Technology acceptance by health professionals in Canada: An analysis with a modified UTAUT model

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Abstract
Information systems (IS) offer healthcare practitioners a variety of benefits. As such, the acceptance of such technologies by healthcare professionals is an important topic of interest to both practitioners and researchers. IS acceptance has been widely researched in the extant literature; however, studies focusing on perspectives of healthcare professionals are sparsely represented. To add the growing work in this area, we used the unified theory of acceptance and use of technology (UTAUT) with a minor modification to examine the factors influencing IS acceptance among five healthcare professionals in Canada. A research model was developed and tested with data collected in a survey. Analyses of 227 healthcare professionals' data confirmed that their intentions to use IS and usage behaviors were significantly influenced by effort expectancy, social influence, compatibility, and organizational facilitating conditions. Performance expectancy did not yield meaningful interpretations. The study's implications for practice and research are discussed.

1. Introduction

Information systems (IS) are vitally important IS for the healthcare sector for benefits that such systems offer [9,28-30]. IS has the potential to improve the quality of services that healthcare users receive, enhance health safety and standards, and reduce healthcare costs [1,10,30]. In fact, healthcare organizations demand that their workers use such technologies in their duties [12,14,21,28,30]. Regardless of the potential benefits of IS use and organizational directives regarding such applications, the success and effectiveness of implemented IS in adopting organizations cannot be fully realized if such applications are underutilized or unused at the workplace [5].

Studies have indicated that IS acceptance among healthcare professionals is low and in some instances, has been resisted [1,14,17,26,28,30]. It is therefore not surprising that a good number of health-based IS projects around the world have failed or been abandoned, in part, due to such shortcomings [12,15].

In this research, we are interested in understanding the factors influencing IS acceptance by healthcare professionals. By focusing on this group of professionals, we acknowledge their importance and unique roles in improving the wellbeing of the population, and in fact, some healthcare professionals “may exhibit characteristics subtly different from those of end users and managers in ordinary business organizations” [5, p196].

Empirical evidence in the IS acceptance area strongly supports the notion that when an individual accepts IS, it is likely that their resistance to such systems is reduced [7,27]. Thus, user acceptance can be viewed as a means by which the ultimate success of IS implementation in adopting healthcare organizations can be achieved [14-17,26,27]. To gain an understanding of the sorts of issues that influence users’ perceptions and intentions to adopt IS, researchers often draw from models, frameworks, and theories with roots in social sciences [2,27]. This is because IS acceptance has both human dimensions and socio-technical underpinnings [12,29]. This current research’s effort is conceived against the backdrop of such an understanding.

The purpose of this current study is twofold. First, we intend to present empirical information regarding technology acceptance by healthcare professionals, excluding physicians, in one province of Canada: Nova Scotia. Canada’s physicians’ perceptions of such issues have been adequately studied [9]. Moreover, researchers in other countries have presented useful information concerning the views of physicians’ IS adoption [5,28]. Other healthcare professionals’ viewpoints are needed to increase knowledge in the area. The second objective of this research is to extend and modify the unified theory of acceptance and use of technology (UTAUT) by including compatibility, a factor that other healthcare researchers [5,21,31] have noted as been important in the IS decision making processes of healthcare workers.
2. Background information

Canadian governments (federal and provincial) have been allocating financial resources to modernizing the country’s healthcare infrastructure [18]. The federal government of Canada established the Canada Health Infoway (CHI) initiative with approximately $500 million to improve health information systems across Canada [18]. At the provincial level, the Nova Scotian government initiated the Nova Scotia hospital Information System (NShIS) project in 2001 and completed it in 2006 with $55.7 million. The information provided in NShIS [18] noted that “[p]rior to the NShIS project, approximately 70% of Nova Scotia healthcare facilities did not have information systems or support systems in place to fully address the management … [and] challenges faced by the healthcare system.” The relative newness of IS in the work environments of healthcare professionals in our research setting i.e. Nova Scotia presents an opportunity for research.

3. Literature review and theoretical foundations

3.1. Theories of intention and healthcare professionals’ IS acceptance

The literature shows that researchers have drawn from behavioral intention theories [2,7,23,24,27] in social sciences and related domains to propose models for investigating an individual’s acceptance and use of IS [27]. Some of the widely used theories and frameworks in the area include theory of reasoned action (TRA), theory of planned behavior (TPB), self-efficacy, diffusion of innovation, technology acceptance model (TAM), and the combined TAM and TPB model [2,7,20,23-25,27]. Despite the success of the foregoing underlying theories and models in examining user’s IS acceptance and behavioral intentions, criticisms have surfaced to underline the limitations in their use [27].

Venkatesh et al. [27] proposed the unified theory of acceptance and use of technology (UTAUT), which essentially integrated prior eight models from the technology acceptance models with the behavioral intention perspectives. This framework has also been used to examine IS acceptance by healthcare professionals around the world [13,21].

The UTAUT consists of several constructs that are hypothesized to influence the intention to use IS and system usage, in general. The constructs of the model include performance expectancy, effort expectancy, social influence and facilitating conditions which directly or indirectly impact behavioral intentions and usage. The definitions of the terms are provided in Appendix C.

Previous research in the healthcare sector confirmed that performance expectancy was a strong predictor of intention use IS [4]. Effort expectancy was shown to positively impact IS behavioral intentions of professionals in the healthcare sector [1,4,13,21]. Although some studies that used occupational therapists and physicians did not find social influence to be a predictor of intention to use IS [5,21], others found the construct to be significantly related to IS behavioral intentions [1,4,13]. The organizational facilitating conditions are of importance for healthcare professionals’ IS behavioral intentions [12,13,21]. Some healthcare researchers have shown that compatibility has an important influence on IS behavioral intention and usage [5,21,31]. The foregoing constructs are highlighted in our research model shown in Figure 1.

Figure 1. The research model

4. Formulation of the research hypotheses

Healthcare professionals who believe that their work goals can be enhanced significantly through IS use tend to have high intentions to use such systems [1,5]. Although some healthcare research that examined the association between these two variables did not find support for the relationship [21], many other studies confirmed that performance expectancy and behavioral intentions are positively related [1,4]. We predict that:

H1: Performance expectancy will have positive impacts on behavioral intentions
Effort expectancy in the UTAUT is composed of constructs such as perceived ease of use and complexity. To that end, healthcare professionals who do not perceive IS to be difficult to use will more readily use such systems in their work [1,4,13,21]. However, other researchers did not find effort expectancy to be useful in predicting the behavioral intentions of healthcare professionals [5]. We hypothesize that:

H2: Effort expectancy will have positive impacts on behavioral intention

Consistent with the conceptualization in TAM [7], one of the underlying frameworks that informed the development of the UTAUT, we propose that performance expectancy will be positively impacted by effort expectancy. Prior studies of healthcare professional found that where implemented IS are perceived to be easy to use, the usefulness of such systems usually tends to be high as well [31]. We predict that:

H3: Effort expectancy will have positive impacts on performance expectancy

An individual’s intention to use IS can be influenced by the opinions and perceptions of people in his or her immediate environment, i.e. workplace [2,27]. As members of an allied healthcare system [21], some health professionals may be susceptible to such influences [12,13,21]. Researchers that used allied healthcare professionals found social influence to be positively associated with behavioral intention [1,13], although others did not confirm this proposition [21]. We hypothesize that:

H4: Social influence will have positive impacts on behavioral intention.

Facilitating conditions include technical infrastructure available to the users of the system as well as top management and other internal support [31]. In the healthcare domain, studies by Kaplan and Shaw[12], Chau and Hu [5], Chang et al. [4], and Kijsanayotin et al. [13] found support for the significant positive relationship between facilitating conditions and IS use. In agreement with such viewpoints we predict that:

H5: Facilitating conditions will have positive impacts on IS use.

Compatibility refers to the extent to which an innovation is perceived to be consistent with potential users’ existing values, prior experiences, and needs [20,31]. Thus, when healthcare professionals believe that a particular technology will support their work styles and practices they tend to readily accept such systems [5,21,31]. Conversely, when they believe that such technologies threaten their work practices, they develop resistance toward such applications [14,26,28]. Health researchers [21,31] found that compatibility has significant effects on behavioral intention and IS use. We hypothesize that:

H6: Compatibility will have positive impacts on IS use.

In line with tenets from the IS acceptance frameworks and intentions theories, it is to be expected that IS behavioral intention of healthcare professionals will have a significant positive effect on IS use [10,21]. In general, the relationship between intentions and usage behavior has been shown to be consistently strong across contexts [22,27]. We predict that:

H7: Behavioral intention will have positive impacts on IS use.

5. Research methodology

5.1. Data collection

The research model was tested with data collected from a survey. In 2010, we contacted some healthcare professional associations (http://www.crnns.ca and http://www.cotns.ca) and individual professionals whose contacts we obtained from publicly available directories in Nova Scotia, Canada. From all the above sources, we got 491 responses out of the 1335 questionnaires mailed out, which gives an effective response rate of approximately 31%. The distribution of the respondents was not uniform. So as not to over-represent any particular occupation we randomly selected 227 participants from our data. The demographic profile of the selected 227 healthcare professionals is presented in Table 1.

Each participant was sent a packet containing a cover letter explaining the purpose of the survey, a questionnaire, and self-addressed, stamped envelope. The participants were motivated by five (5) $100 gift certificates and a promise to share the summary of the results with them.

77 percent of the respondents are female, which compares with the characteristics of allied healthcare workers in Canada [3]. More than 90% of the participants had university education. On average, the
participants have worked for 9.3 years with their current employers (s.d. = 7.9). The majority of the participants are employed by the government; this information is indicative of where the majority of Canadian healthcare professionals work [3]. About 70% of them live in urban and urban areas to suggest that IS usage and accessibility would not pose a problem to them [9].

To assess whether non-response bias was present in the data, independent t-tests were conducted [11]. We compared early and late respondents in all the data sources used in this study. The tests did not show any statistically differences in characteristics such as age, gender, tenure at place of work and education.

Table 1. Demographic profile of the sample (n = 227)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Content</th>
<th>N</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>52</td>
<td>22.9</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>175</td>
<td>77.1</td>
</tr>
<tr>
<td>Age</td>
<td>21-30 years</td>
<td>41</td>
<td>18.1</td>
</tr>
<tr>
<td></td>
<td>31-40 years</td>
<td>53</td>
<td>23.3</td>
</tr>
<tr>
<td></td>
<td>41-50 years</td>
<td>65</td>
<td>28.6</td>
</tr>
<tr>
<td></td>
<td>51-60 years</td>
<td>58</td>
<td>25.6</td>
</tr>
<tr>
<td></td>
<td>60 years and above</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Missing</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>Education</td>
<td>Diploma</td>
<td>16</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Professional certification only</td>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td>Bachelors</td>
<td>135</td>
<td>59.5</td>
</tr>
<tr>
<td></td>
<td>Masters</td>
<td>57</td>
<td>25.1</td>
</tr>
<tr>
<td></td>
<td>Doctorate</td>
<td>15</td>
<td>6.6</td>
</tr>
<tr>
<td></td>
<td>Missing</td>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td>Occupation</td>
<td>Registered nurses</td>
<td>47</td>
<td>20.7</td>
</tr>
<tr>
<td></td>
<td>Occupational therapists</td>
<td>47</td>
<td>20.7</td>
</tr>
<tr>
<td></td>
<td>Pharmacists</td>
<td>44</td>
<td>19.4</td>
</tr>
<tr>
<td></td>
<td>Physiotherapists</td>
<td>42</td>
<td>18.5</td>
</tr>
<tr>
<td></td>
<td>Psychotherapists/clinical psychologists</td>
<td>47</td>
<td>20.7</td>
</tr>
</tbody>
</table>

5.2. Operationalization of the measures

The scales used for the research were adapted from previous research, in particular those presented in the work of Venkatesh et al. [27]. These items were worded to suit the healthcare context. We defined IS to the participants as follows: IS are computer-based systems capable of storing, retrieving, processing, and producing output (information) in a useful format for users. Examples may include electronic medical record (EMR), clinical decision support (CDS), patient care systems (PCS), etc. As a means of providing appropriate answers to the current inquiry, participants were also asked to think about similar systems that are in use at their workplaces.

The scales for performance expectancy (PERF), effort expectancy (EFFT), and social influence (SOCI) were adapted from Venkatesh et al. [27]. We adapted the facilitating conditions (FACC) from Venkatesh et al. [27] and Wu et al. [31]. Items used in compatibility (COMP) were adapted from Rogers [20]. We adapted behavioral intention (BEHI) and IS use (ISUS) were adapted from Davis [7] and Venkatesh et al. [27]. The measurement items were anchored on a 7-point Likert scale ranging from “strongly disagree” (1) to “strongly agree” (7) in which participants were asked to indicate an appropriate response. The full list of the constructs and their descriptive statistics is provided in Appendix A.

6. Analyses and results

Our research model was tested using the Partial Least Squares (PLS) technique, which is suitable for validating predictive models that uses reflective latent constructs; it places minimal demands on sample sizes and data distribution assumptions [6]. We used SmartPLS 2.0 in this research [19]. The PLS supports two measurement models: a) the assessment of the measurement model and b) the assessment of the structural model.

6.1. Assessment of the measurement model

The psychometric properties of the scales are assessed by their internal consistency, convergent validity and discriminant validity. The internal consistency measures as indicated by the composite reliabilities for each of the scale in Appendix B exceeded the recommended threshold of 0.7 [8]. Convergent validity is assured if factor loadings are 0.707 or above and if each item loads significantly on its latent construct [6,8]. Our data meets these requirements as well.

Discriminant validity is assured when the following two conditions are met: a) the value of the AVE is above the threshold value of 0.50, and b) the square root of the AVE is larger than all other cross-correlations. Appendix B shows that the AVE ranged from 0.59 to 0.85 and in no case was any correlation between the constructs greater than the squared root of the AVE (the principal diagonal element). Overall, the assessment of the measurement model showed the study’s measures possessed the required reliability and validity.
6.2. Assessment of the structural model

The structural model presents information about the path significance and the squared R ($R^2$). The latter gives an indication of the model’s predictive power. The SmartPLS 2.0 results for the $\beta$s and the $R^2$ are shown in Figure 2. The path significance levels (t-values) are estimated by the bootstrapping method [6]. The PLS structural model can also be assessed by their effect sizes, $f^2$ [18,20]. Chin [6] noted that $f^2$ values of 0.02, 0.15, and 0.35 signify small, medium, and large effects, respectively.

The data's $\beta$s, $R^2$, t-values and $f^2$ are presented in Table 2. The PLS results indicate that the research model is structurally sound as it possesses adequate predictive performance. Figure 2 and Table 2 provides a summary of the results. Hypothesis (H1) that indicated that performance expectancy would have positive impacts on behavioral intention was not supported. A plausible explanation for the unsupported prediction might be due to the sample composition and other contextual or extraneous influences.

![Figure 2. The SmartPLS 2.0 results for the hypothesized paths](image)

Supporting hypothesis (H6), compatibility had significant impacts on IS use ($\beta=0.26$). The prediction made about the effect of behavioral intention on IS use (H8) was confirmed ($\beta=0.24$). Effort expectancy explained 26% of the variance in the performance expectancy construct. Performance expectancy, effort expectancy, and social influence explained 26% of the variance in the behavioral intention construct. Behavioral intention, facilitating conditions, and compatibility explained 10% of the variance in IS use behavior.

7. Discussion

The objectives of this research are as follows: a) to present empirical information regarding technology acceptance by healthcare professionals in a region of Canada, and b) to extend and modify the UTAUT by incorporating a relevant construct i.e. compatibility.

Our result did not show that performance expectancy had positive impacts on behavioral intention. This finding might be suggesting that the perceived usefulness and relative advantage that IS use provides is not a sufficient motivation to make the healthcare professionals sampled in this research accept IS in their setups. Put differently, having knowledge of the benefits of IS for a healthcare professional may play an insignificant role in motivating him or her to accept it. Another study that used healthcare professionals in a differing geographical setting produced a similar insight to the one presented in this study [21].

<table>
<thead>
<tr>
<th>Hypothesized path</th>
<th>$\beta$</th>
<th>t-value</th>
<th>$f^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance expectancy $\rightarrow$ Behavioral intention</td>
<td>0.15</td>
<td>1.071</td>
<td>0.02</td>
</tr>
<tr>
<td>Effort expectancy $\rightarrow$ Behavioral intention</td>
<td>0.19</td>
<td>1.996*</td>
<td>0.02</td>
</tr>
<tr>
<td>Effort expectancy $\rightarrow$ Performance expectancy</td>
<td>0.51</td>
<td>7.027***</td>
<td>0.26</td>
</tr>
<tr>
<td>Social influence $\rightarrow$ Behavioral intention</td>
<td>0.31</td>
<td>2.558**</td>
<td>0.10</td>
</tr>
<tr>
<td>Facilitating conditions $\rightarrow$ IS use</td>
<td>0.24</td>
<td>1.994**</td>
<td>0.06</td>
</tr>
<tr>
<td>Compatibility $\rightarrow$ IS use</td>
<td>0.26</td>
<td>2.520**</td>
<td>0.06</td>
</tr>
<tr>
<td>Behavioral intention $\rightarrow$ IS use</td>
<td>0.24</td>
<td>1.986**</td>
<td>0.07</td>
</tr>
</tbody>
</table>

Path significance: * p<0.05, ** p<0.01, *** p<0.001

Our research shows that effort expectancy, which encapsulates the degree of ease associated with IS use, among others significantly impacts the behavioral intentions of healthcare professionals. This information suggests that healthcare professionals who have positive perceptions of the
ease of use of their IS will inherently make an effort to try it and go on to use such systems [1,4,13]. The literature shows that healthcare workers’ effort expectancy was strongly related to their IS behavioral intention [1,5,13,21,30]. We found that where the effort expectancy of health professionals vis-à-vis IS were relatively high, their performance expectancy tend to be positively high to corroborate findings elsewhere in the literature [30].

The impact of social influence on behavioral intention was significant in our study. Our finding in this aspect is inconsistent with the viewpoint noting that some healthcare professional notable physicians and occupational therapists may have less need to rely on social influence when making decisions about accepting or rejecting IS perhaps due to their high level of autonomy [5,21,28]. In our study, we found that social influence in relation to enhancing IS behavioral intention does matter for the healthcare professionals sampled in our study.

Consistent with our expectation, we found that where IS behavioral intention among healthcare professionals was high, their actual utilization of the implemented system tend to be high also [13]. Our data analyses showed that healthcare professionals working in organizations that provide relevant required infrastructure and have requisite employee and top management support are the ones with relatively better IS usage behaviors. Our result is congruent with the findings in studies that indicated that organizational conditions matter in shaping the IS behaviors of healthcare professionals [1,12,21]. Likewise, our result indicated that where there the implemented IS is compatible with the work styles and practices of a healthcare professional, his or her utilization of the system tend to be high as well [5,31].

7.1. Implication for research

Our research contributes to current IS and technology acceptance research as it offers diversification in the area. Specifically, the focus on healthcare professionals’ acceptance of IS complements the emerging body of work in the literature. Our research offers further support to the UTAUT framework as useful tool for explicating healthcare professionals IS usage behavior [13,21]. To the extent that other relevant constructs i.e. compatibility not indicated in the UTAUT model are pertinent to the discourse of IS acceptance by healthcare professionals, our research like those of others [5,21,31] makes a strong case for such a factor to be considered. We believe the inclusion of such variables will add useful insight to our understanding of the issues and factors impacting IS behavioral intention and usage behaviors among allied healthcare workers. Our research effort enriches perspectives related to healthcare professionals’ acceptance of technologies from a less privileged region of an advanced country. Cumulative evidence from differing contexts serves to consolidate the theory of IS acceptance.

Our research confirmed that healthcare professionals’ technology acceptance can be explicaded by effort expectancy, social influence, compatibility, and facilitating conditions, which collectively can act as proximal determinants of IS behavioral intentions and usage among healthcare professionals. In other words, our study enriches the findings and observations that indicated that the foregoing factors are among the relevant constructs to be considered when evaluating IS acceptance in the context of healthcare professionals [1,10,13,16,21,29-31]. To that end, theory consolidation and knowledge accumulation in the area is further enhanced by our insight. Another key contribution made by our research was to present a perspective highlighting the fact that social influence may matter to allied healthcare professionals. In that respect, our data offers the view noting that a healthcare professional’s decision making processes with respect to technology acceptance may benefit from or be influenced by the views of other important personnel in their work contexts. Thus, healthcare workers’ perceptions of IS behavioral intentions and usage may differ by their levels of autonomy [5,21]. As 27% of the variance in the behavioral intentions and 32% of the variance in the usage behavior were explained in our model, we believe that the inclusion of other relevant constructs (as was done with compatibility) will further improve the predictability of our research model. Other researchers may be enticed to consider such constructs in similar studies.

7.2 Implication for practice

The results of this research have implications for practitioners in the research setting and in comparable parts of the world. First, healthcare organizations with desires to introduce IS may consider providing training sessions and programs aimed at improving their workers grasp of the overall benefits and useful of such systems. With such enhanced knowledge, it is to be expected that workers’ perceptions and behaviors toward implemented systems will increase. Second, this study alerts managers and IS designers to the fact that healthcare professionals’ appreciation of the system and subsequent use intentions are favorably
engendered where the deployed IS is perceived to be easy to use and not too complex. Accordingly, the design and procurement of systems that are relatively easy to use by healthcare workers should be given utmost attention.

Third, influential people in healthcare organizations capable of motivating or shaping the opinions of others could be tasked to “champion” the cause of using IS in their contexts. This may be useful during the early stages in the system’s lifecycle as the views of such important, influential personnel may influence the decisions of others about the new system. Fourth, management should ensure that required support and infrastructure are in place when introducing new IS. Such support should be readily available in the organization; it should be realized that awareness and training that are usually provided during the initial implementation stages may not be sufficient. It has to be sustained for continued use of the system to be assured. Feedback from a healthcare professional in this study notes, “We need help readily available if we run into trouble. It doesn't help to be trained on a system and then 'loose it' because [adequate, sustained support] is not available.”

Fifth, our data confirmed that the use of IS by healthcare professionals can be assured where the implemented has some compatibility or fit with the work styles and practices of the adopter. Thus, where an implemented system fits the work styles and practices of a healthcare professional or has features that a professional can relate to, a high level of IS acceptance ensues. Conversely, resistance usually builds up when an implemented IS lacks such features [12,14,15,17,26]. Therefore, the onus is on management to ensure that the workers in their contexts are provided with systems that are compatible with their worker’s job functions. Where such a fit is lacking, appropriate training could be instituted to help bridge such a gap. Sixth, our data may have some useful value to the administrators of healthcare organizations in our research location. Information gleaned from this study could be used as input in effectively managing the expectations and behaviors of healthcare workers in Nova Scotia and comparable provinces in Canada and elsewhere.

7.3. Limitations of the study and future research

Our research has its limitations. As our research focused on the individual, common method bias should not pose a problem. However, the possibility exists that some participants might have provided “socially desirable responses” to some of the issues being investigated. This might have negatively impacted our results. We did not account for differing IS used in the participants’ workplaces. It is possible the varying degrees of complexity associated with diverse systems and applications might have negatively affected our data. Our sample had more females to reflect the characteristics of the selected occupations in the research setting. It would have been useful if an equal number of males and females were represented in the data analyses. Differing sampling frames were used in this research; this might have presented some problems. However, comparisons of responses from the differing sources did not indicate any major differences among the participants.

The analysis based on 227 responses is adequate for an exploratory study such as this one. Our data is also above and beyond the recommended requirements for using PLS [6]. Nonetheless, a larger sample size may provide more statistical power and performance. The data came from a cross-sectional field survey; longitudinal data may facilitate more insight. It is difficult to say with certainty if our results can be generalized to all healthcare professionals in Canada and other comparable parts of the world in light of the fact that contextual imperatives might have influenced the findings presented herein. To that end, we caution against generalizing our results to all healthcare occupations in Canada and elsewhere.

Future research may consider adding personal and organizational factors such as habit, personal innovativeness, self-efficacy, training, and computer anxiety to further increase the model explanatory power. It is somewhat surprising that our data did not show that performance expectancy impacted healthcare professional’s IS behavioral intention. As more results similar to what was presented in this research emerge in the relevant literature, it would be reasonable for future studies to attempt to uncover why such might be case with healthcare professionals.

The effects of the mediating effects of age, gender, work and computer experience, and educational attainment can also be studied as these items have been noted to be relevant to the IS adoption processes of healthcare professionals [10,16,25,27]. Comparative analyses in Canada and elsewhere are needed to reify or debunk our claims. Importantly, efforts should be made to address some this study’s limitations especially those related to the large variances obtained in this study. Two possible ways to improve this current research may include: 1) selecting a sample of homogeneous job profiles or
professionals, 2) repeating the data collection so as to gather sufficient respondents to (re-)do the statistical analysis.

8. Conclusion

The effectiveness of IS in adopting healthcare organizations cannot be fully realized if such applications are underutilized or underused at the workplace. Research efforts attempting to study the acceptance of IS by healthcare professionals is relevant, topical and timely. Our endeavor was presented to add to the growing body of knowledge in this area of study. Using an extension of widely popularized UTAUT model, we investigated and found that the intention to use and IS usage behaviors of the healthcare professionals were higher where healthcare professionals believe that the implemented IS in their contexts are relatively easy to use. Further to this, the critical importance of social influence and organizational support to technology acceptance among healthcare professionals was also signified by our research results.

Management and administrators of healthcare organizations as well as IS designers or vendors in our research location and comparable settings are alerted to key factors that could hasten technology acceptance among healthcare workers. In sum, by exploring and accumulating knowledge in area of healthcare professional’s acceptance of IS, an effective healthcare system that accords a pride of place to the utilization of IS by some of its key stakeholders is well served.

10. References


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Appendix A (Continued): The questionnaire’s items, their descriptive statistics, item loadings, and t-values

<table>
<thead>
<tr>
<th>Construct</th>
<th>Measurement item</th>
<th>Mean</th>
<th>S.D</th>
<th>Loading</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERFORMANCE EXPECTANCY</td>
<td>I would find computer-based IS useful in my job</td>
<td>6.273</td>
<td>1.033</td>
<td>0.931</td>
<td>16.209</td>
</tr>
<tr>
<td></td>
<td>Using computer-based IS enables me to accomplish tasks more quickly</td>
<td>5.978</td>
<td>1.361</td>
<td>0.905</td>
<td>37.477</td>
</tr>
<tr>
<td></td>
<td>Using computer-based IS increases my productivity</td>
<td>5.780</td>
<td>1.450</td>
<td>0.900</td>
<td>37.646</td>
</tr>
<tr>
<td></td>
<td>If I use computer/IT systems, I will increase my chances of getting a raise</td>
<td>2.833</td>
<td>1.770</td>
<td>0.557</td>
<td>4.620</td>
</tr>
<tr>
<td></td>
<td>Using computer-based IS is good for my professional development</td>
<td>5.604</td>
<td>1.399</td>
<td>0.682</td>
<td>10.315</td>
</tr>
<tr>
<td>EFFORT EXPECTANCY</td>
<td>My interaction with computer-based IS would be clear and understandable</td>
<td>5.066</td>
<td>1.353</td>
<td>0.748</td>
<td>7.425</td>
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<tr>
<td></td>
<td>It would be easy for me to become skillful at using computer/IT systems</td>
<td>5.278</td>
<td>1.265</td>
<td>0.908</td>
<td>39.306</td>
</tr>
<tr>
<td></td>
<td>I would find computer-based IS easy to use</td>
<td>5.216</td>
<td>1.231</td>
<td>0.935</td>
<td>37.455</td>
</tr>
<tr>
<td></td>
<td>Learning to operate computer-based IS is easy for me</td>
<td>4.956</td>
<td>1.457</td>
<td>0.927</td>
<td>61.088</td>
</tr>
<tr>
<td>SOCIAL INFLUENCE</td>
<td>People who influence me think that I should use computer-based IS</td>
<td>4.714</td>
<td>1.558</td>
<td>0.699</td>
<td>4.256</td>
</tr>
<tr>
<td></td>
<td>People who are important to me think that I should use computer-based IS</td>
<td>4.753</td>
<td>1.602</td>
<td>0.700</td>
<td>4.174</td>
</tr>
<tr>
<td></td>
<td>My colleagues think that I should use computer/IT systems</td>
<td>4.916</td>
<td>1.539</td>
<td>0.830</td>
<td>6.405</td>
</tr>
<tr>
<td></td>
<td>My organization has helped me in using computer-based IS at work</td>
<td>4.802</td>
<td>1.750</td>
<td>0.794</td>
<td>13.188</td>
</tr>
<tr>
<td></td>
<td>In general, my organization has supported the use computer-based IS</td>
<td>5.348</td>
<td>1.522</td>
<td>0.778</td>
<td>10.417</td>
</tr>
<tr>
<td>FACILITATING CONDITIONS</td>
<td>Top management believes that the use of computer-based IS provides significant benefits to the</td>
<td>5.599</td>
<td>1.424</td>
<td>0.769</td>
<td>12.101</td>
</tr>
</tbody>
</table>
organization

I receive necessary assistance from my organization that helps me to use computer-based IS 4.811 1.611 0.837 14.368

I have access to resources that would enable me use computer-based IS 5.207 1.447 0.799 15.002

A specific person (or group) is available for assistance with difficulties arising from computer-based IS use 5.405 1.578 0.727 9.701

Employees and managers in my organization help one another with computer-based IS use 5.088 1.497 0.765 10.149

In all, I have necessary knowledge to use computer-based IS 5.264 1.360 0.749 12.623

COMPATIBILITY

Using computer-based IS is compatible with my beliefs 5.553 1.364 0.821 15.445

Using computer-based IS fits my work values 5.621 1.296 0.903 24.763

Computer-based IS use is compatible with my working style 5.680 1.320 0.883 18.404

BEHAVIORAL INTENTIONS

I am certain I will use my organization’s computer-based IS in the coming months 6.419 1.120 0.961 65.366

I predict I would use my organization’s computer-based IS in the coming months 6.344 1.127 0.956 48.979

In general, I intend to follow my organization’s directives to use computer-based IS 6.185 1.156 0.812 10.000

It is my plan to use my organization’s computer-based IS in the coming months 6.396 1.077 0.954 47.057

IS USE

I frequently use computer-based IS to understand a health problem or an illness 5.291 1.509 0.758 8.369

I often use computer-based IS to serve patients 5.211 1.667 0.775 8.870

I frequently use computer-based IS to find information about a health problem 5.480 1.345 0.896 26.955

I very often use computer-based IS to do my job 5.744 1.562 0.875 34.039

Appendix B: Descriptive statistics, composite reliabilities, AVEs, and inter-construct correlations

<table>
<thead>
<tr>
<th>Construct</th>
<th>Mean</th>
<th>SD</th>
<th>CR</th>
<th>AVE</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: PERF</td>
<td>5.29</td>
<td>1.40</td>
<td>0.87</td>
<td>0.59</td>
<td>0.77</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2: EFFT</td>
<td>5.13</td>
<td>1.33</td>
<td>0.93</td>
<td>0.78</td>
<td>0.51</td>
<td>0.88</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3: SOCI</td>
<td>4.91</td>
<td>1.59</td>
<td>0.87</td>
<td>0.58</td>
<td>0.49</td>
<td>0.26</td>
<td>0.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4: FACC</td>
<td>5.23</td>
<td>1.49</td>
<td>0.90</td>
<td>0.60</td>
<td>0.48</td>
<td>0.40</td>
<td>0.59</td>
<td>0.77</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5: COMP</td>
<td>5.62</td>
<td>1.32</td>
<td>0.90</td>
<td>0.76</td>
<td>0.58</td>
<td>0.34</td>
<td>0.47</td>
<td>0.59</td>
<td>0.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6: BEHI</td>
<td>6.34</td>
<td>1.12</td>
<td>0.86</td>
<td>0.85</td>
<td>0.40</td>
<td>0.35</td>
<td>0.44</td>
<td>0.48</td>
<td>0.31</td>
<td>0.92</td>
<td></td>
</tr>
<tr>
<td>7: ISUS</td>
<td>5.43</td>
<td>1.52</td>
<td>0.89</td>
<td>0.70</td>
<td>0.47</td>
<td>0.39</td>
<td>0.39</td>
<td>0.45</td>
<td>0.42</td>
<td>0.44</td>
<td>0.84</td>
</tr>
</tbody>
</table>

Notes: a) Composite reliability (CR), Standard deviation (SD), Average valance extracted (AVE), Performance expectancy (PERF), Effort expectancy (EFFT), Social influence (SOCI), Facilitating conditions (FACC), Compatibility (COMP), Behavioral intentions (BEHI), and IS use (ISUS); b) The bold fonts in the leading diagonals are the square root of AVEs; c) Off-diagonal elements are correlations among latent constructs.

Appendix C: The definition of the UTAUT’s constructs

Performance expectancy - The degree to which an individual believes that using the system will help him or her attain gains in job performance [27]; Effort expectancy - The degree of ease associated with the use of the system [27]; Social influence - The degree to which an individual perceives that important others believe he or she should use the new system [27]; Facilitating conditions - The degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system) [27,31]; Behavioral intention – This is an indication that an individual is ready to perform a given behavior, in this case use the implemented system [7,27]; IS use - This indicates that an individual is employing or utilizing the new system [7].