Evaluation of Personal Digital Assistant Acceptance in Nursing Education

تقبُل استخدام المساعد الرقمي المحمول في تعلُم التمريض

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المستخلص

الهدف: قياس مستوى تقبّل إستعمال المساعد الرقمي المحمول بين طالبات التمريض في المملكة العربية السعودية. **المنهجية:** أكملت تسعة وثمانون طالبة استبيانا مبني على نموذج تقبل التقانة من قبل ديفيس. تمت من خلاله دراسة منحنيين أساسيين هما: (١) قابلية تطبيق النموذج في تقييم تقبل إستعمال المساعد الرقمي المحمول. و(٢) النسبة الكلية لاتفاق الطالبات على متغيرات النموذج المختلفة.

النتائج: تؤكد النتائج الإيجابية بين متغيرات النموذج المستخدم على ملائمة تطبيق هذا النموذج بمتغيراته وعلاقاته السببية في هذه الدراسة. النسبة الأكبر كانت ٣٢،٢٪ لعنصر السلوك المتعمد الناتج من أثر العنصر المسبب وهو الموقف تجاه إستعمال التكنولوجيا. كما أظهر ٩٤،٩٪ من الطالبات عن توجه إيجابي لإمكانية إستعمال المساعد الرقمي المحمول في المستقبل. واستُخلص أن طالبات التمريض يدركن فاعلية إستعمال المساعد الرقمي المحمول في تعليمهن.

التوصيات: بالنظر لكل هذه النتائج، يتضح التوجه الإيجابي العام لإستعمال المساعد الرقمي المحمول في التعلُم والذي بدوره سوف ينعكس على التجربة التعليمية للطالبة سواءاً في الفصل الدراسي أو الزيارات الإكلينيكية. لذلك، يوصي الباحثون بدراسات مستقبلية تقيس أثر إستعمال مثل هذة الأجهزة في تحسين مخرجات التعليم الصحي والتطبيقات الإكلينيكية.

الكلمات المفتاحية: المساعد الرقمي، التمريض، التعليم، الطلاب، نموذج تقبّل التكنولوجيا.

Abstract

Objective: To measure the acceptance level of the Personal Digital Assistance (PDA)'s use among nursing students as a tool of education in the Kingdom of Saudi Arabia.

Methodology: Eighty-nine nursing students participated in this cross-sectional descriptive study by completing a questionnaire based on the Technology Acceptance Model (TAM) by Davis. Two dimensions were explored and evaluated; (1) the applicability of the TAM model in assessing this technology; and (2) the overall percentage of students' agreement on the different TAM variables.

Results: This study presented significant positive influence between all the casual elements in TAM and therefore have confirmed the applicability of the TAM model in this study. The largest influence was 32.2% of intentional behavior caused by the attitudes toward using the technology. Overall, 94.9% of students reported a positive attitude in the future utilization of PDA's.

Recommendations: The results of the study revealed a positive direction. An encouraging impact of the use of PDA's in both classroom and clinical settings. Therefore, the researchers recommend to explore more areas of research in measuring the effect of utilization of such devices in improving health educational outcomes in both classroom and clinical setting.

Keywords: PDA, Nursing, Education Students, Technology Acceptance Model

Introduction

The utilization of the Personal Digital Assistance (PDA)'s among nurses has introduced significant improvements to the practice and delivery of healthcare services [1,2]. PDA's have advertently moved references and standards of care from the shelves into hands of nurses [1,2]. They provide instant information on patients' data, treatment options, and drug therapy [3].

Many studies have assessed nursing students' uses of PDA's. One study experimented the use of PDA's in an undergraduate and graduate nursing education program. The study reported initial hesitation from older students due to lack of general technology preparedness. However, this improved as clinical requirements increased and students discovered the usefulness of the tool [4]. At the County Hospital of Kalmar, a study on senior students reported that a PDA has the potential to be accepted as a supportive tool in healthcare organizations if it facilitated access to information about the patients, knowledge resources, and functions for their daily work [5].

At Duke University, the school of nursing incorporated the use of PDA's for one year as part of the bachelor program. With students, PDA's were reported more useful in clinical settings where access to nursing recourses is convenient and fast. Faculty have also reported usefulness in maintaining an electronic record of all students, where monitoring students and following through their clinical experience is more convenient and time saving [3]. Furthermore, a comparative study on nursing students done by an interdisciplinary team at Virginia State University reported that 81% of students found that resources on their PDA's where useful in answering their clinical questions. Students made substantial use of their PDA's while decreasing their reliance on textbooks and clinical faculty for answers [6]. Areas that were found to be of particular value to students and faculty were tracking documentation, tracking of medication administration, as well as care planning and research [6].

PDA's have been reported to be useful tools for physicians based on several studies. In the US, five teaching hospitals participated in a multistate study of PDA use in clinical decision making. 85% of participating physicians reported that PDA use had positively influenced their overall clinical decision making and 73% reported that the use of PDA's aided in supporting the appropriate treatment plan for their patients [7]. PDA's have also been reported as being useful tools in the clinical setting in aiding evidence-based practice and educational needs [8].

In Saudi Arabia, our search for similar studies did not reveal any published material assessing the effects of handheld technology in improving nursing education. However, from these international significant experiences with the utilization of PDA's in the clinical and educational setting, it is encouraging to see how this technology can contribute to an enhanced practice and delivery of health care among nursing students.

Measuring the acceptance of this technology, which is the objective of this study, can confidently reflect how its utilization can contribute to similar results as the ones presented throughout our review.

Research Methodology

Study Design and participants: This is a cross-sectional descriptive study conducted on a convenient sample of students enrolled in the College of Nursing at King Saud bin Abdulaziz University for Health Sciences. The inclusion criteria was female undergraduate nursing students between the ages of 18 and 35 who had finished at least one clinical course. Responses were received from 98 subjects, giving a response rate of around 81.7% (N=120). This is considered a small sample. However, due to the small size of the college and the small number of enrolled student' in the nursing program it was expected to have a sample size within this range.

Research Model: Research into factors that predict Information Technology acceptance has received much attention because a major goal for many organizations is IT adoption and use [9]. The Technology Acceptance Model (TAM) is one such research model developed by Fred Davis in the 1980s [10]. TAM is designed to study IT adoption and use, and to predict and explain user acceptance of information technologies [11,12].

The ultimate objective of TAM is to measure and explain the system usage behavior. TAM posits that the influences of External Variables (EV) are mediated through Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitudes Towards using (AU), and Behavioral Intensions (BI) leading to performance of the behavior: actual system usage (U). See Figure (1) for a visual representation of Davis' (1989) TAM [13].
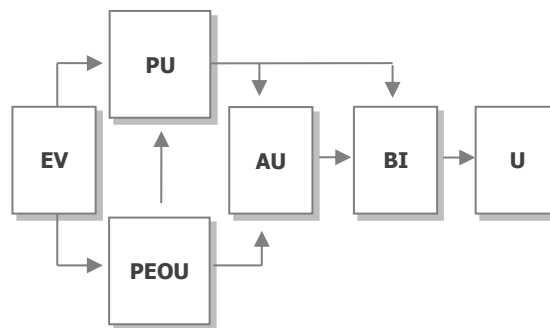

Figure (1). Technology Acceptance Model

Research Questions: The main research questions to be answered in this study were:

1. What are the nursing students' perceptions of PDA usefulness?
2. What are the nursing students' perceptions of ease of PDA use?
3. What are the perceived attitudes of the nursing students towards PDA use?
4. What are the perceived intensions of the nursing students towards PDA use?

Data Collection: The Department head of the Nursing Department identified all courses with targeted student criteria, and nursing faculty members assisted by distributing the questionnaires in their classes. Willing participants were asked to complete a 3-page Likert scale items measuring the different independent and dependent variables. The scores of every group of the TAM variable questions were combined together to represent one of the four main variables used in this study.

Analytical Technique: The analysis of gathered data was carried out to serve two objectives. The first was to assess the casual influence of each TAM variable on the other and for that, simple and multiple regression

was used to test the study hypotheses as listed in Table (1).

Table (1): Study Hypotheses & Analysis Method

Hypothesis	Analysis
H1: Perceived ease of use of PDA will NOT have a significant influence on perceived usefulness of PDA.	Simple Regression
H2: Perceived usefulness of PDA will NOT have a significant influence on behavioral intention of using PDA.	Simple Regression
H3: Perceived ease of use and usefulness of PDA will NOT have a significant combined influence on attitude towards using PDA.	Multiple Regression
H4: Attitude towards using PDA will NOT have a significant influence on Behavioral Intention to PDA usage.	Simple Regression

The second objective was to measure the total perceived use of PDA's through an accumulated quantitative representation of each variable in TAM, a simple numbering system was followed as presented in Table (2).

Table (2): Numerical System Model

Variable	Methodology	Result
(1) Perceived ease of use	- Calculate Average	1: if Value >= Avg 0: if Value < Avg
(2) Perceived usefulness	- Calculate Average	1: if Value >= Avg 0: if Value < Avg
(3) Attitude towards using	- Eliminate unqualified responds from Variables (1) and (2) - Calculate Average	1: if Value => Avg 0: if Value < Avg
(4) Behavioral Intentions	- Eliminate unqualified responds from Variables (2) and (3) - Calculate Average	1: if Value => Avg 0: if Value < Avg

Reliability of Results: Internal consistency of constructed factors was evaluated. Table (3) shows the reliability of the measurement scales. Cronbach's alpha reliability for the third item (Attitude Towards Using) scored lower than 0.6, which indicates that the relationship within the three items are not to be considered reliable as a group in measuring this parent variable.

Table (3): Cronbach's alpha (Reliability)

Scale	Alpha	Items
Perceived Usefulness (PU)	0.899	5
Perceived Ease of Use (PEOU)	0.790	5
Attitude Towards Using (A)	0.527	3
Behavioral Intention to Use (IU)	0.794	2

Results

Table (4): Participants' Demographics		
Variable	**Frequency**	**Percentage**
Student Age		
20 – 24	67	68.2
25 – 29	27	27.6
30 - 35	2	2
Student Level		
Level 3	6	6.1
Level 4	7	7.1
Level 5	32	32.7
Level 6	21	21.4
Level 7	20	20.4
Level 8	7	7.1

B:Unstandardized Regression Coefficient F:F-statistic   P:Probability value   R2:Coefficient of determination

Descriptive statistics collected from the survey showed that the majority of students were from level 5 in the course program. Respondents' age varied from 20 to 35 years with a Mean of 23 years and a Std. Deviation of 2.4. Table (4) displays the demographic data.

Table (5): Test of Hypotheses					
		B	**F**	**p**	**R2**
H1	*Perceived ease of use*	.177	40.469	.000	.297
H2	*Perceived usefulness*	.313	10.596	.002	.099
H3	*Perceived usefulness*	.174	5.600	.005	.105
	Perceived ease of use	.154			
H4	*Attitude towards using*	.689	45.571	.000	.322

B:Unstandardized Regression Coefficient F:F-statistic   P:Probability value   R2:Coefficient of determination

Simple and Multiple Regression analyses were used to test the study hypotheses. The results listed in Table (5) show that all hypotheses were rejected and thus indicate a positive linear influence between all causal elements of the TAM model.

Based on the numerical model presented in Table (2), the participants' agreement on each element of TAM is quantified as illustrated in Figure (2).
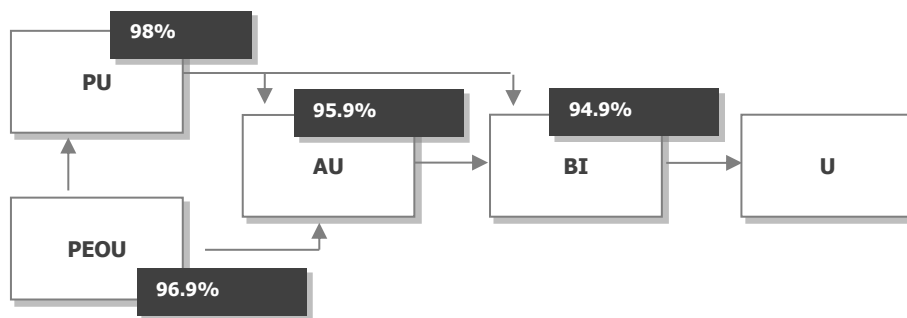
Figure (2). TAM Quantitative Representation

Table (6): Result Summary			
Variable	**Perceivability**	**Relationship With**	**Influence**
Perceived Usefulness (PU)	98%	Attitude Towards Using (A)	10.5%
		Behavioral Intention to Use (IU)	9.9%
Perceived Ease of Use (PEOU)	96.9%	Perceived Usefulness (PU)	29.7%
		Attitude Towards Using (A)	10.5%
Attitude Towards Using (A)	95.9%	Behavioral Intention to Use (IU)	32.2%
Behavioral Intention to Use (IU)	94.9%	-	-

B:Unstandardized Regression Coefficient F:F-statistic   P:Probability value   R2:Coefficient of determination

A summary of results is listed in Table (6) showing the influence of every TAM element along with its perceivable agreement.

Discussion

This study presented the different variables affecting the acceptance level of PDA technology among nursing students. The findings from this study conclude that a favorable percentage of nursing students have the actual behavioral intentions to use PDA's. The factors influencing this large proportion varied among the TAM factors. The larger influencing factor of this outcome was the attitudes towards using the PDA which contributed to about a third of the intentional behavior. A considered limitation of this study is the internal consistency of the items accumulating to this factor which might have affected the results of a possible larger influence on the intentional behavior (Cronbach's alpha: 0.527). Generally, this study supports many of the outcomes revealed in the literature. Almost all the nursing students believed that PDA's are useful tools in enhancing their performance, productivity, and time effectiveness in both the classroom and clinical setting. Although, it must be pointed out that the majority of reviewed studies had performed some kind of a comparative approach and went beyond the behavioral intention paradigm and thus, the participants' response reflected their actual experience with these tools.

Ease of use also gained a very high perception in this study. Obviously participants' age is a great contributor to that as the study targeted undergraduate students who are used to technology in their daily lives. This confirms the results of previous studies where technology barriers were identified between graduate and undergraduate students [3,4].

Overall, the study supported the general perception of this technology and reinforces PDA's as useful tools which can significantly contribute to improved practice in nursing students' education in Saudi Arabia. The adoption of this technology can enhance the clinical outcomes in the educational process and ultimately in professional practice.

This study had shown that nursing students believed in the usefulness of PDA's in their education, which consequently affected their intention to use this technology. Based on the TAM model, the significant results of this study highlight the positive impact of diffusing such a technology in Nursing Education and that the widespread introduction of PDA's among nursing students will be highly utilized.

Recommendations

The results of the study revealed a positive direction and thus an encouraging impact of the use of PDA's in both classroom and clinical settings. Therefore, the researches recommend to explore more areas of research in measuring the effect of utilization of such devices in improving health educational outcomes in both classroom and clinical setting.

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