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The Impact of Sociological Factors on Nurse Educators' Use of Information Technology

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Abstract

Background: Today, as the rapid progress of Information Technologies (I.T) in health care continues, it is crucial to find out more information about the factors that might advance or hinder the nurses' educators' acceptance of technological changes. The main goal of this study was to explain the use of using I.T, by focusing on sociological factors like the impact of support and influence. The study design was a quantitative research, using a written and online survey. One hundred and nine academic nurse educators from ten different academic nursing schools in Israel participated.

Results: support and influence predict actual use of I.T. The Chi-square Goodness-of-Fit index presented an excellent fit for the data *(*p=0.46; Normed Fit Index (NFI)=0.96; Root Mean Square Error of Approximation (RMSEA)=0.00). The relationship between sociological factors from significant others and the actual use of IT was mediated by personality characteristics such as self-efficacy, and innovativeness.

Conclusion: Management should ensure that sociological factors (such as support and influence) and personality characteristics (such as self-efficacy, attitudes toward I.T, and innovativeness) are considered when preparing to introduce new technologies to nurse educators. Enhancing support and influence and self-efficacy should be considered in the organization, in order to encourage favorable use among healthcare professionals.

Keywords: Social support; Nurse educators; Use of information technology; Attitudes; Self-efficacy; Innovativeness

Introduction

The twenty-first century is an age of new technologies, in which technology is used almost everywhere, mostly for information sharing. Smartphones, laptops, electronic devices, and social online communities are a few examples of nurses' constant immersion in technology [1]. As technology has become more powerful, it has provided educators with a valuable tool to support learning by advanced technology that has made learning more accessible, and offered educators a way to support learning inside and outside the classroom. Information technology (I.T) is the application of computers and internet to store, retrieve, transmit, and manipulate data, or information, often in the context of a business or other enterprise [2]. Information Technology (I.T) uses computers, networking, and software to manage information, in a way in which students are no longer tied to their desks and can interact with learning objects [3].

Informatics education in the nursing career has direct impact in training and future development of nurses in the professional field [4]. The exception to this constant exposure to I.T can be found in nursing education, and the big question is how faculty staff can integrate technology into their daily activities and into the curriculum in order to enhance their way of teaching.

In the contemporary information systems literature, research on I.T acceptance focuses mainly on the examination of attitudes towards using I.T [5,6]. On the other hand, behavioral sciences and individual psychology literature suggests that social influences and personal traits are potentially important and can be explanatory variables in technology adoption as well [7].

The ministry of health/nursing division, in Israel is characterized by a global trend of growing recognition in the importance of the academization of nurses. Today, there are in Israel more than 20 Institutions for training academic registered nurses that are entitled to enrich the study program required for register nurses [8]. The required courses in the learning program contains 126 academic credits, 100 of which are theoretical academic credits and 26 are clinical experience academic credits.

With this in mind, the authors chose to build a research model that would explain the behavior process of using I.T, by nurses' educators, focusing on the impact of support and influence. A S.E.M (Structural Equation Modeling) model-a statistical technique embodying multiple linear regressions, will be used to explain the relationship between influence and support received by the nurse educators and variables concerning the use of Information Technology (I.T), including a number of variables such as self-efficacy, innovativeness, attitudes, and actual use of I.T.

Theoretical Framework

Over the years, many models and theories have been developed and have been tested in order to identify variables affecting the acceptance and use of I.T provided to end-users. Among them, the classical Theory of Reasoned Action (TRA) [9] is based on the subjective norms and attitudes that determinate the intention to change a behavior and the behavioral response, (i.e., their actual use of the system). The Ajzen [10] developed the TPB (Theory of Planned Behavior) model that explains

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various human actions by integrating subjective norms, attitudes, self-efficacy, and use. In this study, our theory is based on the Theory of Planned Behavior, and we hypothesized that subjective norms, attitudes, self-efficacy, and innovativeness, all serve as antecedents to a mediating process that results in the actual behavioral use of I.T.

Subjective norms

The second determinate of the theory of reasoned action [9] is subjective norm-one's perception of the social pressures put on one to perform or not to perform the behavior in question. Subjective norm was found to be the most important antecedent of user intention towards use of e-learning [11]. Subjective norm is influenced by the judgment of significant others, people that are important to the person such as parents, spouse, friends, and direct manager. These people can influence and support the behavior, and one might feel social pressure (subjective norm) regarding performance or non-performance of a certain behavior.

In addition to teaching at an academic nursing school, the nurse belongs to multiple other groups, such as family, friends, and organizations, and this fact highlights the demand from the manager to consider the vitality of the nurse environment. One of the important benefits that a person receives from the environment is social support. The literature extensively indicates the main role and impact of social support [12,13]. Altogether, it is surprising to find out that the relationship between supports from significant others and the level of influence that the nurse educator feels concerning using I.T has received so far very little attention.

Social support may yield a wide range of functions, including empathy, encouragement, assistance, and sense of sharing. Koivunen et al. [6] claim that nursing directors have a significant role, because their important task is management of change in many areas including innovative I.T implementation processes. Significant others, such as family and friends, have an important role that can be seen when the nurse educators seek their support, and the influence they have on them can be seen in the nurse educators' attitudes and behavior. Yang et al. [14] found that behavioral beliefs in combination with social influences are all important determinants for services adoption and use, but their impacts on behavioral intention do vary across different stages. Therefore, the need for social support in nursing education is very important. By reinforcing support, I.T can increase the nurse educator's self-efficacy, and possibly lead to increased academic performance [15], which can also be related to beliefs in one's ability to accomplish and use I.T. [16] found that social influence had direct influence on using I.T.

IT use

I.T use is the technology hardware and software that everyone is using in daily work in the healthcare and education surrounding-this term includes using the servers, networks, computers, software programs and other equipment used to manage information. Using I.T, is the most significant change to occur in nursing education since the move from hospital training to academic teaching [17]. Most nurses use information and communication technology, and the Internet is part of their daily work. A number of factors have been associated with acceptance and use of I.T [6]. These include the level of I.T skills, and managers' support. Usually, the nurse educators already have years of hands-on experience, and it may be quite difficult for them to change their way of teaching without providing them with substantial support and guidance. Duncan et al. [18] claim that the world has indeed changed, and these changes will shape the way nursing should be prepared for the next generation of nurses. Task forces and research reports sheds light on strategies needed to support nurses to address today's challenges in nursing practice and education. Today, nurse educators have taken steps to transform their curriculum and make use of a variety of educational technologies to facilitate learning, and that is so important to advance nurses' motivation to use I.T.

Nurse educators must keep in pace with technological changes not only in the classroom but also in the practical arena. Members of the academic staff have to use the power of I.T tools to create learning communities for sharing and exchanging ideas, research, and knowledge about nursing education. Nguyen et al. [19] conducted a survey about nursing faculty needs for training in the use of new technologies for education and practice. Their findings suggest that nursing faculty perceive a need for training and support to effectively use educational technologies in nursing education, and this leads to the main aim of the research. For this reason, it is important to investigate whether there is a connection between the nurses' educators' use of I.T, and other variables such as self-efficacy, sense of innovation, attitudes and whether the level of influence and support received by them is also linked to using I.T use.

Attitudes

Users' beliefs and attitudes have been shown to have a major influence on the acceptance of new technology [20]. A number of models and frameworks have been developed to measure these influences on users' acceptance and model adoption. Concerning the use of I.T in the education field [21], who studied teacher adoption of technology, claim that positive attitude toward technology and having the skill to use the technology in the classroom are important in the level of integration of technology into the teaching process. Individual nurse's attitudes toward I.T use may be effected by attitudes among other nurses on the ward, due to normative beliefs related to social pressures that may hinder the intention to use I.T [22].

Self-efficacy

Another important dimension in computers' use is self-efficacy. Self-efficacy is defined as peoples' beliefs about their capabilities to produce performance that influence over events that affects their lives. The term was coined by the classical Social Learning Theory of Bandura (1977). Teachers' self-efficacy influences their level of enjoyment and feeling of control when using technology in the classroom [23]. Studies conducted in healthcare settings have found that self-efficacy has a significant influence on using I.T [15,24,25]. Nurse educators that have high levels of self-efficacy are more confident, they tend to use new teaching approaches, and have more motivated students. When self-efficacy is extended to the context of integrating IT into teaching, it describes teachers who view technology as an effective way to enable student learning and perceive I.T as a useful means to support their teaching.

Innovativeness

Innovativeness is the nursing educators' willingness to use new technology. Innovativeness is not defined as a part of the TPB Theory, but was added due to its importance. Innovativeness is the capacity to be enthusiastic about new ideas, to initiate new projects, to innovate new ideas or methods and to plan to what extent this new idea or invention can be useful. Innovativeness can be expressed in various ways such as interest in technological innovation, intention to buy new gadgets, etc. A tendency to innovativeness should have a positive relationship with attitudes towards computer use, as was presented by Reference [26,27].

In summary, according to the TPB theory [10], Subjective norms as it is expressed in variables such as social support and significant other' influence, are parts of the whole model. Attitudes toward using I.T, subjective norms, self-efficay and the addition of innovativeness, will be tested for their relationship with nurses' educators' use of II.

Aims of this research

This study's main goal was to examine the correlation between nurse educators' perception of the degree of influence and support they get from their significant others (close family, friends, and managers) concerning the use of I.T, as well as examining a number of variables such as self-efficacy, innovativeness, attitudes, and use of I.T.

Research hypotheses

The following research hypotheses were derived from the aims of this research:

a) A positive correlation will be found between the nurse educators' sense of influence and support from their significant others and their attitudes toward using I.T, use of I.T, self-efficacy, and innovativeness.

b) The nurse educators' perception of their sociological factors (such as support and influence) and personality factors (such as attitudes, innovativeness, and sense of efficacy) will predict actual I.T use.

The importance of the research

This study attempts to contribute a better theoretical understanding of the antecedents of adoption of I.T by nurse educators, focusing on the influence and support of their significant others. The degrees of support and the amount of influence by significant others will point to the characteristics of the relationship between using I.T and specific personal and professional factors. Knowing what sociological factors are related to the I.T use is important and can be used to assist education and to develop better attitudes toward I.T use. A good number of I.T projects around the world have failed or have been abandoned, due to their discrepancy for the nurses, therefore, it is critically important that factors influencing healthcare professionals' acceptance and use behavior of I.T and related technology be investigated [28].

Methods

Nurse educators are an important group in the nursing field. They build, design, and mold the future nurses. This study will examine different angles of the nurse's behavior: the relationship between the level of nurse educators' I.T use and three groups of human factors: **a)** Sociological factors-subjective norms (the current study), **b)** Environments factors-work climate [25], and **c)** Emotional factors-perceived level of threat and challenge (in process). Each of these factors is important, and its discussion can be of great benefit to the nursing profession. Each part is individual, and the insights from the entire three parts will provide a comprehensive perspective of the issue. For the avoidance of any doubt, the present study, examining the impact of the support and influence of the significances others, was carried out using it to the same participants at the same time. Every issue was presented in the questionnaire with the appropriate questions.

Design, population and research tools

Design: This study is a correlative, quantitative research.

Population: A convenience sampling was done, 109 nurses educators, working at 10 different academic institution around Israel (out of 20 nursing academic institutions), participated in the survey. These institutions differs by their sizes; the bigger the institution, the greater the number of nurses educators employed. The sample was made up of female nurses because the number of male educators nurses during the study period was less than 8% of the total number of nurses educators. The age range of the participants is 20 to 65 years. A nurse educator in Israel must have the minimum academic degree, a Master's degree, which explains why their average years of experience were 16, and the average age was 46.

Research tools: An online survey and hardcopy questionnaires were prepared. The main aim of using hardcopy questionnaires was to encourage those who were deterred by technology to participate. Both the online survey and the questionnaire were accompanied by an introductory letter including information about the purpose of the study, assurance of confidentiality, and each nurse was asked to sign informed consent.

Data collection: The survey that was conducted during 2015. The managers of the nursing academic institution were asked to help the authors by approaching the nursing staff faculty in each institution and ask them to participate. Participation was voluntary and the data was collected anonymously. Out of the 150 questionnaires, 109 were returned (71 hand written+38 online), and the total response rate 72.5%.

Ethical consideration: The research was approved by the Ethics Committee of the Academic Institution. Health professionals participated on a voluntary basis, and their rights to anonymity and confidentiality were ensured.

Measures

A questionnaire with a total of 66 questions was constructed by the authors to examine factors that support and influence nurse educators' use of technology. Most of the questions were adapted from [26] questionnaire, except the I.T use's part that was developed by the current authors. The whole questionnaire included the following sections: "background demographic factors such as age, seniority, and religion; Sociological factors such as support and influence from significant others and Personality factors such as attitude toward using I.T, self-efficacy, a innovativeness and I.T use.

Measurement of Significance others: The nurses were asked to state their opinion, about if and how they believe they were influenced by the significance others such as their manager, their direct family (spouse and children) and their colleagues. They were also asked what the level of support they believed they received from significance others concerning the concept of their use of I.T during the daily work, all these on a scale of 1-4: from 1- not influenced at all to 4 totally influenced, or 1-totally non-supportive to 4-totally supportive. An example of the influence from significant others' scale: "To what extent do you believe that you are influenced by the opinions of the listed below: (direct manager, peer group, close family)", and another example of the support variable: "Do you believe that your direct manager thinks that it is important for you to use Technological tools in teaching?".

Measurement of Attitudes: The questionnaire of Attitude toward using I.T consists of 19 questions on a Likert scale, was based on the classic attitudes scale by Ref. [29]. The scale has good reliability; Cronbach's alpha=0.89. Factor analysis confirmed a one-factor solution explaining 34% of the variance. Sense of innovativeness scale consists of three questions on a Likert scale, and has good psychometric properties; Cronbach's alpha=0.78. Factor analysis confirmed a one-factor solution explaining 70.51% of the variance. Sense of self-

efficacy scale consists of two questions on a Likert scale, and has good psychometric properties; Cronbach's alpha=0.41. Factor analysis confirmed a one-factor solution explaining 63.80% of the variance.

Measurement actual I.T use: The scale of actual I.T use was constructed for this study by the authors. It is not simple to measure the actual I.T use due to the fact that there are some levels of use in the nurse's education pattern of I.T uses. The whole process of building this scale included consulting with 2 senior nursing educator experts. They revised the questions and approved them. The next step involved a pilot questionnaire for five nursing educators. In sum, this scale starts with very basic tools like the MS-Office (Word, Excel, Power Point, Outlook). Since the nurses' educators average age was 46, the assumption was that not all of them are familiar with such competencies. There were 4 items and the Cronbach's alpha was=0.82.

Another dimension of using I.T is reflected by the way the nurses' educators are using the internet and working with emails. We used 2 items and the Cronbach's alpha was=0.83.

The more advanced way of using I.T is reflected by the way they use more complicated educational and healthcare software in class like Moodle (a free and open-source software learning management system), or Poll everywhere app (Poll Everywhere is a mobile app, for responding to polls, presenting polls, and clicking through PowerPoint presentation)-this stage included two items; and the Cronbach's alpha was 0.83. The reliability of the combined three scales of I.T use was 0.83 [30].

5.2.4 Data analysis: In order to assess the relationship between sociological, personality and behavioral factors, Pearson correlations were conducted. In order to assess the direct and indirect influence of sociological factors such as support and influence from significant others on actual I.T use, a Hierarchical Regression analysis was used. In order to understand the mediated effect of sociological factors on actual I.T use (mediated by personality factors) a Structural Equation Model (SEM) was used. The SEM model adds to the regression model in that it assesses direct and indirect paths simultaneously.

Results

The first research hypothesis referred to possible correlations between influence and support and attitudes toward using I.T, use of I.T, self-efficacy, and innovativeness. As can be seen, Table 1 shows the correlations between the indices. Positive correlations between support, influence, self-efficacy, attitudes towards I.T, meaning that the higher support, the higher the influence and the more positive the attitudes, the sense of efficacy. No correlations between influence and the other indices emerged. Sense of efficacy, positive attitudes towards using I.T, and actual use were all highly inter-correlated.

The second research hypothesis intended to check which variables would best predict the actual use of I.T. The variables were divided into two factors: sociological factors (such as support and influence) and personality factors (such as attitudes, innovativeness, and sense of self-efficacy). This hypothesis was tested using a hierarchical regression model in which actual use was the dependent variable; personal factors were entered in the first step, followed by personality factors. The Table 2 shows the outcomes of the regression analysis.

As can be seen in Table 2, support and influence predict actual use. Support predicts it positively, while influence predicts use negatively. This means that the more support you have the higher the actual use of I.T is, but the more influence you have, the less actual use there is. Sense of self-efficacy and innovativeness both fully mediated this result, meaning that support and influence predict actual use of I.T through personality factors. The study tried to build a research model that would explain the behavior process of using I.T, focusing on the influence and impact of the support and influence. We hypothesized that personality characteristics (innovativeness, attitudes and self-efficacy) would mediate the relationship between personal factors and actual use. The Figure 1 depicts our SEM model. The Chi-square Goodness-of-Fit index presented an excellent fit for the data ($p=0.46$; Normed Fit Index (NFI)=0.96; Root Mean Square Error of Approximation (RMSEA)=0.00). The statistically significant path coefficients are provided as standardized estimates in Figure 1.

The SEM model shows that influence does not directly predict any of the other variables. Its only influence is through its positive correlation with support. This may explain the negative predictive strength it had in our regression model. Support positively predicted self-efficacy, attitudes toward I.T, and innovativeness, but did not predict actual use directly. This supports our regression model in the understanding that personality characteristics fully mediate the relationship between sociological factors and actual use of I.T.

Discussion

The main aim of this study was to provide information regarding the impact of significant others on the nurse educators' actual I.T use. The first research hypothesis about correlation between influence and support and attitudes toward using I.T, actual use of I.T, self-efficacy, and innovativeness was supported. We have evidence to support the importance of the influence and support variables in connection with the significance other. Burke et al. [31] who collected Data from 2104 nurses in Spain concerning job demands, social support, and work satisfaction, found that lack of social support, particularly from supervisors and co-workers, were associated with d more unfavorable work/organizational outcomes.

The impact of the significant others (social support) on the nurse educators use of I.T was substantiated, and it is quite important. Sources of social support can be colleagues, subordinates or superiors, as well as factors outside the workplace such as family and friends. The support pattern can be emotional, functional, and informative or appreciation. It can be assumed that social support would help the nurse educator to face workplace pressure [31]. Poelmans et al. [32] showed that the enrichment of family or work have a positive effect on satisfaction from both work and family life, and produce a feeling of well-being, physically and mentally. Job satisfaction increases the possibility that work will enrich the family, and family satisfaction increases the likelihood that the family will enrich the work system [33]. Accordingly, when the needs of the nurse educators' job are suitable to the close family environment, there will be less conflicts between the significant others and work, and the nurse educator's attitude toward the workplace would be more positive. The significant correlation between social support and intention to use I.T was found also by Ref. [28,34,35]. The variable of behavioral intention toward accepting and integrating I.T was less relevant in this study because the subjects were already (more or less) using the new technology.

The research model explained the behavior process of using I.T, focusing on the effect and impact of support and influence. Support positively predicted self-efficacy, attitudes toward I.T, and innovativeness, but did not predict actual use directly. This strengthens our regression model in the understanding that personality characteristics fully mediate the relationship between sociological factors and actual use of I.T.

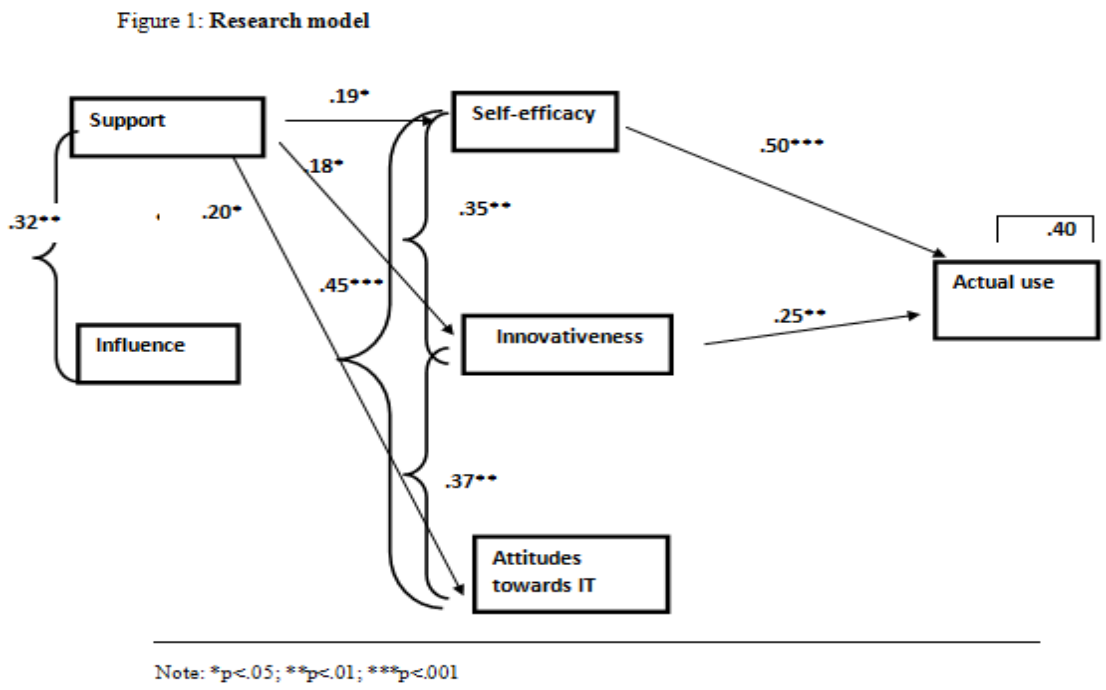

Figure 1: Research model.

	Influence	Self-efficacy	Attitudes toward IT	Intention to use IT	Actual IT use
Support	0.32***	0.19*	0.20*	0.20*	0.15
Influence		-0.10	-0.009	-0.01	-0.13
Self-efficacy			0.47***	0.34***	0.59***
Attitudes toward IT				0.60***	0.27**
Intention to use IT					0.11

Note: *P<0.05; **P<0.01; ***P<0.001

Table 1: Pearson correlations between subjective norms, personality characteristics, intention to use IT, and actual use of IT.

	R^2	Adj. R^2	ΔR^2	F	B	T
Step 1	0.06	0.04		(2,103)=3.12*		
Support					0.20	2.02*
Influence					-0.21	-2.03*
Step 2	0.41	0.38	0.35***	(5,100)=13.65***		
Support					0.04	0.52
Influence					-0.10	-1.16
Self-efficacy					0.51	5.61***
Innovativeness					0.27	3.10**
Attitudes toward IT					-0.09	-0.98

N=109; *p<05; **p<01; ***p<001

Table 2: Hierarchical Regression Analysis predicting actual IT use from demographic data, personality characteristics and intention to use.

Computer self-efficacy has been proven an important variable concerning attitudes and acceptance of I.T [36]. The nurse educator who has a sense of self-efficacy is more confident and believes in her ability to cope successfully with I.T. Consequently, the nurse has positive attitudes and is more willing to use new technology. A sense of innovativeness is also a valuable factor [37]. A sense of innovativeness is a very important value for nurse educators and for their students, because innovativeness helps to find novel ways of virtual teaching for the benefit of the profession. Innovative teaching/learning strategies are needed, because the virtual world provides a big opportunity for nurse educators to develop meaningful, simulated learning that may then be transferred to the real world of the nursing practice.

Findings of this study, especially the model, may be applicable to other research dealing with human behavior, and may serve as a useful base for comparisons in future studies.

Finally, the uniqueness of this study's results is proof of sociological factors' importance and how they affect the nurse educators' personality characteristics, namely attitudes, computer self-efficacy, and innovativeness. These insights should be used by policymakers and managers, who should ensure that when introducing new I.T to nurse educators, sociological factors are taken into consideration in order to encourage favorable use behavior among them [38-40].

Limitations

a) The study was conducted in one country. Israel is a multicultural country, and there might be differences in generalization of the study's findings to other countries.

b) The authors used a sample that is really not big enough for a SEM.

c) The questions about I.T use was developed by the authors and it would be interesting to check it with further more research.

Conclusions

This study is an interesting approach to outline the factors that are involved in the adoption/acceptance and use of certain I.T. Today, as the rapid progress of Information Technologies (I.T) in health care continues, it is crucial to find out more information about the factors that might advance or hinder the nurses' educators' acceptance of technological changes. The relationship between sociological factors from significant others and the actual use of I.T was mediated by personality characteristics such as self-efficacy, and innovativeness.

The managers should ensure that sociological factors (such as support and influence) and personality characteristics (such as self-efficacy, attitudes toward I.T, and innovativeness) are taken into account when introducing new technologies to the nurse educators. Enhancing support and influence and should be considered in the organization, in order to encourage favorable use among healthcare professionals**.**

In the field of nursing education, the findings of this study contribute to expanding the knowledge of the sociological factors that affect nurse educators' behavior concerning I.T use. Activating and implementing the research insights, concerning the relationship with significant others, could help to provide nurses' educators with the relevant skills that would act to improve the quality of the nursing education and profession.

Conflict of Interest

There are no possible conflicts of interest in the manuscript including financial, consultancy, institutional or other relationships that might lead to bias or conflict of interest.

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