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ABSTRACT

Recent studies have indicated that nurses use their smartphones for work purposes to enhance productivity. However, few theory-driven quantitative studies have examined factors associated with such use. This study aims to address this research gap by developing and testing a model based on the theory of planned behavior, organizational support theory, and IT consumerization theory. Hypothesis testing used structural equation modeling of survey data from 517 staff nurses employed in 19 tertiary-level general hospitals in the Philippines. Results showed that injunctive norm, descriptive norm, and perceived behavioral control were positively associated with intention to use smartphones for work purposes. Moreover, intention was positively associated with nurses' use of smartphones for work purposes. Interestingly, nurses' use of smartphones for work purposes was positively associated with perceived work productivity and perceived quality of care. An alternative model examines how perceived organizational support indirectly affects nurses' use of smartphones for work purposes. The discussion considers theoretical and practical implications.

1. Introduction

Whereas previous research has examined nurses' use of health information technologies (HITs) like electronic health records (Carayon et al., 2011; Moody, Slocumb, Berg, & Jackson, 2004) and clinical decision support systems (Randell & Dowding, 2010; Weber, Crago, Sherwood, & Smith, 2009), more recent work has suggested that nurses are also using their smartphones for work purposes. Specifically, nurses have used their own smartphones to communicate with members of the healthcare team, search for clinical information, and perform patient documentation (Chiang & Wang, 2016; Johansson, Petersson, Saveman, & Nilsson, 2014; McBride, LeVasseur, & Li, 2013, 2015a, 2015b; Mobasheri et al., 2015; Moore & Jayewardene, 2014; Sharpe & Hemsley, 2016). Scholars have argued that nurses' use of smartphones for work purposes can help increase their productivity and improve the quality of care rendered to patients (Chiang & Wang, 2016; Johansson et al., 2014; Mobasheri et al., 2015; Sharpe & Hemsley, 2016). However, such use has certain drawbacks such as potential work distractions, elevated privacy concerns, and professionalism issues (Brandt, Katsma, Crayton, & Pingenot, 2016; McNally, Frey, & Crossan, 2017; Royal College of Nursing, 2016).

Examining smartphones as a HIT is interesting because, unlike other HITs, they are seldom instituted and supported by hospitals (Bautista & Lin, 2016; Brandt et al., 2016). Such actions by hospitals are understandable, since implementing BYOD (i.e., bring your own device) policies have implications for security (e.g., privacy and confidentiality risks to patient information) and governance (e.g., lack of clear guidelines and protocols; Marshall, 2014). Although such issues warrant attention, it is equally important to understand why nurses are using their smartphones for work purposes and to what outcomes. This is given the observation that nurses are routinely using smartphones for work purposes despite potential risks associated with it (e.g., Bautista & Lin, 2016; Flynn, Polivka, & Behr, 2018; Mobasheri et al., 2015). Understanding why they use their smartphones for work purposes can help guide hospital administrators in developing context-sensitive policies that consider the increasing consumerization of technologies in healthcare settings (Marshall, 2014). Moreover, this study is relevant to policy-making in hospitals from developing countries where smartphones

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are used to compensate for the lack of HITs (Bautista & Lin, 2016).

An examination of prior work on nurses' use of smartphones for work purposes reveals some research gaps. First, prior findings are largely descriptive and in the context of Western countries (e.g., McBride et al., 2013, 2015a, 2015b; Flynn et al., 2018; Johansson et al., 2014; Mobasheri et al., 2015). Also, prior studies have often lacked a theoretical framework (e.g., Chiang & Wang, 2016; Flynn et al., 2018; Johansson et al., 2014; McBride et al., 2013, 2015a, 2015b; Mobasheri et al., 2015; Moore & Jayewardene, 2014). Indeed, research on HIT use is frequently atheoretical (Fanning et al., 2017; Holden & Karsh, 2009; Orlowski et al., 2015; Xue et al., 2015). These research gaps warrant a more theory-based study.

To overcome these research gaps, this study developed and tested a theory-based model of nurses' use of smartphones for work purposes. The model derives from the theory of planned behavior (Ajzen, 1991), organizational support theory (Eisenberger, Huntington, Hutchinson, & Sowa, 1986), and IT consumerization theory (Niehaves, Köffer, & Ortbach, 2013). Combining behavioral and organizational theories allow for a robust examination of factors associated with the use of HITs (Holden & Karsh, 2009). We used survey data from 517 staff nurses in the Philippines to test the model, which gives this study a non-Western orientation. The Philippines serves as a good research context since its mobile phone penetration rate already exceeds 100% (GSMA Intelligence, 2014). Moreover, most of the hospitals there have inadequate healthcare staff (Castro-Palaganas et al., 2017) and most nurses work without any hospital-provided HITs (Bautista & Lin, 2016). Acknowledging several workplace constraints along with high mobile phone adoption, the Philippines serves as an ideal context for this study.

2. Literature review

2.1. Nurses' use of smartphones for work purposes

Previous studies have illustrated how nurses use their smartphones for work purposes. Common findings are that nurses use their smartphones at work for communication, information seeking, and documentation purposes. In this context, communication refers to the interpersonal exchange of verbal and nonverbal messages. For instance, a survey of U.K. nurses found that many used voice calls and text messaging for clinical communication (Flynn et al., 2018; Mobasheri et al., 2015). Nurses also use commercially available instant messaging applications (e.g., Viber, Line, and Facebook Messenger) to coordinate patient care with fellow nurses (Bautista & Lin, 2017; Chiang & Wang, 2016). Some hospitals even develop their own messaging applications, which nurses install and use on their smartphones (Stephens et al., 2017). Not only do nurses use their smartphones to communicate with other healthcare professionals, but they also use them to communicate with patients or their guardians when coordinating patient care (Bautista & Lin, 2016; Chiang & Wang, 2016; Nilsson, Skär, & Söderberg, 2010).

Another use of smartphones for work purposes is related to information seeking. Indeed, smartphones are powerful devices that professionals can use to facilitate ubiquitous learning (Shin, Shin, Choo, & Beom, 2011). In this context, smartphones can help nurses to quickly search for information that serves a utility or is useful for achieving a functional outcome. For instance, about half of U.K. nurses use their smartphones to search for information on the Internet (Mobasheri et al., 2015). Other uses include reviewing clinical textbooks and applications (Moore & Jayewardene, 2014) and accessing clinical information via the Internet (Bautista & Lin, 2016; Flynn et al., 2018; Johansson et al., 2014).

Finally, nurses use their smartphones for documentation. In this context, documentation refers to storing visual, audio, or textual information as a record of patient care. Some instances of documentation via smartphones include the use of note-taking applications (Johansson et al., 2014), setting reminders in calendar applications (Mobasheri et al., 2015), and, in some cases, taking photographs of patient records (e.g. patient chart) or outcomes (e.g., presence of wound; Bautista & Lin, 2016; Flynn et al., 2018; Sharpe & Hemsley, 2016).

Based on prior studies, we define nurses' use of smartphones for work purposes as *nurses' use of their own smartphones at work for communication, information seeking, and documentation purposes*. Given this definition, there are some relevant theories that can explain why nurses' use smartphones for work purposes and to what outcomes.

2.2. Theory of planned behavior

The theory of planned behavior (Ajzen, 1988, 1991) is one of the most influential theories used to predict human behavior, including the use of technology (Ajzen, 2011; Nosek et al., 2010). Previous works have used this theory to explain healthcare professionals' use of mobile devices (Wu, Li, & Fu, 2011), electronic health records (Leblanc, Gagnon, & Sanderson, 2012), and computerized systems (Malo, Neveu, Archambault, Émond, & Gagnon, 2012; Shoham & Gonen, 2008). According to the theory, attitude toward the behavior, subjective norm, and perceived behavioral control predict behavioral intention. Then, behavioral intention predicts actual behavior, particularly when there is a high degree of actual behavioral control.

Although theories like the technology acceptance model (TAM; Davis, 1989) and its successor, the unified theory of acceptance and usage of technology (UTAUT; Venkatesh & Zhang, 2010), can also be used as theoretical frameworks in this study, their use may lead to some potential problems or conceptual confusion (Bagozzi, 2007; Chen & Levkoff, 2015). For instance, van Raaij and Schepers (2008) argued that constructs within UTAUT are theoretically and psychometrically problematic because they lack conceptual specificity. Besides, these theories are often used to examine healthcare professionals' acceptance and usage of new technologies implemented in hospital settings (e.g., Liu et al., 2015; Maillet, Mathieu, & Sicotte, 2015). In contrast, the current study examines a technology and its affordances that see routine use, with varying degrees of formal and informal adoption in healthcare settings. Previous works suggest such routine use is the case among nurses in the U.S. (Flynn et al., 2018), U.K. (Mobasheri et al., 2015), and the Philippines (Bautista & Lin, 2016). In sum, the theory of planned behavior draws clear distinctions among a few key constructs and is appropriate to predict nurses' use of an existing communication technology.

2.2.1. Intention

Behavioral intention refers to a willingness to exert effort to perform a behavior (Ajzen, 1991). Intention has a rational basis and reflects motivations that derive from beliefs about the behavior. Previous research has examined this concept in healthcare settings. In the context of nurses' use of Web 2.0 (e.g., blogs, wikis, and social media), intention was positively correlated with use (Lau, 2011). In the context of HIT use among Thai healthcare professionals, there was a positive association between intention and use (Kijsanayotin, Pannarunothai, & Speedie, 2009). Consistent with the theory and prior research, this study hypothesizes that:

H1. Nurses' intention to use smartphones for work purposes is positively associated with their use of smartphones for work purposes.

2.2.2. Instrumental and affective attitudes

Attitude towards a behavior is based on beliefs formed when individuals associate the behavior with certain perceptions, outcomes, or consequences (Ajzen, 1991). Based on the aggregate of these beliefs, individuals develop positive or negative feelings toward a behavior, which directly influences their intention to perform the behavior.

Scholars have differentiated instrumental and affective dimensions of attitude (Ajzen & Fishbein, 2005; Lawton, Ashley, Dawson, Waiblinger, & Conner, 2012). Instrumental attitude refers to the cost-benefit aspects (e.g., useful, necessary, helpful) of performing the behavior, whereas affective attitude refers to feelings or emotions associated with performing the behavior (e.g., pleasant, acceptable, a good idea). These dimensions may have unique influences on intention because individuals make both rational and emotional considerations about behaviors they may perform (Lawton et al., 2012).

Prior research has shown a link between attitude toward HITs and intention to use HITs (Park & Chen, 2007; Putzer & Park, 2012; Wu et al., 2011), but has not examined separately how the instrumental and affective components of attitude affect intention. Such differentiation may be informative by suggesting the relative importance of functionality versus feeling as sources of behavioral motivation. Thus, this study proposes the following hypotheses:

H2. Instrumental attitude is positively associated with nurses' intention to use smartphones for work purposes.

H3. Affective attitude is positively associated with nurses' intention to use smartphones for work purposes.

2.2.3. Injunctive and descriptive norms

Subjective norm refers to the perception of others' approval or disapproval of a behavior (Ajzen, 1991). Social influences create a normative pressure that directs the performance of a behavior (White, Smith, Terry, Greenslade, & McKimmie, 2009). Normative influences are particularly strong when they emanate from perceptions of important others (Rivis & Sheeran, 2003).

Some discussions of normative influence have emphasized social approval of a behavior, which is an injunctive norm (Rivis & Sheeran, 2003; Smith et al., 2008). Scholars have differentiated this norm from descriptive norm, which is related to beliefs that other people engage in the behavior (Lawton et al., 2012; White et al., 2009). Descriptive norm is an element of social cognitive theory (Bandura, 2001), which suggests that individuals are motivated to perform a behavior when they observe others performing it, particularly when that behavior results in a positive outcome for others.

Prior research has shown that subjective norm is positively related to intention to use HITs (Yi, Jackson, Park, & Probst, 2006), electronic health records (Aggelidis & Chatzoglou, 2009; Leblanc et al., 2012), and Web 2.0 (Lau, 2011). Those studies operationalized subjective norm by referring only to the injunctive dimension. The linkage between descriptive norm and intention appears in related contexts, such as the use of smartwatches (Chuah et al., 2016). Likewise, expected social conformity (a concept synonymous to injunctive norm) was positively related to intention to use smartglasses (Rauschnabel, Brem, & Ivens, 2015). Although it is unclear from prior research whether injunctive or descriptive norms affect intention to use HITs, such relationships are consistent with theory and align with empirical findings in similar research contexts. Therefore, this study hypothesizes that:

H4. Injunctive norm is positively associated with nurses' intention to use smartphones for work purposes.

H5. Descriptive norm is positively associated with nurses' intention to use smartphones for work purposes.

2.2.4. Perceived behavioral control

Perceived behavioral control refers to beliefs about the resources, opportunities, and skills that facilitate the performance of a behavior (Ajzen, 1991, p. 2002). If these facilitating factors are limited, then individuals may feel unable to control the behavior (Sparks, Guthrie, & Shepherd, 1997). Consequently, individuals will have a weaker behavioral intention. Further, even when individuals have intention, the lack of facilitating factors means that intention is unlikely to translate into behavior.

Previous studies have found that perceived behavioral control is positively associated with intention to use several HITs such as personal digital assistants (Yi et al., 2006), clinical decision support systems (Hung, Ku, & Chien, 2012), telemedicine (Chau & Hu, 2001), and electronic health records (Leblanc et al., 2012). A common limitation of those prior studies is that they only predicted intention and did not examine behavioral outcomes (Chau & Hu, 2001). Thus, this study hypothesizes that:

H6. Perceived behavioral control is positively associated with nurses' (a) intention and (b) use of smartphones for work purposes.

2.3. Organizational support theory

According to organizational support theory, employees develop beliefs about how organizations support their actions, and those beliefs affect their intentions to engage in related work behaviors (Eisenberger et al., 1986), such as technology use in the workplace. Researchers have often used perceived organizational support as a proxy for organizational support (e.g., Eisenberger et al., 1986). In the context of the current study, organizational support refers to nurses' perceptions of how organizational members (e.g., hospital administration, immediate superiors, coworkers) allow and support their use of smartphones for work purposes (Bautista & Lin, 2016; Sharpe & Hemsley, 2016).

2.3.1. Perceived organizational support

Perceived organizational support refers to employee perceptions of the level of support that employers provide (Eisenberger et al., 1986). Such perception is instrumental to workplace technology adoption since employees can easily ascertain whether their employers support or restrict the use of a particular technology (O'Driscoll, Brough, Timms, & Sawang, 2010). Hein and Rauschnabel (2016) suggested that support from both top management (i.e., hospital administrators) and employees (i.e., immediate supervisors and colleagues) are key to workplace technology adoption. Previous studies have examined the effects of similar constructs, such as internal environment (Putzer & Park, 2012) and management support (Park & Chen, 2007), on intention to use smartphones for work purposes. In the current context, the hospital administration and its employees (nursing supervisors, doctors, and fellow nurses) have discretion to support or not support the use of smartphones for work purposes (Bautista & Lin, 2016; Brandt et al., 2016), and nurses' perceptions of this support may affect their intention and use of smartphones for work purposes. Therefore, this study proposes the following hypothesis:

H7. Perceived organizational support is positively associated with nurses' (a) intention and (b) use of smartphones for work purposes.

2.4. IT consumerization theory

The final theoretical perspective informing this study is IT consumerization theory, which posits that the use of privately-owned devices for business purposes improves work performance (Niehaves et al., 2013). IT consumerization theory is rooted in the consumerization of information technology, where personal digital devices are increasingly used for all kinds of purposes, including work purposes (Köffer, Junglas, Chiperi, & Niehaves, 2014). With personal devices like smartphones, tablets, and laptops becoming more accessible, powerful, and portable (Marshall, 2014), consumers have new capabilities to perform certain work-related activities (Köffer et al., 2014). Proponents of IT consumerization theory have argued that allowing employees to use their own devices at work can improve work performance since ancillary devices are less necessary in order for them to perform tasks (Köffer, Ortbach, & Niehaves, 2014). Consistent with that argument, some employers have policies that encourage employees to bring their own devices to work (i.e., BYOD policies; Marshall, 2014; Schalow, Winkler, Repschlaeger, & Zarnekow, 2013).

This framework fits the current context because nurses' use of smartphones for work purposes is an example of IT consumerization (Marshall, 2014). Of present interest is to what extent nurses associate their use of smartphones for work purposes with their work performance. Following IT consumerization theory, nurses' use of smartphones for work purposes should enhance their work performance. The current study considers two dimensions of perceived work performance that are specific to the healthcare setting: perceived work productivity and perceived quality of care (Krebs, Volpe, Aisen, & Hogan, 2000; Letvak, Ruhm, & Gupta, 2013).

2.4.1. Perceived work productivity

Nurses' work productivity is important to any healthcare organization since it affects the quality of patient service (Letvak et al., 2013; McNeese-Smith, 2001). In this context, work productivity refers to nurses' ability to be effective and efficient in performing their work (McNeese-Smith, 2001). Thus, perceived work productivity pertains to beliefs nurses hold about their ability to perform their work effectively and efficiently.

Relevant to the current study, there is evidence that information and communication technologies positively affect employees' perceived work productivity (Torkzadeh & Doll, 1999), including in healthcare settings (Prgomet, Georgiou, & Westbrook, 2009). For example, electronic health records reduce the amount of time needed for documentation and increase the amount of time for direct patient care. These changes positively affect nurses' perceived work productivity (Kossman & Scheidenhelm, 2008; Kutney-Lee & Kelly, 2011). Research has also shown that nurses associate their use of smartphones for work purposes with faster communication and information seeking, which they feel can enhance their productivity (Bautista & Lin, 2016; Mobasheri et al., 2015; Moore & Jayewardene, 2014). Thus, this study hypothesizes that:

H8. Nurses' use of smartphones for work purposes is positively associated with perceived work productivity.

2.5. Perceived quality of care

Nurses' primary role is to provide quality care based on established nursing standards (American Nurses Association, 2010). Quality of care refers to the provision of healthcare in a way that satisfies the patient (Mosadeghrad, 2014). Thus, the best judge of the quality of care received is the patient (Donabedian, 1988; Leggat, Bartram, Casimir, & Stanton, 2010). However, acquiring such data from patients is not always feasible. Rather, nurses' own ratings of quality of care can be informative and relatively easy to access (Aiken, Clarke, & Sloane, 2002; Chang, Ma, Chiu, Lin, & Lee, 2009). Since nurses typically provide direct patient care, they should have accurate perceptions of quality of care (Laschinger, Shamian, & Thomson, 2001).

Previous studies have examined many non-HIT factors related to perceived quality of care, such as nurse staffing (Aiken et al., 2002), shift work category (Griffiths et al., 2014), and burnout (Poghosyan, Clarke, Finlayson, & Aiken, 2010; Van Bogaert, Meulemans, Clarke, Vermeyen, & Van de Heyning, 2009). Other scholars have suggested that research should focus on how HITs affect perceived quality of care (DesRoches, Miralles, Buerhaus, Hess, & Donelan, 2011; While & Dewsbury, 2011). There is evidence of this linkage in the context of electronic health records (DesRoches et al., 2011) and personal digital assistants (Doran et al., 2010). There is some evidence that the use of smartphones in healthcare settings enhances information accuracy, delivery of patient care, and communication among healthcare workers (Bautista & Lin, 2016, 2017; Chiang & Wang, 2016). It is unclear to what extent such uses affect nurses' perceptions of the quality of care rendered to patients. Thus, this study hypothesizes that:

H9. Nurses' use of smartphones for work purposes is positively associated with perceived quality of care.

Fig. 1 shows the research model with links among variables of interest and hypothesis numbers.

3. Method

3.1. Sampling procedure

Target respondents were staff nurses working for at least one year in tertiary-level general hospitals in Metro Manila, Philippines. Staff nurses were selected because they allocate more time to direct patient care than other healthcare professionals (Harvath et al., 2008) and their actions have a significant impact on patient care (Neville et al., 2015). In addition, staff nurses are mostly young adults and tend to be heavy users of digital technologies (Bautista & Lin, 2016).

We used multistage sampling to obtain a heterogeneous sample (Eide, Benth, Sortland, Halvorsen, & Almendingen, 2015). Sampling began with a list of all Metro Manilla hospitals categorized by their level, ownership, bed capacity, and location (PhilHealth, 2015). Among tertiary-level general hospitals in the list ($N = 45$), hospitals were stratified based on ownership (i.e., government and private), bed capacity (i.e., <300 beds and ≥300 beds), and location (i.e., North, Central, South). The stratification produced 12 clusters, each of which had a minimum of two and a maximum of ten hospitals. Hospital selection was conducted by randomly selecting half of the hospitals within each cluster. Finally, respondents were selected based on purposive sampling at the hospital level. Only respondents who were at least 21 years of age, who held a staff nurse position, and had worked for at least a year answered the survey.

3.2. Data collection

The study protocol received ethical approval from the Institutional Review Board of Nanyang Technological University (IRB-2016-09-003). Data collection took place between January and June 2017. Initially, written requests for data collection were submitted to all randomly selected hospitals. When hospitals declined to participate in the study, replacements were drawn at random from among unselected hospitals within the clusters of the declining hospitals. Five government and 14 private hospitals gave

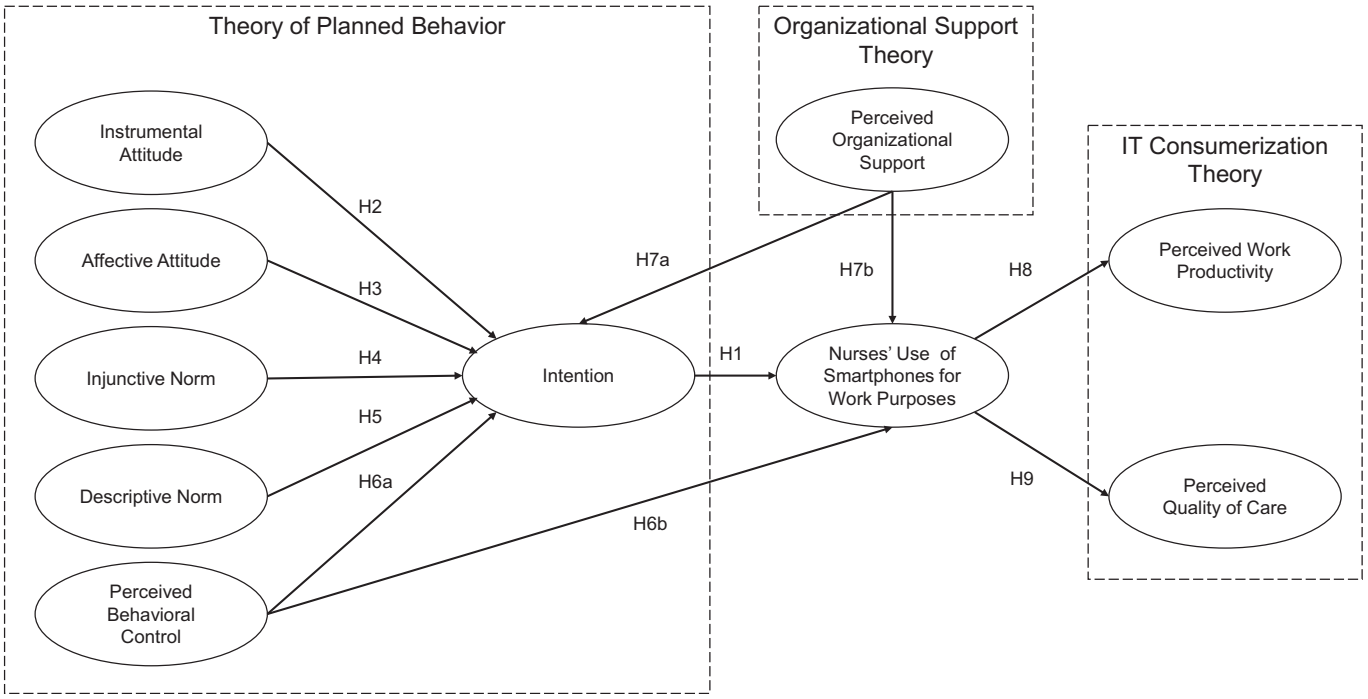

Fig. 1. Research model.

permission for data collection. This ratio is representative of tertiary-level general hospitals in Metro Manila, where there is more than twice the number of private hospitals than government hospitals (PhilHealth, 2015).

Based on the advice of each hospital's nursing department, staff nurses were invited to take the survey after working hours in a designated area. Before starting the anonymous survey, each respondent provided both verbal and written consent. It took around 15 min to finish the survey and participants received an incentive of 100 Philippine pesos (Approximately USD 2) for completing the survey. We collected data from 534 respondents, sampling 28 respondents from all but one hospital; we unintentionally sampled an additional two respondents in one hospital. After cleaning the data by removing non-smartphone users, we obtained a final sample size of 517. Given the number of variables in the model and an anticipated effect size of 0.03, the sample size was adequate (Soper, 2017).

3.3. Measurement

Most measurement items were modified from previous studies (see Table 1). The items were originally written in English, which was retained, as English is the language for nursing education in the Philippines (Kinderman, 2006). Prior to full data collection, the survey items were evaluated by five experts who are university faculty members with doctoral degrees in communication, information, or nursing. In addition, a pilot test among 30 staff nurses in the Philippines was conducted to ensure preliminary item reliability. Some items were removed after testing the model since they had factor loadings of less than 0.60 (McKay et al., 2015). Standardized factor loading of the items for injunctive norm, descriptive norm, and perceived organizational support were not computed since they are formative constructs (see Bollen & Bauldry, 2011). Appendix 1 shows the complete list of the items and their factor loadings. Table 1 shows that the remaining items had good internal consistency, with Cronbach's alphas exceeding 0.70 and average variance extracted greater than 0.50. We determined the measures had approximately normal distributions, based on Kline's (2011) criteria for kurtosis (within ±10) and skewness (within ±3).

3.3.1. Measuring nurses' intention and use of smartphones for work purposes

Items to measure nurses' intention and use of smartphones for work purposes were based partly on a preliminary study (Bautista & Lin, 2016, 2017) and some previous studies (e.g., Brandt et al., 2016; McBride, LeVasseur, & Li, 2015b, 2013; Mobasheri et al., 2015; Moore & Jayewardene, 2014; Sharpe & Hemsley, 2016). As the resulting instrument contains many novel items, it was important to validate its dimensionality by conducting exploratory factor analysis using *SPSS Statistics 23*. The wording of these items is related to the use of smartphones for communication (12 items), information seeking (5 items) and documentation (3 items). Items measuring intention asked about the use of smartphones during the next month, whereas items measuring use asked about the use of smartphones during the past month.

First, we performed exploratory factor analysis on items regarding nurses' use of smartphones for work purposes. The analysis used maximum likelihood estimation and promax rotation. Preliminary analyses suggested that the data were suitable for this analysis. The KMO test for sampling adequacy was 0.86 and Bartlett's test of sphericity was significant ($p < 0.001$; Williams, Onsman, & Brown, 2010). The results showed that there were five factors with eigenvalues larger than 1: *communication with clinicians via call and text* (four items, Eigenvalue = 7.98, % of variance = 39.88, $\alpha = 0.89$), *communication with doctors via instant messaging* (three items, Eigenvalue = 2.00, % of variance = 9.98, $\alpha = 0.89$), *information seeking* (three items, Eigenvalue = 1.70, % of variance = 8.51, $\alpha = 0.85$), *communication with nurses via instant messaging* (three items, Eigenvalue = 1.50, % of variance = 7.47, $\alpha = 0.85$), and *communication with patients via call and text* (two items, Eigenvalue = 1.19, % of variance = 5.93, *Spearman-Brown*

Table 1
Survey items.

Factor		Reference	Items	*M*	*SD*	α	*AVE*	*S*	*K*
1	Nurses' use of smartphones for work purposes	Bautista and Lin (2016, 2017); Brandt et al. (2016); McBride et al. (2013, 2015b); Mobasheri et al. (2015); Moore and Jayewardene (2014); Sharpe and Hemsley (2016)	15/20^	2.52	0.68	0.90	0.68	0.10	0.22
2	Intention to use of smartphones for work purposes	Bautista and Lin (2016, 2017); Brandt et al. (2016); McBride et al. (2013, 2015b); Mobasheri et al. (2015); Moore and Jayewardene (2014); Sharpe and Hemsley (2016)	15/20^	2.55	0.74	0.93	0.67	0.25	0.35
3	Instrumental attitude	Hung et al. (2012); McBride et al. (2013)	3/6*	4.14	0.73	0.86	0.72	-1.23	2.71
4	Affective attitude	Hung et al. (2012); McBride et al. (2013)	4/5*	3.51	0.75	0.90	0.70	-0.37	0.70
5	Injunctive norm	Hung et al. (2012); Yi et al. (2006)	4/4*	3.44	0.87	0.90	0.69	-0.87	0.98
6	Descriptive norm	Fishbein and Ajzen (2010); Shteynberg, Gelfand, and Kim (2009); Yi et al. (2006)	3/3^	3.92	0.67	0.79	0.56	-0.35	0.73
7	Perceived behavioral control	Sparks et al. (1997); Terry and O'Leary (1995)	4/4*	3.79	0.80	0.86	0.59	-0.96	1.82
8	Perceived organizational support	Eisenberger et al. (1986)	4/4*	3.60	0.87	0.89	0.67	-0.87	1.05
9	Perceived work productivity	Torkzadeh and Doll (1999)	3/3*	3.71	0.84	0.90	0.76	-0.87	1.40
10	Perceived quality of care	Aiken et al. (2002); Van Bogaert et al. (2009)	3/3#	4.11	0.58	0.86	0.68	-0.41	0.69
11	Non-work-related use of smartphones at work	Brandt et al. (2016); McBride et al. (2013, 2015a)	5/7^	2.41	0.77	0.88	0.57	0.16	0.24

Note: Items = retained over total, *M* = mean of retained items, *SD* = standard deviation of retained items, α = Cronbach's alpha of retained items, *AVE* = average variance extracted of retained items, *S* = skewness, *K* = kurtosis. ^ 1 (Never) – 5 (All the time). * 1 (Strongly disagree) – 5 (Strongly agree). # 1 (Poor) – 5 (Excellent).

coefficient = 0.92).

Next, we performed the same procedure on items for intention. Preliminary analyses suggested that the data were suitable for exploratory factor analysis since the KMO test for sampling adequacy was 0.89 and Bartlett's test of sphericity was significant ($p < 0.001$). The results showed a similar five-dimension structure based on eigenvalues larger than 1: *communication with doctors via instant messaging* (three items, Eigenvalue = 9.71, % of variance = 48.54, $\alpha = 0.94$), *communication with clinicians via call and text* (four items, Eigenvalue = 1.86, % of variance = 9.31, $\alpha = 0.91$), *information seeking* (three items, Eigenvalue = 1.54, % of variance = 7.72, $\alpha = 0.85$), *communication with nurses via instant messaging* (three items, Eigenvalue = 1.32, % of variance = 6.62, $\alpha = 0.89$), and *communication with patients via call and text* (two items, Eigenvalue = 1.02, % of variance = 5.12, *Spearman-Brown coefficient* = 0.96).

In both exploratory factor analyses, the items measuring documentation failed to load on any factor. Two items on information seeking were also dropped due to weak factor loadings. Although documentation may be a work-related use of smartphones, the current findings suggest a discrepancy between conceptual and operational definitions. Thus, we revised the definition of nurses' use of smartphones for work purposes as *nurses' use of their own smartphones at work for communication (with healthcare professionals and patients) and information seeking purposes.*

3.4. Data analysis

We tested the hypotheses by conducting structural equation modeling in *Mplus 7*, using the default maximum likelihood estimator. There were missing values in the data, but a non-significant Little's MCAR test ($p = 0.20$) suggests that the missingness was completely at random (Little, 1988). The analysis used full information maximum likelihood estimation (Wang & Benner, 2014) to estimate the model based on all available information. That approach retains the full sample size and results in less statistical bias than other approaches to handling missing values, such as listwise deletion and mean imputation (Rosenthal, 2017; Wang & Benner, 2014).

4. Results

4.1. Respondent profile

Respondents were 21–50 years of age ($M = 28.93$, $Mdn = 27$, $SD = 5.90$). Most of them were female (69.8%), held a Bachelor of Science in Nursing degree (90.9%), and earned below PHP15,000 per month (66.1%). Most of them were employed in private hospitals (73.3%), were assigned to general nursing units (53.8%), and had between 1 and 27 years of experience ($M = 4.61$, $Mdn = 3$, $SD = 4.28$). Most (56.7%) of the respondents reported that they do not have any mobile phone that they can use in their work area. These variables were used as controls in the analysis. Additional controls were the uses of smartphones for non-work purposes at work, the number of smartphones and subscription type, and the number of patients handled in the previous shift (see Table 2).

4.2. Structural equation model

The measurement model had adequate fit with the observed data, $X^2/df = 1.84$, RMSEA = 0.041 (90% CI = 0.038–0.043), CFI = 0.96, TLI = 0.95, SRMR = 0.062. Likewise, the full structural model had adequate fit with the observed data, $X^2/df = 1.84$, RMSEA = 0.040 (90% CI = 0.038–0.042), CFI = 0.93, TLI = 0.93, SRMR = 0.073 (Bentler, 1990). In addition to assessing model fit, we tested for the presence of multicollinearity and common method bias, which can bias regression estimates (Alin, 2010; Podsakoff, MacKenzie, & Podsakoff, 2012). Table 3 shows that multicollinearity was not a concern since the values for tolerance (>0.20) and variance inflation factors (VIF < 5) among the predictor variables were within the normal range (Lin, Paragas, & Bautista, 2016). Similarly, common method bias was not a concern since results of Harman's single factor test showed that the first factor for nurses' intention and use of smartphones for work purposes explained less than 50% of the total variance among indicators (Sheng & Chien, 2016).

Results supported 6 out of 11 hypotheses, which Fig. 2 shows. The first set of hypotheses tested the theory of planned behavior. Intention was positively associated with use ($\beta = 0.85$, $p < 0.001$), which supported H1. Instrumental and affective attitudes were not associated with intention, which failed to support H2 and H3. Both injunctive ($\beta = 0.13$, $p = 0.04$) and descriptive ($\beta = 0.11$, $p = 0.02$)

Table 2
Profile of the respondents ($N = 517$).

Characteristics	n	%
Demographics		
Age ($M = 28.93$, $Mdn = 27$, $SD = 5.90$)		
21–29	346	66.9
30–39	113	21.9
≥ 40	46	8.9
Missing	12	2.3
Gender		
Male	156	30.2
Female	361	69.8
Highest educational attainment		
Bachelor of Science in Nursing	470	90.9
Pursuing Master's Degree	30	5.8
Master's Degree	16	3.1
Pursuing Doctoral Degree	1	0.2
Monthly salary (USD 1 = PHP 51.65, Feb 2018)		
< PHP10,000	118	22.8
PHP 10,000–14,999	224	43.3
PHP 15,000–19,999	81	15.7
PHP 20,000–24,999	56	10.8
≥ PHP 25,000	38	7.4
Technographics		
Number of smartphone owned		
1	375	72.5
≥ 2	142	27.5
Subscription		
Prepaid	367	71.0
Postpaid	150	29.0
Monthly Mobile Phone Expenditure (USD 1 = PHP 51.65, Feb 2018)		
< PHP 500	264	51.1
PHP 500–999	147	28.4
PHP 1000–1499	50	9.7
PHP 1500–1999	23	4.4
≥ PHP 2000	31	6.0
Missing	2	0.4
Work Background		
Hospital Category		
Private	379	73.3
Government	138	26.7
Nursing Unit		
General (Wards, Ancillary, Outpatient)	278	53.8
Special (Intensive care, Emergency, Operating room)	239	46.2
Years of clinical experience ($M = 4.61$, $Mdn = 3$, $SD = 4.28$)		
1–4.99	338	65.4
5–9.99	114	22.1
10–14.99	42	8.1
15–19.99	13	2.5
≥ 20	8	1.5
Missing	2	0.4
Patients handed in previous shift ($M = 10.60$, $Mdn = 7$, $SD = 14.04$)		
1–5	173	33.5
6–10	178	34.4
≥ 11	136	26.3
Missing	30	5.8
Presence of mobile phone in work area		
Present	224	43.3
Absent	293	56.7

Table 3
Multicollinearity diagnostics.

Factors	Intention		Use	
	Tolerance	Variance inflation factor	Tolerance	Variance inflation factor
Instrumental attitude	0.55	1.82	–	–
Affective attitude	0.61	1.65	–	–
Injunctive norm	0.43	2.31	–	–
Descriptive norm	0.69	1.46	–	–
Perceived behavioral control	0.57	1.75	0.64	1.55
Perceived organizational support	0.45	2.24	0.69	1.45
Intention	–	–	0.83	1.21

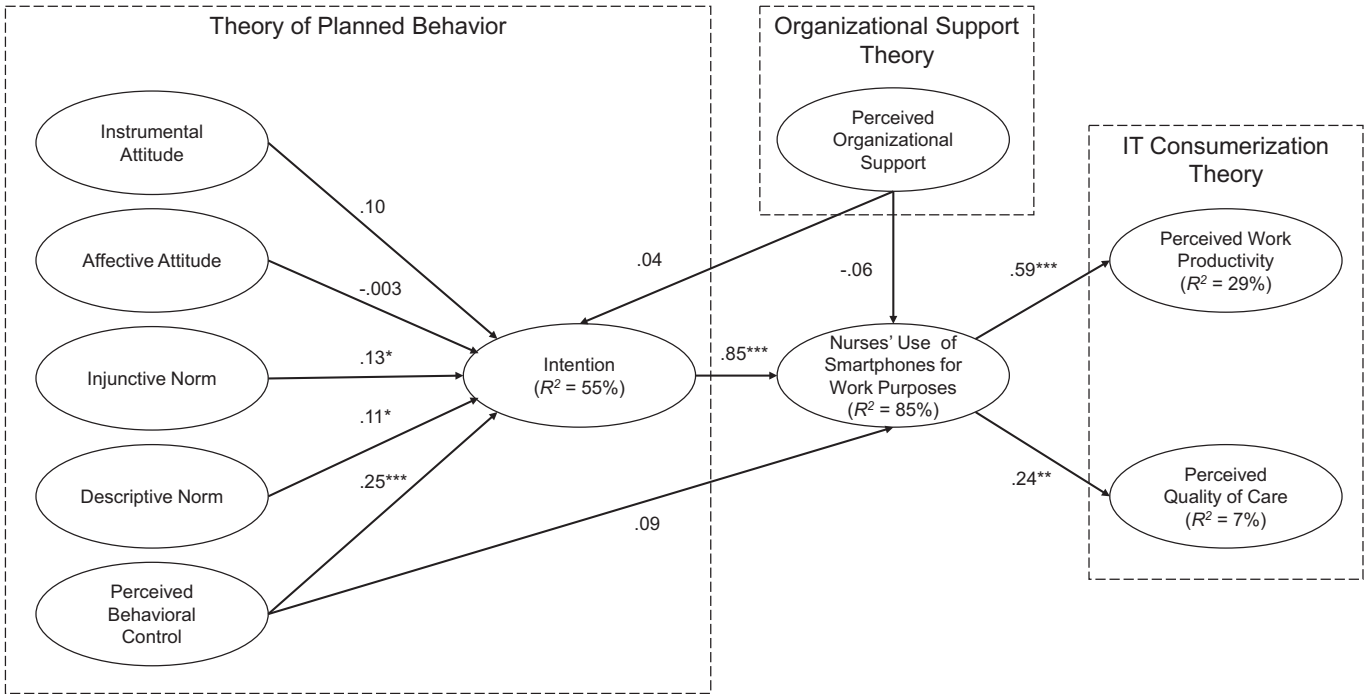

Fig. 2. SEM results. Note: $X^2/df = 1.84$, RMSEA = 0.040 (90% CI = 0.038–0.042), CFI = 0.93, TLI = 0.93, SRMR = 0.073. Control variables were included in the analysis but not shown. Path coefficients were standardized. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

norms were positively associated with intention, which supported H4 and H5. Perceived behavioral control was positively associated with intention ($\beta = 0.25$, $p < 0.001$), but not with use, which supported H6a and failed to support H6b. Indirect effect analysis using 5000 bootstrap samples showed that perceived behavioral control was indirectly related to use via intention ($\beta = 0.21$ [95% C.I. = 0.04–0.38], $p = 0.02$).

Further, perceived organizational support was not significantly related to intention or use, which failed to support H7a and H7b. Finally, use was positively associated with perceived work productivity ($\beta = 0.59$, $p < 0.001$) and perceived quality of care ($\beta = 0.24$, $p = 0.002$), which supported H8 and H9. Table 4 summarizes the results of the hypothesis testing.

4.3. Alternative model

Perceived organizational support was a key theoretical variable, and we considered the possibility that the null findings regarding its effects on intention and use were due to model misspecification. We referenced the modification indices of the structural equation model to develop a logical alternative model.

In the alternative model, we tested to what extent perceived organizational support predicts instrumental and affective attitudes, injunctive and descriptive norms, and perceived behavioral control. The rationale for this alternative model is that organizational support may create an environment where nurses are more likely to see their smartphones as practical and positive in the workplace, to see other nurses using smartphones for work purposes and feel accepted in their own use, and to feel capable and confident in using their smartphones for work purposes. Such rationale is consistent with prior research, which has shown that organizational support predicts individual factors such as perceived usefulness (Lee, Lee, Olson, & Chung, 2010; Son, Park, Kim, & Chou, 2012) and perceived ease of use of organizational technologies (Chuo, Tsai, Lan, & Tsai, 2011; Lee et al. 2010). Fig. 3 shows the results of the SEM analysis for the alternative model.

The alternative model had adequate fit with the observed data, $X^2/df = 1.86$, RMSEA = 0.041 (90% CI = 0.039–0.043), CFI = 0.94, TLI = 0.93, SRMR = 0.078. Compared with the original model, the alternative model had better fit since Akaike's information criterion

Table 4
Hypothesis testing results.

Hypothesis		β	Decision
H1	Intention → Nurses' use of smartphones for work purposes	0.85^{***}	Supported
H2	Instrumental attitude → Intention	0.10	Rejected
H3	Affective attitude → Intention	-0.003	Rejected
H4	Injunctive norm → Intention	0.13^{*}	Supported
H5	Descriptive norm → Intention	0.11^{*}	Supported
H6a	Perceived behavioral control → Intention	0.25^{***}	Supported
H6b	Perceived behavioral control → Nurses' use of smartphones for work purposes	0.09	Rejected
H7a	Perceived organizational support → Intention	0.04	Rejected
H7b	Perceived organizational support → Nurses' use of smartphones for work purposes	-0.06	Rejected
H8	Nurses' use of smartphones for work purposes → Perceived work productivity	0.59^{***}	Supported
H9	Nurses' use of smartphones for work purposes → Perceived quality of care	0.24^{**}	Supported

Note: β = standardized path coefficients. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

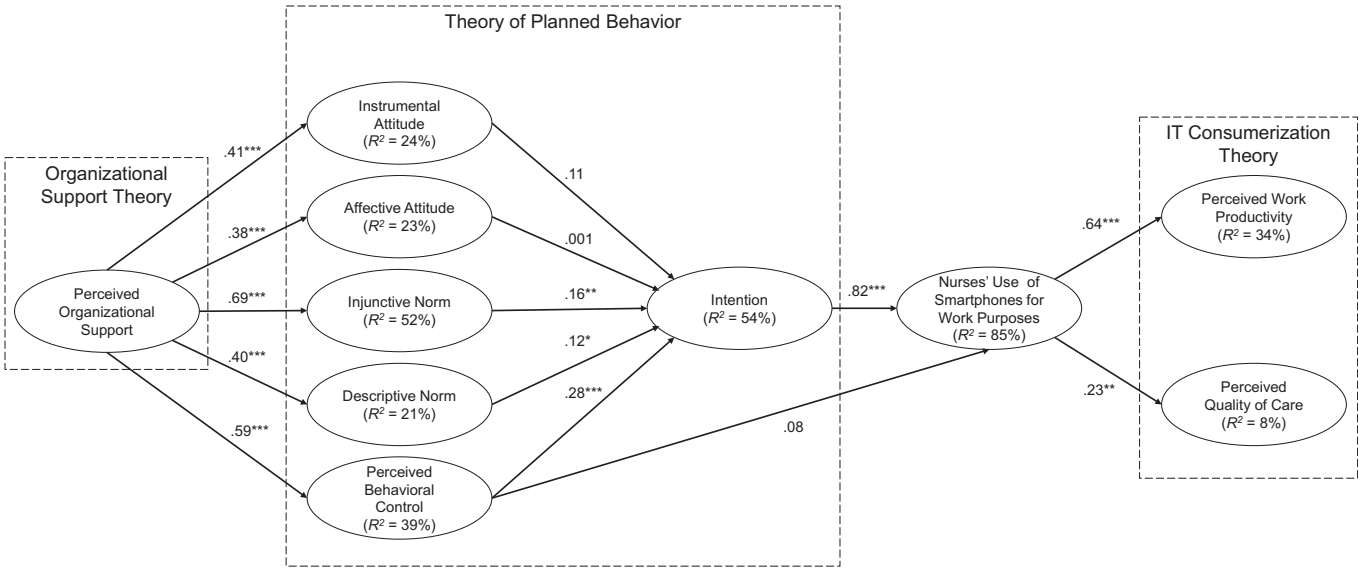

Fig. 3. SEM results for the alternative model. Note: $X^2/df = 1.86$, RMSEA = 0.041 (90% CI = 0.039–0.043), CFI = 0.94, TLI = 0.93, SRMR = 0.078. Control variables were included in the analysis but not shown. Path coefficients were standardized. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

(AIC) and the Bayesian information criterion (BIC) values were lower than those of the original model (Kuha, 2004; Vrieze, 2012; see Table 5).

Results showed that perceived organizational support was positively associated with instrumental attitude ($\beta = 0.41$, $p < 0.001$), affective attitude ($\beta = 0.38$, $p < 0.001$), injunctive norm ($\beta = 0.69$, $p < 0.001$), descriptive norm ($\beta = 0.40$, $p < 0.001$), and perceived behavioral control ($\beta = 0.59$, $p < 0.001$). Further, indirect effect analysis using 5000 bootstrap samples showed that perceived organizational support was indirectly related to use (see Table 6).

Table 6
Indirect effect of perceived organizational support.

Indirect path	Indirect effect (95% confidence interval), p value
POS → IN → INT → USE	$\beta = 0.09$ (95% C.I. = 0.012–0.169), $p = 0.02$
POS → PBC → INT → USE	$\beta = 0.14$ (95% C.I. = 0.043–0.230), $p = 0.004$

Notes: POS = perceived organizational support. IN = injunctive norm. PBC = perceived behavioral control. INT = intention. USE = nurses' use of smartphones for work purposes.

5. Discussion

Consumer devices like smartphones are one of the many HITs that nurses can use to facilitate their work. Their use for work purposes is an example of the consumerization of IT in healthcare settings (Marshall, 2014). Like previous research on HITs has shown, there are several factors associated with the use of smartphones. To identify those factors, we developed and tested a research model based on the theory of planned behavior, organizational support theory, and IT consumerization theory. We tested the hypotheses using structural equation modeling of cross-sectional survey data from staff nurses in the Philippines.

5.1. Predictors of nurses' use of smartphones for work purposes

The results were largely consistent with the theory of planned behavior and related empirical work (e.g., Kijsanayotin et al., 2009; Lau, 2011), but did not support our hypotheses regarding organizational support theory. Specifically, we found that injunctive norm, descriptive norm, and perceived behavioral control were directly related to intention. Moreover, we found that intention directly predicted use, and perceived behavioral control was indirectly related to use. Counter to our predictions, perceived organizational support was not directly related to use. Taken together, these results suggest that use is based more on behavioral-motivational factors than on organizational considerations. These findings contribute to literature regarding the usefulness of the theory of planned behavior to explain the use of mobile technologies in healthcare settings.

Previous research provides clues to explain these patterns in the results. First, prior evidence suggests that nurses are willing to use their smartphones to accomplish tasks, and this willingness is independent of hospital regulations about such use (Bautista & Lin, 2016; Sharpe & Hemsley, 2016). Factors that motivate willingness include co-workers' expectation of its use, observation of others' use, and confidence in use (Bautista & Lin, 2016; Mobasheri et al., 2015). Further, some nurses believe that restrictive policies are outdated and counterproductive given how smartphones can support work activities (Bautista & Lin, 2016; Brandt et al., 2016). In other words, nurses are inclined to use smartphones for work purposes because of how they think and feel about such use. When that inclination pushes against restrictive hospital policies, nurses may attempt to justify their behavioral preference by regarding the policies as unwarranted. When hospital policies are supportive,

Table 5
Model fit comparison.

	AIC	BIC	X^2/df	RMSEA	CFI	TLI	SRMR
Original	56,679.16	58,013.04	1.84	0.040 (90% CI = 0.038–0.042)	0.93	0.93	0.073
Alternative	54,555.86	56,020.76	1.86	0.041 (90% CI = 0.039–0.043)	0.94	0.93	0.078

nurses might perceive the policies as concordant with their preferences, but still , their preferences dominate the behavioral decision.

Nonetheless, organizational support may be crucial to influencing antecedents of use. This was the thrust of our alternative model, which grew out of the null findings discussed above, and which better situates perceived organizational support as an antecedent of behavior. Our analysis of that model suggests that perceived organizational support influences behavior indirectly by changing how individuals think and feel about the behavior, which then affects their intentions. There is a certain causal logic to that sequence, which is a requirement of mediation analyses (Hayes, 2013); though, the current results, being cross-sectional, cannot resolve any causal ordering among the variables of interest. This finding extends organizational support theory since previous research only depicted a direct relationship between organizational support and intention or acceptance to use organizational technologies (e.g., Hsiao & Chen, 2015; Park & Chen, 2007; Putzer & Park, 2010). Moreover, the findings contribute to the theory of planned behavior since perceived organizational support was identified as a strong predictor of behavioral antecedents of technology use. On the practical side, a key takeaway is that hospital policies can affect smartphone use for work purposes, but that influence is indirect. Policies that target norms and perceived behavioral control should be effective at influencing the use of smartphones for work purposes.

5.2. Outcomes of nurses' use of smartphones for work purposes

Consistent with IT consumerization theory, results showed that nurses' use of smartphones for work purposes was positively associated with perceived work productivity and perceived quality of care. This finding supports IT consumerization theory and provides empirical support for the argument that nurses' use of smartphones can improve work productivity (Bautista & Lin, 2016; Mobasheri et al., 2015; Moore & Jayewardene, 2014) and enhance the quality of care rendered to patients (Bautista & Lin, 2016; Chiang & Wang, 2016). Moreover, the results of the alternative model suggest that perceived organizational support could facilitate these positive outcomes by encouraging nurses to use their smartphones for work purposes. Such findings should be especially interesting to hospitals, which have a strong interest in improving employee work performance. Although perceived work productivity and perceived quality of care are not the same thing as actual work performance, they are likely close proxies. Overall, the findings contribute to IT consumerization theory since it provides a mechanism of how organizational and behavioral antecedents of using consumer devices (e.g., smartphones) can lead to positive work outcomes in hospital settings.

Although this study offers a positive view of the use of smartphones in hospital settings, nurses should also be cautious about such use. The findings also showed that non-work-related use of smartphones at work was negatively related to perceived work productivity ($\beta = -0.16$, $p = 0.046$) and perceived quality of care ($\beta = -0.24$, $p < 0.001$), which are consistent with previous studies (McBride et al., 2015a; McNally et al., 2017). Whereas hospitals can enact policies that allow nurses to use their smartphones at work, such policies should emphasize that smartphones should only be used for work purposes (e.g., communication and information seeking purposes). These policies could also emphasize the functionality of work uses and dysfunctionality of non-work uses with respect to work performance. This would help create explicit awareness among hospital staff regarding the positive and negative ramifications of using smartphones at work. Moreover, the results can also be used to justify the deployment of hospital-provided mobile technologies or other relevant HITs to discourage healthcare professionals from over-relying on their own smartphones at work.

5.3. Limitations and conclusion

The value of this study's implications should be balanced with its limitations. First, despite using probability sampling methods in the selection of hospitals, respondent selection at the hospital level was limited to purposive sampling. This presents a certain degree of selection bias. Future studies can reduce bias by utilizing random sampling methods (Shin, 2015). Second, although the data were derived from nurses working in several hospitals in the Philippines, the results may not be completely generalizable in other countries, as context plays a significant role in HIT research. Cross-national comparisons would help resolve this limitation. Third, the outcomes in this study were only limited to perceptions of work productivity and quality of care. Perceptions are relatively easy to measure, but they do not necessarily correspond with actual conditions. Finally, although the predictors of intention to use smartphones for work purposes explained more than half of its variance, future studies can explore other predictors such as habit, impulsivity, and personal norm.

Despite these limitations, this study contributes in meaningful ways to a currently small body of literature. Results showed that nurses' use of smartphones for work purposes had direct (i.e., intention to use) and indirect (i.e., injunctive norm, perceived behavioral control, and perceived organizational support) antecedents. Such use can improve nurses' perceived work productivity and perceived quality of care rendered to patients. Theoretically, the results support the applicability of the theory of planned behavior, organizational support theory, and IT consumerization theory to the context of nurses' use of smartphones for work purposes. Likewise, the findings provide practical value to healthcare organizations interested in understanding the implications of nurses' use of smartphones in hospital settings.

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Appendix 1

List of survey items and factor loadings.

Nurses' use of smartphones for work purposes

COM = Communication; INFO = Information seeking; DOC = Documentation*

Key for retained items (N = 15):

1. Communication with clinicians via call and text: COM1, COM2, COM6, COM7
2. Information seeking: INFO3, INFO4, INFO5
3. Communication with doctors via instant messaging: COM8, COM9, COM10
4. Communication with nurses via instant messaging: COM3, COM4, COM5
5. Communication with patients via call and text: COM11, COM12

*DOC1 to DOC3 can be included for exploratory purposes.

Instruction: The following questions ask about your use of YOUR OWN MOBILE PHONE AT WORK DURING THE PAST MONTH.

How often did you use your own mobile phone at work to engage with NURSES for the following communication activities?

1. Making work-related calls (COM1)	0.79
2. Exchanging work-related text messages via SMS[1] (COM2)	0.80
3. Exchanging work-related text messages via instant messaging apps[2] (COM3)	0.73
4. Exchanging work-related images via instant messaging apps (COM4)	0.84
5. Exchanging work-related videos via instant messaging apps (COM5)	0.77
6. Asking for clinical information (INFO1)	dropped

[1] SMS refers to short message service, the usual way of sending text messages in the Philippines.
[2] Some examples of instant messaging apps include Viber, Facebook Messenger, Line, We Chat, etc.

How often did you use your own mobile phone at work to engage with MEDICAL DOCTORS for the following communication activities?

7. Making work-related calls (COM6)	0.76
8. Exchanging work-related text messages via SMS (COM7)	0.75
9. Exchanging work-related text messages via instant messaging apps (COM8)	0.78
10. Exchanging work-related images via instant messaging apps (COM9)	0.94
11. Exchanging work-related videos via instant messaging apps (COM10)	0.84
12. Asking for clinical information (INFO2)	dropped

How often did you use your own mobile phone at work to engage with PATIENTS or PATIENTS' GUARDIAN(S) for the following communication activities?

13. Making work-related calls (COM11)	0.96
14. Exchanging work-related text messages via SMS (COM12)	0.88

How often did you use your own mobile phone at work to search for clinical information from the following sources?

15. Clinical reference apps[1] (INFO3)	0.89
16. Websites[2] (INFO4)	0.87
17. E-books saved on your own mobile phone (INFO5)	0.68

[1]Some clinical reference apps include WebMD, Epocrates, Medscape, etc.
[2]Some websites include Google, WebMD, Medscape, etc.

How often did you use your own mobile phone at work for the following clinical documentation activities?

18. Using mobile apps to document patient care such as creating notes, reminders or checklists (DOC1)	Dropped
19. Taking a picture of patient outcomes like wounds, ECG tracing, X-ray films, skin rashes, etc. (DOC2)	dropped
20. Taking a picture of the patient's chart (DOC3)	dropped

Intention to use smartphones for work purposes

COM = Communication; INFO = Information seeking; DOC = Documentation*

Key for retained items (N = 15):

1. Communication with clinicians via call and text: COM1, COM2, COM6, COM7
2. Information seeking: INFO3, INFO4, INFO5
3. Communication with doctors via instant messaging: COM8, COM9, COM10
4. Communication with nurses via instant messaging: COM3, COM4, COM5
5. Communication with patients via call and text: COM11, COM12

DOC1 to DOC3 can be included for exploratory purposes.

Instruction: The following questions ask about your use of your own mobile phone at work during the NEXT MONTH.

How often will you use your own mobile phone at work to engage with NURSES for the following communication activities?

1. Making work-related calls (COM1)	0.81
2. Exchanging work-related text messages via SMS (COM2)	0.80
3. Exchanging work-related text messages via instant messaging apps (COM3)	0.60
4. Exchanging work-related images via instant messaging apps (COM4)	0.68
5. Exchanging work-related videos via instant messaging apps (COM5)	0.68
6. Asking for clinical information (INFO1)	dropped

How often will you use your own mobile phone at work to engage with MEDICAL DOCTORS for the following communication activities?

7. Making work-related calls (COM6)	0.75
8. Exchanging work-related text messages via SMS (COM7)	0.75
9. Exchanging work-related text messages via instant messaging apps (COM8)	0.92
10. Exchanging work-related images via instant messaging apps (COM9)	0.93
11. Exchanging work-related videos via instant messaging apps (COM10)	0.84
12. Asking for clinical information (INFO2)	dropped

How often will use your own mobile phone at work to engage with PATIENTS' GUARDIAN(S) for the following communication activities?

13. Making work-related calls (COM11)	0.98
14. Exchanging work-related text messages via SMS (COM12)	0.93

How often will you use your own mobile phone at work to search for clinical information from the following sources?

15. Clinical reference apps (INFO3)	0.89
16. Websites (INFO4)	0.88
17. E-books saved on your own mobile phone (INFO5)	0.71

How often will you use your own mobile phone at work for the

following clinical documentation activities?

18. Using mobile apps to document patient care such as creating notes, reminders or checklists (DOC1)	Dropped
19. Taking a picture of patient outcomes like wounds, ECG tracing, X-ray films, skin rashes, etc. (DOC2)	dropped
20. Taking a picture of the patient's chart (DOC3)	dropped

Instrumental attitude

Using my own mobile phone at work for work purposes would be …

1. Useful	0.85
2. Necessary	0.86
3. Distracting (reverse coded)	dropped
4. Helpful	0.83
5. Inexpensive	dropped
6. unhygienic (reverse coded)	dropped

Affective attitude

Using my own mobile phone at work for work purposes would be …

1. A good idea	Dropped
2. Professional	0.90
3. Pleasant	0.81
4. Acceptable	0.90
5. Ethical	0.73

Injunctive norm

For the following statements, please indicate how much you agree or disagree that the following people would EXPECT you to use your own mobile phone at work for work purposes.

1. Hospital management	Measured as a formative construct
2. Immediate nursing superiors	Measured as a formative construct
3. Fellow staff nurses	Measured as a formative construct
4. Medical doctors	Measured as a formative construct

Descriptive norm

How often DO YOU THINK THAT THE FOLLOWING PEOPLE WILL USE THEIR OWN MOBILE PHONE at work for work purposes?

1. Immediate nursing superiors	Measured as a formative construct
2. Fellow staff nurses	Measured as a formative construct
3. Medical doctors	Measured as a formative construct

Perceived behavioral control

For the following statements, please indicate how much you agree or disagree.

1. It will be very easy for me to use my own mobile phone at work for work purposes.	0.81
2. If I wanted to, I could easily use my own mobile phone at work for work purposes.	0.85
3. Using my own mobile phone at work for work purposes is completely up to me.	0.69
4. I feel in complete control over using my own mobile phone at work for work purposes.	0.71

Perceived organizational support

For the following statements, please indicate how much you agree or disagree that the following people would ALLOW you to use your own mobile phone at work for work purposes.

1. Hospital management	Measured as a formative construct
2. Immediate nursing superiors	Measured as a formative construct
3. Fellow staff nurses	Measured as a formative construct
4. Medical doctors	Measured as a formative construct

Perceived work productivity

For the following statements, indicate how much you agree or disagree.

1. Using my own mobile phone at work for work purposes will save me time.	0.81
2. Using my own mobile phone at work for work purposes will increase my productivity.	0.92
3. Using my own mobile phone at work for work purposes will allow me to accomplish more work than would otherwise be possible.	0.88

Perceived quality of care

Please select the answer that best describes your perception of the following statements:

1. In general, how would you describe the quality of nursing care delivered to patients in your unit?	0.81
2. How would you describe the quality of nursing care that you have delivered on your last shift?	0.84
3. The quality of care that you have provided over the previous year has been …	0.80

Non-work-related use of smartphones at work

How often did you use your own mobile phone at work for the following activities?

1. Making non-work-related phone calls	0.60
2. Exchanging non-work-related text messages	0.67
3. Browsing websites not related to work	0.88
4. Accessing social media	0.86
5. Playing mobile games	dropped
6. Listening to music	dropped
7. Watching videos not related to work	0.73

References

Aggelidis, V. P., & Chatzoglou, P. D. (2009). Using a modified technology acceptance model in hospitals. *International Journal of Medical Informatics, 78*(2), 115–126.
Aiken, L. H., Clarke, S. P., & Sloane, D. M. (2002). Hospital staffing, organization, and quality of care: Cross-national findings. *International Journal for Quality in*

Health Care, 14(1), 5–14.
Ajzen, I. (1988). *Attitudes, personality, and behavior*. Chicago, IL: Dorsey.
Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179–211.
Ajzen, I. (2011). The theory of planned behaviour: Reactions and reflections. *Psychology & Health, 26*(9), 1113–1127.
Ajzen, I., & Fishbein, M. (2005). The influence of attitudes on behaviour. In D. Albarracin, B. T. Johnson, & M. P. Zanna (Eds.), *Handbook of attitudes and attitude change: Basic principles* (pp. 173–221). Mahwah, NJ: Erlbaum.
Alin, A. (2010). Multicollinearity. *Wiley Interdisciplinary Reviews: Computational Statistics, 2*(3), 370–374.
American Nurses Association. (2010). *Nursing: Scope and standards of practice* (2nd ed.) Retrieved from https://www.iupuc.edu/academics/divisions-programs/nursing/course-descriptions/Website%20-%20ANA%202010%20Nursing%20Scope%20and%20Standards%20of%20Practice.pdf.
Bagozzi, R. P. (2007). The legacy of the technology acceptance model and a proposal for a paradigm shift. *Journal of the Association for Information Systems, 8*(4), 244–254.
Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology, 52*(1), 1–26.
Bautista, J. R., & Lin, T. T. C. (2016). Sociotechnical analysis of nurses' use of personal mobile phones at work. *International Journal of Medical Informatics, 95*, 71–80.
Bautista, J. R., & Lin, T. T. C. (2017). Nurses' use of mobile instant messaging applications: A uses and gratifications perspective. *International Journal of Nursing Practice, 23*(5), e12577.
Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107*(2), 238.
Bollen, K. A., & Bauldry, S. (2011). Three Cs in measurement models: Causal indicators, composite indicators, and covariates. *Psychological Methods, 16*(3), 265.
Brandt, J., Katsma, D., Crayton, D., & Pingenot, A. (2016). Calling in at work: Acute care nursing cell phone policies. *Nursing Management, 47*(7), 20–27.
Carayon, P., Cartmill, R., Blosky, M. A., Brown, R., Hackenberg, M., Hoonakker, P., & Walker, J. M. (2011). ICU nurses' acceptance of electronic health records. *Journal of the American Medical Informatics Association, 18*(6), 812–819.
Castro-Palaganas, E., Spitzer, D. L., Kabamalan, M. M. M., Sanchez, M. C., Caricativo, R., Runnels, V., & Bourgeault, I. L. (2017). An examination of the causes, consequences, and policy responses to the migration of highly trained health personnel from the Philippines: The high cost of living/leaving—a mixed method study. *Human Resources for Health, 15*(1), 25.
Chang, W. Y., Ma, J. C., Chiu, H. T., Lin, K. C., & Lee, P. H. (2009). Job satisfaction and perceptions of quality of patient care, collaboration and teamwork in acute care hospitals. *Journal of Advanced Nursing, 65*(9), 1946–1955.
Chau, P. Y., & Hu, P. J. H. (2001). Information technology acceptance by individual professionals: A model comparison approach. *Decision Sciences, 32*(4), 699–719.
Chen, H., & Levkoff, S. E. (2015). Delivering telemonitoring care to digitally disadvantaged older adults: Human-computer interaction (HCI) design recommendations. In J. Zhou, & G. Salvendy (Eds.), *Human aspects of IT for the aged population. Design for everyday life* (pp. 50–60). Switzerland: Springer International Publishing.
Chiang, K. F., & Wang, H. H. (2016). Nurses' experiences of using a smart mobile device application to assist home care for patients with chronic disease: A qualitative study. *Journal of Clinical Nursing, 25*(13-14), 2008–2017.
Chuah, S. H. W., Rauschnabel, P. A., Krey, N., Nguyen, B., Ramayah, T., & Lade, S. (2016). Wearable technologies: The role of usefulness and visibility in smartwatch adoption. *Computers in Human Behavior, 65*, 276–284.
Chuo, Y. H., Tsai, C. H., Lan, Y. L., & Tsai, C. S. (2011). The effect of organizational support, self efficacy, and computer anxiety on the usage intention of e-learning system in hospital. *African Journal of Business Management, 5*(14), 5518–5523.
Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319–340.
DesRoches, C. M., Miralles, P., Buerhaus, P., Hess, R., & Donelan, K. (2011). Health information technology in the workplace: Findings from a 2010 national survey of registered nurses. *Journal of Nursing Administration, 41*(9), 357–364.
Donabedian, A. (1988). The quality of care: How can it be assessed? *Journal of the American Medical Association, 260*(12), 1743–1748.
Doran, D. M., Haynes, R. B., Kushniruk, A., Straus, S., Grimshaw, J., Hall, L. M., & Nguyen, H. (2010). Supporting evidence-based practice for nurses through information technologies. *Worldviews on Evidence-Based Nursing, 7*(1), 4–15.
Eide, H. K., Benth, J.Š., Sortland, K., Halvorsen, K., & Almendingen, K. (2015). Prevalence of nutritional risk in the non-demented hospitalised elderly: A cross-sectional study from Norway using stratified sampling. *Journal of Nutritional Science, 4*(e18), 1–9.
Eisenberger, R., Huntington, R. H., Hutchinson, S., & Sowa, D. (1986). Perceived organizational support. *Journal of Applied Psychology, 71*(31), 500–507.
Fanning, J., Roberts, S., Hillman, C. H., Mullen, S. P., Ritterband, L., & McAuley, E. (2017). A smartphone "app"-delivered randomized factorial trial targeting physical activity in adults. *Journal of Behavioral Medicine, 40*(5), 712–729.
Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach*. New York, NY: Psychology Press.
Flynn, G. A. H., Polivka, B., & Behr, J. H. (2018). Smartphone use by nurses in acute care settings. *CIN: Computers, Informatics, Nursing*. https://doi.org/10.1097/CIN.0000000000000400.
Griffiths, P., Dall'Ora, C., Simon, M., Ball, J., Lindqvist, R., Rafferty, A. M., & Aiken, L. H. (2014). Nurses' shift length and overtime working in 12 European countries: The association with perceived quality of care and patient safety. *Medical Care, 52*(11), 975.
GSMA Intelligence. (2014). *Analysis country overview: Philippines growth through innovation*. Retrieved from https://gsmaintelligence.com/research/?file=141201-philippines.pdf&download.
Harvath, T. A., Swafford, K., Smith, K., Miller, L. L., Volpin, M., Sexson, K., & Young, H. A. (2008). Enhancing nursing leadership in long-term care: A review of the literature. *Research in Gerontological Nursing, 1*(3), 187–196.
Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York, NY: Guilford Press.
Hein, D. W., & Rauschnabel, P. A. (2016). Augmented reality smart glasses and knowledge management: A conceptual framework for enterprise social networks. In A. Rossmann, G. Stei, & M. Besch (Eds.), *Enterprise social networks: Einführung in die thematik und ableitung relevanter forschungsfelder* (pp. 83–109). Wiesbaden: Springer Gabler.
Holden, R. J., & Karsh, B. T. (2009). A theoretical model of health information technology usage behaviour with implications for patient safety. *Behaviour & Information Technology, 28*(1), 21–38.
Hsiao, J. L., & Chen, R. F. (2015). Critical factors influencing physicians' intention to use computerized clinical practice guidelines: An integrative model of activity theory and the technology acceptance model. *BMC Medical Informatics and Decision Making, 16*(1), 3.
Hung, S. Y., Ku, Y. C., & Chien, J. C. (2012). Understanding physicians' acceptance of the medline system for practicing evidence-based medicine: A decomposed TPB model. *International Journal of Medical Informatics, 81*(2), 130–142.
Johansson, P., Petersson, G., Saveman, B. I., & Nilsson, G. (2014). Using advanced mobile devices in nursing practice—the views of nurses and nursing students. *Health Informatics Journal, 20*(3), 220–231.
Kijsanayotin, B., Pannarunothai, S., & Speedie, S. M. (2009). Factors influencing health information technology adoption in Thailand's community health centers: Applying the UTAUT model. *International Journal of Medical Informatics, 78*(6), 404–416.
Kinderman, K. T. (2006). Retention strategies for newly hired Filipino nurses. *Journal of Nursing Administration, 36*(4), 170–172.
Kline, R. B. (2011). *Principles and practice of structural equation modeling* (3rd ed.). New York, NY: The Guildford Press.
Köffer, S., Junglas, I., Chiperi, C., & Niehaves, B. (2014). Dual use of mobile IT and work-to-life conflict in the context of IT consumerization. In *Proceedings of the thirty fifth international conference on information systems, Auckland, New Zealand*. Retrieved from https://pdfs.semanticscholar.org/ab51/18fc639326a9d5492086eac51cde2ac6321d.pdf.
Köffer, S., Ortbach, K., & Niehaves, B. (2014). Exploring the relationship between it consumerization and job performance: A theoretical framework for future research. *Communications of the Association for Information Systems, 35*, 261–283.
Kossman, S. P., & Scheidenhelm, S. L. (2008). Nurses' perceptions of the impact of electronic health records on work and patient outcomes. *Computers Informatics Nursing, 26*(2), 69–77.
Krebs, H. I., Volpe, B. T., Aisen, M. L., & Hogan, N. (2000). Increasing productivity and quality of care: Robot-aided neuro-rehabilitation. *Journal of Rehabilitation Research and Development, 37*(6), 639.
Kuha, J. (2004). AIC and BIC: Comparisons of assumptions and performance. *Sociological Methods & Research, 33*(2), 188–229.
Kutney-Lee, A., & Kelly, D. (2011). The effect of hospital electronic health record adoption on nurse-assessed quality of care and patient safety. *The Journal of Nursing Administration, 41*(11), 466–472.
Laschinger, H. K. S., Shamian, J., & Thomson, D. (2001). Impact of magnet hospital characteristics on nurses' perceptions of trust, burnout, quality of care, and work satisfaction. *Nursing Economics, 19*(5), 209.
Lau, A. S. (2011). Hospital-based nurses' perceptions of the adoption of Web 2.0 tools for knowledge sharing, learning, social interaction and the production of collective intelligence. *Journal of Medical Internet Research, 13*(4), e92.
Lawton, R., Ashley, L., Dawson, S., Waiblinger, D., & Conner, M. (2012). Employing an extended theory of planned behaviour to predict breastfeeding intention, initiation, and maintenance in White British and South-Asian mothers living in Bradford. *British Journal of Health Psychology, 17*(4), 854–871.
Leblanc, G., Gagnon, M. P., & Sanderson, D. (2012). Determinants of primary care nurses' intention to adopt an electronic health record in their clinical practice. *Computers Informatics Nursing, 30*(9), 496–502.
Lee, D., Lee, S. M., Olson, D. L., & Chung, S. H. (2010). The effect of organizational support on ERP implementation. *Industrial Management & Data Systems, 110*(2), 269–283.
Leggat, S. G., Bartram, T., Casimir, G., & Stanton, P. (2010). Nurse perceptions of the quality of patient care: Confirming the importance of empowerment and job satisfaction. *Health Care Management Review, 35*(4), 355–364.
Letvak, S., Ruhm, C., & Gupta, S. (2013). Differences in health, productivity and quality of care in younger and older nurses. *Journal of Nursing Management, 21*(7), 914–921.
Lin, T. T., Paragas, F., & Bautista, J. R. (2016). Determinants of mobile consumers' perceived value of location-based advertising and user responses. *International Journal of Mobile Communications, 14*(2), 99–117.
Little, R. J. (1988). A test of missing completely at random for multivariate data with missing values. *Journal of the American Statistical Association, 83*(404), 1198–1202.
Liu, L., Miguel Cruz, A., Rios Rincon, A., Buttar, V., Ranson, Q., & Goertzen, D. (2015). What factors determine therapists' acceptance of new technologies for

rehabilitation—a study using the Unified Theory of Acceptance and Use of Technology (UTAUT). *Disability and Rehabilitation, 37*(5), 447–455.
Maillet, É., Mathieu, L., & Sicotte, C. (2015). Modeling factors explaining the acceptance, actual use and satisfaction of nurses using an Electronic Patient Record in acute care settings: An extension of the UTAUT. *International journal of medical informatics, 84*(1), 36–47.
Malo, C., Neveu, X., Archambault, P. M., Émond, M., & Gagnon, M. P. (2012). Exploring nurses' intention to use a computerized platform in the resuscitation unit: Development and validation of a questionnaire based on the theory of planned behavior. *Interactive Journal of Medical Research, 1*(2), e5.
Marshall, S. (2014). *IT consumerization: A case study of BYOD in a healthcare setting*. Retrieved from http://timreview.ca/article/771.
McBride, D. L., LeVasseur, S. A., & Li, D. (2015a). Non-work-related use of personal mobile phones by hospital registered nurses. *JMIR mHealth and uHealth, 3*(1), e3. https://doi.org/10.2196/mhealth.4001.
McBride, D. L., LeVasseur, S. A., & Li, D. (2015b). Nursing performance and mobile phone use: Are nurses aware of their performance decrements? *JMIR Human Factors, 2*(1), e6. https://doi.org/10.2196/humanfactors.4070.
McBride, D. L., LeVasseur, A, S., & Li, D. (2013). Development and validation of a web-based survey on the use of personal communication devices by hospital registered nurses: Pilot study. *JMIR Research Protocols, 2*(2), e50.
McKay, M. T., Worrell, F. C., Temple, E. C., Perry, J. L., Cole, J. C., & Mello, Z. R. (2015). Less is not always more: The case of the 36-item short form of the Zimbardo Time Perspective Inventory. *Personality and Individual Differences, 72*, 68–71.
McNally, G., Frey, R., & Crossan, M. (2017). Nurse manager and student nurse perceptions of the use of personal smartphones or tablets and the adjunct applications, as an educational tool in clinical settings. *Nurse Education in Practice, 23*, 1–7.
McNeese-Smith, D. K. (2001). Staff nurse views of their productivity and nonproductivity. *Health Care Management Review, 26*(2), 7–19.
Mobasheri, M. H., King, D., Johnston, M., Gautama, S., Purkayastha, S., & Darzi, A. (2015). The ownership and clinical use of smartphones by doctors and nurses in the UK: A multicentre survey study. *BMJ Innovations, 00*, 1–8.
Moody, L. E., Slocumb, E., Berg, B., & Jackson, D. (2004). Electronic health records documentation in nursing: Nurses' perceptions, attitudes, and preferences. *Computers, Informatics, Nursing, 22*(6), 337–344.
Moore, S., & Jayewardene, D. (2014). The use of smartphones in clinical practice: Sally Moore and Dharshana Jayewardene look at the rise in the use of mobile software at work. *Nursing Management, 21*(4), 18–22.
Mosadeghrad, A. M. (2014). Factors influencing healthcare service quality. *International Journal of Health Policy and Management, 3*(2), 77–89.
Niehaves, B., Köffer, S., & Ortbach, K. (2013). The effect of private IT use on work performance - Towards an IT consumerization theory. In *Proceedings of the 11th international Conference on Wirtschaftsinformatik, Germany*. Retrieved from https://pdfs.semanticscholar.org/4467/68162c86681fcc8d9dfddece47fcf0470388.pdf.
Nilsson, C., Skär, L., & Söderberg, S. (2010). Swedish district nurses' experiences on the use of information and communication technology for supporting people with serious chronic illness living at home—a case study. *Scandinavian Journal of Caring Sciences, 24*(2), 259–265.
Nosek, B. A., Graham, J., Lindner, N. M., Kesebir, S., Hawkins, C. B., Hahn, C., & Tenney, E. R. (2010). Cumulative and career-stage citation impact of social-personality psychology programs and their members. *Personality and Social Psychology Bulletin, 36*(10), 1283–1300.
O'Driscoll, M. P., Brough, P., Timms, C., & Sawang, S. (2010). Engagement with information and communication technology and psychological well-being. In P. L. Perrewe, & D. C. Ganster (Eds.), *Research in occupational stress and well-being: Vol. 8. New developments in theoretical and conceptual approaches to job stress* (pp. 269–316). Bingley, UK: Emerald.
Orlowski, S. K., Lawn, S., Venning, A., Winsall, M., Jones, G. M., Wyld, K., & Collin, P. (2015). Participatory research as one piece of the puzzle: A systematic review of consumer involvement in design of technology-based youth mental health and well-being interventions. *JMIR Human Factors, 2*(2), e12.
Park, Y., & Chen, J. V. (2007). Acceptance and adoption of the innovative use of smartphone. *Industrial Management & Data Systems, 107*(9), 1349–1365.
PhilHealth. (2015). *List of accredited hospitals as of March 31, 2015*. Retrieved from https://www.philhealth.gov.ph/partners/providers/institutional/accredited/hospitals_032015.pdf.
Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual Review of Psychology, 63*, 539–569.
Poghosyan, L., Clarke, S. P., Finlayson, M., & Aiken, L. H. (2010). Nurse burnout and quality of care: Cross-national investigation in six countries. *Research in Nursing & Health, 33*(4), 288.
Prgomet, M., Georgiou, A., & Westbrook, J. I. (2009). The impact of mobile handheld technology on hospital physicians' work practices and patient care: A systematic review. *Journal of the American Medical Informatics Association, 16*(6), 792–801.
Putzer, G. J., & Park, Y. (2012). Are physicians likely to adopt emerging mobile technologies? Attitudes and innovation factors affecting smartphone use in the Southeastern United States. *Perspectives in Health Information Management, 9*(Spring), 1b.
Randell, R., & Dowding, D. (2010). Organisational influences on nurses' use of clinical decision support systems. *International Journal of Medical Informatics, 79*(6), 412–421.
Rauschnabel, P. A., Brem, A., & Ivens, B. S. (2015). Who will buy smart glasses? Empirical results of two pre-market-entry studies on the role of personality in individual awareness and intended adoption of Google Glass wearables. *Computers in Human Behavior, 49*, 635–647.
Rivis, A., & Sheeran, P. (2003). Descriptive norms as an additional predictor in the theory of planned behaviour: A meta-analysis. *Current Psychology, 22*(3), 218–233.
Rosenthal, S. (2017). Data imputation. In J. Matthes (Ed.), *International encyclopedia of communication research methods*. Wiley-Blackwell. https://doi.org/10.1002/9781118901731.iecrm0058.
Royal College of Nursing. (2016). *RCN position statement: Nursing staff using personal mobile phones for work purposes*. Retrieved from https://www.rcn.org.uk/-/media/royal-college-of-nursing/documents/publications/2016/november/005705.pdf.
Schalow, P. R., Winkler, T. J., Repschlaeger, J., & Zarnekow, R. (2013). The blurring boundaries of work-related and personal media use: A grounded theory study on the employee's perspective. In *Proceedings of the 21st European conference on information systems, Utrecht, The Netherlands*. Retrieved from https://www.researchgate.net/profile/Till_Winkler/publication/261527899_The_Blurring_Boundaries_Of_Work-Related_And_Personal_Media_Use_A_Grounded_Theory_Study_On_The_Employee's_Perspective/links/0046353480418423960000000.pdf.
Sharpe, B., & Hemsley, B. (2016). Improving nurse–patient communication with patients with communication impairments: Hospital nurses' views on the feasibility of using mobile communication technologies. *Applied Nursing Research, 30*, 228–236.
Sheng, M. L., & Chien, I. (2016). Rethinking organizational learning orientation on radical and incremental innovation in high-tech firms. *Journal of Business Research, 69*(6), 2302–2308.
Shin, D. H. (2015). Effect of the customer experience on satisfaction with smartphones: Assessing smart satisfaction index with partial least squares. *Telecommunications Policy, 39*(8), 627–641.
Shin, D. H., Shin, Y. J., Choo, H., & Beom, K. (2011). Smartphones as smart pedagogical tools: Implications for smartphones as u-learning devices. *Computers in Human Behavior, 27*(6), 2207–2214.
Shoham, S., & Gonen, A. (2008). Intentions of hospital nurses to work with computers: Based on the theory of planned behavior. *Computers Informatics Nursing, 26*(2), 106–116.
Shteynberg, G., Gelfand, M. J., & Kim, K. (2009). Peering into the "magnum mysterium" of culture: The explanatory power of descriptive norms. *Journal of Cross-Cultural Psychology, 40*(1), 46–69.
Smith, J. R., Terry, D. J., Manstead, A. S., Louis, W. R., Kotterman, D., & Wolfs, J. (2008). The attitude–behavior relationship in consumer conduct: The role of norms, past behavior, and self-identity. *The Journal of Social Psychology, 148*(3), 311–334.
Son, H., Park, Y., Kim, C., & Chou, J. S. (2012). Toward an understanding of construction professionals' acceptance of mobile computing devices in South Korea: An extension of the technology acceptance model. *Automation in Construction, 28*, 82–90.
Soper, D. (2017). *A-priori sample size calculator for structural equation models*. Retrieved from https://www.danielsoper.com/statcalc/calculator.aspx?id=89.
Sparks, P., Guthrie, C. A., & Shepherd, R. (1997). The dimensional structure of the perceived behavioral control construct. *Journal of Applied Social Psychology, 27*(5), 418–438.
Stephens, K., Zhu, Y., Harrison, M., Iyer, M., Hairston, T., & Luk, J. (2017). January). Bring your own mobile device (BYOD) to the hospital: Layered boundary barriers and divergent boundary management strategies. In *Proceedings of the 50th Hawaii international conference on system sciences (HICSS). Kauai, HI* (pp. 3517–3526). Piscataway, NJ: IEEE.
Terry, D. J., & O'Leary, J. E. (1995). The theory of planned behaviour: The effects of perceived behavioural control and self-efficacy. *British Journal of Social Psychology, 34*(2), 199–220.
Torkzadeh, G., & Doll, W. J. (1999). The development of a tool for measuring the perceived impact of information technology on work. *Omega, 27*(3), 327–339.
Van Bogaert, P., Meulemans, H., Clarke, S., Vermeyen, K., & Van de Heyning, P. (2009). Hospital nurse practice environment, burnout, job outcomes and quality of care: Test of a structural equation model. *Journal of Advanced Nursing, 65*(10), 2175–2185.
van Raaij, E. M., & Schepers, J. J. (2008). The acceptance and use of a virtual learning environment in China. *Computers & Education, 50*(3), 838–852.
Venkatesh, V., & Zhang, X. (2010). Unified theory of acceptance and use of technology: US vs. China. *Journal of Global Information Technology Management, 13*(1), 5–27.
Vrieze, S. I. (2012). Model selection and psychological theory: A discussion of the differences between the Akaike information criterion (AIC) and the bayesian information criterion (BIC). *Psychological Methods, 17*(2), 228.
Wang, Y., & Benner, A. D. (2014). Parent–child discrepancies in educational expectations: Differential effects of actual versus perceived discrepancies. *Child Development, 85*(3), 891–900.
Weber, S., Crago, E. A., Sherwood, P. R., & Smith, T. (2009). Practitioner approaches to the integration of clinical decision support system technology in critical care. *Journal of Nursing Administration, 39*(11), 465–469.
While, A., & Dewsbury, G. (2011). Nursing and information and communication technology (ICT): A discussion of trends and future directions. *International Journal of Nursing Studies, 48*(10), 1302–1310.

White, K. M., Smith, J. R., Terry, D. J., Greenslade, J. H., & McKimmie, B. M. (2009). Social influence in the theory of planned behaviour: The role of descriptive, injunctive, and in-group norms. *British Journal of Social Psychology, 48*(1), 135–158.

Williams, B., Onsman, A., & Brown, T. (2010). Exploratory factor analysis: A five-step guide for novices. *Australasian Journal of Paramedicine, 8*(3), 1–13.

Wu, L., Li, J. Y., & Fu, C. Y. (2011). The adoption of mobile healthcare by hospital's professionals: An integrative perspective. *Decision Support Systems, 51*(3), 587–596.

Xue, Y., Liang, H., Mbarika, V., Hauser, R., Schwager, P., & Getahun, M. K. (2015). Investigating the resistance to telemedicine in Ethiopia. *International Journal of Medical Informatics, 84*(8), 537–547.

Yi, M. Y., Jackson, J. D., Park, J. S., & Probst, J. C. (2006). Understanding information technology acceptance by individual professionals: Toward an integrative view. *Information & Management, 43*(3), 350–363.