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# **P40. The Moderating Effects of Age and Computer Knowledge on Nurses' Acceptance of Information Systems: A Canadian Study**

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## ***Abstract***

The objective of this study was to educate on the moderating effects of age and computer knowledge on nurses' acceptance of information systems (IS). The background theoretical framework used was the technology acceptance model (TAM), which has been widely favored by healthcare researchers. A relevant research model including TAM's core constructs, i.e., perceived usefulness (PUSS) and ease of use (PEOU), age, and computer knowledge was used. Usable data was collected from 197 registered nurses (RNs) in Nova Scotia, Canada, in a cross-sectional survey. The partial least squares (PLS) technique of structural equation modeling was used for data analysis. The results of the hypothesized relationships show that computer knowledge has a positive moderating effect on the influences of PEOU and PUSS on nurses' attitudes toward IS (ATTI); the demographic factor of age did not. PEOU and PUSS have direct positive influence on nurses' ATTI, which in turn impacts their behavioral intentions to use IS (BEHI). Lastly, nurses' self-reported IS use is positively influenced by BEHI. The study's results drew the attention of practitioners and academics to the impacts of age and computer knowledge in the discourse of nurses' IS acceptance in work environments.

## ***Keywords***

Information Systems, Technology Adoption, Acceptance, Nurses, Technology Acceptance Model, Age, Computer Knowledge, PLS, Canada, and Survey.

## **1. Introduction**

The use of computer-based technologies and information systems (IS), such as enterprise or electronic medical record (EMR) systems, electronic health record (EHR), clinical decision support (CDS), and patient care systems (PCS), have become critical resources for reducing costs and improving quality and standards in healthcare (Kuhn et al. 2006; Combs 2006). The diffusion of such technologies in healthcare has expanded dramatically across the world, and is expected to increase in the coming years (Ludwick & Doucette 2009; Lee et al. 2013). Despite well-documented benefits of IS to healthcare, it has been reported that clinicians, including nurses, have not readily accepted such tools (Kaya 2011; Ifinedo 2012; Kipturgo et al. 2014). In some cases, nurses' resistance has led to the failure of several health IS implementations. At other times, underutilization, reluctance to use computers and IS, and even sabotage have been reported (Alquraini et al. 2007; Montague et al. 2013). Clearly, the benefits of IS will not be fully realized if those expected to benefit from such tools resist or underutilize them. It is critical for researchers

to study factors that can positively influence healthcare workers' behavior toward IS, in general (Ludwick & Doucette 2009; Holden & Karsh 2010; Montague et al. 2013; Lee et al. 2013). Admittedly, the health sector has a variety of professionals; however, for illustrative purposes, this study focuses on registered nurses (RNs) to enrich insight. Researchers have also noted that nurses tend to have unfavorable attitudes toward IS and computerization in work environments (Timmons 2003; Alquraini et al. 2007), while others offered a different view on the matter (Lee 2008; Kivuti & Chepchirchir 2011). A study such as this one adds to the growing knowledge in the area.

To assess health workers' acceptance or use behavior toward IS, several theoretical frameworks have been suggested and used (Holden & Karsh 2010). Prominent among such frameworks is the technology acceptance model (TAM) (Davis 1989) and subsequent extensions of the framework (Venkatesh et al. 2003). Although Davis (1989) conceptualized the impacts of relevant antecedents on PUSS and PEOU, research shows that very few healthcare studies have examined the effect of antecedent factors on nurses' acceptance of IS (Holden & Karsh 2010; Kuo et al. 2013; Chiu & Tsai, 2014). This study argues that the exclusion of antecedent factors in healthcare research aiming to comprehend acceptance of IS among clinicians, including nurses, may limit understanding of the phenomenon of IS acceptance. In fact, individual characteristics related to computer knowledge and the demographic variable of age have been shown to matter for nurses' acceptance of IS in work environments (Simpson & Kenrick 1997; Sinclair & Gardner 1999; Dillon et al. 2005; Brumini & Kovic 2005; Alquraini et al. 2007; Ammenwerth et al. 2003; Chan 2009; Kipturgo et al. 2014; Kahouei et al. 2015).

Without a doubt, studies that used TAM to examine nurses' acceptance of IS have advanced knowledge in the area (please see Yarbrough & Smith 2007; Holden & Karsh 2010); however, much remains unknown. It is worth noting the assumption in prior TAM studies of the existence of a one-way sequence of events between PUSS, PEOU, and attitude toward IS (ATTI). This study strongly argues against the overuse of such conceptualization as the main approach through which IS acceptance in healthcare is studied and discussed. In fact, an extension of TAM proposed by Venkatesh et al. (2003), acquiesces with this study's argument as their framework underscored the role of the moderating effects of variables, such as age, gender, and experience, in explicating an individual's acceptance of IS. Rarely do independent factors, such as PEOU and PUSS, act in isolation to influence an outcome for an IS end-user; indeed, the interacting effects of factors are present. To that end, this study maintains that the moderating roles or interacting effects of computer knowledge and age on PUSS and PEOU would add more meaningful insights to the discourse of nurses' acceptance of IS at work. Not many researchers have studied the interacting effects of variables in healthcare contexts (e.g., Kummer et al. 2013). This study is designed to contribute to current research, in that regard, as it attempts to fill this lacuna in healthcare literature. Specifically, this study seeks to provide an answer to the following question: What are the moderating roles of age and computer knowledge on nurses' acceptance of information systems?

## **2. Literature review**

Computer knowledge and age are among factors of note to IS acceptance among nurses; gender was not considered herein as this study's data indicated the predominance of one sex— females. Several studies (Brumini & Kovic 2005; Dillon et al. 2005; Shoham & Gonen 2008; Kipturgo et al. 2014) found age to be a major contributor to nurses' attitudes toward IS acceptance in work

contexts. However, other researchers (Marasovic et al. 1997; Sleutel & Guinn, 1999) did not support this viewpoint. The positive impact of computer knowledge on nurses' attitudes toward IS and computerization is well documented in healthcare literature. For instance, Huryk's (2010) comprehensive review of the literature found that computer experience was the most influential factor to nurses' positive attitudes toward IS use. Studies by Burkes (1991) and Kaya (2011) reported a significant relationship between nurses' exposure to computers and IS use. Sinclair and Gardner (1999) showed that nursing students with prior computer training and knowledge were more likely to use IS. Eley et al. (2008) indicated that nurses who had received generic computer education during training believed that such exposure was relevant to their job needs regarding IS use. In sum, computer knowledge continues to be viewed as an important factor that can enhance nurses' acceptance of IS at work (Ammenwerth et al. 2003; Brumini & Kovic 2005; Alquraini et al. 2007; Kipturgo et al. 2014; Kahouei et al. 2015).

## 2.1 Theoretical framework

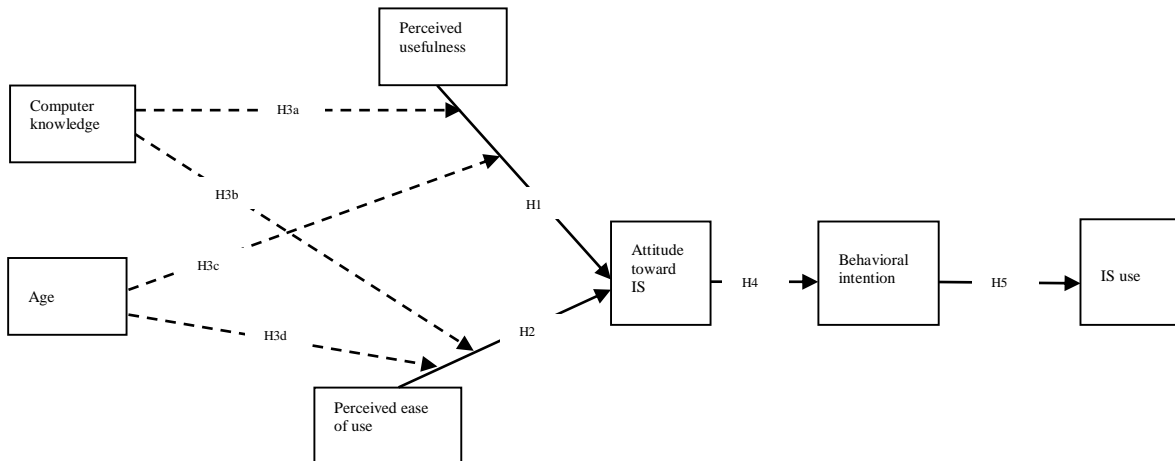
Davis developed the technology acceptance model (TAM), which is generally considered a useful tool for understanding users' acceptance of IS in several fields including the healthcare sector (Yarbrough & Smith 2007; Holden & Karsh 2010). TAM has several extensions; this study uses its original form. Despite its relative simplicity, recent studies have provided evidence that TAM is a good predictor of behavioral intent to accept IS in the healthcare sector (Yarbrough & Smith 2007). TAM's constructs explain about 30-40% of the variance in individuals' acceptance of IS. TAM posits that users' perceived usefulness and perceived ease of use (PEOU) are two major determinants of IS acceptance; these two factors are influenced by exogenous variables. Perceived usefulness (PUSS) refers to "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, p. 320). Perceived ease of use (PEOU) refers to "the degree to which a person believes that using a particular system would be free from effort" (Davis, p. 320). Both PUSS and PEOU influence attitude (ATTI), which represents an individual's positive or negative feelings toward engaging in a specified behavior, in this instance, using IS. Attitude (ATTI), in turn, influences behavioral intention (BEHI), which is considered to be the most proximal antecedent to IS use. BEHI positively influences IS use (ISUE).

## 3. Research model and hypotheses

The study's research model shown in Figure 1 highlights the direct and interacting effects of the study's constructs. Namely, the relationships in the original TAM are indicated with full ( ) while the interacting effects are indicated by broken arrows ( ). The hypotheses are present as follows.

Several studies of health informatics have consistently found perceived usefulness of IS to be positively associated with clinicians' attitudes toward IS tools (please see Holden & Karsh 2010; Yarbrough & Smith 2007). Past studies indicated that nurses are more likely to develop favorable attitudes toward IS if the tangible benefits of IS are adequately appreciated (Holden & Karsh 2010). In fact, PUSS was found to be a strong motivator for predicting healthcare professionals' attitudes toward IS in work settings (Aggelidis & Chatzoglou 2009; Holden & Karsh 2010; Kuo et al. 2013). Thus, it is hypothesized that:

H1: Nurses' PUSS positively influences their attitudes toward IS (ATTI)



**Figure 1: The Research Model**

In healthcare research across the world, findings have consistently confirmed that clinicians who perceive implemented IS to be easy to use often develop positive attitudes toward such tools in their settings (Yarbrough & Smith 2007; Aggelidis & Chatzoglou, 2009; Holden & Karsh 2010). Recent TAM studies that used the opinions of nursing professionals have affirmed this point of view as well (Ifinedo 2012; Kuo et al., 2013; Chiu & Tsai 2014). Thus, it is hypothesized that:

H2: Nurses' PEOU positively influences their attitudes toward IS (ATTI)

Nurses with basic computer knowledge tend to develop positive attitudes toward implemented IS in their work environments (Ammenwerth et al., 2003; Brumini & Kovic 2005; Huryk 2010; Kaya, 2011). Such prior, generic computer education and knowledge enhances positive attitudes toward computerization and IS utilization at work (Sinclair & Gardner 1999; Ammenwerth et al. 2003; Alquraini et al. 2007; Eley et al. 2008; Chan 2009; Kipturgo et al. 2014; Kahouei et al. 2015). Likewise, nursing literature has shown that age is a major contributing factor to nurses' attitudes toward IS acceptance (Simpson & Kenrick 1997; Brumini & Kovic 2005; Dillon et al. 2005). These prior studies indicated that younger nurses' attitudes toward IS tend to more favorable compared to those of older colleagues. As indicated, PUSS and PEOU are positively related to ATTI (e.g., Aggelidis & Chatzoglou 2009; Holden & Karsh 2010). It is therefore expected that the interacting effects of age and computer knowledge on PUSS and PEOU will permit the following set of hypotheses:

H3a: Nurses' PUSS effect on ATTI will be moderated by their computer knowledge, such that the effect will be stronger for more computer-savvy nurses.

H3b: Nurses' PEOU effect on ATTI will be moderated by their computer knowledge, such that the effect will be stronger for more computer-savvy nurses.

H3c: Nurses' PUSS will be moderated by age, such that the effect will be stronger for younger nurses.

H3d: Nurses' PEOU will be moderated by age, such that the effect will be stronger for younger nurses.

Behavioral intention to use IS is influenced by attitude toward using such systems (Chen et al. 2007; Holden & Karsh, 2010). Previous studies in the healthcare sector have confirmed that clinicians having favorable attitudes toward IS tend to have intentions to use such tools in their organizations (Shoham & Gonen 2008; Aggelidis & Chatzoglou, 2009; Huryk 2010; Leblanc et al. 2012). Behavioral intention is usually accepted as a reliable variable predicting actual use (Holden & Karsh 2010). As actual usage was not measured in this study, nurses' self-reported usage of IS is employed in lieu. That said, healthcare studies (Chen et al. 2007; Or et al. 2011; Ifinedo 2012) have reported the existence of a positive association between behavioral intentions to use IS and usage, self-reported or otherwise. Thus, it is hypothesized that for nurses:

H4: Nurses' ATTI positively influences their behavioral intention to use IS (BEHI)

H5: Nurses' BEHI positively influences IS use (ISUE)

### **3. Research methodology**

#### **3.1 Study design and procedure**

A cross-sectional survey was used to test the research model. A list of 500 names and postal addresses of members of the College of Registered Nurses of Nova Scotia, Canada, (<http://www.crnns.ca>) was procured. The instruction was that names should be randomly selected from their membership directory. Afterward, each participant was sent a packet containing a cover letter explaining the purpose of the survey, a questionnaire, and self-addressed, stamped envelope. Excluding undeliverable mail and incomplete responses, the study's effective response rate was 40.4% (198/493); one questionnaire was not included in the data analysis as it did not contain enough data. The questionnaire asked respondents to provide views reflecting their use of computer-based health IS in their organizations. Several participants made references to an IS including EHR, EMR, CDS, and PCS used in their workplaces in Nova Scotia (NSHIS 2014).

#### **3.1 Sample**

About 96% of the respondents are female, which is an indication of the characteristics of RNs in Canada and elsewhere (Alquraini et al. 2007; CIHI 2014). More than 70% of the participants had university education. On average, the participants have worked for 14.5 years with their current employers (S.D. = 10.8). Table 1 shows the rest of the participants' demographic information. As the survey method used in this study collected both independent and dependent data from the same source, common method variance (CMV) cannot be ruled out. CMV refers to a bias arising from the collection of both independent and depend data from one source. Procedural remedies recommended by Podsakoff et al. (2003) in reducing the effects of CMV were followed.

#### **3.1 The study's constructs**

For computer knowledge, participants were asked: "In general, how would rate your overall computer knowledge level?" Responses were provided on a scale ranging from 1 (Far below average) to 5 (Highly advanced). The demographic variable of age (different age ranges) was collected. Measures validated in literature were used for all TAM constructs; these were adapted from Davis (1989) and Venkatesh et al (2003).

Construct	Measurement item	Mean	S.D	Item loading
<b>PERCEIVED USEFULNESS</b> (Mean = 5.413 SD = 1.668)	I would find computer-based IS useful in my job	5.868	1.472	0.847
	Using computer-based IS enables me to accomplish tasks more quickly	5.213	1.886	0.934
	Using computer-based IS increases my productivity	5.015	1.874	0.938
	Using computer-based IS is good for my professional development	5.556	1.440	0.796
<b>PERCEIVED EASE OF USE</b> (Mean = 5.009 SD = 1.429)	My interaction with computer-based IS would be clear and understandable	5.046	1.375	0.858
	It would be easy for me to become skillful at using computer/IT systems	5.249	1.398	0.910
	I would find computer-based IS easy to use	5.015	1.444	0.949
	Learning to operate computer-based IS is easy for me	4.726	1.500	0.911
<b>ATTITUDE</b> (Mean = 5.442 SD = 1.383)	Using computer-based IS is a good idea	6.030	1.073	0.776
	Computer-based IS make work more interesting	5.355	1.507	0.926
	Working with computer-based IS is fun	5.091	1.495	0.930
	In general, I like working with computer-based IS	5.289	1.458	0.927
<b>BEHAVIORAL INTENTIONS</b> (Mean = 6.107 SD = 1.299)	I am certain I will use my organization's computer-based IS in the coming months	6.107	1.338	0.967
	I predict I would use my organization's computer-based IS in the coming months	6.102	1.317	0.867
	In general, I intend to follow my organization's directives to use computer-based IS	6.102	1.237	0.884
	It is my plan to use my organization's computer-based IS in the coming months	6.117	1.302	0.961
<b>IS USE</b> (Mean = 5.005 SD = 1.758)	I frequently use computer-based IS to understand a health problem or an illness	5.178	1.560	0.800
	I often use computer-based IS to serve patients	4.421	1.977	0.755
	I frequently use computer-based IS to find information about a health problem	5.305	1.498	0.870
	I very often use computer-based IS to do my job	5.117	1.998	0.739

Note: S.D. = Standard deviation

**Table 1:** The questionnaire's items, their descriptive statistics and item loadings.

## 4. Data analysis

The Partial Least Squares (PLS) technique, which utilizes a principle component-based for estimation, was used for analysis. It permits the use of interacting variables as well. Generally, PLS accommodates small sample sizes and does not require multivariate data normality (Chin 1998). The PLS software used in this study was WarpPLS 4.0 (Kock 2014). Essentially, PLS provides information for two related models: a) the measurement or the outer model, which describes the constructs (latent variables) and relationships between the constructs' indicators (manifest variables); b) a structural or inner model, which describes the causal relationships among used constructs.

### 4.1 The measurement model

To assess the measurement model, tests for internal consistency and convergent and discriminant validities were performed (Fornell & Larcker 1981; Chin 1998). Two tests used to evaluate internal consistency of measures are composite reliability (COM) and Cronbach's alpha (CRA) values. In general, values no less than 0.70 are considered adequate for assessing internal consistency of variables (Chin 1998). Convergent and discriminant validities are assessed using the following criteria: (a) standardized item loadings should exceed 0.707; (b) the square root of the average variance extracted (AVE) should be no less than 0.707 (i.e. the AVE should be above the threshold value of 0.50); (c) the square root of AVE should be larger than the correlations between that

construct and all other constructs (Chin 1998). Table 2 shows that CRA and COM are consistently above the threshold value of 0.70, AVEs ranged from 0.628 to 0.888, and in no case was any correlation between the constructs greater than the squared root of AVE (the principal diagonal element). Overall, the results of the psychometric assessment of the measures used for construct were adequate.

	COM	CRA	AVE	PUSS	PEOU	ATTI	BEHI	ISUE
PUSS	0.932	0.902	0.776	<b>0.881</b>	0.705	0.681	0.278	0.457
PEOU	0.948	0.926	0.819	0.705	<b>0.905</b>	0.681	0.276	0.402
ATTI	0.936	0.907	0.786	0.681	0.681	<b>0.889</b>	0.292	0.402
BEHI	0.969	0.957	0.888	0.278	0.276	0.292	<b>0.942</b>	0.502
ISUE	0.870	0.801	0.628	0.457	0.402	0.402	0.502	<b>0.792</b>

Note: a) Not applicable (NA), Composite reliability (COM), Cronbach's alpha (CRA), Average valance extracted (AVE);  
 b) Off-diagonal elements are correlations among constructs; c) The bold fonts in the leading diagonals are the square root of AVEs.

**Table 3:** Composite Reliability, Cronbach Alphas, Aves, and Inter-Construct Correlations

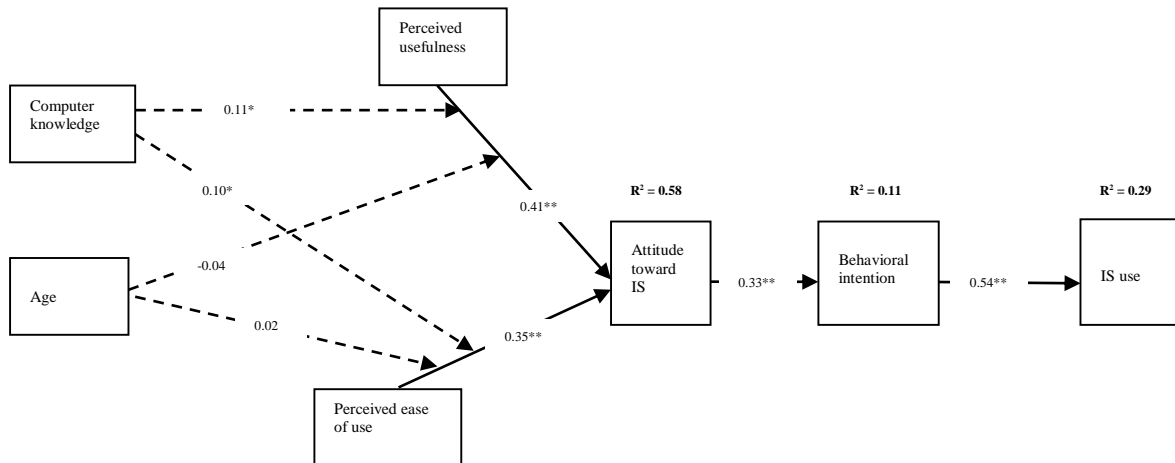
## 4.2 The structural model

With reliability, convergent and discriminant validities of the constructs established, the structural model for the hypothesized paths were then tested. The structural model presents information related to the significance of hypothesized relationships using the path coefficients beta ( $\beta$ ) and the coefficient of determination ( $R^2$ ) (Chin 1998). The results are provided as follows: H1 (PUSS  $\rightarrow$  ATTI) was supported ( $\beta = 0.41$ ;  $p < 0.01$ ). The data supported H2 (PEOU  $\rightarrow$  ATTI) ( $\beta = 0.35$ ;  $p < 0.01$ ). H3a (PUSS \* COMK  $\rightarrow$  ATTI) was confirmed ( $\beta = 0.11$ ;  $p < 0.05$ ) and H3b (PEOU \* COMK  $\rightarrow$  ATTI) was supported by the data as well ( $\beta = 0.10$ ;  $p < 0.05$ ). The data did not confirm H3c (PUSS \* AGEN  $\rightarrow$  ATTI) ( $\beta = -0.04$ ;  $p = 0.29$ ) and H3d (PEOU \* AGEN  $\rightarrow$  ATTI) ( $\beta = 0.02$ ;  $p = 0.36$ ). The result shows that H4 (ATTI  $\rightarrow$  BEHI) was confirmed ( $\beta = 0.35$ ;  $p < 0.01$ ) and H5 (BEHI  $\rightarrow$  ISUE) was strongly supported as well ( $\beta = 0.54$ ;  $p < 0.01$ ). The factors of age and computer knowledge, and their interactions with PUSS and PEOU explained 58% of the variance in ATTI, which in turn accounted for 11% of the variation in BEHI. Lastly, BEHI accounted for 29% of the variation in ISUE. The variance amounts are adequate (Chin 1998), and compares with amounts of variance explained in prior studies that used TAM (Yarbrough & Smith 2007; Holden & Karsh 2010). The results are highlighted in Figure 2.

## 5. Discussions and conclusion

The purpose of this study was to determine the moderating effects of age and computer knowledge on nurses' acceptance of information systems from data collected in a region of Canada, specifically Nova Scotia. The result indicated that nurses' perceived ease of use and usefulness of IS positively influences their attitudes toward IS; this is consistent with findings in similar studies (Aggelidis & Chatzoglou 2009; Holden & Karsh 2010; Kuo et al. 2013; Kuo et al., 2013; Chiu & Tsai 2014). The study revealed that computer knowledge moderated the impact of PUSS and PEOU on nurses' attitudes toward IS. The result, in this regard, lends support to studies indicating that computer knowledge is an important factor capable of improving attitudes toward acquired IS in nurses' work environments; such skills serve to bolster perceptions of usefulness and usability of healthcare technologies by nurses (Sinclair & Gardner 1999; Ammenwerth et al. 2003; Alquraini et al. 2007; Eley et al. 2008; Chan 2009; Kipturgo et al. 2014; Kahouei et al. 2015).





Note: \* = significant at  $p < 0.05$  level; \*\* = significant at  $p < 0.01$  level

**Figure 2:** The WarpPLS 4.0 Software's Results

Nurses' age is not a significant moderator in the relationships between nurses' PEOU and PUSS, on the one hand, and ATTI, on the other. Essentially, these results are suggesting that evaluations of the usefulness and ease of use of IS by nurses do not hinge upon how young or old the individual may be. These results, in this aspect, mirror viewpoints in the literature indicating that age has little or no bearing on the formation of nurses' attitudes toward implemented IS in their work environments (Simpson & Kenrick 1997; Kivuti & Chepchirchir 2011). Attitude toward IS is a significant factor that influences nurses' behavioral intention to use IS, and it has been constantly shown to be a key factor facilitating the willingness of nurses to use IS at work (Chen et al. 2007; Shoham & Gonen 2008; Aggelidis & Chatzoglou, 2009; Huryk 2010; Holden & Karsh 2010; Leblanc et al. 2012). The result indicated that behavioral intentions to use IS by the sampled nurses strongly influenced IS usage behaviors. Namely, where the willingness to use implemented IS was seen to be high, favorable levels of acceptance of such systems, among nurses, ensued. The result of the strong relationship between intention and use behavior is consistent with past findings in healthcare studies (Chen et al. 2007; Or et al. 2011; Ifinedo, 2012).

## 5.1 Theoretical contributions

This study has several theoretical contributions, some of which are highlighted as follows:

- This study is among the first of its kind to examine the moderating effects of age and computer knowledge on nurses' acceptance of information systems. This approach adds more meaning to the knowledge of IS acceptance among healthcare professionals.
- To some degree, this study also signifies the need for researchers not to downplay the effects of antecedent factors on healthcare professionals, including nurses' acceptance of IS. The impacts of such factors could be examined from the angle of interacting effects on core TAM constructs.
- With regard to the interacting effects of variables, this study offers an extension to the usability of TAM for healthcare research.

- This study provided further proof of the applicability of the core constructs of TAM to investigating nurses' acceptance of IS.
- The constructs of attitudes toward IS, behavioral intentions, and use of IS by nurses sampled in this study, provide further evidence to support the view that nurses are embracing and accepting IS in their work environments. To some extent, this information contradicts espoused viewpoints that suggest that nurses are professionally averse to IS use in their work contexts (Timmons 2003; Alquraini et al. 2007).
- The use of PLS, which is not widely used in nursing research studies, has an advantage over regression models that cannot deal with complex and interacting models.

## 5.2 Practical implications

This study has several practical contributions, some of which are highlighted as follows:

- Managers of healthcare professionals need not worry about nurses' age when developing measures and policies to enhance nurses' acceptance of IS in their organizations. Rather, this study shows that nurses' computer knowledge is a factor of note in such matters.
- Given that computer knowledge may facilitate the use and acceptance of IS by hired nurses, the need to employ nurses having such endowments and resources may become more salient. Alternatively, management could provide such expertise and training to already hired nurses lacking such resources and knowledge. For example, Kuo et al. (2013) commented that "continuous educational programs can be provided for nurses to enhance their information technology literacy, minimizing their ....discomfort about information technology."
- It can be argued that a good starting point for encouraging IS acceptance by nurses at work would be to incorporate general, basic computer knowledge and training in nursing program curriculums; others have identified and signified this need as well (Sinclair and Gardner 1999; Russell & Alpay 2000; Eley et al. 2008).
- To motivate nurses' favorable attitudes toward IS, the ease of use and overall usefulness of such systems have to be palpable. Healthcare software designers and administrators are alerted to such realities. For instance, healthcare-based IS that are easy to use should be developed or procured. Similarly, the benefits of easy to use and relevant IS to nurses' work should be communicated. Accordingly, the need to align acquired IS with nurses' job requirements should not be taken lightly. Positive attitudes stem from such efforts.
- To sustain favorable acceptance and use of IS by nurses, management should endeavor to enact policies and incentives that positively influence nurses' attitudes toward technologies. For example, programs that provide IS help, support and re-training should be supported.

## 5.3 Study's limitations and future research directions

This study used perceptual use measures, i.e., frequency of use rather than actual use. Actual logs of nurses' IS use may offer better information. Cross-sectional data was used; studies have shown that clinicians' perceptions of IS acceptance change over time (Carayon et al. 2011). A longitudinal study may offer deeper insights in the matter. Data for the study came from one region of Canada; thus, the generalizability of this study's results may be limited. It is possible that results discussed herein are gender-related; the predominance of females in the sample may support this claim. Future studies should endeavor to overcome the shortcomings noted in this study. Other factors such as gender, years of nursing experience, job characteristics, job position, habit, organizational

support, size of hospital, and so on, could be included in the research model to enhance knowledge of nurses' acceptance of IS at work. Studies that employ an approach and design similar to this effort could be conducted to grow knowledge in the area.

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