Examining the Factors Affecting PDA Acceptance among Physicians: An Extended Technology Acceptance Model

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ABSTRACT
This study aims at identifying the factors affecting the intention to use personal digital assistant (PDA) technology among physicians in Turkey using an extended Technology Acceptance Model (TAM). A structural equation-modeling approach was used to identify the variables that significantly affect the intention to use PDA technology. The data were collected from 339 physicians in Turkey. Results indicated that 71% of the physicians' intention to use PDA technology is explained by perceived usefulness and perceived ease of use. On comparing both, the perceived ease of use has the strongest effect, whereas the effect of perceived enjoyment on behavioral intention to use is found to be insignificant. This study concludes with the recommendations for managers and possible future research.

Keywords: personal digital assistant; technology acceptance model; personal innovativeness; perceived enjoyment

1. INTRODUCTION
Personal digital assistant (PDA) is a handheld, point-of-care technology that helps healthcare professionals practice medicine [1]. PDAs allow healthcare professionals to work more efficiently. The main purpose of a PDA in a clinical setting is to facilitate and improve the healthcare practice [2]. The use of PDAs differs largely in clinical practice. PDAs have been commonly used for patient tracking, medical reference, to glean medical information, prescription, medical education, and clinical guidelines, as well as personal use [3–5]. Rapid access to medical information is obviously the most significant benefit at point of care. With the help of PDAs, physicians can easily access an enormous amount of medical information at any moment [6] by virtue of their portability [7]. They also help the physicians reduce or eliminate errors in drug prescription by generating and sending prescriptions electronically [8]. The most significant advantage is to maintain up-to-date patient information and spend more time with patients, resulting in time savings [8, 9].

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These advantages play a pivotal role in increasing the productivity and improvement of patient care and quality of services, thus reducing clinical errors and integrating resources [10]. A variety of applications are available for PDAs for physicians. Many of these applications are free, whereas others are available for a nominal fee. Therefore, PDAs have been widely accepted and used within many disciplines of medicine such as healthcare professionals including physicians, nurses, therapists, and pharmacists [11]. In spite of the advantages of PDA technology in a clinical setting, some healthcare professionals do not prefer to use these devices and have doubts about accepting the technology. Therefore, it is vital to explain the factors that affect the decision to use PDAs.

Several theoretical models have been employed in practice to study human behavior in the context of new information technology (IT) [12]. The Theory of Reasoned Action (TRA) proposed by Ajzen and Fishbein [13] is one of the fundamental theories used to explain human behavior [12]. According to TRA, behavioral intention can be explained by the attitude toward behavior and subjective norms [13]. In order to understand individual acceptance of IT, Davis, Bagozzi and Warshaw [14] have proposed Technology Acceptance Model (TAM) on the basis of TRA. TAM is a powerful, robust, and commonly applied model for predicting and explaining user behavior and IT usage [15–17]; it is formed by perceived ease of use (PEU), perceived usefulness (PU), attitude toward use, behavioral intention to use, and system usage. Both PU and PEU are the most important determinants of intention to use and system usage [18].

Health care differs from other IT settings with regard to one-to-one interaction with patients. In addition, "Health care is different from other goods and services: the health care product is ill-defined, the outcome of care is uncertain, large segments of the industry are dominated by nonprofit providers, and payments are made by third parties such as the government and private insurers. Many of these factors are present in other industries as well, but in no other industry are they all present. It is the interaction of these factors that tends to make health care unique" [19]. In this study, the acceptance of PDA by physicians in Turkey is analyzed by extending TAM through the factors that perceived enjoyment, subjective norms, personal innovativeness, and computer self-efficacy. The main motivation of this study is to identify the determinants (subjective norms, personal innovativeness, and computer self-efficacy) of PU and PEOU in a PDA context and to find the indirect effects of these antecedents on behavioral intention to use a PDA. These variables are selected because of their potential effects on exploring the adoption of PDA technology. Further, the literature shows the role of subjective norms, personal innovativeness, and computer self-efficacy on intention to use a PDA [20–24]. The second motivation is to explore the role of perceived enjoyment in PDA adoption by physicians, as perceived enjoyment has not been included in the studies related to PDA technology acceptance of healthcare professionals. However, perceived enjoyment has been an important factor in the acceptance of IT [25–28]. Therefore, it is also included.

This study contributes to the existing literature in several ways. First, this study provides evidence for the direct influence of perceived enjoyment, subjective norms, personal innovativeness, and computer self-efficacy on PU and PEOU and their indirect effects on intention to use PDA technology. Second, there are studies that focus on the acceptance of PDA of students [23], pharmacists [20], [21], nurses [22],

and physicians [24, 29, 30]. However, in the studies related to physicians, the data were collected from a single hospital or a specific region. For example, Vishwanath, et al. [30] used the preadoption and postadoption data collected from physicians who interacted with an actual PDA. They obtained the data from the physicians in a single hospital. In a study by Yi et al. [24], the data were collected from resident and faculty physicians who were working in residency programs located in an eastern state of the United States. Joseph [29] gathered the data from the resident physicians working in a single medical center. Our study differs from those studies related to physicians in that the data were collected from different hospitals all over Turkey.

This paper discusses the research model and the hypotheses followed by the methodology and the analysis of the surveys. The results of the surveys are presented, and this paper concludes with a discussion of the findings, as well as its managerial implications and recommendations for further studies.

2. RESEARCH MODEL AND HYPOTHESES

2.1. Behavioral Intention to Use

Behavioral intention is a measure of the likelihood that a person will get involved in a given behavior [13]. Behavior is influenced by motivational factors that are a part of behavioral intention. These factors are "indications of how hard are people planning to try and how much effort they are planning to exert in order to perform the behavior" [31]. At first, users intend to use a particular technology and afterward they use it. Thus, behavioral intention to use becomes the direct estimator of actual use [32]; however, behavior is determined by behavioral intention only if an individual makes a decision about performing a behavior [31]. The more a person is willing to use a system, the more he or she is expected to try using it [33]. Other studies also confirm the relationship between behavioral intention to use and actual use [34-36]. In this study, because the PDA usage is arbitrary, determination of the factors affecting behavioral intention to use PDA technology will be critical for the actual use of the system in the future.

2.2. Perceived Usefulness

Perceived usefulness is "the degree to which a person believes that using a particular system would enhance his or her performance" [16]. In TAM, perceived usefulness and perceived ease of use are the determinants of behavioral intention to use [16]. Of the two, perceived usefulness is the main determinant of behavioral intention to use [14]. Healthcare professionals find the usefulness of PDAs in their work, because using PDAs as medical tools improves the quality of their work so that it helps them improve their job performance [24]. The key point at point of care is the speed of delivery of the medical information. Healthcare professionals need to transmit the information within seconds to make a proper decision in clinical practice [37]. Hence, physicians may prefer to use a PDA according to the contribution of its usage in their performance. Thus, it is theorized that there is a positive relationship between perceived usefulness and behavioral intention to use. TAM [14, 16] is used to verify this relationship. Furthermore, several studies confirm the significant effect of perceived usefulness on

behavioral intention to use [38-41]. Therefore, we hypothesize as follows: Perceived usefulness will have a positive effect on behavioral intention to use.

2.3. Perceived Enjoyment

Davis, et al. [42] have defined *perceived enjoyment* as "the extent to which the activity of using the computer is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated." The Motivational Model [42] states that the behaviors related to computer usage are determined by both extrinsic motivation, which refers to the performance of an activity apart from its own sake, and intrinsic motivation, which refers to the performance of an activity for its own sake. According to the model, perceived usefulness is an example of extrinsic motivation, whereas perceived enjoyment is an example of intrinsic motivation. In the study by Van der Heijden [28], it was theorized that there is a direct impact of perceived enjoyment on behavioral intention to use. If use of a specific system makes individuals experience joy and pleasure, they will be intrinsically motivated to use it. Lee, et al. [43] have also stated that given that the use of a specific system is perceived enjoyable, an individual may show favorable feelings toward that system and willingness to use it. Furthermore, several studies confirm the significant effect of perceived enjoyment on behavioral intention to use [44-46]. Therefore, we hypothesize as follows: Perceived enjoyment will have a positive effect on behavioral intention to use.

2.4. Perceived Ease of Use

Perceived ease of use is "the degree to which a person believes that using a particular system would be free of effort" [16]. It is the second major determinant of the behavioral intention to use. TAM asserts that the perceived ease of use widely explains people's perceived usefulness and their attitudes about using a particular system [14]. If all other things are held constant, an easier to use system will enhance the user's job performance. Therefore, perceived usefulness should be increased either by functional capabilities that are recently added to a system or by current functions that are made easier to be used in the system [47]. Because the users do not have the necessary skills and confidence, they feel uncomfortable at their first interaction with a computer system. However, after gaining familiarity with the system and having enough knowledge to be able to use it, most users change their perceptions of its ease of use [48]. Furthermore, the effect of perceived ease of use on perceived usefulness has been theoretically proved in TAM [38, 39, 44]. Therefore, we hypothesize as follows: Perceived ease of use will have a positive effect on perceived usefulness.

If using a PDA is not easy and users have to spend more time on that particular technology to learn how to use it, they may not prefer to use it or may give up using it. Therefore, regarding users' increasing experience with a new system, they are expected to anchor their perception of ease of use in their general opinions about the system [25, 26]. Davis et al. [14] showed the direct effect of perceived ease of use on behavioral intention to use in TAM. Furthermore, several studies confirm the significant effect of perceived ease of use on behavioral intention to use [38, 44].

Therefore, we hypothesize as follows: Perceived ease of use will have a positive effect on behavioral intention to use.

Another relationship is between perceived ease of use and perceived enjoyment. Van der Heijden [28] has proved that there is an indirect effect of perceived ease of use on behavioral intention to use through perceived enjoyment. This means that if individuals find the system easy to use, they are expected to enjoy themselves more while interacting with it. Therefore, an easier to use system may be perceived as more fun to use. Users may experience greater enjoyment while doing a given task [49]. Ha et al. [50] have also found a greater influence of perceived ease of use on perceived enjoyment. Therefore, we hypothesize as follows: Perceived ease of use will have a positive effect on perceived enjoyment.

2.5. Subjective Norms

Subjective norms are the "person's perception that most people who are important to him think that he should or should not perform the behavior in question" [13]. Several theories suggest that subjective norms play an important role in determining user behavior. According to empirical research results, it can be hypothesized that subjective norms may affect behavioral intention to use through perceived usefulness. If a superior or a colleague says that using a particular technology is effective in their work, a belief that the technology is actually beneficial may occur and potential users may intend to use it [26]. In this case, a physician as a peer may influence another physician to use a PDA in clinical practice, because physicians are more likely to consider the opinions or the suggestions of their highly experienced colleagues [24]. Bhatti [51] has also indicated that cognitive belief of perceived usefulness may be influenced by subjective norms. It is expected that social influence shapes an individual's perception about using a system, so they act in accordance with the opinions of the referents regarding the utility of the system [52]. Furthermore, several studies confirm the significant effect of subjective norms on perceived usefulness [44], [53]. Therefore, we hypothesize as follows: Subjective norms will have a positive effect on perceived usefulness.

2.6. Personal Innovativeness

Rogers [54] defined *personal innovativeness* in the Innovation Diffusion Theory (IDT) as "the degree to which an individual adopts new ideas earlier than other members of a system." Based on this definition, Agarwal and Prasad [55] have used personal innovativeness in the domain of information technology (PIIT) and then defined it as "the willingness of an individual to try out any new information technology." They emphasized that when two people have the same perception about the adoption of innovation, the one with higher levels of PIIT may show greater desire and exert positive influence to use the innovation even if there is an uncertainty about advantages, because people who are more innovative are more likely risk-takers compared with individuals with lower personal innovativeness [56]. Lewis et al. [57] have also mentioned that higher personal innovativeness causes individuals to develop more positive beliefs by using a particular system. According to IDT, earlier adopters of any new technology become more capable of using that technology than later adopters and are respected by

their colleagues or peers because of their first-hand knowledge. Therefore, earlier adopters see the technology as less complex and troublesome with regard to their competencies and so on; the direct influence of personal innovativeness on perceived ease of use has been pointed out [24]. Furthermore, several studies confirm the significant effect of personal innovativeness in the domain of IT on perceived ease of use [39, 44]. Therefore, we hypothesize as follows: Perceived innovativeness will have a positive effect on perceived ease of use.

2.7. Computer Self-Efficacy

Self-efficacy that was first proposed in Social Cognitive Theory [58] refers to "the people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" [59]. Bandura [58] has asserted that when individuals face threatening situations that they may not cope with, they usually believe that they cannot handle them and accordingly prefer avoiding these situations rather than getting involved in them. Following this concept, Compeau and Higgins [60] have defined computer self-efficacy as "the judgment of one's capability to use a computer." According to Venkatesh and Davis [61], computer self-efficacy is an important determinant that helps ascertain the comprehension of the user and acceptance and use of the system. They pointed out that users strongly believe that perception of ease of use about any system is related to their computer self-efficacy. Agarwal, et al. [62] have also found that computer self-efficacy is the antecedent of the technology usage. According to them, the higher perceived computer self-efficacy, the easier technology accepted. Therefore, users' self-confidence based on their computer skills and knowledge may serve to create a basic judgment about how difficult or easy using a particular system will be. Thus, individuals with higher self-confidence perceive that particular information technology is easier to learn and to use than their counterparts with lower self-confidence [63]. Furthermore, several studies confirm the significant effect of computer self-efficacy on perceived ease of use [36, 64]. Therefore, we hypothesize as follows: Computer self-efficacy will have a positive effect on perceived ease of use.

Based on the description above, the overall research model including eight hypotheses can be seen in Figure 1.

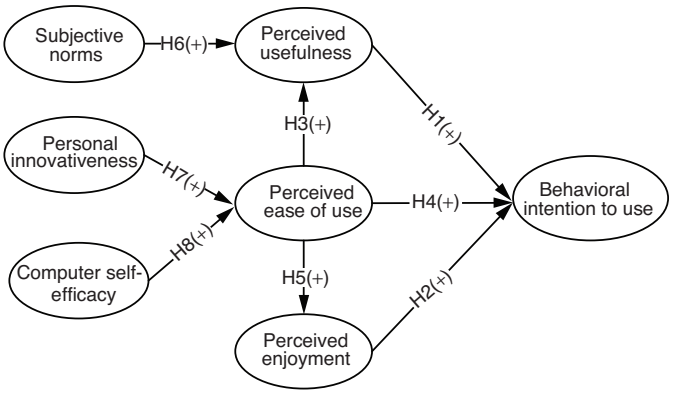

Figure 1. Research model.

3. METHODS

This study was approved by the Istanbul Technical University Management Faculty Review Board for the protection of human subjects in research. A survey methodology was used in this study to gather data. The target population was the physicians who specialized in different areas of medicine. The contact information of physicians were supplied by the Healthcare Informatics Association by random sampling. Physicians were told about the definition of PDA, application areas, and its advantages in healthcare settings. Participants then signed a consent form informing them about the aim of the study. The questionnaire and a cover letter with instructions were sent to them via the postal service, and return of the questionnaire was requested via facsimile or the postal service. A total of 2900 questionnaires were distributed.

The questionnaire was formulated based on the literature review in the area of TAM [16, 24, 25, 32, 55, 60, 65]. The questionnaire included two main parts. The first part consisted of demographic questions designed to solicit information on gender, age, affiliation (hospital), specialization area, full-time professional experience, full-time working experience in the current hospital, computer experience, computer use in a week, and Internet experience. Overall, 339 questionnaires were collected from 44 different hospitals and from 54 different specialized areas. The response rate was 12%. The nonresponse bias was investigated using analyses outlined in [53] and [66]. Assuming the responses of the last quartile of the respondents were most similar to the nonrespondents, their responses were compared with those of the first three quartiles. As the comparison of the means of responses provided by each group did not reveal any significant differences in all variables analyzed, nonresponse bias was not an issue. Among all the respondents, 63.7 % were men, and the average age of all respondents was 44.2 years, with 66.67 % working in teaching hospitals and 28.6 % working in private hospitals. A summary of the demographic profiles of physicians of the participants is given in Table 1.

The second part of the questionnaire consisted of the items measuring behavioral intention to use [25], perceived usefulness [16], perceived ease of use [16], perceived enjoyment [25], subjective norms [32, 65], computer self-efficacy [60], and personal innovativeness [24, 55]. The items for the constructs can be seen in Table 2. These items were modified to relate to PDA technology, and a five-point Likert-type scale was adopted to measure all these items. In a five-point Likert-type scale, 1 represents "strongly disagree" and 5 represents "strongly agree". To test the general readability and overall flow of the survey, we conducted a pilot study with 30 physicians. Based on the information provided by these participants, the questionnaire was improved and finalized.

4. RESULTS

In this study, a two-model approach including a measurement model and a structural model was taken for the analysis [67]. The models were tested using the Linear Structural Relations software LISREL, v8.54 [68].

4.1. Measurement Model

Confirmatory factor analysis was performed to test the validity and reliability of the constructs to build the model. The measurement model included 33 items describing

Table 1. Demographic profiles of the respondents.

Gender (%)		
Female: 36.3	Male: 63.7	
Age (year)		
Max: 74	Min: 22	Average: 44.2
Working Hospital (%)		
Teaching Hospital: 66.67	Training and Research Hospital: 4.73	Private Hospital: 28.6
Department (%)		
Medical Science: 53.98	Basic Science: 13.28	Surgical Science: 32.74
Full-time professional experience (year)		
Max: 49	Min: 0.5	Average: 18.65
Full-time working experience in the current hospital (Year)		
Max: 32	Min: 0.16	Average: 10.93
Computer experience (year)		
Max: 30	Min: 3	Average: 16.15
Computer use per week (hour)		
Max: 100	Min: 3	Average: 27.17
Internet use per week (hour)		
Max: 56	Min: 1.5	Average: 16.39

7 constructs: behavioral intention to use (INT), perceived ease of use (PEU), perceived usefulness (PU), perceived enjoyment (PENJ), personal innovativeness (PINN), computer self-efficacy (CSE), and subjective norms (SN). The initial analysis of the measurement model showed the requirement of the construct revisions.

The items that had factor loadings lower than 0.7 and modification indices higher than 40 were dropped from the model. The decision was taken one by one based on the differences in the values of χ^2 for the current and revised models if the theory and content allowed for changes [67]. A total of five items were dropped from the measurement model, and 28 items were retained for further analyses. The items in Table 2 without an asterisk were used for further analyses.

The fit statistics showed that the model provided a reasonably good fit of the data. Table 3 shows the model-fit indexes. The values of χ^2, degrees of freedom, root-mean-square of approximation (RMSEA), normed-fit index (NFI), comparative-fit index (CFI), and standardized root mean residual (SRMR) were selected. The overall χ^2 for the model was 881, with 329 degrees of freedom. The absolute fit indexes (RMSEA = 0.072, SRMR = 0.046), incremental fit indexes (NFI = 0.97, CFI = 0.98), and ratio of χ^2 to degrees of freedom (at 2.67) had better values than the recommended values [64, 65], suggesting that the measurement model fitted the data well.

The convergent validity of the constructs was assessed using the confirmatory factor analysis. Convergent validity indicates whether the items of the constructs measure the specified construct. In this study, standardized factor loadings, t-statistics, the average

Table 2. Constructs and items of second part of the questionnaire.

Construct	Code	Items
Behavioral intention to use	INT1	Assuming I had access to a PDA, I intend to use it.
	INT2	Given that I had access to a PDA, I predict that I would use it.
	INT3	I plan to use a PDA in the future.
Perceived usefulness	PU1*	Using a PDA in my job would enable me to accomplish tasks more quickly.
	PU2	Using a PDA would make it easier to do my job.
	PU3	Using a PDA in my job would improve my productivity.
	PU4	Using a PDA would improve my job performance.
	PU5	I would find PDA useful to my job.
	PU6	Using a PDA would enhance my effectiveness in the job
Perceived enjoyment	PENJ1	The actual process of using PDA is pleasant.
	PENJ2	I have fun using a PDA.
	PENJ3	I would find using a PDA to be enjoyable.
	PEU1	It would be easy for me to become skillful at using the system.
Perceived ease of use	PEU2	I would find a PDA easy to use.
	PEU3*	I would find it easy to get a PDA to do what I want it to do.
	PEU4	Learning to use a PDA would be easy for me.
	PEU5	My interaction with PDA would be clear and
understandable.		
Subjective norms	SN1	People who are important to me would think that I
should use a PDA.		
	SN2	People who influence my behavior would think that
I should use a PDA.		
	SN3	People whose opinions I value would prefer me to
use a PDA.		
Personal innovativeness	PINN1	I like to experiment with new IT.
	PINN2	Among my colleagues, I am usually the first to try out new information technologies.
	PINN3	If I hear about a new information technology, I would look for ways to experiment with it.
	PINN4*	In general, I am hesitant to try out new information technologies (Rv.).

Table 2 ***(Continued)***

Table 2 ***(Continued)***

	Construct	Code	Items
		PINN5*	I prefer letting other people work out the bugs and problems with a new IT before I use it.
Computer self-efficacy		CSE1	If someone showed me how to do it first, I could complete the job using a PDA.
		CSE2	If someone else had helped me get started, I could complete the job using a PDA.
		CSE3	If I had a lot of time to complete the job based on which software was provided, I could complete the job using a PDA.
		CSE4	If I had only PDA manuals for reference, I could complete the job using a PDA.
		CSE5	If there was no one around to tell me what to do as I go, I could complete the job using a PDA.
		CSE6	If I had seen someone else using it before trying it myself, I could complete the job using a PDA.
		CSE7	If I could call someone for help when I got stuck, I could complete the job using a PDA.
		CSE8*	If I had just the built-in help facility for assistance, I could complete the job using a PDA.

*Items dropped for further analysis
Rv.: Reverse items

Table 3. Fit statistics of the confirmatory factor analysis (measurement model).

Fit index	Recommended value	Observed value
(χ^2/df) χ^2; df	≤ 5	2.67 (881; 329)
RMSEA	≤ 0.08	0.072
CFI	≥ 0.95	0.98
NFI	≥ 0.90	0.97
SRMR	≤ 0.1	0.046

variance extracted (AVE), and composite reliability were adopted as the indicators of convergent validity. As shown in Table 4, all items in the measurement model exceeded the recommended factor loading value of 0.70 [69] and the *t*-values between the items and the constructs were significant at the 0.95 confidence level [70].

The AVE estimates of each construct exceeded the recommended value of 0.50 [71]. The minimum AVE value is 0.60 for perceived ease of use, and the maximum is 0.80

Table 4. Confirmatory factor analysis.

Construct	Item	Mean	Standard deviation	Factor loadings	t-statistics
Behavioral intention to use	INT1	4.03	0.84	0.83	18.20
	INT2	3.82	0.95	0.78	16.66
	INT3	3.91	0.93	0.80	17.06
Perceived usefulness	PU2	3.83	0.91	0.74	15.74
	PU3	3.81	0.93	0.87	19.93
	PU4	3.65	0.94	0.91	21.46
	PU5	3.79	0.87	0.89	20.85
	PU6	3.70	0.88	0.87	20.15
Perceived ease of use	PEU1	3.76	0.93	0.78	16.30
	PEU2	3.92	0.83	0.80	17.07
	PEU4	3.90	0.83	0.77	16.09
	PEU5	3.63	0.85	0.74	15.29
Perceived enjoyment	PENJ1	3.52	0.91	0.80	17.55
	PENJ2	3.70	0.90	0.91	21.47
	PENJ3	3.76	0.85	0.90	20.83
Subjective norms	SN1	3.22	1.04	0.85	18.69
	SN2	3.24	1.04	0.84	18.39
	SN3	3.21	1.04	0.88	19.83
Personal innovativeness	PINN1	4.08	0.99	0.87	19.86
	PINN2	3.40	1.04	0.91	21.11
	PINN3	3.73	1.02	0.91	21.14
Computer self-efficacy	CSE1	3.96	0.87	0.81	17.66
	CSE2	3.78	0.90	0.87	19.89
	CSE3	3.56	0.81	0.77	16.52
	CSE4	3.73	0.84	0.79	17.25
	CSE5	3.58	0.88	0.81	17.91
	CSE6	3.61	0.90	0.76	16.18
	CSE7	3.76	0.88	0.81	17.76

	Average variance extracted (AVE)	Composite reliability	Cronbach's alpha
Behavioral intention to use	0.65	0.85	0.84
Perceived usefulness	0.74	0.93	0.93
Perceived ease of use	0.60	0.86	0.85
Perceived enjoyment	0.76	0.90	0.90
Subjective norms	0.73	0.89	0.89
Personal innovativeness	0.80	0.92	0.92
Computer self-efficacy	0.65	0.93	0.93

for personal innovativeness. Composite reliability measures the internal consistency of the measurement model [72], and all the composite reliabilities exceeded the 0.60 threshold [73]. In addition, Cronbach's alpha values of each construct exceeded the recommended value of 0.70, indicating an acceptable level of reliability. Therefore, the convergent validity of each construct was achieved.

4.2. Structural Model

The structural model analyzes the relationships defined in the research model. The present results show that the fit indices (ratio of χ^2 to degrees of freedom = 3.52, SRMR = 0.08, CFI = 0.97, NFI = 0.96) have better values than the recommended ones [69, 74], suggesting that the structural model provided a good fit to the data.

Figure 2 shows the significant and insignificant relationships, explanation rates of dependent variables, and standardized path coefficients. The 71% of the behavioral intention to use PDA system is explained by both perceived usefulness and perceived ease of use, whereas the effect of perceived enjoyment on intention to use PDA system is found to be insignificant. The other result indicates that subjective norms and perceived ease of use have positive effects on perceived usefulness. Furthermore, the perceived ease of use is explained by personal innovativeness and computer self-efficacy, and perceived ease of use has a positive effect on perceived enjoyment.

Table 5 shows the direct, indirect, and total effects of the constructs in the research model on the behavioral intention to use the PDA system. It is shown that subjective norms, personal innovativeness, and computer self-efficacy have indirect positive significant effects on intention to use the PDA system. In addition to the direct effect, the perceived ease of use has an indirect effect on the intention to use the PDA system through perceived usefulness.

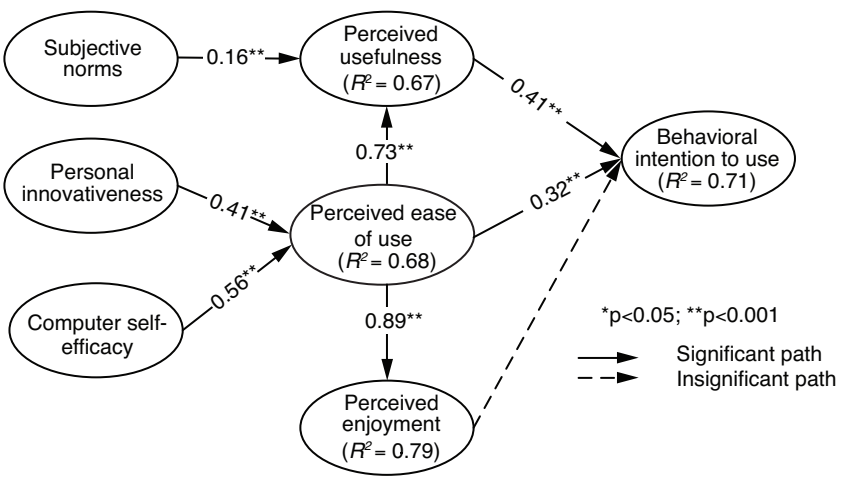

Figure 2. Results of the research model.

Table 5. Direct, indirect, and total effects on intention to use PDA.

Dependent variable	Independent variables	Direct effects	Indirect effects	Total effects
Intention to use PDA	Subjective norms	-	0.064**	0.064**
	Personal innovativeness	-	0.32***	0.32***
	Computer self-efficacy	-	0.44***	0.44***
	Perceived usefulness	0.41***	-	0.41***
	Perceived ease of use	0.32*	0.45**	0.77***
	Perceived enjoyment	insig.	-	insig.

*p < 0.05; **p < 0.01; ***p < 0.001.
insig.: insignificant relationship

5. DISCUSSION

5.1. Discussion of Study Results

The explanation rate of behavioral intention to use, which is 0.71, is relatively high in this study compared with the other studies [24, 30, 34]. The results also show that behavioral intention to use PDA technology is explained by perceived usefulness and perceived ease of use. Of the two, perceived usefulness has a higher direct influence on behavioral intention to use PDA technology. If physicians find PDA productive in their work and perceive their advantageous outcomes, they will be motivated to use that technology.

Another result of this study is that perceived usefulness is explained by perceived ease of use and subjective norms. Among them, perceived ease of use has a higher direct influence on perceived usefulness. Therefore, the perception of ease of use of PDA technology and the opinions of other physicians may increase one's perceived usefulness and so the intention to use PDA technology will also be increased. Similar to our findings, Yi, et al. [24] have shown that both perceived ease of use and subjective norms play a significant role in explaining the perceived usefulness of PDA technology among residents and faculty physicians in the United States.

Another result of this study is that perceived ease of use is explained by personal innovativeness and computer self-efficacy. Of the two, computer self-efficacy has a higher direct impact on the perceived ease of use. If an individual believes in his/her ability to use a PDA and has enough knowledge about the technology, perception of the easiness of the PDA technology will be improved, and therefore improved perception of ease of use may alter physicians' intention to use it. Similar to our findings, Gu, et al. [64] have found that computer self-efficacy has a positive direct effect on perceived ease of use, and computer self-efficacy has the highest direct impact on perceived ease of use among other factors.

This study also shows that perceived enjoyment is explained by perceived ease of use. An individual who has a higher degree of perceived ease of use is expected to show enjoyable feelings toward using it. In the study by Lee, et al. [43], perceived ease of use is found to be the single determinant of perceived enjoyment in the acceptance of an Internet-based learning medium.

Furthermore, perceived ease of use has an indirect effect on behavioral intention to use a PDA through perceived usefulness. If the PDA technology consumes too much time and requires high effort, potential users may not start using the system. Therefore, user friendliness is important to using a system. Similar to our findings, Adigüzel, et al [38] have found an indirect effect of perceived ease of use on hand-held computer acceptance of special education teachers, as mediated by perceived usefulness. Therefore, enhancing the feeling of ease of use will be critical in favorably altering the perceptions regarding the usefulness of the system in PDA technology.

Another result regarding indirect effects is that computer self-efficacy has an indirect effect on behavioral intention to use a PDA. Consistent with our findings, Chen, et al. [75] have reported the indirect effect of computer self-efficacy on smartphone acceptance of healthcare professionals. Therefore, an individual's positive belief about his or her computing skills may be effective in showing a higher degree of intention to use PDA technology in clinical practice.

Moreover, personal innovativeness has an indirect effect on behavioral intention to use a PDA. Innovative individuals are more eager to experience new technologies. Therefore, personal innovativeness plays an important role in the acceptance of PDA technology. Similar to our findings, Yi, et al. [24] have shown that personal innovativeness has an indirect effect on behavioral intention of healthcare professionals to use PDA technology.

Finally, our study shows that perceived enjoyment has an insignificant effect on behavioral intention to use. It may be interpreted that physicians may not be interested in having a pleasurable time while interacting with a PDA. Therefore, enjoyment does not motivate physicians to adopt the PDA for purposes of medical practice. Regardless of whether PDA-based activities are enjoyable or not, perceived enjoyment of physicians does not explain the acceptance of this technology.

5.2. Managerial Implications

Perceived ease of use is found to be the most important factor for behavioral intention to use a PDA. First, hospital management must choose the most user-friendly PDA device among others, so that users would not be demotivated by the technical difficulties in using the device. Second, hospital management has to ensure that physicians will not experience difficulties related to PDAs, and should proactively help them overcome problems related to the usage of these devices.

Another factor that is important to using this technology is the degree of perception about possessing necessary skills and knowledge to use a PDA. First, hospital management must determine potential users' ability and knowledge of using that technology, because lack of computer skills may be an obstacle for physicians to use a PDA in the practice of medicine. Therefore, training programs must be arranged to provide training about using the products. Second, because many physicians are not accustomed to using computers in their work, hospital management must encourage and motivate them to use PDA technology. For this reason, hospital management should meet all kinds of requests for improving users' knowledge and skills.

The other factor that may be important to the use of PDA technology is perceived usefulness. Physicians must understand the advantages of using PDA technology, which

provides better job performance and productivity. Hospital management may try different methods to convey the importance of using PDA technology for increasing physicians' job performance. The use of PDA technology can be set as a goal for the physicians to achieve performance targets by hospital management. When physicians use a PDA and perceive its usefulness, the efficiency and productivity of their work may be improved. In this way, potential adopters may also see the benefits of this technology.

In addition, subjective norms are also important factors for the behavioral intention to use PDA technology. The opinions and suggestions of a superior or a colleague may be very important tophysicians. If a superior or a colleague appreciates and shares the benefits of PDA usage, other physicians in the hospital may be encouraged and actually try this technology.

5.3. Study Limitations

The findings of this study provide a better understanding of the factors affecting the intention to use a PDA among physicians, but we should also consider its limitations. Primarily, only limited percentage of the variables can be explained in the present model; specifically, 71% of behavioral intention to use, 67% of perceived usefulness, 68% perceived ease of use, and 79% of perceived enjoyment are explained. Therefore, a considerable percentage of the variables remains unexplained, suggesting the need for future studies to explain user behaviors.

5.4. Future Research

Regarding future research, first, some additional factors that are important in explaining the adoption of IT, such as perceived playfulness [76], computer anxiety [77], and compatibility [78], can be included in a model of further study. Second, the effects of demographic attributes on PDA adoption were not analyzed in this study. A similar study, including demographic characteristics, such as the extent of computer and Internet use, experience, age, and gender of the respondents, may be a subject for future research. Third, by increasing the size of the data collected, group differences among university hospitals, private hospitals, and training and research hospitals, and also among different departments of medicine such as surgical sciences, medical sciences, and basic sciences, can be analyzed.

6. CONCLUSION

This study confirms the significant effects of perceived usefulness, perceived ease of use, subjective norms, computer self-efficacy, and personal innovativeness on the intention of the use of PDA technology. For this purpose, 339 questionnaires have been collected from physicians. The results of the analysis show that the measurement and structural models have adequate reliability and validity. The results contribute to the literature of TAM by showing that both perceived ease of use and perceived usefulness are the most important factors affecting the adoption of PDA technology. This study also contributes to the literature by introducing external variables into the models. Personal innovativeness and computer self-efficacy are found to be the antecedents of perceived ease of use, and subjective norms are found to be the antecedent of perceived usefulness in the context of PDA technology.

CONFLICT OF INTEREST:

The authors indicated no potential conflicts of interest.

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