Investigating primary health care nurses' intention to use information technology: An empirical study in Taiwan

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ABSTRACT

Information technology (IT) has become a significant part of providing consistent care quality. The applications of the primary health information system (PHIS) in primary health care have rapidly influenced the care service delivery. Improved understanding of critical antecedents leading the PHIS usage can serve as a foundation for practice to develop implementation strategies and enhance system use for nurses. In accordance with the theory of reasoned action (TRA), this study aims to investigate the antecedents that influence nurses to use the PHIS, and to incorporate a framework of technology acceptance by individual professionals to improve the IT attitude in the health care setting. A total of 768 valid questionnaires were completed by primary health care nurses. The results indicated that compatibility has a positive influence on the perceived usefulness and perceived trust in the PHIS. If primary health care nurses perceive the PHIS to be trustworthy then they are more likely to consider it to be useful. In addition, when the PHIS is seen as both trustworthy and useful, then nurses are more likely to have a positive attitude toward using it. These findings have valuable implications for technology management practice in promoting PHIS usage by primary health care nurses.

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1. Introduction

The primary health information system (PHIS) is a technological aid to primary health care services, and is expected to bring about a significant improvement in the quality of care practice and delivery. The implementation of information technology (IT) is being acknowledged to have a positive influence on health care quality and efficiency [69,71]. Increasing the use of the PHIS by nurses is generally recognized as an important facilitator of primary health care improvement in Taiwan. But, these nurses are experiencing heavy workloads as the ratio of nurses to care recipients in urban areas is 1:14,273 people [25]. Because of this, taking on a new system appears burdensome to them in their already busy routine practice, hence promoting the PHIS to these nurses and avoiding negative feedback is difficult and costly [21,43,44,75].

It is unlikely that the full benefits of an integrated national care system can be fully realized without the usage of PHIS by nurses. Any single nurse resisting its use may impair care quality because the lack of updated information may result in misleading medical data in multiple sub-systems. Many health care organizations have experienced resistance to the implementation and the use of IT in the workplace

from nurses and other health care professionals [13,38,39,45,51,67]. Generally, the use of the PHIS is discretionary and nurses are not compelled to use it, partly because they can still access the legacy systems. Moreover, health care professionals are entitled to make their own decisions regarding system usage [27]. In response to this concern, researchers have suggested that the decision-making process on IT usage should be addressed [6,27,58]. This could increase the possibility of adopting the new technology in their workplace [6,58]. Traditionally, discussions of IT acceptance by health care professionals have focused primarily on the role of physicians [13,19,52,74]. Whereas the findings from these previous studies may not be suitable for extrapolation to nurses in primary health care [71], little attention has been addressed to IT acceptance by them [56,70], who are actually the main providers of primary health care [25,75].

Motivated by the need to further the understanding of nurses' intentions to use PHIS, this study structures the theory of reasoned action (TRA) as a basis for investigating these. Health care professionals usually differ from general users in terms of their innovative adoption process [71]; an extension of attitude within a framework for technology acceptance is used to comprehensively understand the critical antecedents of nurses' attitudes toward PHIS usage [26,41,48]. This study builds on Chau and Hu's [20] proposed framework where the individual context has a direct impact on IT acceptance; the technological context has a direct impact on the individual context and would be directly influenced by the implementation context. In the individual context, attitude and co-workers' viewpoints are proposed as two essential components. The perceived IT attributes in the technological context are described

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as perceived usefulness and perceived trust. In addition, introducing new technology into the workplace may radically change the established work processes. To address such concerns, system compatibility in the implementation context is described as the fit between PHIS and work needs.

Understanding these factors could provide useful information to policy makers and government agencies on how to successfully introduce PHIS. Further, the field of research regarding nurses' utilization of IT lacks adequate studies to explain attitude formation. The particular beliefs that contribute to attitude formation can be identified by observing the causal relationships in this study providing a reference base for IS vendors in planning and evaluating the PHIS design. We first discuss primary health care nursing and PHIS, the TRA theory, the framework for technological acceptance by an individual professional and the review of previous IT acceptance studies. Second, we propose the investigated model and hypotheses based on the theoretical support. Third, using the data collected from primary health care centers throughout Taiwan, we examine the causal links in the proposed model and provide several implications for associated practitioners. Lastly, limitations and future directions are briefly presented.

2. Theoretical background

2.1. Primary health care nursing and the primary health information system

Primary health care, with its focus on delivering basic care and disease prevention services for everyone, is proposed as a way to create a healthy environment [21,75]. Currently, Taiwan is facing the problem of an unequal distribution of health care resources with the majority of nurses and the location of larger medical institutes being in urban areas. Resources for patients living in the countryside are lagging behind [25]. Those who live in these rural areas (i.e. mountainous regions, remote islands, the countryside and small towns) rely mainly on the medical services provided by local primary health care centers [25]. These health care centers comprise the total epidemic prevention network, which means that primary health care nurses play an important role in disease prevention and the improvement of public health [25]. Through the reinforcement of primary health care services in each district, people living in the countryside receive adequate medical services and information from local primary health care nurses.

The advantage of building a primary health care system for people is that nurses are highly capable of organizing suitable care services to satisfy the basic needs of local patients [25]. The nurses have a deep understanding of patients' needs because of their long-term interaction with the local community [25,75]. They provide the basic level of health care service in Taiwan, and their actions deeply influence the quality of medical services nationally. As suggested by the Department of Health (DOH) [25], primary health care nurses should put more emphasis on participating in the improvement and prevention of public health and also on developing a partnership with local community teams. The fast and changing health environment highlights several issues which primary health care nurses must face in Taiwan such as establishing a community health service network and promoting a standard for health service, and more importantly structuring a system for disease evaluation and monitoring [61].

Nurses have to spend additional effort to ensure that patient information is consistent and correct in the legacy systems, potentially causing an obstruction to comprehensive care service. The DOH intends to set up an integrated national primary health care system, PHIS, in each primary health care center to support the delivery of a better and faster response to local patients. Through the use of such a system, nurses have the potential to improve disease management and quality of care, and to provide more reliable care services. In early 2007, DOH was seeking an IS vendor to develop a PHIS which is capable of performing disease management, establishing a disease prevention system, and monitoring

chronic disease care and other major health problems that may affect the public. The main requirements for a PHIS are addressed in the following: (a) to design the architecture for the primary health care that meets the specific requirements documented, (b) create an infrastructure that can be extended to allow the integration of the current sub-systems within the PHIS, (c) develop a module based system so that additional modules can be added to the system to meet the future needs. A beta of the full functionality is expected by the end of 2013.

This study is conducted in voluntary usage contexts in which primary health care nurses have a choice about their use of the legacy systems or PHIS in its implementation stage. The PHIS implementation process is firstly to update the sub-systems that are embedded in the legacy systems, and then have the key users interact with the newly updated functions and provide feedback for their development. However, it is all proving very time-consuming. Apparently, the best way to accommodate the change and reduce the risk of resistance is to keep the routine applications in the legacy systems for nurses to use alongside the updating process. Therefore, the legacy system and PHIS currently exist together. As any improper usage in an unfamiliar system may result in serious injury to patients, nurses are encouraged but not compelled to use PHIS in the implementation stage.

2.2. Theory of reasoned action

The TRA, developed by Fishbein and Ajezn [28], states that a person's intention to perform a given behavior is a function of his or her attitude toward that behavior and his or her subjective norm concerning that behavior. The attitude toward performing a certain behavior is assumed to be based on his or her beliefs about that behavior. In other words, attitude is the degree to which one has a positive versus a negative evaluation of a certain behavior [28]. The subjective norm is the person's perception that most people who are important to them think they should or should not perform the behavior [28]. The co-workers' viewpoint is like a kind of subjective norm that influences a person to perform a certain behavior. Later, Ajzen [2] integrated perceived behavioral control with TRA to predict individual intention and behavior that are not completely under volitional control. In the theory of planned behavior (TPB), Ajzen [2] believed that persons with a higher perceived behavioral control are more likely to form a strong intention to perform a given behavior than those who perceive that they have lower control.

Based on the concept of the TRA, Davis [23] developed the technology acceptance model (TAM) to predict user acceptance of IT. The TAM posits that the main determinants of behavioral intention are perceived usefulness and perceived ease of use [23]. The TRA, the TPB, and the TAM have provided the theoretical basis for many studies on understanding intention toward IT usage and even for researchers to integrate various theories into their individual behavioral model [45,68,74]. In the TRA, attitude is the central construct in understanding and explaining behavioral intention [4,8]. Compared with the effect of the subjective norm, the causal relationship of IT acceptance with a user's attitude is much stronger than that with the subjective norm in normal situations [35,36,72]. Basically, the use of PHIS in primary health care services involves a series of evaluation processes within the nurses' mind to verify the value of usage. At the same time, the nurses may be influenced by social pressure, such as from colleagues, physicians or head nurses. The core concept throughout the TRA allows for the explanation and prediction of IT usage under volitional control, with the potential to increase the understanding of nurses' attitude toward PHIS usage.

2.3. A generic framework for technology acceptance by individual professionals

Nurses are professionals in an emergency environment. They can provide health care with skill and responsibility. Their knowledge, education, and training enable them to provide professional support to