**(Concepts) Measurements**
Performance Expectancy	Usefulness	1/2/3//22/20/12/13/15/14/10	Provide better services
			The usefulness of this technology
			Provide remote services
	Efficiency Expect	7/23/2/10/19/1/3/9/11/14	Increase knowledge
			Efficiency
			Expedite work
Effort Expectancy (or easy to use)	Easy to use	1/2/3/6//24/16/17/13/12/24/15/13	Easy to use
	Easy to learn		Easy to learn
			Clear and understandable
	Impact of disability		Proportionate for disability **(**disability friendly)
Facilitation	Hardware	2/4/6/7/8/5/12/11/24/22/1	Internet access

Condition	Software	/9	Equipment
			Support and guidance services for users
			Improving e-health knowledge
	Accessibility	24/22/20/19/3/2/1/11/10/ 9/8	Health services appropriate to local conditions
			Services of this technology in all areas, even remote areas
			Services at any hour of the day
Price value	Price Value	11/9/21/18/17/3/4/6/1/7/5	Expect the impact on costs.
			Expect a reduction in costs.
			Reduce costs
			Feelings of rising costs
Habit	Technology preference	24/19/2/3/8/1/4/9/12/8/	Habit
			Dependence on new technologies
			Normalized

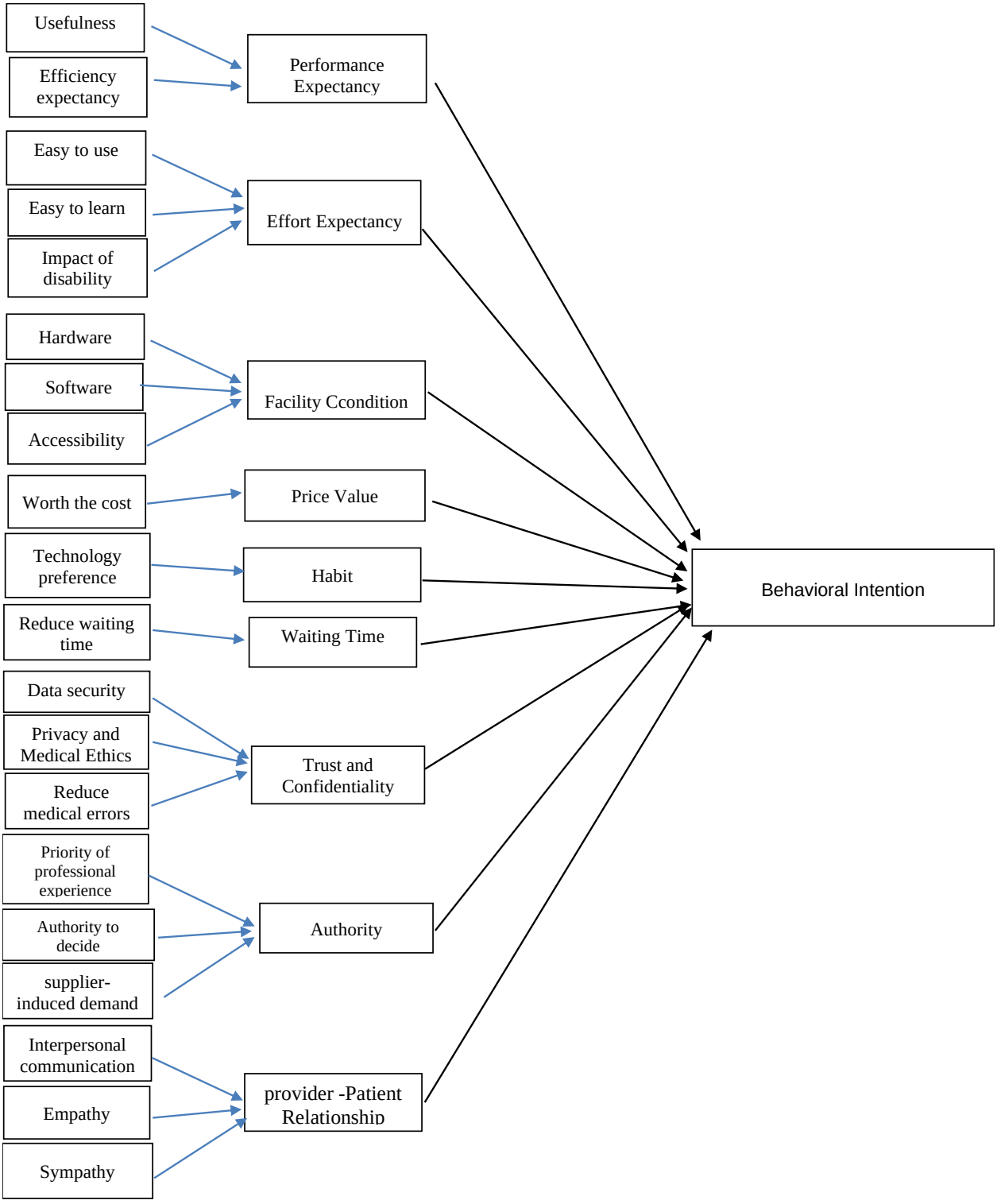
Waiting time	Reduce waiting time	1/10/9/11/8/16/22/23/24/18/3/24/19/17	Provide services on holidays
			Time Management
			Reduce waiting time to receive service
Trust and Confidentiality	Data security	1/4/6/2/12/14/7/10/11/23/21	Trust in data entry
			Data security
			Trust in content
	Privacy and Medical Ethics	16/4/13/8/11/12/9/10/20	Access level
			Interpersonal trust
			Privacy
	Reduce medical errors	1/14/8/11/5/3/20/19/5/7	Standardization
			Reduce medical error
			Increase accuracy and speed
Authority	A priority of professional experience	8/11/1/6/5/10/1/3/18/12/24/23/19	The necessity of accompanying the experience with the health system

			The dominant position of experience over EHCR
			The precedence of experience over EHCR
	Authority to decide	/16/18/4/6/3/8/1//22/24/21/19/10/7/1/10	Non-compliance with system guidelines
			A priority of the patient's condition to EHCRs guideline
			Prefer to use a professional specialization tailored to the circumstances
	Supplier-Induced demand	3/4/5/8/7/12/13//11/12/1/10/16/18/24	
			Mandatory notification of use
			The necessity of providing health services with the EHCR
			Provide non-priority services
			Insemination costs
			The choice of technology is based on the interests of stakeholders.
			Fear of administrative and legal consequences

			The need to be up to date with new technologies used by others
Health Provider-Patient Relationship	Interpersonal communication	/22/24/172/11/6/3//12/10/1/8/9/10/15/14/18/19/2/4	communication
			Feedback
			Eye contact
			Interpersonal Trust
	Empathy	/2/16/20/217/11/14/11/13/12/23/1/3/5/10/9/24/18/17	Perception of the patient's problem and condition/person
			Patient relief
			Understand patient's personal world
			Mutual feelings (connecting yourself with the patient)
	Sympathy		

Source: Own elaboration

Figure 15. Modified UTAUT2 model for EHR Adaption



Source: Own elaboration

3.4. Validation of the conceptual model

The interview results were used as a basis for FGD questions to guide the Focus group discussion. Focus groups of 12 people were used to confirm the themes and in-depth study, as well as to confirm the determinants and related measures. Sometimes, the exact same question phrase was not used only to guide each of the determinants. In addition, follow-up questions were asked if it was needed.

FGD sessions were created to validate the proposed modified model for healthcare based on UTAUT2. The purpose was to (1) confirm the respondents' concepts or not, (2) to exchange ideas about conceptualization - the order and connection between the former between the determinants and the categories. Moreover, (3) to discuss the respondents' new factors that could be added to the proposed initial model. Interview results were used as a basis for FGD questions.

A questionnaire was created to guide the focus groups. Each question was related to a category that was related to a specific determinant. After that, the categories were examined in more detail, and their relationship with the relevant general determinant was examined. Based on the results of the analysis of interviews and classification of categories, 20 separate mechanisms affect the nine structures of the UTAUT2 model and show the factors influencing the acceptance of technology in a health care system (Table 16).

Data were collected from October to December 2019. However, after the Coronavirus pandemic in March 2020, additional information was collected through virtual communication with some participants to collect more data about the impact of the Covid-19 pandemic on E-health and EHR.

Table 16. Determinants and related factors extracted from the content analysis results

Determinants	Category (Themes)	Interviews containing semantic codes	The number of FGD respondents who mention this concept before seeing links and determinants	The number of FGD respondents who mention this concept after seeing links and determinants	Validation
Performance Expectancy	Usefulness	1/2/3//22/20/12/13/15/14/10	10	10	Validated
	Efficiency Expect	7/23/2/10/19/1/3/9/11/14			
Effort Expectancy (or easy to use)	Easy to use	1/2/3/6//24/16/17/13/12/24/15/13	12	12	Validated
	Easy to learn				
	Impact of disability				
Facilitation Condition	Hardware	2/4/6/7/8/5/12/11/24/22/1/9	10	12	Validated
	Software				

	Accessibility	24/22/20/19/3/2/1/11/10/9/8			
Price Value	Price Value	11/9/21/18/17/3/4/6/1/7/5	8	8	Partially validated
Habit	Technology preference	24/19/2/3/8/1/4/9/12/8/	8	8	Partially validated
Waiting Time	Reduce waiting time	1/10/9/11/8/16/22/23/24/18/3/24/19/17	11	12	Validated
Trust and Confidentiality	Data security	1/4/6/2/12/14/7/10/11/23/21	12	12	Validated
	Privacy and Medical Ethics	16/4/13/8/11/12/9/10/20			
	Reduce medical errors	1/14/8/11/5/3/20/19/5/7			

Authority	A priority of professional experience	8/11/1/6/5/10/1/3/18/12/24/23/19	12	12	Validated
	Authority to decide	/16/18/4/6/3/8/1//22/24/21/19/10/7/1/10			
	Supplier-induced demand	3/4/5/8/7/12/13//11/12/1/10/16/18/24			
Health Provider-Patient Relationship	Interpersonal communication	/22/24/172/11/6/3//12/10/1/8/9/10/15/14/18/19/2/4	12	12	Validated
	Empathy	/2/16/20/217/11/14/11/13/12/23/1/3/5/10/9/24/18/17			
	Sympathy				

Source: Own elaboration

The following section explains the research model and the validation of the hypotheses. Initially, the survey design and data collection were explained, and then, the results of the analyses were presented (construct validity, reliability, and discriminant validity) that led to the structural model. The statistical population in this study was physicians who are working in health centers.

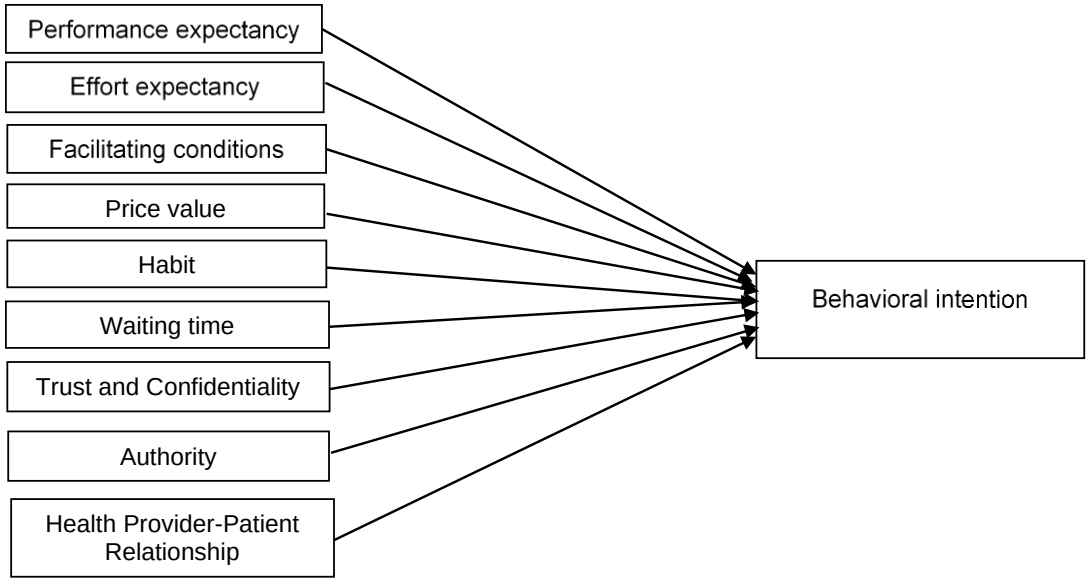
3.5. Methodology for the Quantitative stage

In the second stage, samples were randomly selected. The main intention at this stage was to evaluate and measure the obtained scales. The questionnaires were distributed online among physicians in Iran's health centers. At this stage, the sample size was determined using Cochran's formula. The statistical population was 15000 physicians, of whom 375 samples were obtained with 0.05 error, and finally, 417 questionnaires were answered which is means 42 sample more. This questionnaire was used with minor changes proportional to EHR, and the validity and reliability of the questionnaire were measured. IoT technology and its applications and examples in health care were acknowledged at the beginning of the questionnaire. The introduction aimed to ensure that respondents were aware of this concept and connected with their previous knowledge to prevent the problem with the lack of knowledge in this regard. The Likert scale was used in the form of a questionnaire, and the statistical population in this study was physicians who are working in health centers. A total of 417 correct questionnaires were collected in 20 cities of Iran. The inclusion criteria were the experience of using one of the EHR technologies, being a physician, and conscious consent to participate in the study. Incomplete completion of the questionnaire was also considered as an exclusion criterion.

3.6. Research model and hypotheses

The qualitative survey confirmed the factors influencing adoption that had been reported in the literature, which led to five new constructs in the final model and became the foundation for developing the final research model for the quantitative study (Figure 16).

Figure 16. Research model



Source: Own elaboration

According to this model, the research hypotheses are as follows:

1. Performance Expectation (PE) is what users consider, which is the strongest predictor of technology intent (Wills et al., 2008). Using a tool helps them gain performance, and the authors described this behavioral intention as "the degree to which a person believes that the use of technology helps him/her to perform certain behaviors or tasks that are beneficial to performance achievements, such as health care" (Wills et al., 2008). Overall performance is expected to be a significant factor that directly affects the intention to accept technology. Generally, healthcare providers choose technologies that offer benefits in doing health-related tasks online (Alpay et al., 2010; Årsand et al., 2008; Keselman et al., 2008).

Hypothesis 1: Performance expectation (PE) have a positive effect on the behavior intention to adopt EHRs.

2. Effort expectancy (EF) is the extent of the facility regarding users' communication with a particular technology (Thong & Yap, 1995). The easier it is for patients to understand and use the Internet of Things technology, the more likely they are to use it (Alpay et al., 2010; Årsand et al., 2008; Keselman et al., 2008).

Hypothesis 2: Effort expectancy (EF) have a positive effect on the behavior intention to adopt EHRs.

3. Facilitating conditions refer to consumers' perception of the resources and support available to perform a particular behavior (Venkatesh et al., 2003). A possible barrier to users' use of health technologies is the lack of resources or support services that allow them to access and apply these types of operating systems properly (Higgins, 2006). In this study, FC expresses stakeholders' opinions on the use of EHRs in the health care system.

Hypothesis 3: Facilitating conditions (FC) have a positive effect on the behavior intention to adopt EHRs.

4. The Price value (PV) in the UTAUT2 model is defined as the perception of technology users of the proportion of technology's perceived benefits and the monetary cost of using them (Chang & Tseng, 2013). Using remote services of health technologies can save time and money by preventing unnecessary travel to the clinic or hospital. Accordingly, it can be argued that the value of the price can be a decisive determinant factor in the acceptance of technology for EHRs.

Hypothesis 4: Price value (PV) have a positive effect on the behavior intention to adopt EHRs.

5. Habit can be considered a concept that people tend to do behaviors automatically due to learning (Chang & Tseng, 2013). Recent studies have shown a positive effect on acceptance regarding habits in health technologies such as e-Health and EHRs (J. Tavares & T. Oliveira, 2016; Yuan et al., 2015).

Hypothesis 5: Habit have a positive effect on the behavior intention to adopt EHRs.

6. One of the influential factors that can make the acceptance of technology relative is the benefits that arise from independent interactions of time and space to prevent waiting times (Mallat, 2007). This conceptual definition includes personal choice over an old system in terms of time and space benefits. Dwivedi et al. (2016) also considered the waiting time to increase mobile health technology among users (Dwivedi et al., 2016).

Hypothesis 6: waiting times have a positive effect on the behavior intention to adopt EHRs.

7. Resistance is more likely to occur when technology negatively affects job roles, professional status, and independence (Abdekhoda et al., 2015; Walter & Lopez, 2008). The EHR makes fundamental changes that can affect positions or power relations in the medical field (Abdekhoda et al., 2015).

Hypothesis 7: Authority have a negative effect on the behavior intention to adopt EHRs.

8. In the electronic healthcare record, the possibility of exchanging medical information between health care providers, security threats, and patient health information privacy is increased because the data meets the protection standards applied by the health system when sent to another institution. Therefore, the appropriate policies and regulations and conscious satisfaction of patients can be a factor in protecting against the challenge of confidentiality (Abdekhoda et al., 2015).

Hypothesis 8: Trust and Confidentiality have a positive effect on the behavior intention to adopt EHRs.

9. The relationship between physician and patient with an interface technology such as a computer can be considered an obstacle, which prevents workflow efficiency and harassment for patients and service recipients (Hsu et al., 2005).

Hypothesis 9: Physician-Patient Relationship have a negative effect on the behavior intention to adopt EHRs.

3.7. Study 3 Results

The participants' demographic information showed that 64.3% of the respondents were female, and the rest (35.7%) were male. Therefore, the majority of respondents in this study were female. The participants' average age was 35.84 ± 8.94 years, which indicates that the physicians working in Iran's health centers are young (figure 20). Also, the average work experience was 14.58 years (Table 17 and figure 21). Model evaluation is performed at two levels of the measurement model and the structural model. In the first step, the relationship between factors and dimensions was measured. The structural model of the relationship between dimensions was then examined using the SmartPLS3 software, partial least squares analysis method, and the partial least square analysis method.

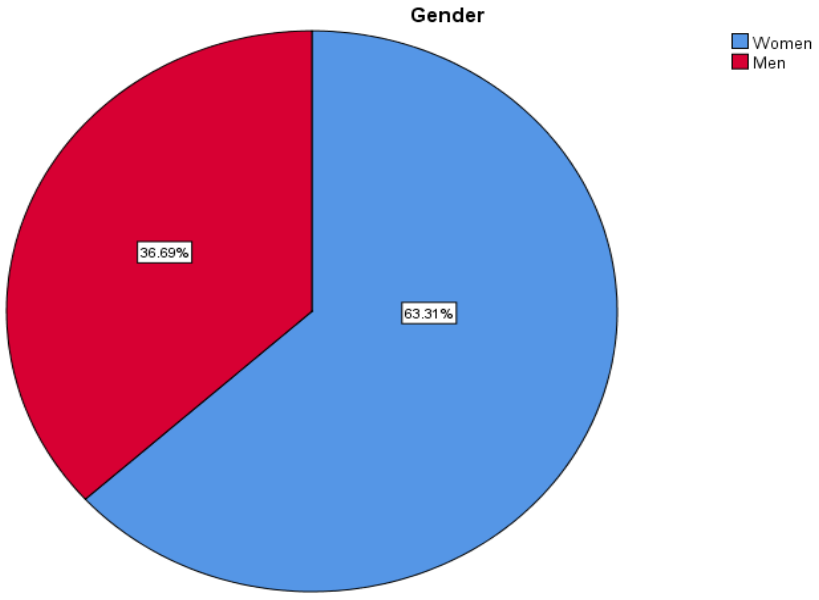
Table 17. Demographic information

		Frequency	Percent	Valid Percent	Cumulative Percent
Gender	Women	264	63.3	63.3	63.3
	Men	153	36.7	36.7	100.0
	Total	417	100.0	100.0	

Educational Level	BS	211	50.6	50.6	50.6
	MA	38	9.1	9.1	59.7
	doctor	168	40.3	40.3	100.0
	Total	417	100.0	100.0	
Organizational Position	Health Providers	205	49.2	49.2	49.2
	Health Expert	76	18.2	18.2	67.4
	Physicians	136	32.6	32.6	100.0
	Total	417	100.0	100.0	
Marital Status	Marriage	383	91.8	91.8	91.8
	Single	34	8.2	8.2	100.0
	Total	417	100.0	100.0	

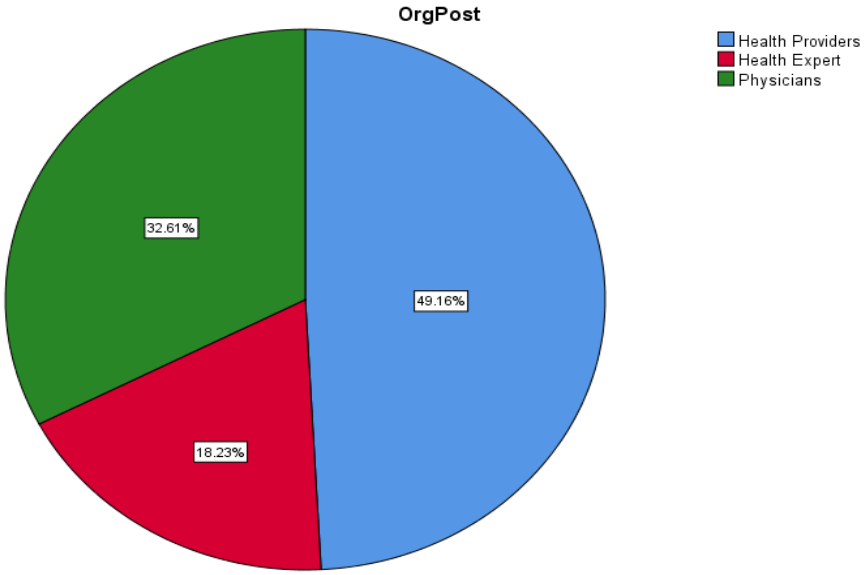
Source: Own elaboration

Figure 17. Gender ratio



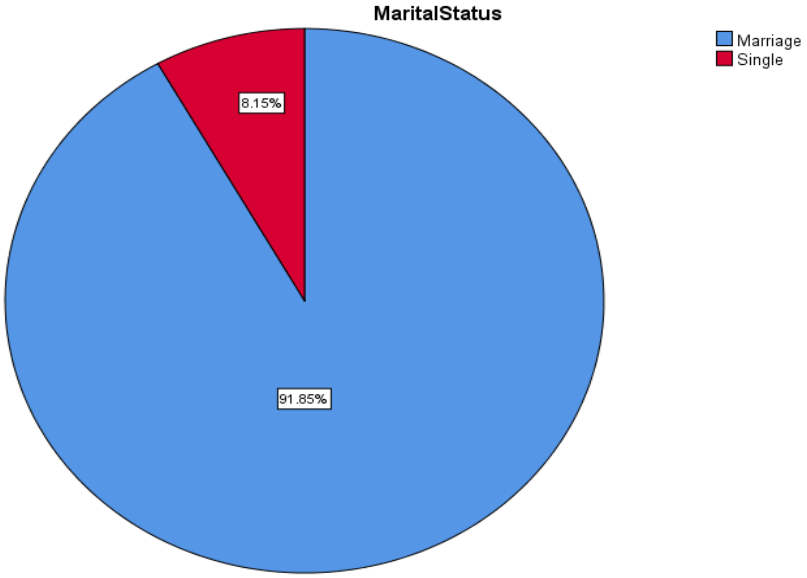
Source: Own elaboration

Figure 18. Human resources ratio



Source: Own elaboration

Figure 19. Marital Status



Source: Own elaboration

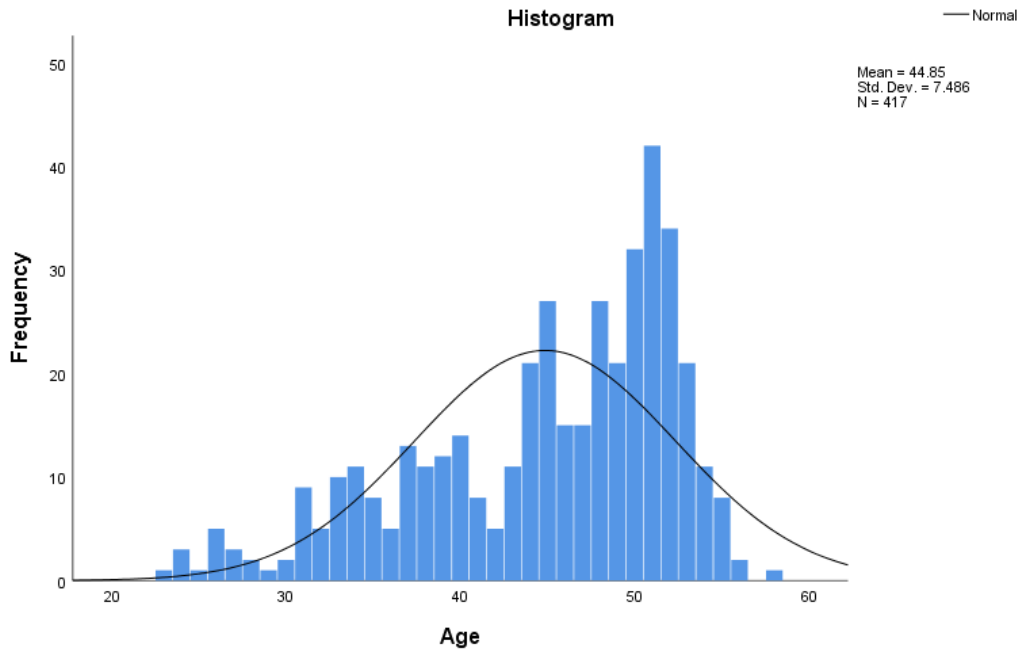
Table 18. Age frequency

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
23	1	.2	.2	.2
24	3	.7	.7	1.0
25	1	.2	.2	1.2
26	5	1.2	1.2	2.4
27	3	.7	.7	3.1
28	2	.5	.5	3.6
29	1	.2	.2	3.8
30	2	.5	.5	4.3
31	9	2.2	2.2	6.5
32	5	1.2	1.2	7.7
33	10	2.4	2.4	10.1
34	11	2.6	2.6	12.7
35	8	1.9	1.9	14.6
36	5	1.2	1.2	15.8
37	13	3.1	3.1	18.9
38	11	2.6	2.6	21.6
39	12	2.9	2.9	24.5
40	14	3.4	3.4	27.8
41	8	1.9	1.9	29.7
42	5	1.2	1.2	30.9
43	11	2.6	2.6	33.6
44	21	5.0	5.0	38.6
45	27	6.5	6.5	45.1
46	15	3.6	3.6	48.7
47	15	3.6	3.6	52.3
48	27	6.5	6.5	58.8
49	21	5.0	5.0	63.8
50	32	7.7	7.7	71.5

51	42	10.1	10.1	81.5
52	34	8.2	8.2	89.7
53	21	5.0	5.0	94.7
54	11	2.6	2.6	97.4
55	8	1.9	1.9	99.3
56	2	.5	.5	99.8
58	1	.2	.2	100.0
Total	417	100.0	100.0	

Source: Own elaboration

Figure 20. The average age of the participants



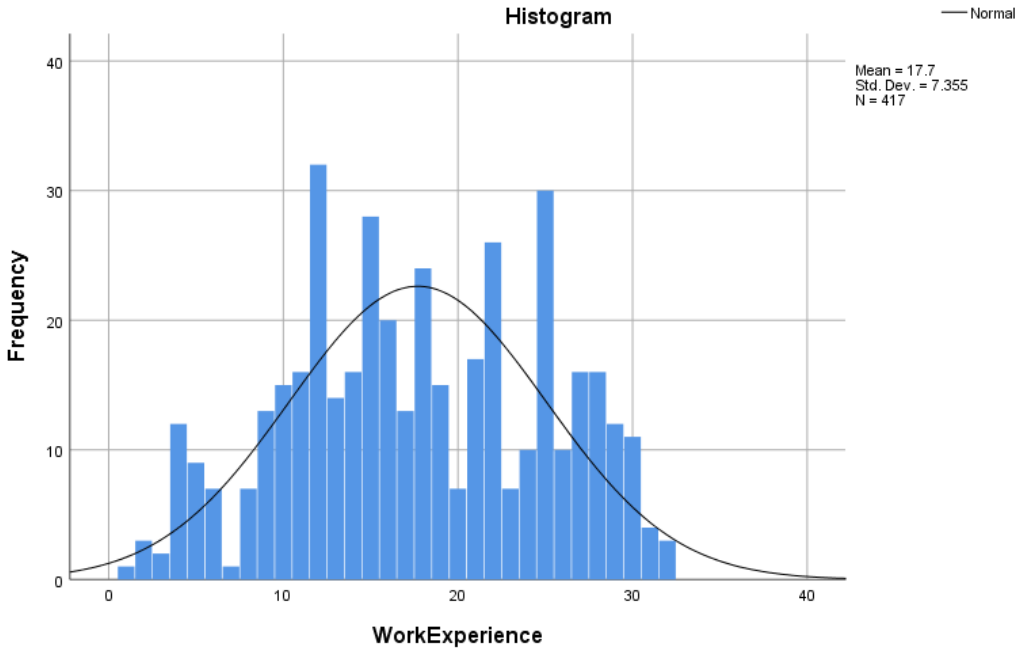
Source: Own elaboration

Table 19. Work Experience

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
1-5	1	.2	.2	.2
5-10	3	.7	.7	1.0
10-15	2	.5	.5	1.4
15-20	12	2.9	2.9	4.3
20-30	9	2.2	2.2	6.5
6	7	1.7	1.7	8.2
7	1	.2	.2	8.4
8	7	1.7	1.7	10.1
9	13	3.1	3.1	13.2
10	15	3.6	3.6	16.8
11	16	3.8	3.8	20.6
12	32	7.7	7.7	28.3
13	14	3.4	3.4	31.7
14	16	3.8	3.8	35.5
15	28	6.7	6.7	42.2
16	20	4.8	4.8	47.0
17	13	3.1	3.1	50.1
18	24	5.8	5.8	55.9
19	15	3.6	3.6	59.5
20	7	1.7	1.7	61.2
21	17	4.1	4.1	65.2
22	26	6.2	6.2	71.5
23	7	1.7	1.7	73.1
24	10	2.4	2.4	75.5
25	30	7.2	7.2	82.7
26	10	2.4	2.4	85.1
27	16	3.8	3.8	89.0
28	16	3.8	3.8	92.8
29	2	.5	.5	93.3
29	10	2.4	2.4	95.7
30	11	2.6	2.6	98.3
31	4	1.0	1.0	99.3
32	3	.7	.7	100.0
Total	417	100.0	100.0	

Source: Own elaboration

Figure 21. The average age of the Work Experience



Source: Own elaboration

Results of factor loads: The factor load of all items is more than 0.5, which indicates the accuracy of all the questions in the questionnaire. The questions' weight also indicates the balanced distribution of questions in each structure (Table 20).

Table 20. Values obtained Factor analysis for relevant determinants and items

Determinant	Item	Factor load	T Statistics	Weight	Mean
PE	**PE1**	0.852	35.472	0.281	0.852
	PE2	0.848	44.354	0.274	0.848
	PE3	0.869	53.112	0.297	0.871
	PE4	0.875	91.579	0.308	0.876

EE	**EE1**	0.882	66.584	0.288	0.881
	EE2	0.856	45.166	0.306	0.856
	EE3	0.882	54.393	0.294	0.882
	EE4	0.832	37.434	0.271	0.832
FC	**FC1**	0.816	34.894	0.184	0.813
	FC2	0.766	13.756	0.174	0.756
	FC3	0.610	11.524	0.169	0.606
	FC4	0.753	12.993	0.173	0.743
	FC5	0.859	40.891	0.234	0.857
	FC6	0.504	9.793	0.313	0.508
	FC7	0.612	12.015	0.203	0.607
PV	**PV 1**	0.808	34.493	0.287	0.808
	PV 2	0.902	80.277	0.335	0.902
	PV 3	0.833	44.752	0.283	0.834
	PV 4	0.813	38.236	0.283	0.817
HB	**HB 1**	0.922	83.862	0.349	0.922
	HB 2	0.887	63.873	0.344	0.887
	HB 3	0.911	80.771	0.409	0.910
WT	**WT 1**	0.814	51.430	0.448	0.814
	WT 2	0.889	72.763	0.394	0.888
	WT 3	0.834	39.456	0.341	0.833
AU	**AU1**	0.890	54.698	0.412	0.891
	AU2	0.824	20.568	0.303	0.822
	AU3	0.815	18.788	0.206	0.806
	AU4	0.524	4.985	0.093	0.511

	AU5	0.737	14.130	0.226	0.729
TR	**TR1**	0.768	37.034	0.225	0.768
	TR2	0.749	22.612	0.213	0.748
	TR3	0.867	66.923	0.240	0.867
	TR4	0.771	26.119	0.229	0.772
	TR5	0.809	37.144	0.211	0.809
	TR6	0.637	17.616	0.175	0.638
RE	**RE1**	0.912	68.660	0.381	0.912
	RE2	0.883	36.327	0.287	0.880
	RE3	0.675	9.419	0.030	0.661
	RE4	0.781	19.422	0.218	0.777
	RE5	0.801	13.734	0.130	0.787
	RE6	0.813	13.991	0.129	0.799
BI	**BI1**	0.938	118.981	0.436	0.938
	BI2	0.829	30.245	0.355	0.829
	BI3	0.841	34.712	0.353	0.841

Source: Own elaboration

3.8. Evaluation of the measurement model

The one-dimensionality of the model indicators is the first factor to evaluate the measurement models. All of the set indicators must be loaded with only one dimension or latent variable with a considerable factor load value. The amount of factor loads less than 0.4 is removed (C. Fornell & D. F. J. J. o. m. r. Larcker, 1981) and Cornbrash's alpha (CA) coefficient is used to assess the reliability of internal consistency reliability. This coefficient value varies from 0 to 1, where values higher than 0.7 are considered appropriate, and values less than 0.6 are inappropriate (Werts et al., 1974). Another factor

called Composite Reliability (CR) can assess the internal compatibility of measurement models. This coefficient value varies from 0 to 1, the values higher than 0.7 are considered appropriate, and values higher less than 0.6 are inappropriate (C. Fornell & D. F. J. J. o. m. r. Larcker, 1981). As shown in Table 21, this value is above 0.7 in all cases (Table 15).

Convergence validity shows the high correlation of one structure's indicators compared to other indicators. AVE is used to evaluate convergence in SmartPLS3, which is between 0 and 1, where values above 0.5 are accepted (Magner et al., 1996).

Individual validity indicates the existence of minor correlations between the indicators of one structure and the indicators of other structures that should be evaluated in the measurement models. The mentioned criteria refer to the fact that the second root of each structure's described values (AVE) is higher than the structure correlation values with other structures. As shown in Table 21, the reliability of all structures was between 0.5 and 0.8, which indicates the appropriateness of convergence and the structures (latent variables) had a high validity for the goodness of fit.

Table 21. Reliability and validity

Determinant	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Authority	0.829	0.929	0.875	0.591
Behavioral Intention	0.839	0.858	0.904	0.758
Effort Expectations	0.886	0.887	0.921	0.745
Facility Condition	0.835	0.834	0.876	0.508
Habit	0.892	0.900	0.933	0.822
Performance	0.884	0.886	0.920	0.742

Expectations				
Cost Value	0.860	0.867	0.905	0.705
Physician / patient Relationship	0.909	1.016	0.921	0.663
Trust and Confidentiality	0.860	0.868	0.897	0.593
Waiting Time	0.803	0.811	0.883	0.717

Source: Own elaboration

The next step is to evaluate the model's diagnostic validity, which will use the Fornell-Larcker criterion. According to this criterion, the second root of the described variance values of any structure called AVE must necessarily be higher than the correlation values of that structure with other structures. The results indicate that all values on the main diameter of Table (22) are higher than those values, which means that the model's diagnostic validity is supplied.

It should be noted that the elements of the main diameter, the sum of the values of variance described in each structure, and the elements of the original diameter are the values of correlation between the structures. The diameter elements must be larger than the non-diameter elements for diagnostic validity.

Table 22. Validated diagnostic constructs to model *(Fornell-Larcker)*

Authority	0.769									
Behavioral Intention	0.315	0.871								
Effort Expectations	0.144	0.717	0.863							

Facility Condition	0.236	0.464	0.188	0.713						
Habit	0.088	0.679	0.542	0.287	0.907					
Performance Expectations	0.343	0.651	0.415	0.244	0.412	0.861				
Cost Value	0.179	0.713	0.578	0.208	0.589	0.505	0.840			
Physician / patient Relationship	0.641	0.279	0.156	0.181	0.105	0.347	0.148	0.814		
Trust and Confidentiality	0.304	0.725	0.517	0.282	0.573	0.544	0.586	0.363	0.770	
Waiting Time	0.313	0.654	0.409	0.259	0.514	0.483	0.535	0.371	0.570	0.847

Source: Own elaboration

3.9. Evaluation of the Structural Model

Evaluation of the structural model is performed after the evaluation of measurement models. To this end, the R^2 coefficient of determination is used to measure the relationship between the described variance value of a latent variable and its total variance value. In this evaluation, values close to 0.67, 0.33 , and 0.19 is are desired, usual (normal), and weak, respectively (Chin, 1998). The coefficient of determination was strong (0.845).

Table 23. R2 coefficient

	R Square	**R Square Adjusted**
BI	0.845	0.842

Source: Own elaboration

The value of Q2 (Stone-Geisser)

This criterion determines the predictive power of the model. If the value of Q2 in the case of an exogenous structure is 0.15, 0.20, 0.35, then it respectively indicates the weak, medium, and strong predictive power of the structure or its exogenous structures (Henseler et al., 2009). SSO represents the sum of observation squares for each group or block. Moreover, SSE/SSO also shows the subscription validity index or CV-com. If the validity index of the latent variables is positive, the measurement model has good quality. As shown in Table 6, the model is also suitable based on this criterion with positive values (Table 24). This indicator has a good model prediction about this structure and confirms the proper fit of the research structural model.

Table 24. Construct Cross validated Communality

Determinant	SSO	SSE	Q^2 (=1-SSE/SSO)
Authority	2,085.000	1,258.986	0.396
Behavioral Intention	1,251.000	655.172	0.476
Effort Expectancy	1,668.000	774.497	0.536
Facility Condition	2,919.000	1,918.038	0.343
Habit	1,251.000	540.963	0.568
Performance Expectancy	1,668.000	780.415	0.532
Price Value	1,668.000	861.464	0.484
Relationship	2,502.000	1,207.198	0.518
Trust and Security	2,502.000	1,435.801	0.426
Waiting Time	1,251.000	742.475	0.406

Source: Own elaboration

The goodness of Fit test (GOF)

The fit of the general model was controlled by the goodness of fit index, developed by (Tenenhaus et al., 2004). In this criterion, the values are between zero and one, and the values close to one indicate the appropriate quality of the model *(Ringle & retailing, 2006)*. The overall model can be predicted to show whether the tested model has successfully predicted endogenous latent variables. This criterion is calculated using the following formula.

$$\text{GOF} = \sqrt{communalities \times R - squares}$$

Communalities are the average of the shared values, and these values are equal to: 0.68, and R2 is the mean value of R-Squares of the endogenous structures of the model, which is equal to 0.842.

$\text{GOF} = \sqrt{}\text{average (Commonality)} \times \text{average } (R^2) = \sqrt{}0/68^* \ 0.84 = 0.75$

Considering the achievement of 0.75 for GOF in the present study, the overall model's suitability can be emphasized.

Table 25. Model Fit Summary

	Saturated Model	**Estimated Model**
SRMR	0.086	0.086
d_ULS	7.598	7.598
d_G	5.183	5.183
Chi-Square	7,301.599	7,301.599
NFI	0.584	0.584

Source: Own elaboration

3.10. Analysis of the structural model

The research hypotheses are tested after examining the measurement and structural models, as well as the general model of the research. At this stage, the algebraic sign of the coefficient, the size, and the significance level are examined. The path coefficient size indicates the strength of the relationship between the two latent variables. The path coefficient greater than 0.1 indicates a certain amount of effect of the model. If t-values are higher than 1.96, then its significance level would be .05.

Moreover, the significance level is 0.01 for t-values higher than 2.57 and 0.001 for values greater than 3.29. The path coefficients and the significance level are shown in Table (26) and Figure (22). According to the Table, all hypotheses were significant because the absolute value of the significant number obtained from the T-statistic in all hypotheses was higher than 1.96. In other words, the Performance expectancy, Effort expectancy or ease of use, Facilities, Price value, Habit, waiting time, Trust and Confidentiality, authority, Health Provider (physician)-Patient Relationship related to behavior intention and its effective rate was as much as 0.84.

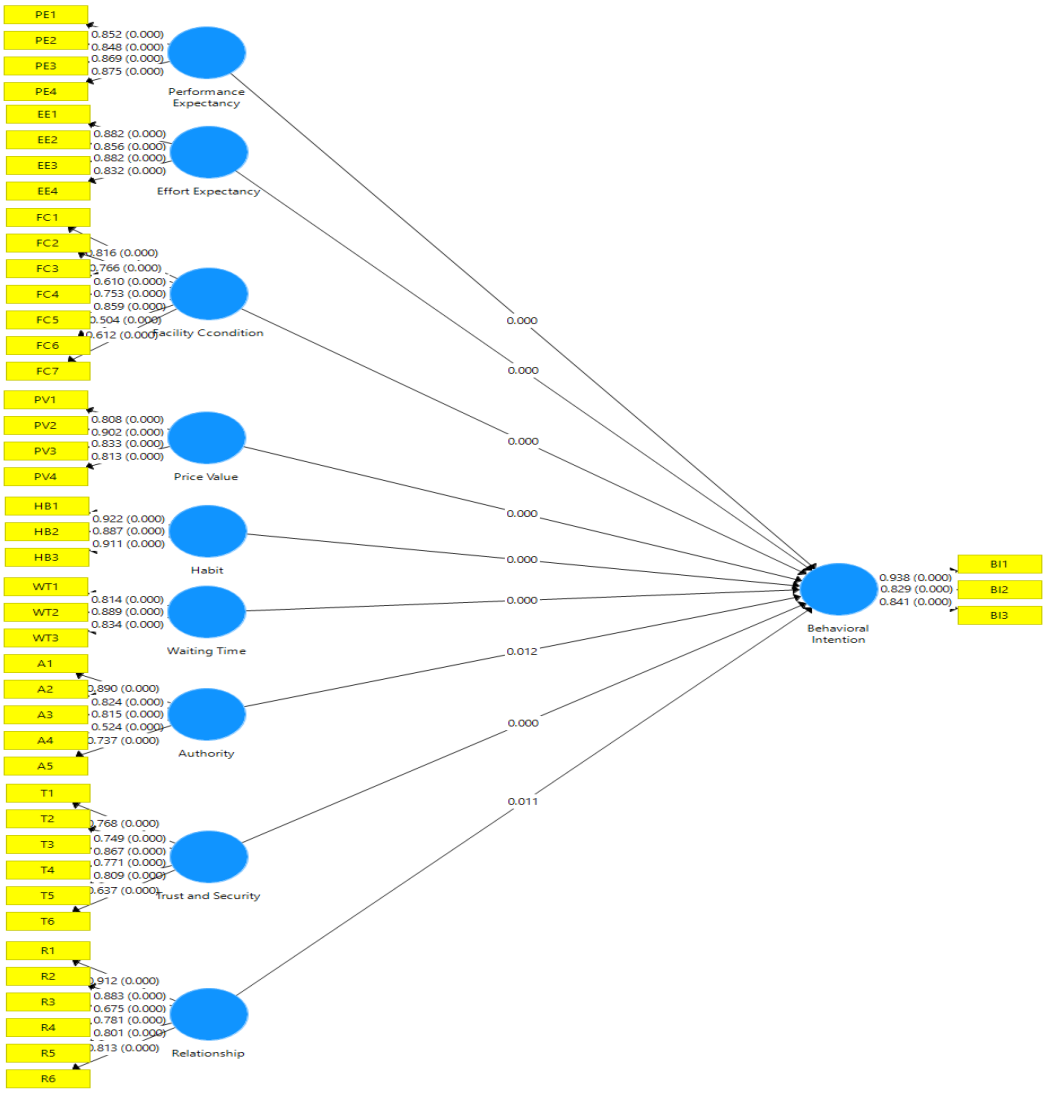
Table 26. Determinant test result

Mean, STDEV, T-Values, P-Values	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Authority -> Behavioral Intention	0.062	0.063	0.025	2.523	**0.012**
Effort Expectancy -> Behavioral Intention	0.302	0.301	0.027	11.104	**0.000**
Facility Condition -> Behavioral Intention	0.206	0.204	0.022	9.191	**0.000**

Habit -> Behavioral Intention	0.114	0.117	0.028	4.134	**0.000**
Performance Expectancy -> Behavioral Intention	0.184	0.183	0.027	6.709	**0.000**
Price Value -> Behavioral Intention	0.149	0.148	0.029	5.175	**0.000**
Relationship -> Behavioral Intention	-0.064	-0.060	0.025	2.551	**0.011**
Trust and Security -> Behavioral Intention	0.173	0.174	0.028	6.214	**0.000**
Waiting Time -> Behavioral Intention	0.155	0.153	0.026	6.005	**0.000**

Source: Own elaboration

Figure 22. Structural model testing results



Source: Own elaboration

3.11. Discussion

The purpose of this study is to in-deep understand of the determinants of IOT adaption in healthcare systems, especially electronic health care records and modify the current

UTAUT2 model for the health system to bring this model in line with the characteristics of the health system. However, this study goes further as it reinforces the importance of nine factors as determinants in accepting electronic health care information record, and the identified dimensions were confirmed by quantitative method (0.84, $p<0.001$). In this regard, the extraction dimensions are as follows:

1. Performance expectation (PE)

Health centers are important community service institutions with a significant role in the health fields. Unfortunately, the follow-up and monitoring of patients are not done well and qualitatively in many health centers, and as a result, the organizational performance of health centers is negatively affected. Health technology has a direct impact on healthcare, and monitoring, diagnosing, and physicians counseling with their patients remotely through health technology and also provide online reports (Suriya Begum & Computing, 2016).

The performance expectation category in the technology acceptance model is the strongest predictor of the behavior intention, and its measurement in both the mandatory and optional status of technology use remains significant (Venkatesh et al., 2003). The healthcare providers use more technologies related to their tasks. Users are more likely to accept certain technologies that will help their efficiency. Therefore, health providers are more likely to accept health technology if they realize that EHCR will improve health care performance and improve patients' health services. These results are consistent with the results of previous studies (Alpay et al., 2010; Årsand et al., 2008; Keselman et al., 2008).

2. Effort expectation

The effort expectation is defined as the ease of using technology derived from the perceptual ease of technology acceptance model, which determines the level at which a person comprehends a particular technology or system that will require less effort (Venkatesh et al., 2003). Adopting new technology or systems will be successful when people consider it easy to learn how to use it (Årsand et al., 2008). When there are fewer barriers for using new technology, it would be more acceptance. In this context, ease of use will be a critical factor in reinforcing users' behavioral intention. The results are

consistent with the findings of previous researchers (Bhatiasevi, 2016; Park et al., 2007; Sun et al., 2014; Wang & Communication, 2015) and confirm the expectation effect of effort on behavioral intention.

3. Facilitating Conditions (FC)

Facilitation is defined as the extent to which an individual believes that there is an organizational and technical infrastructure to support the use of new technology (Venkatesh et al., 2003). A potential barrier to use health services and provide health care is the lack of resources or support services that allow users to access and adequately use health technologies, such as electronic healthcare records (Keselman et al., 2008). When users are confident of technical facilities and resources to support the system, there would be more expectations for their acceptance. Knowledge of online access, compatibility between technologies and systems, customer or user support, adequate hardware and software resources, knowledge of information technology, and availability of technical knowledge are likely to reduce barriers in using new technology in terms of Internet infrastructure (Wang et al., 2015). The results also confirm the findings of previous researchers (Aarts et al., 1998; Webb et al., 2009) regarding the effect of facilitative conditions on behavioral intention.

4. Price value

Cost and price may have a significant impact on the use of technology. The price value is obtained from the amount of value perceived by the used technology, which can effectively select and accept technology (Chang & Tseng, 2013; Wang & Wang, 2010). The price value is emphasized by researchers in the field of information technology and technology markets. Findings indicate that the concept of price value is crucial in technology adoption (Kuo et al., 2009; Soltani et al., 1970; Zhao et al., 2012). Cost value is positive when the benefits of using technology outweigh the material costs, and such a value has a positive effect on the intention to use (Venkatesh & Bala, 2008). Accordingly, Vankatesh et al. (2008) described price value as consumers' cognitive exchanges between perceived benefits of services and the monetary costs of use (Venkatesh & Bala, 2008).

5. Habit

The habit of technology was the last factor added to the Utaut model. Vankatesh et al. (2012) defined habit as the degree of consumer desire to learn, use technology, or use the behaviors of technology products automatically (Venkatesh et al., 2012). According to the definition of Limayem et al. (2007), habit is the degree to which individuals tend to engage in behavior automatically, which is due to learning (Limayem et al., 2007), While Kim et al. (2005) equated habit with self-efficacy. Habit is organized in two distinct ways, although they have a relatively similar concept. First, habit is seen as a repetition of previous behavior (Kim & Malhotra, 2005); second, habit is measured to the extent that one believes that the behavior is automatic.

Habit structure consists of three criteria: past behavior, reflex behavior, and individual experience. Past behavior is described as previous user behavior. Reflex behavior refers to user behavior customs that are part of everyday life (Kim & Malhotra, 2005). Personal experience refers to the accumulation of everyday experiences, norms and enduring habits created by users to use technology products. Such experiences reduce the need for discussion, coordination, or difficult decisions (Kim & Malhotra, 2005). Previous experiences of using information technology have predicted the intention to use it and facilitate the situation.Habit determinant has been widely discussed in various fields, including psychology, consumer buying behaviors, education, health sciences and management (Limayem et al., 2007). The research results in line with our research on the goals of habits and behaviors resulting from habits have shown that habit predicts the severity of the tendency to use technology to promote behavioral change(Kim et al., 2007; Morton, 2008; Venkatesh et al., 2012; Wang & Wang, 2010; Webb et al., 2009).

6. Waiting time

One of the influential factors that can lead to adoption of technology is the benefits that result from independent time-space interactions to avoid waiting time (Mallat, 2007). Dwivedi et al. (2016) consider that the waiting time dimension increase the acceptance of

mobile health technology among users (Dwivedi et al., 2016). El-Wajeeh et al. concluded that saving time due to using health technology increases acceptance (Nguyen et al., 2019). Scheindenhelm Kossman indicated that health technology reduces the time spent at the patient's bedside (Kossman & Scheidenhelm, 2008), which can be effective in adopting the technology.

7. Authority

"Physicians' Authority" is another new determent that significantly affect the "behavioral intention" of EHR. Physicians are characterized by their high professional autonomy (Jensen & Aanestad, 2006; Venkatesh et al., 2011; Walter & Lopez, 2008). The implementation of EHR contains significant changes that can affect power relations or positions in the medical practice (Abdekhoda et al., 2015).

Resistance is more likely to occur when technology negatively affects job task, professional status, and independence (Walter & Lopez, 2008). Therefore, resistance to accept technology will likely occur when professional status, work roles, and autonomy are negatively affected (Abdekhoda et al., 2015; Walter & Lopez, 2008). Many studies have shown that perceived threat of professional autonomy has a significant negative impact on accepting EHR among physicians (Abdekhoda et al., 2015; Esmaeilzadeh & Sambasivan, 2012; Hamid, 2013; Walter & Lopez, 2008).

Therefore, doctors and other health providers welcome to implementation of EHR with high computer skills. Awareness of the benefits and positive EHR effects on the work process also reduces their resilience (Terry et al., 2008a).

8. Trust and confidentiality

Unfortunately, one of the most critical problems that have not been completely solved in the Internet environment is data security and information exchange. Indeed, no one likes his/her confidential medical information to be stolen by hackers. Confidentiality concerns refer to the degree to which the health providers, such as physician believes that using EHR would impose a risk to the confidentiality of patients' information. Many studies reported that patient information confidentiality is one of the main factors in the acceptance of EHR and e-health technologies among physicians and other healthcare

providers (Boonstra & Broekhuis, 2010a; De Grood et al., 2016). Few studies considered the association between confidentiality concerns and physicians' decision to accept and use EHR (Steininger et al., 2015). The study conducted by Yoon et al. (Yoon et al., 2012) showed that the accessibility of regulations to protect doctors from personal obligation for privacy and security breaches or record tampering by external parties was a facilitator to electronic healthcare record adoption. Previous study showed that privacy concerns negatively affect both attitudes toward and perceived usefulness of EHR by physicians. Physicians and healthcare providers are concerned that patients' information in the EHR system and e-health would be accessible to those not authorized (Boonstra & Broekhuis, 2010a). According to (Boonstra & Broekhuis, 2010a), physicians are more concerned about the confidentiality of patients' information than patients themselves.

Expose of patient data may lead to legal problems for physicians. Generally, patient confidentiality threats happen due to insufficient legal regulations or technical system design weakness and implementation(De Grood et al., 2016; Steininger et al., 2015). Most physicians who use EHR believe that comparing paper records are involved with more security and confidentiality risks (Boonstra & Broekhuis, 2010a). Additionally, as the final objective of EHR is to exchange data and medical information among physicians and healthcare providers, threats to privacy and security of patient health information increase because the data loses the protection standards applied by the healthcare institution during transferring data to another institution (Steininger et al., 2015). Therefore, creating a secure and impenetrable program in the field of personal health information should have three main objectives, including maintaining the privacy of personal data, ensuring the accuracy and precision of data and ensuring timely access for authorized people (Yoon et al., 2012).

9. Health Provider-Patient Relationship (emotional communication and empathy)

Interpersonal communication, emotions, and feelings are the main factors, which are less considered in the design and deployment of health technologies.

Emotion is a physiological reaction or reflection, which is directly related to people's targeted behavior. Moreover, emotion is a short-lived, fleeting emotional state that

depends on the external environment and conditions. Emotions in psychology usually refer to feelings and emotional reactions.

Researchers have defined ten common emotional states for consumers, including anger, humiliation, hatred, helplessness, fear, guilt, interest, pleasure, shame, and wonder. Therefore, different emotions will have different behavioral consequences. Emotions provide a complete understanding of shopping intentions, which can be a significant driver of consumer behavior. Research has shown that understanding unfair pricing can lead to consumer dissatisfaction with a negative feeling of anger. Therefore, awareness of unequal prices or unequal services can lead to frustration, anger, or injustice. Emotions affect buyers' satisfaction and intentions to use or purchasing in the future. The study of emotion in psychology goes back more than a hundred years. There are two basic approaches to emotion: the first approach has emerged among behavioral science researchers who commonly employ the stimulus-response paradigm — hoping to understand the emotional mind's mechanisms through each person's behavioral reactions when faced with the stimulus. The second approach found its origin in the neuropsychology systems, which tried to understand and predict human behavior to explain how the human brain works when it encounters a given stimulus. Behavioral research depends on the outcomes and behavioral consequences of the stimulus and indirectly predicts or theoretical reasoning about the human brain. However, the nervous system is directly linked to understanding and observing the human brain (Blossom, 2001).

Studies show that empathy and emotion are essential for effective health care services. When doctors listen directly to patients, they feel more relaxed and have better treatment. In addition, effective communication and empathy between doctor and patient positively reduce patient anxiety and depression, which is associated with reduced specific symptoms (Neumann et al., 2011). In particular, health care personnel will have more useful and practical health care by paying attention to the patient's feelings and symptoms (Van Dulmen et al., 2002). Some studies show that the use of computers in the doctor checkup room is considered as an obstacle to the efficiency of the doctor's workflow and negligence of patients (Gadd & Penrod, 2000; Hsu et al., 2005; Huber, 2001). The excessive use of the computer in health centers creates communication barriers and leads

to patient dissatisfaction (Baron et al., 2005). When doctors are typing, patients may not want to stop the doctors' working process (Booth et al., 2004). Doctors may break conversations when they watch information on the computer monitor and patients try to remain silent when they see the doctors are silent so as to avoid interrupting them. Their reliance on technology for diagnosis and limited bedside interactions with patients may reduce empathy by losing their listening skills and talking to their patients (Crandall et al., 2006 and Vallabh, 2011).

However, some other studies suggested that EHR technology may improve the physician and patient relationship (Baron et al., 2005; Huber, 2001). Positioning strategies front of computer screen and keeping eye contact can help alongside patient-centered approaches. Highly skilled doctors anticipate EHR as a source for facilitating doctor-patient communication. However, doctors with low communication skills see computers as a threat to doctor-patient communication (Rouf et al., 2007). A patient-based communication seems to be better because the patient's communication and emotional needs are prioritized over health technology, and they are involved in the process. Therefore, it is necessary to pay attention to the component of physician-patient communication in designing IoT health technologies such as electronic health records. The design and implementation of this system should not overshadow interactions between physicians or health personnel and patients and eliminate some of the interactions.

3.12. Conclusion

Examining the acceptance factors of the technology can be a suitable guide for a better selection of technology, more effective deployment, prevention, and solution of problems regarding using health technology according to the characteristics of the health system, working conditions, and system culture, which leads to increased acceptance. According to results, the factors and model could be useful as a standard tool to assess health technology acceptance and identify its effective factors. Suppose the health technologies such as electronic healthcare record systems are designed and implemented regardless of

autonomy, Health Provider-Patient Relationship and empathy, trust, and confidentiality. Therefore, it will be nothing, just a "cookbook" for doctors, and it will not be welcome.

3.13. Research Limitations

The present study, like other studies, has faced limitations that are briefly mentioned.

- Due to the lack of use of IOT in most health centers in Iran, many staff were unfamiliar with IOT, we had to use the well-known electronic healthcare record technology, which was a national IOT project and all health centers were required to use it.
- Lack of similar research in the field of research led to more time to provide accurate information.
- Although the sample size is theoretically acceptable, but due to the wide distribution of questionnaires in the country, higher participation was expected, which was affected by coincidence with the corona situation and the involvement of health workers with the corona.
- In this research, no intermediate variables were studied that can be studied in future research.
- the present study does not fully address some of the key issues, including topology, architecture and operating system, and security requirements for EHRs.
- This study did not examine patients' opinions
- In this study, the survey was distributed and analyzed before the current pandemic. Nevertheless, the motivation of use technologies before and during this pandemic shows many differences. So, during this pandemic, the reactions of users may be changed.

3.14. Implications for research

The findings contribute in four different ways. The first contribution is identifying additional factors of electronic health care information record and Health IoT adoption.

The results were consistent to Holden and Karsh (2010), Vahdat (2018), and Martínez-Caro et al. (2018) based on the need for developing specific models in the healthcare context (Holden & Karsh, 2010; Martínez-Caro et al., 2018).

Second is the adoption of electronic health care information record by exploring and presenting new drivers for filling the gap of the insatiable general model of adopting healthcare, as well as combining and modifying the UTAUT2 model or creating new models.

Third is the knowledge of technology acceptance by testing theoretical constructs. As proposed by previous researchers, there is an insistent call for more experimental validation of UTAUT2 in new settings Vahdat (2018), and Martínez-Caro et al. (2018), Jawahar and Harindran (2016), Venkatesh (2012), and the present research opens the way to context-related research (Holden & Karsh, 2010; Jawahar & Harindran, 2016; Martínez-Caro et al., 2018; Venkatesh et al., 2012).

Fourth is the use of a mixed methods approach. Most studies were based on quantitative and there was a need for a qualitative study to develop a deeper understanding of a specific phenomenon (Venkatesh et al., 2012). Using interviews and focus discussion groups as a qualitative approach was useful and suitable for modifying the UTAUT2 model, exploring adoption factors, and generating four new constructs. Finally, quantitative research was used for testing and validating the resulting factors.

Practical suggestions

Based on the results of the analysis, the following recommendations can be made:

Since doctors are reluctant to use the mouse and keyboard, advanced data entry tools such as barcodes, light pens, optical character readers, and voice recognition technology by users can be a good alternative. Moreover, *access to the patient record should be considered.* Paying attention to the physician-patient communication component is necessary in designing an electronic healthcare record. The design and implementation of this system should not overshadow interactions between physicians or health providers and patients. When physicians use the EHR, they should use communication procedures

and techniques to interact with the patient. For example, explaining the patient's work process shows some EHR information to the patient by using conversations or short questions during working with the EHR. Future research should examine the type of screen content to facilitate physician-patient communication.

- The results of the mentioned studies show that the design and implementation of EHR should be conducted to prevent threatening physicians' autonomy. Therefore, physicians should be free to choose the steps of diagnosis and treatment of patients, and the system should be considered only as a support system.
- Theoretical findings, development, and validation in this study provide a framework that includes the factors influencing the adoption of health technology, theoretical foundations for designing and selecting health technology in future health care before entering the market, or solving the problems of their acceptance.

3.15. Future research suggestion

Factors influence Health IOT and EHRs in different cultures dimensions. is an interesting topic for **further research.** Additionally, whether the findings regarding EHRs adoption will also hold true, the results differ when changing the users to different background, age and educational. Also, UTAUT 2 modified model and the results will compare to newly released technologies within the field of Health IoT and EHRs. Examining the acceptance of other IoT technologies, such as big data, augmented reality and cognitive systems could be considered in future research. Policies and regulations in the healthcare sector are very important and could impact on induced technology demand in health market that should be considered in future research thus it is suggested that the role of induced demand in technology acceptance be study for further research. It is suggested that the importance of paying attention to the role of emotions and feelings in the design of technologies be examined in separate research. It is worth repeating this study after the Covid-19 pandemic due to the number of changes in Health technologies using.

Ethical considerations

This study has been approved by the Ethics Committee in the research of the Ferdowsi University of Mashhad with the code of IR.UM.REC.1398.143 which is part of the doctoral dissertation. Participants collaborated with researchers with personal satisfaction.

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Appendix

A1. UTAUT2 questionnaire for physician acceptance

Based on your experience with the IOT in healthcare, please read the following sentences and rate on a scale of 1-5, how much you disagree/agree. 1 being strongly disagree, and 5 being strongly agree

Construct	Items		1	2	3	4	5
Performance expectancy	**PE1**	I find the IOT useful in my job.					
	PE2	Using the IOT increases my chances of achieving things that are important to me.					
	PE3	Using the IOT helps me accomplish things more quickly.					
	PE4	Using the IOT increases my productivity.					
Effort expectancy	**EE1**	Learning how to use the IOT is easy for me.					
	EE2	My interaction with the IOT is clear and understandable.					
	EE3	I find the IOT easy to use.					

	EE4	It is easy for me to become skilful at using the IOT.					
Social influence	**SI1**	People who are important to me think that I should use the IOT.					
	SI2	People who influence my behaviour think that I should use the IOT.					
	SI3	People whose opinions that I value prefer that I use the IOT.					
Facilitating conditions	**FC1**	I have the resources necessary to use the IOT.					
	FC2	I have the knowledge necessary to use the IOT.					
	FC3	The IOT is compatible with other technologies I use.					
	FC4	I can get help from others when I have difficulties using the IOT.					
Hedonistic motivation	**HM1**	Using the IOT is fun.					
	HM2	Using the IOT is enjoyable.					

	HM3	Using the IOT is very entertaining.					
Price value	**PV1**	The IOT is reasonably priced.					
	PV2	The IOT is a good value for the money.					
	PV3	At the current price, the IOT provides a good value.					
Habit	**HT1**	The use of the IOT has become a habit for me.					
	HT2	I am addicted to using the IOT.					
	HT3	I must use the IOT.					
	HT4	Using the IOT has become natural to me.					
Behavioural intention	**BI1**	I intend to continue using the IOT in the future.					
	BI2	I will always try to use the IOT in my job.					
	BI3	I plan to continue to use the IOT frequently.					

Regards, thank you for taking the time to answer your questions. The purpose of this interview is to conduct research entitled "Adaptation of technology (IOT and electronic health system) in the health system." At the beginning of the questions, a general description of the IOT technology and the Healthcare record system in healthcare systems. Your honesty and accuracy in answering these questionnaires will greatly help the value of the information obtained from this research and ultimately improve the health system. You are assured that all answers will be kept strictly confidential and that the information obtained will be used for research purposes only. In order for all your orders to be considered, the conversation will be recorded if you are satisfied. After extracting the information on paper, the interview files will be deleted. Also, there is no need to mention your name and surname. Thank you again for your cooperation.

A.2 INTERVIEW PROTOCOL

Basic description

The Internet of Things is a network that with the help of communication and wireless technology, connects different objects to each other or to humans. For example, IoT innovations have led to the production of telemedicine, e-health, mobile health, tele-surgery, and health information systems such as electronic health records and virtual therapies. In the field of health, one of the Internet of Things systems in health care that is used in Iran is the health information system or electronic healthcare record. Please express your opinions about any of the electronic healthcare system such as Sib, Nab and Sina, etc. or other IoT technologies that you have use it.

Please provide your general details other than your first and last name (occupation, age, digital knowledge, etc.) if you wish.

1. Why did you decide to use the electronic health system (or other technology they mentioned)?
2. What are the important criteria in your decision to use (acceptance, experimentation, curiosity, tools, entertainment)?
3. What are the factors that make you use the electronic health record system typically?
4. What does have an effect on performance with using this system?
5. Do you think it is easy to use the electronic health record system or not?
6. What are the requirements for using the electronic health record system?
7. Do you recommend the use of technology to other colleagues? Why?
8. Do you have anything to add?

A.3 MODIFIED UTAUT2 QUESTIONNAIRE

Modified UTAUT2 questionnaire for physician EHR acceptance

Introduction presented to respondents before the questionnaire started:

Regards, thank you for taking the time to complete this questionnaire. **Electronic healthcare record:** it is one of the IoT systems in health care used in Iran, which provides remote health services. Information related to a person's physical or mental health or condition is recorded in electronic systems to obtain, transmit, receive, store, retrieve, connect, and manipulate multimedia data to provide primary health care and related health services. Please answer the questionnaire only if you have prior knowledge and contact with electronic healthcare record. When we mention "EHRs" in this questionnaire, it refers to electronic healthcare record.

Construct	Items		1	2	3	4	5
Performance Expectancy	**PE1**	I find the EHRs useful in my job.					
	PE2	Using EHR Portals will support critical aspects in my job.					
	PE3	Using the EHRs helps me accomplish things more quickly.					
	PE4	Using the EHRs increases my					

		effectiveness.					
Effort Expectancy	**EE1**	Learning how to use the EHRs is easy for me.					
	EE2	My interaction with the EHRS is clear and understandable.					
	EE3	I find the EHRS easy to use.					
	EE4	It is easy for me to become skilful at using the EHRS.					
Facilitating Conditions	**FC1**	I have the resources necessary to use the EHRS.					
	FC2	I have the knowledge necessary to use the EHRS.					
	FC3	The EHRS is compatible with other technologies I use.					
	FC4	I can get help from others when I have difficulties using the EHRS.					
	FC5	The services of this health technology are available in all areas, even remote areas.					

	FC6	The services of this health technology are available 24 hours a day.					
Price Value	**PV1**	The EHRS is reasonably priced.					
	PV2	The EHRS is a good value for the money.					
	PV3	At the current price, the EHRS provides a good value.					
	PV4	Using this health technology reduces out-of-pocket payments.					
Habit	**HT1**	The use of the EHRS has become a habit for me.					
	HT3	I must use the EHRS.					
	HT4	Using the EHRS has become natural to me.					
Waiting Time	**WT1**	Using this health technology has helped to manage time					
	WT2	Using this health technology can reduce the health service provide time					

	WT3	With the use of this technology, it possible to receive health services on holidays.					
Authority	**AT1**	This health technology allows the use of clinical experience of physicians					
	AT2	This health technology allows healthcare physicians to make professional decisions					
	AT3	If necessary, the instructions and guidelines of this health technology cannot be followed					
	AT4	The choice and application of this health technology is optional					
	AT5	You need to use this health technology to stay up to date					
Trust and Confidentiality	**TC1**	The services of this health technology are reliable					
	TC2	This health technology has high accuracy					
	TC3	Diagnosis of diseases by this health technology is better than diagnosis by humans					
	TC4	This health technology reduces					

		medical errors					
	TC5	The information and data recorded in this health technology is completely confidential					
	TC6	The security of data storage and access to this health technology is high					
Health Provider-Patient Relationship	**PR1**	Using this health technology maintains non-verbal communication such as eye contact (face to face)					
	PR2	The use of this health technology maintains a verbal communication between physicians and the patient					
	PR3	This health technology helps the doctor and the patient to better understand each other					
	PR4	This health technology helps to express the doctor's empathy with the patient					
	PR5	This health technology helps to express the doctor's sympathy with the patient					
	PR6	This health technology helps					

		maintain mutual cooperation between doctor and patient					
Behavioural Intention	**BI1**	I intend to continue using the EHRS in the future.					
	BI2	I will always try to use the EHRS in my perfectional.					
	BI3	I plan to continue to use the EHRS frequently.					

A.4 RESEARCH ETHICS CERTIFICATE

Ferdowsi University of Mashhad

Research Ethics Certificate

Approval ID:	IR.UM.REC.1398.143	Approval Date:	2019-11-13
Evaluated by:	Ferdowsi University of Mashhad		
Status:	Approved		
Approval Statement:	The project was found to be in accordance to the ethical principles and the national norms and standards for conducting Medical Research in Iran. Notice: 1. Although the proposal has been approved by the research ethics committee, meeting the professional and legal requirements is the sole responsibility of the PI and other project collaborators. 2. This certificate is reliant on the proposal/documents received by this committee on 2019-11-13. The committee must be notified by the PI as soon as the proposal/documents are modified.		
Thesis Title:	Developing New Technology Adoption Model in Healthcare Systems within the field of Internet of Things: The Role of Feeling and Authority on Adoption Behavior		
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