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Evaluation of a Quality Management Initiative and HIV Ambulatory Services Performance in Thailand

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EVALUATION OF A QUALITY MANAGEMENT INITIATIVE AND HIV AMBULATORY SERVICES PERFORMANCE IN THAILAND

by

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ABSTRACT

The accomplishment of pilot implementation of the HIVQUAL-T model, an innovative HIV care quality management tool, has led to an authoritative decision to scale up the use of the model nationwide in Thailand. However, the level of implementing this model varies across target hospitals. Some hospitals have fully adopted the model by conducting quality improvement (QI) activities following performance measurement (PM) results while others have partially adopted only PM or have not used this model at all. The differential level of implementation could be a contributing factor accounting for discrepancies in the quality of care across different HIV ambulatory care facilities.

A cross-sectional study was conducted by using two main datasets, including Thailand's national HIV care performance results and an online survey of all public hospitals nationwide. A total of 382 hospitals responded to the survey, accounting for a response rate of 50%. A confirmatory factor analysis (CFA) method was performed to examine the validity of latent constructs developed from the diffusion of innovation theory. Structural equation modeling (SEM) approach was employed to investigate the relationship between the determinants of organizational decision-making and their contribution to organizational outcomes, under the context-design-performance framework. Furthermore, using a panel model of hospitals that reported performance results across a 3-year period, the improvement in HIV ambulatory services performance among the adopters was examined.

The results indicated that two innovation attributes – relative advantage and simplicity perceived by HIV care practitioners in hospitals – were found to be positively associated with the

level of the HIVQUAL-T model implementation. Two structural characteristics – interconnectedness and organizational slack – appeared to be positively associated with the level of model implementation, while rate of adoption in the region also had significant positive contribution. Ultimately, the extensiveness of the HIVQUAL-T model implementation demonstrated a proportionate impact on the variation in hospitals' HIV ambulatory services performance. It was noted that the implementers considerably improved their performance within two years of implementing the model.

The study findings imply that adoption is more likely when individual practitioners assess the innovation and find it to be easy to comprehend and operate and also worthwhile to implement. Furthermore, hospitals' decision making is likely influenced by their relations to external environment. The findings suggest more emphasis on individual and hospital-level capacity building for meaningful use of this quality management initiative, accompanied by an adjustment of performance measurement software with valid, reliable, and interpretable indicators.

To the loving memory of my grandparents
-Yod & Nanta Thaveephon-
To my parents -Nat & Malee-
To my beloved husband -Beet-
To my family

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LIST OF ACRONYMS/ABBREVIATIONS

AEM	Asian Epidemiological Model
AIDS	Acquired Immune Deficiency Syndrome
ART	Antiretroviral Therapy
BATS	Bureau of AIDS, Tuberculosis, and Sexually Transmitted Infections
CFA	Confirmatory Factor Analysis
HIV	Human Immunodeficiency Virus
HRSA	U.S. Department of Health and Human Services, Health Resources and Services Administration
NAP	National AIDS Program
NHSO	National Health Security Office
NYSAI	New York State Department of Health AIDS Institute
OI	Opportunistic Infection
PAP	Papanicolaou test
PCP	Pneumocystis Pneumonia prophylaxis
PLHA	Person living with HIV/AIDS
PM	Performance Measurement
PMTCT	Prevention of Mother-to-Child Transmission
QI	Quality Improvement
SEM	Structural Equation Modeling

STIs	Sexually Transmitted Infections
TB	Tuberculosis
TQM	Total Quality Management
TUC	Thailand Ministry of Public Health and U.S. Centers for Disease Control and Prevention Collaboration
UNGASS	United Nations General Assembly Special Session
VCT	Voluntary Counseling and Testing

CHAPTER ONE: INTRODUCTION

This study investigated organization structural characteristics and individuals' perceptions that could determine the adoption of a quality management model, and the extent to which differential adoption of the model could improve HIV ambulatory service performance. The study was conducted in Thailand with a nationwide survey of all hospitals with an HIV care unit that were introduced with the model in the year 2007. This chapter addresses the study background and significance of the problem, along with research questions, theoretical context, scope of the study, and definition of the terms used in the study.

Current HIV/AIDS Setting: A Focus on HIV Care Quality

The response to the human immunodeficiency virus (HIV) pandemic is critical to progress across the global development agenda. Over the past three decades, many countries have stepped up efforts with multisectoral, multinational alliances to fight the epidemic. After the AIDS epidemic passed its peak in 1999, the number of new infections decreased by 19% globally (UNAIDS, 2010).

Despite the significant decline, HIV/AIDS, as a chronic disease with a multifaceted nature, requires access to comprehensive care from health care professionals. Currently, HIV-infected patients' life expectancies have increased through the delivery of clinical care and treatment services, particularly antiretroviral therapy, prophylaxis and treatment of opportunistic infections, general medical health screenings, promotion of healthy activities, and retention in medical care (Horberg et al., 2010). There are more than 5 million people around the world receiving HIV treatment as of 2009 (UNAIDS, 2010). Yet the need for intensified action to move towards the access to HIV service

delivery to HIV prevention, treatment, care, and support persists, and in particular, the monitoring and evaluation of HIV care is essential in order to improve clinical service delivery and ultimately the quality of life of people living with HIV/AIDS (PLHA) (Avert, 2010).

HIV Care and Treatment, and Monitoring System in Thailand

Thailand, among developing countries encountering HIV/AIDS problems, has instituted a series of successful campaigns that helped to reduce the HIV prevalence nationally (Tantives & Walt, 2006). The rate of infection in Thailand continues to decrease over time. The number of people newly infected with HIV is estimated to have fallen from approximately 140,000 in 1991 to 10,097 in 2011 (Avert, 2010; National AIDS Prevention and Alleviation Committee, 2010), with a significant decline of AIDS-related deaths from 8,589 in 2001 to 1,276 cases in 2009 (Epidemiological Information Section, 2010).

As indicated by the Asian Epidemiological Model (AEM) projection, the estimated number of PLHA who met the indications for highly active antiretroviral therapy (HAART) criteria in 2008 and 2009 was 266,369 and 275,621, respectively. Thailand's nationwide scaling up to increase ART coverage was deemed to be successful; however, 25% of the eligible PLHA are still without access. Among those treated, 85% are known to still be under treatment 12 months after initiation of ART, according to the indicator data reported to the United Nations General Assembly Special Session (UNGASS) in 2010 (National AIDS Prevention and Alleviation Committee, 2010). Yet, there has not been much evidence of other HIV care indicators, such as opportunistic infection prophylactic treatment or baseline screening services, reported officially.

In 2007, the National Health Security Office (NHSO) introduced the National AIDS Program (NAP) Database system to monitor PLHA care and treatment throughuot the country. The core modules of the NAP system consist of registration, following, authorization for second line ARV, laboratory request, and reports. This paperless system also includes four additional modules: voluntary counseling and testing (VCT), prevention of mother-to-child transmission (PMTCT), postexposure prophylaxis, and reporting systems (National AIDS Prevention and Alleviation Committee, 2010). In the meantime, the Ministry of Public Health, Bureau of AIDs, TB, and STIs (BATS) has nationally introduced the 'HIVQUAL-T' model for evaluating HIV ambulatory service performance in which hospitals all over the country have to report their performance evaluation results annually (BATS, 2011). The HIVQUAL-T model is now adjusted to be compatible with the NAP data (National AIDS Prevention and Alleviation Committee, 2010).

The 'HIVQUAL' Model: A Quality Management Initiative for HIV Care

Performance measurement is an essential element in any quality improvement strategy. It provides health care practitioners with the diagnostic information they need to make informed improvement decisions. Thus, measuring clinical performance could be regarded as an important step in providing better care for patients (NYS Department of Health AIDS Institute, 2006). There have been attempts to develop HIV care quality measures to monitor and evaluate HIV clinical performance at the system level, clinic level, and individual level (AMA & NCQA, 2008; Backus et al., 2010; Horberg et al., 2010).

HIVQUAL-U.S.

The New York State Department of Health AIDS Institute (NYSAI) initiated an HIV Quality of Care program in New York State in 1992, which later was expanded to HIV ambulatory clinics throughout the U.S. under the title "the National HIVQUAL Project." Sponsored by the U.S. Department of Health and Human Services, Health Resources and Services Administration (HRSA)'s HIV/AIDS Bureau, the HIVQUAL software is offered to participants at no cost and is designed to facilitate monitoring of HIV clinical care based on clinical practice guidelines developed by the NYSAI (U.S. Department of Health and Human Services, Health Resources and Services Administration (HRSA), 2011). The program is accountable for the systematic monitoring of medical care quality and support services for HIV-infected people (Horberg et al., 2010; Warner, Drainoni, Parker, Agins, & Eldred, 2004). Most recently, the HIV/AIDS Expert Panel Work Group has coordinated multiple HIV quality measures developed by many organizations, including HIVQUAL indicators. The HIV quality measures created are formally approved and are now being "beta tested" by a few organizations. It is expected that many of these measures could serve as quality improvement elements to resolve gaps in care and to ensure continued success of quality HIV care (Horberg et al., 2010). The HIVQUAL program has now been adopted and implemented in 12 developing countries around the world. Each country applies similar core clinical indicators with additional indicators that are culturally adjusted to serve their HIV care setting (http://healthqual.org/).

HIVQUAL-Thailand

As the first to implement the HIVQUAL model outside the U.S., Thailand's Ministry of Public Health along with the U.S. Centers for Disease Control and Prevention Collaboration (TUC)

have developed the HIVQUAL-T Model, a Thai version of the HIV quality management initiative originally created by the NYSAI. As a monitoring and evaluation tool for HIV care, the model comprises three core components, including 1) performance measurement (PM) with HIVQUAL-T software and indicators based on national guidelines for HIV/AIDS care and treatment; 2) quality improvement (QI) activities following performance data derived from the measurement; and 3) infrastructure development for building hospital-level capacity to interpret performance data, prioritize quality needs, and implement QI processes. The performance assessment and quality improvement activities are guided and facilitated through interactive group learning with experienced implementers (Ningsanond, et al., 2008; Utaipiboon, 2011). The current core indicators for measuring HIV ambulatory service performance include HIV status monitoring with CD4 cell and viral load tests; primary opportunistic infection (OI) prophylaxis; antiretroviral therapy medication; disease screening (e.g., tuberculosis, cervical cancer, CMV retinitis, sexually transmitted infections, hepatitis B/C); and health promotion (e.g., health education, mental health assessment, HIV disclosure to partner) (BATS, 2011).

Adoption and Diffusion of the HIVQUAL-T Software

In 2002, the HIVQUAL-T Model was adopted in pilot sites that reported the most number of people living with HIV/AIDS, which resulted in a better quality of HIV ambulatory services. The evaluation of the HIVQUAL-T model in pilot sites showed a gradually increasing percentage in most core performance indicators as the result of QI projects for eligible patients receiving care and treatment from 2003 to 2006 (BATS, 2011). There have been efforts to promote the model to all public hospitals nationwide and to integrate the practice into a national hospital accreditation system in order to facilitate national expansion (Supawitkul, 2006). Numbers of the HIVQUAL-T adopters

increased from 12 pilot hospitals in 2002 to 228 hospitals in 2006. The Bureau of AIDS, TB, and STIs (BATS) is now encouraging all public and private hospitals to report their HIV clinical service performance using the HIVQUAL-T software and is aiming for the expansion of the HIVQUAL-T system to cover 900 hospitals by 2011 (BATS).

Although the accomplishment of its pilot implementation is obvious, the Ministry's attempt to nationally scale-up the use of HIVQUAL-T model by providing HIVQUAL-T training in 2007 throughout the country convinced only 52% of the participating hospitals to submit their performance reports as of 2008 (Ningsanond et al., 2008). The number of hospitals that submitted the reports slightly decreased in 2009, which could imply that some hospitals may disengage from using the software after adoption. Furthermore, among the adopters, some hospitals reported only the use of HIVQUAL-T performance measurement software but did not report the extensive implementation of quality improvement projects using the measurement results, which is the second element of the model. Such differential adoption and implementation of the HIVQUAL-T model at the national level may entail the significance of factors additional to institutional influences related to the hospitals' decision making to put the model into operation. Although, according to the information from BATS, overall HIV ambulatory services quality has improved over time after the nationwide expansion during 2007–2009, little is known about the variation in quality across different facilities that vary in their structures and level of HIVQUAL-T model implementation.

Consequently, understanding HIV care practitioners' perceptions of the attributes of the HIVQUAL-T model and the hospitals' organizational structural characteristics is essential for profiling HIV clinics' quality management practice. The investigation of HIV care practitioners' perceptions could lead to the adjustments of the HIVQUAL-T model attributes and the early

adaptation of health care providers towards new interventions. Identifying organization structural characteristics could also help to determine organizational decision-making and organizational innovativeness, which may contribute to better organizational performance. Additionally, examining the extent to which the use of the HIVQUAL-T model could lead to hospitals' better delivery of appropriate HIV clinical care and treatment services on a wider scale would help to demonstrate the effectiveness of this initiative.

Research Questions

This study examined the relationships among contextual factors, structural factors, organizational decision making, and organizational performance in two aspects: 1) perceived innovation attributes and organizational structural characteristics as predictors for hospitals' innovation adoption, and 2) the extent of HIVQUAL-T model adoption contributing to HIV ambulatory services quality. In examining these relationships, the primary research questions of this study are as follows:

Q1: To what extent do innovation attributes, as perceived by HIV care practitioners, contribute to the variation in HIVQUAL-T model adoption among hospitals?

Q2: To what extent do organizational structural characteristics contribute to the variation in HIVQUAL-T model adoption among hospitals?

Q3: Do different levels of HIVQUAL-T model adoption contribute to the variation in HIV ambulatory care and treatment services performance among hospitals?

Theoretical Context

HIVQUAL-T model was first introduced to 12 hospitals in Thailand in 2002 as a new approach for HIV ambulatory service quality management and is now expanding to all hospitals nationwide. It is expected that 914 hospitals, both public and private, would be implementing the HIVQUAL-T model by 2011 (BATS, 2011). The present study applies Everett M. Rogers' Diffusion of Innovation theory to explore the influence of innovation attributes and organization structural characteristics on hospitals' decision making. Rogers (2003) defined 'innovation' as "the idea, practice, or object that is perceived as new by an individual or other unit of adoption…whether or not an idea is objectively new as measured by the lapse of time since its first use of discovery" (p. 12). Newness in an innovation need not just involve new knowledge but may be expressed in terms of knowledge, persuasion, or a decision to adopt.

The characteristics of innovations, as perceived by individuals in a system, can help explain their different rate of adoption. The perceived attributes of innovation include relative advantage, compatibility, complexity, trialability, and observability (Rogers, 2003). However, research on the influence of innovation attributes on organizational adoption is rare (Rye & Kimberly, 2007). Perceived compatibility, perceived ease of use, relative advantage, and observability are found to be associated with the adoption or intention to adopt a new technology (Damanpour & Schneider, 2008; Knudsen, Roman, & Johnson, 2003; Scott, Plotnikoff, Karunamuni, Bize, & Rodgers, 2008; Tung, Chang, & Chou, 2008). The study of HIVQUAL-T model attributes would help identify both desirable and undesirable characteristics of the innovation that influence hospitals' adoption decisions and also provide a theoretical contribution to the development and validation of innovation attribute constructs.

Despite some similarities of characteristics associated with earliness of adoption (or innovativeness), organizations' innovation decision processes are more complex than individuals' processes. Rogers (2003) illustrated organizational structure variables related to the innovativeness of organizations including centralization, complexity, formalization, interconnectedness, and organizational slack. Organizational structural characteristics' contribution to organizational adoption has been studied in most innovation research employing diffusion of innovation and innovation theoretical perspectives (Damanpour & Gopalakrishnan, 2008; Hikmet, Bhattacherjee, Menachemi, Kahan, & Brooks, 2008; Kimberly & Cook, 2008; Kimberly & Evanisko, 1981; Moch & Morse, 1977). Many studies of health care providers' innovation adoption found that organizational attributes such as hospital size, ownership, and policy also contribute to the adoption of innovation (Kaluzny, Glasser, Gentry, & Sprague, 1970; Kaluzny, Veney, & Gentry, 1974). In the study context, Thai public hospitals' structural characteristics generally vary across their levels of operation and capacity. An investigation of organizational determinants could identify some structural barriers to HIVQUAL-T model adoption among hospitals. A study of innovation adoption in a country with a unique context like Thailand's may provide a creative way to incorporate organizational culture into the explanation of structural characteristic constructs in innovation research as well.

According to Kovach, Morgan, Nooman, and Brondino (2008), diffusion of innovation is an effective model for making changes in performances of healthcare organizations. However, there are very few studies that examine the influences of the benefits of innovation on organizational adoption of innovation (Rye & Kimberly, 2007). The ultimate goal of HIVQUAL-T implementation, similar to the original HIVQUAL program initiated in the U.S., is to improve quality of HIV care (Agins, et al., 2004; Drainoni, Warner, & Johnson, 2002). Since HIVQUAL-T was reported to increase HIV clinical service performance in pilot sites, an investigation of the performance of HIV ambulatory

care and treatment practice in relation to the HIVQUAL-T adoption would reflect the extent that HIVQUAL-T implementation outcome has been accomplished, particularly in the period during which the healthcare setting put more focus on quality management and medical facility performance.

Moreover, there have been no studies, as reported to date, that systematically investigate a whole policy implementation process by considering contextual factors, organizational structure, individual perceptions, organizational practices, and organizational performance all together using a system approach jointly with innovation diffusion theory. Thus, this study sought to shed light on the application of innovation diffusion theory further than its conventional purposes by linking the theoretically informed constructs to adoption decision making, organizational innovativeness, and organizational performance in its hypothesized model.

Scope of the Study

For the purpose of this study, the implementation of HIVQUAL-T model was defined as the hospital practices on performance measurement and quality improvement in HIV clinical service delivery. As the nationwide scaling-up program emphasized capacity building for HIV care practitioners, it was expected that the practitioners' perceptions on the HIVQUAL-T model would play an important role in adoption decision-making and implementation at the hospital level, in concurrence with organizational structural characteristics. However, some environmental factors such as market competition were not covered in this study. Since the focal populations are public hospitals classified as regional, general, and community hospitals serving local areas, they are not subjected to a competitive environment. On the other hand, a contextual determinant considered in

this study was the adoption rate at the regional level, which implied the facilitation of performance measurement and quality improvement implementation through peer-to-peer learning, as indicated previously as a component of the HIVQUAL-T philosophy. In addition, as this study aimed to examine the extent that the adoption in the nationwide scaling-up period would contribute to better HIV clinical service delivery, pilot hospitals that implemented this model during the years 2003–2005 were excluded from the study population in order to rule out the impact of the length of exposure to the HIVQUAL-T model.

This study focused on the adoption and implementation of the model at 828 public hospitals in Thailand. The inclusion criteria for the selected hospitals included hospitals that 1) are public hospitals operating under the Ministry of Public Health; 2) never participated in HIVQUAL-T pilot implementation during the years 2003–2005; 3) never adopted and implemented the HIVQUAL-T model prior to the year 2006; 4) had submitted *at least* one HIV clinical care performance assessment report during the years 2006–2009 *or* never submitted any performance reports to BATS.

In dealing with theoretical latent constructs, this study used the confirmatory factor analysis (CFA) technique. Structural equation modeling (SEM) was employed to generate theoretically informed models to explain and examine complex relationships among multiple exogenous and endogenous variables. A cross-sectional analysis was conducted in order to compare the relative importance among the determinants of innovation adoption and variability of organizational performance regarding the differentials in adoption. A univariate analysis was performed with a panel model of hospitals' HIV clinical service performance across a 3-year period (2007–2009) in order to examine the improvement of their performance among the adopters.

Since the HIVQUAL-T model is dynamic by nature, with its measures of service quality applicable to varying HIV care settings, such as pediatric care, prevention, education, and so on, this study examined only the ambulatory care aspect of the hospitals' performance. The measures comprised six core indicators for baseline HIV care in a hospital: CD4 and viral load testing, opportunistic infection (OI) prophylaxis, antiretroviral therapy (ART), tuberculosis (TB) screening, sexually-transmitted infections (STIs) screening, and cervical cancer screening for women (PAP smear).

Definitions of Terms Used in the Study

Innovation

In this study, innovation was conceptualized, as stated by Rye and Kimberly (2007), as a "discrete, already developed material artifact or practice" (p. 240) that is put into use for the first time, regardless of whether the practice is objectively new or has ever been introduced or implemented in other organizations (Rogers, 2003). The study considered the HIVQUAL-T model as the focal innovation that has two main administrative components: performance measurement and quality improvement.

Adoption

This study defined adoption as the application of the technology: HIVQUAL-T software and implementation of quality improvement activities regarding performance assessment results in hospitals. HIVQUAL-T model adoption represented hospitals' decisions to bring the HIVQUAL-T

model into full use and their active participation to report their performance measurement results and quality improvement practices to the Ministry of Public Health.

Extensiveness of Innovation Adoption

Extensiveness of innovation adoption was defined as the extent to which hospital practices cover the two main components of the HIVQUAL-T model; thus, this term implied the level of completeness of the implementation in each hospitals, which ranged from no adoption (neither PM nor QI) to partial adoption (only PM) to full adoption (both PM and QI). Unlike other technologies, for which adoption is generally measured dichotomously at a single time point of the decision to use, the HIVQUAL-T model incorporates differing combinations of practice; therefore, the extensiveness of HIVQUAL-T adoption was divided into three stages: 1) no adoption, indicating no implementation of the model at all; 2) partial adoption, indicating the adoption of only performance measurement, the first component of the model; and 3) full adoption, indicating the adoption of performance measurement in first years of practices, followed by the implementation of quality improvement projects in later years.

HIV Services Performance

HIV services performance was defined as the extent to which a hospital could provide eligible patients with appropriate ambulatory services, including HIV status monitoring, treatment, prophylactic medicine, and disease screening. The study applied the concepts of HIV care and treatment according to the national guideline by measuring six aspects of HIV ambulatory care for outpatients: including viral load and CD4 screening, antiretroviral therapy, opportunistic infection

prophylaxis, tuberculosis screening, sexually transmitted infections screenings, and cervical cancer screening for women.

Perceived Innovation Attributes

Perceived innovation attributes was defined as the prospective adopters' perception of the characteristics of the innovation; thus, its measure was subjective and reflected secondary attributes. Five attributes were identified by Rogers (2003), including relative advantages, compatibility, complexity, trialability, and observability, were used in this study to explain HIV care practitioners' decision to adopt the HIVQUAL-T model.

Organization Structural Characteristics

This study defined organizational characteristics as internal characteristics of an organization that could influence innovation adoption behaviors of the adopters (Rogers, 2003). Organization structural characteristics included organizational centralization, complexity, formalization, interconnectedness, and organizational slack that were considered as determinants of HIVQUAL-T model adoption among hospitals at the time the innovation was adopted and put into practice.

Chapter Summary

The study's aims are to 1) explore the factors affecting the decision for HIVQUAL-T model adoption among hospitals in Thailand, and 2) investigate hospitals' HIV ambulatory services performance in relation to their extent of implementation of the model. The study of HIVQUAL-T model adoption could help policy decision makers and practitioners identify key components

contributing to the implementation of the model and the effectiveness of government intervention. Research findings could lead to the adjustments of HIVQUAL-T model attributes and the meaningful use of the model among healthcare providers. In addition, the study could provide a theoretical contribution in terms of the development and validation of construct measures as well as the application of diffusion of innovation theory in the culturally unique context of Thailand.

CHAPTER TWO: LITERATURE REVIEW

Performance measurement, as a means of evaluating organizational effectiveness, encouraging improvement, and making decisions for resource allocation, has become a significant part of quality management in health care, particularly in the domain of chronic disease ambulatory care settings within which the health status of patients has to be continuously monitored and assessed. The philosophy of the HIVQUAL model developed by the New York State Department of Health AIDS Institute emphasizes the ongoing measurement of HIV ambulatory care performance for quality improvement in clinical facilities. The model has been launched internationally since 2003 in Thailand, and it has now been expanded to cover 12 countries worldwide. With the focus in Thailand, this study views the use of the HIVQUAL-T model as an innovation adoption process that began with the Ministry of Public Health's intervention in few pilot sites to implementation at the national scale. Thus, the theoretical framework employed in this study was based on a "Diffusion of Innovation" perspective. This chapter presents an overview of diffusion of innovation theory; a review of the literature related to innovation adoption at the organizational level; a conceptual framework that portrays the relationship among contextual factors, organizational design, and organizational performance; and the study's theoretically informed hypotheses.

Diffusion of Innovation Theory: Overview

Diffusion of innovation is a perspective developed by Everett M. Rogers in 1962 to describe a general diffusion model among various innovation research traditions (2003). Rogers' theory is considered the only theory that covers both individual and organizational innovation domains

(Jerayaj, Rottman, & Lacity, 2006). Diffusion of innovation theory seeks to explain the spread of new technologies or practices. For a study of organization, innovation, according to this perspective, refers to the process by which an organization puts a technology or practice into use for the first time, regardless of whether other organizations have previously used the technology or practice (Rogers, 2003; Weiner, Helfrich, & Hernandez, 2006). A step for which the innovation represents application of a change is called "adoption." The process of incorporating new things within an organization can represent a strategic effort for that organization. Thus, innovation is a multiphase process, not a single event occurring at a single point of time (Pierce & Delbecq, 1977). The process of innovation diffusion is influenced by four main factors including the innovation itself, communication channels that enable the spread of the use of the innovation after it is adopted, time over which the communication is taken place, and a social system in which individuals or organizations are embedded (Rogers, 2003).

Definition of Innovation

As a concept related to organizational change that deals with any modification in organizational composition, structure, or behavior (Weiner et al., 2006), the theory of innovation has been frequently used as an approach for viewing individual and organizational change among various disciplines while the definitions of innovation are not much different among them (Damanpour & Scheider, 2008; Weiner et al., 2006). There are five types of innovations as defined by Joseph Schumpter (1930), the first economist who drew attention to the importance of innovation: 1) the introduction of the new product or qualitative change in an existing product; 2) process innovation new to an industry; 3) the opening of the new market; 4) development of new sources of supply for raw materials or other inputs; and 5) changes in industrial organization (Rogers, 1998).

Anthropologist H. G. Barnett viewed innovation as a basis for cultural change and defined innovation as "any thought, behavior, or thing that is new because it is qualitatively different from existing forms" (Robertson, 1967). For applying organizational perspective to innovation, Damanpour and Gopalakrishnan (1998) stated that innovation is an idea or behavior new to an organization. "Innovation can be a product or a service, an organization process or an administrative program, a technology, or a policy, or a system related to organizational members" (p. 3).

Robertson (1967) illustrated the framework for classifying innovations with regard to their effects on established patterns. Innovation can be classified as continuous innovations, dynamically continuous innovations, or discontinuous innovations. *Continuous innovations* involve alteration of a product rather than the establishment of a new one while *dynamically continuous innovations* involve the creation of a new product or the alteration of the existing product but still not a change to the established patterns. The most disrupting influence comes from *discontinuous innovations*, which involve the establishment of a new product and also the establishment of new behavior patterns.

Weiner et al. (2006) stated that innovation adoption and implementation processes may differ significantly for different types of innovations. Innovation researchers, particularly in the health care field, sometimes distinguish technological innovations from administrative innovations (Kimberly & Evanisko, 1981; Naranjo-Gil, 2009). However, Rogers (2003) stated that the words "innovation" and "technology" are often used as synonyms. In his sense, technology comprises both material or physical objects and information, such as political philosophy or religious ideas. According to him, technology is a means of reducing uncertainty. Once decision makers seek information about a technology and find the cause–effect relationships on which the technology is based, a decision concerning adoption or rejection can be made.

Innovation Adoption

A step that innovation represents application of a change is called "adoption." Rogers defined adoption as "the decision to make full use of the innovation as the best course of action available" (p. 21). The decision to adopt an innovation is a consequence of the innovation-decision process through which an individual or other decision-making unit passes from first knowledge of an innovation to putting the innovation into use and finally to confirming the full use of the innovation (Rogers, 2003). Adoption of innovation at the organizational level basically means that the innovation is new to the adopting units, who intend to obtain expected benefits from changes that the innovation may bring to the organization (Damanpour & Schneider, 2008).

As mentioned previously, innovations could be either physical forms or ideas. The adoption of some innovations, therefore, can be seen more clearly than the adoption of others. The concreteness of the innovation makes the operationalization of innovation vary, since organizations adopt innovation in a variety of ways, such as investing resources to purchase an innovation or hiring external consultants with specialized skills (Rye & Kimberly, 2007). For example, total quality management (TQM) represents both an innovative philosophy and a set of practices for improving the quality of health care services. Organizations adopt TQM by executing activities or interventions following TQM principles (such as conducting customer satisfaction surveys, providing employee training, or benchmarking). The measure of the adoption of such innovation would thus reflect discrete organizational decisions by managers' self-reports of activities or disseminated documents regarding the interventions (Projogo & Sohal, 2003; Rye & Kimberly, 2007; Young, Charns, & Shortell, 2001). Similarly, the HIVQUAL-T model involves the philosophy of quality management; thus, it encompasses both performance measurement using an assessment computer software and quality improvement as an intervention practice in HIV clinical service delivery system. Hence, in

this study the adoption of the HIVQUAL-T model is considered as a full use of these two main components.

Diffusion of Innovation

Rogers (2003) defined diffusion as the "process in which an innovation is communicated through certain channels over time among the members of social system. The diffusion of innovation is a kind of universal process of social change" (p.5). The diffusion of innovation has four main elements: innovation, communication channels, time, and a social system. When one individual delivers messages about innovation to others, *communication channels* are utilized as the means for the message delivery. Most intercommunication takes place when individuals share the same backgrounds or beliefs. The innovation-diffusion process, innovativeness, and an innovation's rate of adoption involve the *time* dimension. Additionally, the *social system* is a significant element as the context that allows the diffusion to take place. Social system is a set of interrelated units that are engaged in joint problem solving to accomplish a common goal, which establishes the behavior pattern for its members (Rogers, 2003). Hence, the diffusion aspect comprises both communication and sociological perspectives.

On account of its multidisciplinary nature, diffusion approach cuts across various scientific fields and makes significant contributions to various research disciplines. According to Rogers (2003), 58 % of diffusion research was accounted for by the study of innovativeness of members of a social system, which saw characteristics of member, and systems as determinants. Until recently, many studies still followed a similar framework (Aubert & Hamel, 2001; Carter & Belanger, 2005; Damanpour & Schneider, 2008; Ducharme, Knudsen, Roman, & Johnson, 2007; Escarce, Bloom, Hillman, Shea, & Schwartz, 1995; Hung, Hung, Tsai, & Jiang, 2010; Meyer, Johnson, & Ethington,

1997; Scott et al., 2008; Young et al., 2001). Other types of diffusion research include earliness of knowing innovations, rate of adoption on different innovations in a social system, opinion leadership, diffusion networks, rate of adoption in different social systems, communication channel usage, and consequences of innovation. Among organizational studies, the consequences of innovation mostly emphasized organizational performance, considering that organizations adopt innovation in order to improve their quality of services, efficiency, and effectiveness (Hikmet et al., 2008; Johnson, la France, Meyer, Speyer, & Cox, 1998; Kovach et al., 2008; Naranjo-Gil, 2009; Projogo & Sohal, 2003). These intellectual paradigms enable scholars to follow the research direction. However, Rogers stated that the diffusion paradigm "also impose[s] and standardize[s] … [a] set of assumptions and conceptual biases [that] are difficult to recognize and overcome," which is a significant challenge for the next generation of diffusion scholars (Rogers, 2003, p. 101).

Innovation and Social System

The perception of innovation characteristics as contributing to the attentiveness of using a technology allows individuals to exchange evaluation information about an innovation, which may affect community or organizational members' adoption decisions (Rogers, 2003). Therefore, social system characteristics also influence individuals' perceptions of an innovation. Peer influence and consensus in horizontal network structures and authoritative bodies in vertical network structures tend to determine adoption decisions. As well, the degree of similarity (referred to as "homophily") of socioeconomic, cultural, or professional backgrounds between individuals, groups, or organizations influences the adoption. Furthermore, an individual who is perceived to be an "opinion leader" is also able to influence other individuals' attitudes and behaviors. Opinion leaders can help raise awareness about innovations and lend them credibility (Weiner et al., 2006). Robertson (1967)

suggested introducing an innovation less to the masses and more to opinion leaders, since the average person is likely to be affected more strongly by social pressures, group associations, and the attitudes of opinion leaders than the direct use of media. Similarly, Valente and Davis (1999) introduced the implementation of the opinion leader model by selecting the opinion leader as the first adopter. This approach would accelerate the adoption rate in a social system.

Innovation Process in an Organization

The innovation model developed by Rogers provides a linear process of innovation. The process includes 1) agenda setting, which is the process by which organizational members identify important problems and search for innovations to address the problems; 2) matching, which is the stage at which the decision to adopt or not adopt is made according to the extent that the innovation is matched to organizations' needs and capacities; 3) restructuring or redefining positions or the adaptation process, which is the step in which organizational members are becoming skillful, consistent, and committed in their use of an innovation; 4) clarifying, which is the step in which the innovation is put into more widespread use in an organization to enable the adopters to have a clear meaning of the innovation; and 5) routinizing, the final stage where the innovation becomes incorporated into the regular activities of the organization (Rogers, 2003; Weiner et al., 2006).

Characteristics of Innovation

Although the characteristics of innovations help to explain adoption decisions, studies of the association between innovation characteristics and innovation adoption at the organizational level are quite limited (Damanpour & Schneider, 2008; Jerayaj et al., 2006). According to Rogers (2003), there are five attributes of innovations that influence the adoption decision and are reflected by

individuals or adoption units' perceptions: relative advantage, compatibility, complexity, trialability, and observability. These characteristics can be considered as "secondary attributes" of innovation since they are qualities perceived by the senses and may be differently estimated by different recipients. The classification of innovation and the determination of adoption will be based on perception.

Relative Advantage

Relative advantage refers to the degree to which an innovation is perceived as superior or advantageous to current practice. It is typically viewed in economic terms of cost-benefit or cost-effectiveness while social prestige factors, convenience, and satisfaction are also considered for measuring advantage. Such attribute is sometimes also regarded as perceived usefulness of the innovation (Tung et al., 2008). Innovation that has a clear advantage will be more easily adopted and implemented (Greenhalgh, Robert, Bate, Macfarlan, & Kyriakidou, 2005; Rogers, 2003). A decision to adopt is more likely when an organization has the capacity to manage downside risk or has a past history or propensity to take risks or when medical practitioners believe that innovation is advantageous. On the other hand, technical uncertainty negatively contributes to adoption of innovation (Hillman & Schwartz, 1985; Roth, Panzano, Crane-Ross, Massatti, & Carstens, 2002; Smythe, 2002). Insufficient information about an innovation provokes uncertainty among adopters about the risk from innovation adoption. Therefore, another important element of diffusion to be considered is information. Informational advantage of clinical group practice was found to hasten the adoption of innovations (Escarce et al., 1995). Relative advantage is one of the attributes usually found to be a significant contributing factor for innovation adoption in the field of health services research (Aubert & Hamel, 2001; Hung et al., 2010; Jerayaj et al., 2006; Scott et al., 2008).

Compatibility

Compatibility refers to the degree to which an innovation is perceived as being consistent with existing values, beliefs, past experiences, and needs of potential users. Innovation that fits with adopters' needs, values, and norms is more rapidly adopted (Rogers, 2003). Knudsen et al. (2003) reported that compatibility, as measured by an organization's rule orientation, presence of an employee assistance program, and mechanization, is associated with the adoption of drug testing modeling. A similar result was confirmed by Tung et al. (2008), who showed that perceived compatibility had a strong positive influence on the intention to adopt an electronic logistics information system in Taiwan's medical industry. In the context of organization, the extent that an innovation is compatible with past experience may be especially relevant because the uncertainty due to the change in organizational behavior is small for organizational members and the technology does not disturb the environment, values, and work habits of the professionals (Aubert & Hamel, 2001; Meyer et al., 1997). Nevertheless, a review of predictors of innovation adoption presented by Jerayaj et al. (2006) argued that compatibility is one of the worst predictors of IT adoption by organizations.

Complexity

Complexity refers to the degree to which an innovation is perceived as difficult to understand and use. Simpler or even equally simple innovations spread faster than complicated ones (Rogers, 2003). Some innovation researchers define this attribute as perceived "ease of use," in order to hypothesize its relationship with innovation adoption in the same direction as other attributes (Aubert & Hamel, 2001; Carter & Belanger, 2005; Tung et al., 2008). Ease of use is among the most frequently used predictors of IT adoption at the individual level. However, the research evidence supporting an association between complexity and innovation adoption is not conclusive. For

example, Hung et al. (2010) found that complexity is negatively associated with a hospital's adoption of a CRM system, although the relationship is not statistically significant. Similarly, Damanpour and Schneider (2008) reported that perceived complexity did not provide any significant contribution to innovation adoption.

Trialability

Rogers (2003) defined trialability as the degree to which an innovation may be experimented with on a limited basis. The ability to try an innovation on a partial basis reduces uncertainty among individuals who are considering it for adoption, since the innovation can be learned by doing. However, health services researchers that consider trialability as an independent variable are very rare. Additionally, some of the empirical literature provides mixed results of the contribution of trialability to innovation adoption (Ducharme et al., 2007; Scott et al. 2008).

Observability

According to Rogers (2003), observability refers to the extent that an innovation gives visible results. Innovations that generate benefits visible to intended adopters get adopted more rapidly because such visibility stimulates peer discussion of a new idea. Scott et al. (2008) found that observability of the benefits of the Heart Health Kit (HHK) was associated with physicians' intention to use the innovation. Grilli and Lomas (1994) stated that complexity, trialability, and observability together accounted for almost half of the variance in the adoption of clinical guidelines among physicians. However, unlike perceived relative advantages, compatibility, and complexity, observability has not usually been investigated, or, if so, has not been found to be a significant determinant of innovation adoption in health services research (Marshall, 1990; Meyer et al., 1997).

Some other constructs seem to have overlapping definitions with observability. Moore and Benbasat (1991) introduced "demonstrability" and "visibility" as additional factors influencing the acceptance and use of an innovation. These concepts were later used by Argarwal and Prasad (1997); Carter and Belanger (2005); Hsu, Lu, and Hsu (2007); and Compeau, Meister, and Higgins (2007) to predict adoption at the individual level.

Accordingly, innovation characteristics can be used for the prediction of the degree to which an innovation is ready for adoption. The innovations that are perceived to be more advantageous, compatible with users' socio-cultural backgrounds, easily comprehended, able to be experimented with before adoption, and able to generate visible results are likely to be adopted rapidly. However, a caution should be made when considering the predictive model of innovation adoption in regard to the research findings that use innovation characteristics as determinants. Several studies tended to capture the relationship of those predictors and individuals' "intention to use"; thus, the predictors may not have a true association with actual adoption. A study of the adoption of information technologies confirmed that innovation characteristics, as informed by other research such as determinants of intention to adopt, did explain acceptance behavior (Agarwal & Prasad, 1997).

Organizational Innovativeness

Up to the present, many innovation studies focused on organizational innovativeness, with an attempt to distinguish the characteristics of the adopters versus the non-adopters, with the emphasis on a stage model in which methodologies directly imitated the individual-level innovativeness studies (Greenhalgh et al., 2005; Rogers, 2003). Some generalized determinants of organizational innovativeness have been suggested in the literature. For example, size of organization is consistently

found to have a positive contribution to innovativeness (Damanpour & Schneider, 2008; Hikmet et al., 2008; Hung et al., 2010; Kaluzny et al., 1974; Kimberly & Evanisko, 1981; Moch & Morse, 1977; Naranjo-Gil, 2009).

In determining organizational innovativeness, the influence of organizational attributes on adoption was studied extensively (Rye & Kimberly, 2007). However, most studies using organization structural characteristics similar to Rogers' perspective as predictors of organizational innovation adoption were conducted during the late 1960s to 1980s (e.g., Hage & Aiken, 1967; Hage & Dewar, 1973; Kaluzny et al., 1974; Meyer & Goes, 1988; Moch & Morse, 1976), while there is hardly any literature addressing these constructs in the current time. In addition, there seems to be no specific standardized measures for these variables (Kimberly & Cook, 2008). Organization characteristics, which could determine organizational adoption as suggested by Rogers (2003), comprise five internal (or structural) attributes: centralization, formalization, complexity, interconnectedness, and slack of resources.

Centralization

Concentration of power in organization systems, as an indication of centralization, refers to the degree to which important decisions generally are made by administrators alone rather than by people throughout the organization (Rogers, 2003). Centralization plays an important role in determining an organization's adoption of innovation. In a meta-analysis by Damanpour (1991), centralization was consistently found to negatively contribute to innovation adoption in organizations. This finding could be due to the domination of the system by a few strong leaders who influence others' opinions (Rogers, 2003). Although centralization has usually been found to be negatively associated with innovativeness (Kimberly & Cook, 2008; Mellor & Mathieu, 1999), it was

found to associate positively for some types of innovations while inhibiting that of others (Kimberly & Evanisko, 1981; Moch & Morse, 1977; Rogers, 2003; Rye & Kimberly, 2007).

Complexity

Complexity, according to Rogers (2003), is the extent to which an organization's members have a relatively high level of knowledge and expertise. Complexity is usually measured by the members' range of occupational specialties and their degree of professionalism. Hence, some innovation researches use specialization, functional differentiation, or professionalism in a similar sense as complexity (Damanpour & Gopalakrishnan, 1998; Kimberly & Cook, 2008; Kimberly & Evanisko, 1981; Moch & Morse, 1977). Organizations with more specialists may be expected to adopt more innovations. (Moch & Morse, 1977). However, while prevalence of specialization is generally assumed to correlate with the tendency of organizational members to embrace innovation, not every innovation will always be adopted in highly specialized organizations. Innovations may be adopted at different rates, and adoption even among specialists depends on the type of innovation and whether it is compatible with the specialists' own interests and needs. For example, Kimberly and Evanisko (1981) found that specialization and functional differentiation is positively associated with hospital adoption of technical innovation but not administrative innovation. Additionally, functional differentiation was found to facilitate adoption of innovation that is compatible with the needs of health care specialists (Moch & Morse, 1977) and was also found to be the strongest determinant of innovation adoption in several studies, as indicated by Damanpour (1991). Structural complexity was also found to positively relate to organizational innovation in some studies (Balridge & Burnham, 1975; Damanpour & Schneider, 2008); however, Damanpour and Schneider (2008) found that structural complexity had a positive impact only on the initiation phase of adoption.

Formalization

Formalization reflects the emphasis on organizational members' following rules and procedures. In other words, formalization measures the degree to which an organization is bureaucratic (Rogers, 2003) or the extent that an organization is run by rules and procedures (Kimberly & Cook, 2008). Formalization is usually found to be negatively associated with innovative behavior (Rye & Kimberly, 2007). Although relatively little empirical evidence is available that presents an association between formalization and innovation adoption, the degree of formalization was found as a primary predictor of innovation in hospitals (Kaluzny et al., 1974).

Some studies argued that formalization might have a positive impact on innovativeness at the organizational level. Johnson et al. (1998) explored the indirect impact of formalization on perceived organizational innovativeness through role conflict, role ambiguity, and communication quality. They found that the influence of formalization on role conflict and role ambiguity was negative, but formalization exerted a positive effect on communication quality, which led to organizational innovativeness (Johnson et al.). Mellor and Mathieu (1999) found that formalization positively associated with local innovation.

Interconnectedness

Interconnectedness is the degree to which the units in a social system are connected by an interpersonal network (Rogers, 2003). Internal and external communication among healthcare practitioners allows the flow of innovative ideas within and across organizations. Thus, this variable is assumed to be positively associated with organizational innovativeness (Rogers, 2003; Rye & Kimberly, 2007). Kimberly's empirical study about organizational structure that would provide

communication channels found that internal mechanisms that allow information about technological innovation to enter the organization (e.g., presentation by outside speakers to meetings of the hospital staff) facilitates innovation adoption (1978). Additionally, external communication achieved through practitioners' involvement in professional associations positively affected all phases of the innovation adoption process (Damanpour & Schneider, 2008). Ducharme, Knudsen, Roman, and Johnson (2007) investigated the impact of organizations' exposure to innovation on their adoption decisions. They found that the adoption of treatment innovation is a function of organizational participation in clinical trails, together with organizational resources and stage of the diffusion process.

Organizational Slack

Organizational slack is the degree to which unencumbered budget, finance, human, and information resources are available to an organization (Rogers, 2003; Kimberly & Cook, 2008). Resources slack in an organization could be one of the supporting reasons explaining a positive relationship between organization size and innovativeness, since larger organizations tend to have more slack resources compared to smaller ones (Nystrom, Ramamurthy, & Wilson, 2002; Rogers, 1998; Rye & Kimberly, 2007). In addition, organizational physical resources, such as adequacy of office and other physical space, availability of staff, and adequate use of computers, has been used as a measure for organizations' readiness for organizational change, which influences the implementation of innovations (Kimberly & Cook, 2008).

Environmental Influences

Widely used to explain the readiness for an innovation's being adopted and the readiness of organizational structures to adopt an innovation as portrayed in this chapter, the domain of diffusion of innovation perspective appears to imply environmental impacts on organizational adoption. Since units of adoption are part of a social system in which the information about an innovation is delivered via communication channels, the theory's definitions of some constructs (e.g., innovation's *observability*, resources obtained from external sources *(organizational slack)*, and organization's external *interconnectedness*) could serve as links to environmental and institutional influences on adoption decision making. Rye and Kimberly (2007) demonstrated the importance of connections among adopting organizations as facilitators of adoption. And, of course, individuals within networks contribute to organizational-level decision making.

Innovation adoption also varies across location of organization and nature of community in which an organization is located (Kaluzny et al., 1970; Knudsen et al., 2003). Some studies on innovation adoption compared the adoption rate between organization located in urban and rural areas. Hospitals located in metropolitan areas were found to have greater rate of adoption (Follan, 1987; Kaluzny et al., 1970; Kaluzny et al., 1974) and those located in the Northeastern states have greater rates of implementation of innovative health care services (Kaluzny et al., 1970).

Contextual characteristics are also claimed to exert institutional influences on innovation adoption in many studies. Hospitals located in the areas with higher rates of innovation adoption were more likely to adopt and implement managerial innovation (Walston & Kimberly, 2001; Young et al., 2001). In addition, economic pressure, demand uncertainty, and market concentration are usually considered to be correlated with organizations' decisions to adopt an innovation (Escarce et

al., 1995; Naranjo-Gil, 2009; Walston & Kimberly, 2001). Interestingly, Marathe, Wan, Zhang, and Sherin (2007) and Naranjo-Gil (2009) consistently found that adopters were more sensitive to environmental factors than to organizational factors.

Innovation Adoption and Organizational Performance

In general, organizational effectiveness or performance is the joint product of both the organization and its environment (Damanpour & Gopalakrishnan, 1998; Naranjo-Gil, 2009). Organizations innovate with the intention to improve or, at least, maintain their level of performance (Damanpour & Schneider, 2008; Wang & Shyu, 2009).

Innovation was also considered an intervention variable in a recent study of performance improvement in nursing homes. A new principle for nursing practice adopted in nursing homes was found to be related to improvement of nurses' behaviors. Furthermore, the advantages of the innovation may lead to sustainability of the practice (Kovach et al., 2008). Similarly, Projogo and Sohal (2003) found that TQM leads to good quality performance.

Although limited studies have been conducted to investigate the extent that innovations, both administrative and technological, contribute to better quality of care or services in the health care setting, all of the research findings concluded that innovation adoption and organizational innovativeness positively contributed to organizational performance (Devaraj & Kohli, 2003; Leidner, Preston, & Chen, 2010; Naranjo-Gil, 2009; Oliver & Antonio, 2009). In addition, in order to capture the impact of an innovation on performance, it is necessary that the "actual" implementation of the innovation be taken into account (Devaraj & Kohli, 2003; Walker, Damanpour, & Devece, 2010).

Analytical Framework and Hypotheses Generation

Considering the extent that a hospital's innovation adoption decision is contingent on its environment, whereas its structural characteristics would facilitate the adoption and implementation of HIV ambulatory services quality improvement, this study applied a *Context-Design-Performance* framework for indicating a hypothesized relationship between the study variables. For the purpose of this study, the implementation of the HIVQUAL-T model is defined as the hospital actual practice on performance measurement and quality improvement in HIV clinical services delivery. Subsequently, organizational performance would require evidence to be collected upon which the assessments can be based.

The Context-Design-Performance Framework

Most studies have focused on the relationship between environmental and organizational variables or between organizational and performance variables, yet the linkages among all three sets of variables have not been much investigated. Keats and Hitt (1988) introduced a conceptual framework for a model construction from general concepts that viewed organization as an open system that is influenced by environment (context), process (organizational characteristics), and outcome (performance), while strategic management perspective puts an emphasis on organizational strategies (Wan & Wang, 2003). Derived from contingency and strategic management perspectives, the context-design-performance (C-D-P) framework has been employed as a systemic model of the environment and organization interface and their associations to performance outcome.

According to Wan and Wang (2003), an organization's strategy is expected to be consistent with both its external environment and its core capabilities. Organizations perform activities within

an environmental context by obtaining inputs from the environment, responding to its demands, and offering their services or products. The adoption of innovation thus could be viewed as organization's response to its external environment (Damanpour & Schneider, 2008; Pierce & Delbecq, 1977). In the same way, internal organizations' structure, capabilities, and strategies should be associated with their performance.

Using the context-structure-performance framework, Lin and Wan (1999) found that contextual factors such as market competition, tax status, and network age contribute to the implementation of organizational strategies, while the strategies are positively correlated with structural design. Wan and Wang (2003) reported that the number of affiliated physicians, profit margin, and network size positively influence integrated health care network (IHN) performance. Marathe et al. (2007) applied a similar conceptual framework and found that contextual and organizational structural factors could determine community health centers' technical and cost efficiency.

The use of this type of framework requires a consideration of time-ordered processes when organizations' decision-making and practices (operational design) do not occur simultaneously with the existence of the social system (context) and organizational structure (structural design) and when organizational performance is regarded as the outcome of the system. Thus, in this study context, the adoption of the HIVQUAL-T model implies not only a single point of time that hospitals put the HIVQUAL-T performance measurement software into practice but also the extensiveness of the implementation: adopting the model, measuring performance, and eliminating deficiencies by executing quality improvement actions, which is expected to result in better quality HIV ambulatory service delivery.

The context-design-performance framework would serve to link contextual components that were hypothesized to stimulate adoption at the hospital level, theoretical constructs and observable indicators of organizational structural characteristics as organizational structural design components, extensiveness of the HIVQUAL-T model adoption as organizational operational design (or strategy) component, and organizational performance of HIV service delivery.

Although organizational structure, as a construct, is also expected to account for a performance dimension as it might directly affect performance level not only through organizational operations, the absence of relevant prior research on a direct relationship between structural characteristics and health care organizations' performance has challenged this study. In addition, the design of organizational structure was found to have only a limited effect on performance level (Child, 1972). Wan (2003) conducted a study of nursing care quality in nursing homes by pointing up the direct relationship between nursing homes' structure components on nursing care adequacy, which was considered a process component, and between nursing care adequacy and nursing care quality. Therefore, the relationships between organizational structure and organizational practice and between organizational practice and organizational outcome were proven to be linearly ordered, which might imply indirect effects of structure to performance (Wan, 2003). Also, Hendrick (2003) proposed that it is not easy to evaluate the complex and contingent relationship of structural variables such as size and complexity with process and performance variables. Since the main purpose of this study is to establish and validate theoretical constructs and measures in the boundary of diffusion of innovation theory and the extent to which adoption would help to improve organization performance, direct causal effects from structural characteristic constructs derived from the theory to the performance measures were not taken into account.

In addition, this study considered possible impacts of individuals' perceptions on innovation characteristics as predictors of innovation adoption since the implementers of HIVQUAL-T model implementation are practitioners who are embedded in hospitals and have certain degree of participation in hospitals' decision making to adopt the model.

Figure 1 provides the conceptual model of contextual, organizational structural, and innovation attribute predictors of HIVQUAL-T Model Adoption and their contributions to HIV clinical services performance based on the context-design-performance framework.

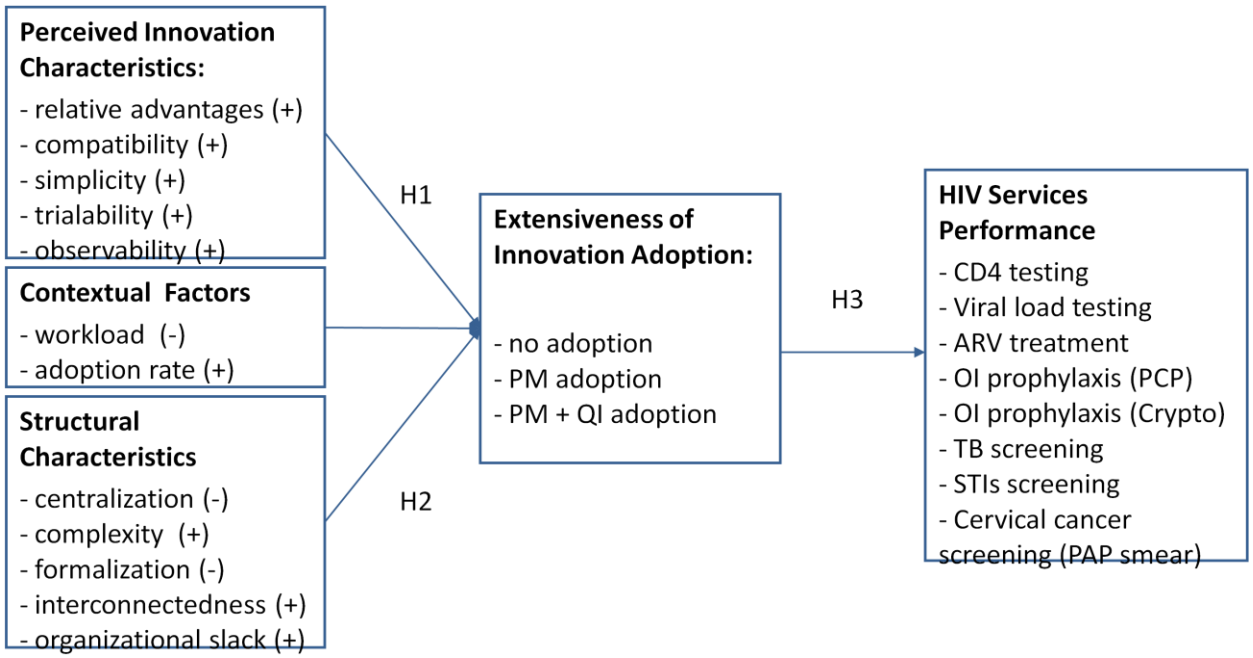


Figure 1. Conceptual Framework for studying HIVQUAL-T Model Adoption and HIV Ambulatory Services Performance

Hypotheses Generation

By using the C-D-P framework, the study investigates the relationships of the variables on three levels: 1) perceived innovation characteristics as predictors for hospitals' extensive degree of innovation adoption; 2) organization structural characteristics as predictors for hospitals' extensive degree of innovation adoption; and 3) extensive degree of innovation adoption as predictor of HIV clinical service performance. The conceptual framework presents major hypothesized relationships as follows:

H_1: Innovation characteristics (relative advantage, compatibility, simplicity, trialability, and observability) as perceived by hospital practitioners are positively associated with the hospitals' extensiveness of HIVQUAL-T model adoption.

H_2: Organizational structural characteristics (centralization, complexity, formalization, interconnectedness, and organizational slack) are associated with the hospitals' extensiveness of HIVQUAL-T model adoption. The detailed hypotheses are given as follows:

H_{2a}: Hospitals that have a greater degree of complexity are more likely to have a greater degree of extensiveness of HIVQUAL-T model adoption.

H_{2b}: Hospitals that have a greater degree of centralization are more likely to have a greater degree of extensiveness of HIVQUAL-T model adoption.

H_{2c}: Hospitals that have a greater degree of interconnectedness are more likely to have a greater degree of extensiveness of HIVQUAL-T model adoption.

H_{2d}: Hospitals that have a greater degree of formalization are less likely to have a greater degree of extensiveness of HIVQUAL-T model adoption.

H_{2e}: Hospitals that have greater resources are more likely to have a greater degree of extensiveness of HIVQUAL-T model adoption.

H_3: Hospitals that adopt and implement HIVQUAL-T model more extensively are more likely to perform better in HIV clinical services delivery.

Chapter Summary

This chapter presents a review of Everett M. Rogers's so-called 'diffusion of innovation' theory and its implications to health services research. Research employing this perspective demonstrates the application mostly in terms of the adoption behavior in regard to the impact of perceived innovation attributes and organization structural characteristics. However, limited studies were found to document the extent to which the adoption of innovation could contribute to the desired outcomes related to better organizational performance.

Innovation adoption could be considered as organizational decision-making that might not depend only on individuals' perceptions and organizational structure but also on environmental influences within organizations' contexts. The constructs proposed by this perspective such as observability, interconnectedness, and organizational slack, as well as observed contextual characteristics such as location and adoption rate in the areas, seem to imply the flow of information and resources from external environments or social systems into organizations. As such, an application of the context-design-performance (C-D-P) framework in this study allowed an assessment of HIVQUAL-T model implementation by postulating the impact of contextual

characteristics and hospitals' structural design on their operational design, namely, the extensiveness of the HIVQUAL-T model adoption and the contribution of the adoption to hospitals' HIV ambulatory services performance. The direct causal effects were hypothetically drawn from organizational context and structural design to operational design, and from operational design to performance. However, the direct causal effects from structural characteristic constructs derived from the diffusion of innovation theory to organizational performance were not taken into account due to the absent of relevant prior research and the fact that the purpose of this study was to validate and examine the relationships among theoretically informed constructs.

CHAPTER THREE: METHODOLOGY

The two-fold purpose of this study in accordance with the research questions is to investigate the extent to which perceived innovation characteristics and organization structural characteristics contribute to the variation of hospitals' HIVQUAL-T model adoption. The relationship between variation in hospitals' HIVQUAL-T model adoption and better HIV clinical care performance was then examined. This chapter discusses the analytical method employed in the study. The study design; data sources; measurements of exogenous, endogenous, and control variables; and hypothesized structural relations among the study variables in multivariate statistical analysis are presented.

Study Design

This study applied a natural experimental design since the HIVQUAL-T program was initiated and implemented by Thailand's Ministry of Public Health with no intervention introduced by the researcher. This is a lagged cross-sectional study that compared hospitals' performance after an adoption period. The dependent variable, extensiveness, has a longitudinal characteristic since the use of the HIVQUAL-T software and the implementation of quality improvement are not a single event. Hospitals generally start conducting performance assessment by a year's end and use the assessment results to inform quality improvement implementation in later years. The sample universe is public hospitals that never participated in the HIVQUAL-T program pilot implementation during the years 2003–2005. The unit of analysis is hospital.

Sources of Empirical Data

Two main data sources were used in this study: 1) HIVQUAL-T performance measurement dataset and 2) an online survey of HIVQUAL-T model adoption.

HIVQUAL-T Performance Dataset

The HIVQUAL-T performance dataset is a national dataset created by the Bureau of AIDS, Tuberculosis, and Sexually Transmitted Infections (BATS), Ministry of Public Health, Thailand, and was provided by BATS' Quality Improvement of HIV/AIDS Treatment and Care Program in May 2010. The dataset contains HIV ambulatory services performance information obtained from the adopting facilities from the pilot implementation period (2003–2005) to the national scaling up period (until present). The most recent information was the performance measurement results as of the year 2009. This dataset was used to identify hospitals' HIV ambulatory services performance, which was reported with core and additional HIV care and treatment indicators developed by the program. Generally, BATS uses this information to report the trends of provincial, regional, and national-level HIV care performance improvement to the public through the program's website: http://www.cqihiv.com.

Survey Instrument

A survey instrument was developed to obtain essential information about 1) HIV practitioners' perceptions toward the characteristics of the HIVQUAL-T model, 2) structural characteristics of hospitals, and 3) the implementation of quality improvement projects regarding performance measurement results in the respondents' facilities. The survey questionnaire contains

measures of five constructs of HIV care practitioners' perceived innovation characteristics and five constructs of hospitals' structural characteristics. All perceived innovation characteristics and some structural characteristics were measured using a five-point Likert Scale, representing a range of attitudes from strongly disagree to strongly agree. The questionnaire requested the respondents to present the information on organization structural characteristics in ordinal-polytomous or continuous questions, depending on each variable.

Since most of the variables in this study were latent constructs, for which validity of scales of measurement is usually a concern, this study attempted to apply pre-tested constructs from previous empirical studies employing innovation or other compatible perspectives wherever possible. Thus, most survey questions were based on the measurements created and validated by similar studies. Where no validation of measurement of any constructs was presented, the indicators for those constructs were developed with the application of the concepts and definition given in the relevant literature.

The study's survey questionnaire was developed with revisions from health services research experts and HIV care specialists. Since this study was conducted in Thailand, the questionnaire was translated into the Thai language and was reviewed and pilot-tested in order to ensure content validity. The drafts of *online* questionnaires were purposively sent to HIV care practitioners in 30 hospitals, in the region with high and low adoption rates. Twenty hospitals completed the questionnaires. The pilot respondents were further asked to provide comments on any questions, statements, and the organization of the questionnaire. Only a few items were reported to be ambiguous and were later removed from the actual version while some more detailed questions about the implementation of quality improvement were added as suggested by the respondents.

Measurement of Endogenous Variables

Extensiveness of HIVQUAL-T model Adoption

Innovation adoption researchers typically measure adoption dichotomously; nevertheless, many innovations are not discrete variables and can vary from one setting to the next, reflecting different combinations of administrative structure and process (Walston & Kimberly, 2001). The adoption variable in this study seemed to have such characteristics, since the innovation: 'HIVQUAL-T' model has two main implementation components. Thus, HIVQUAL-T model adoption was defined as the extensiveness of the practice. As mentioned earlier, it was expected that hospitals conducted the performance assessment by a year-end, following the performance results; they would implement the quality improvement activities in the later years. This study, hence, allowed for possible lagged practices of the HIVQUAL-T model implementation. Extensiveness of HIVQUAL-T adoption was categorized into three ordinal levels, including hospitals that did not adopt the model during the years 2007–2008, indicating that they were non-adopters; hospitals that reported performance measurement results using HIVQUAL-T software in either year 2007 or 2008 but did *not* report quality improvement practices, indicating initial adoption of the model with no extension of use; and hospitals that reported performance measurement results using HIVQUAL-T software *and* reported quality improvement practices in the years 2008–2009, indicating extensive adoption of a whole model. The information in determining hospitals' extensiveness of HIVQUAL-T adoption was the combination of the HIVQUAL-T software utilization reported in the HIVQUAL-T performance dataset and the hospitals' implementation of quality improvement projects indicated by survey respondents.

HIV Ambulatory Services Performance

HIV ambulatory services performance was considered as a latent endogenous variable. The study applied the concepts of HIV clinical care according to the national guidelines by measuring the presence or absence of six domains of baseline HIV clinical care for outpatients provided by hospitals. There were eight indicators that were measured by percentage of eligible patients receiving the following services: 1) CD4 screening; 2) Viral load screening; 3) ARV treatment; 4) primary PCP prophylaxis; 5) primary Cryptococosis prophylaxis; 6) Tuberculosis screening; 7) Sexually transmitted diseases screening; and 8) PAP smears for women. This information was obtained from BATS' HIVQUAL-T Performance Dataset.

Measurement of Exogenous Variables

Perceived Innovation Characteristics

Perceived innovation characteristics—including relative advantages, compatibility, complexity, trialability, and observability—were considered as latent constructs. The concepts for measuring perceived innovation characteristics were mainly obtained from Rogers (2003) and were illustrated in Tornatzky and Klein's meta-analysis of innovation characteristics in relation to innovation adoption (1982). The study used and adjusted the measurement that was developed by Moore and Benbasat in 1991 and re-validated by Agarwal and Prasad in 1997 and Compeau, Meister, and Higgins in 2007. These measurements have been used in many innovation studies to determine individual-level adoption of information technology (Hsu et al., 2007; Yang, Yu, & Yang, 2009). After pilot testing and adjustment, each construct contained four items, which asked the respondents

to express their agreements according to a five-point Likert scale ranging from strongly agree to strongly disagree.

Relative Advantages:

Relative advantage was measured by the degree to which the HIVQUAL-T model is perceived to be better than other performance measurement and quality improvement methods. The items used in the questionnaire asked the respondents whether prior to the adoption decision the HIVQUAL-T software and the quality improvement implementation were perceived 1) to be more convenient; 2) to be less time consuming; 3) to result in better HIV services quality; and 4) to help obtain and maintain hospital accreditation status more easily.

Compatibility:

Compatibility was measured by the degree to which the model can be easily applied to routine practice and the degree to which the model needs special training and consumes time for implementation. The items used in the questionnaire asked the respondents whether prior to the adoption decision the HIVQUAL-T software and the quality improvement implementation were perceived 1) to be compatible with all aspects of the HIV clinic's work; 2) to be compatible with the clinic's needs for assessing performance; 3) to fit with the way they like to work; and 4) to be compatible with their past experience.

Complexity:

Complexity, or simplicity, as used in this study, was measured by the degree to which the HIVQUAL-T software is easy to use and the degree to which QI practice is easy to implement. The items used in the questionnaire asked the respondents whether prior to the adoption decision 1) the

concept of the HIVQUAL-T model was easy to learn; 2) how to use the performance measurement software was easy to remember; 3) the software was user friendly; and 4) QI proposal was easy to write.

Trialability:

Trialability was measured by the degree to which a certain period of time is allowed for trying and making decisions for the adoption. The items used in the questionnaire asked the respondents whether prior to the adoption decision they received 1) enough supports for trying the software; 2) proper chances to try the software; 3) enough opportunity to try the software; and 4) enough time to use and see the benefits of the software.

Observability:

Observability was measured by the degree to which HIV clinic staffs are able to investigate the implementation results among pilot hospitals before making a decision for adoption. The items used in the questionnaire asked the respondents whether prior to the adoption decision they perceived that 1) observing the use of the software in other hospitals is easy; 2) they had opportunities to see the model implemented in pilot sites; 3) the benefits of using the model was visible to them; and 4) seeing pilot sites implementing the model made them feel confident about putting it into use.

Organization Structural Characteristics

Some organization structural characteristics are also latent variables. Using the same instrument as was used in measuring perceived innovation characteristics, this study asked the respondents about organizations' internal attributes, including centralization, complexity,

formalization, interconnectedness, and organizational slack. However, the measurements of these organizational characteristics varied across each study and across theories that were used for determining adoption behavior. As noticed by Rye and Kimberly (2007), some variables were used as measures of constructs in various categories. The only constructs, to the researcher's knowledge, whose measurements have been validated were centralization and formalization developed by Aiken and Hage (Aiken & Hage, 1966; Hage & Aiken, 1967), tested by Dewar, Whetten, and Boje (1980), and adjusted by Auh and Menguc (2007). Nevertheless, these measurements were not found to have been applied in innovation research. Therefore, this study attempted to apply and adjust the measurements of centralization and formalization of Aiken and Hage, Dewar et al., and Auh and Menguc to fit with the study context and develop the measures for complexity, interconnectedness, and organizational slack by applying the concepts from other relevant studies. As well as the measurements of perceived innovation attributes, all constructs of organization structural characteristics had four measurement items. The items could be in the form of statements that asked the respondents to express their level of agreement in a five-point Likert scale or in the form of ordinal-polytomous questions, for non-perception information.

Centralization:

Centralization is the extent to which important decision generally are made by a few people rather than organizational members throughout the facility (Kimberly & Evanisko, 1981; Rogers, 2003). In the study context, centralization is the extent to which HIV clinical staffs can make a decision pertaining to the HIV clinic's activities. The statements asked the respondents whether their HIV clinics' decision making considered 1) their participation regarding the adoption of new

programs; 2) their willingness to implement any voluntry initiatives; 3) the approval from the supervisors as most important; and 4) only higher position staff's agreement.

Formalization:

Formalization is usually considered the extent to which HIV clinic staff follow a formal organizational chart and the extent to which their work deviates from a written job description or organization rules (Auh & Menguc, 2007; Kaluzny et al., 1974; Rogers, 2003). The statements asked the respondents the extent that 1) they strictly followed treatment protocol; 2) the employees had to conforms to rules; 3) they could work beyond job description; and 4) they could work beyond their typical practices.

Complexity:

Organizational complexity reflects functional differentiation and specialization (Damanpour, 1991, Kimberly & Cook, 2008; Moch & Morse, 1977). Thus, it can be generally measured by the number of departments in a hospital, the number of hierachical levels in the organizational chart, and the number of specialized professional categories (Damanpour & Gopalakrishnan, 1998; Subramanian & Nilakanta, 1996). This study measured organizational complexity prior to the adoption regarding 1) the extent that hospitals could provide complex services, which was represented by the type of hospitals; 2) whether the hospitals had medical specialists; 3) whether the hospitals had internal medicine physicians serving HIV clinics; and 4) whether the hospitals had pediatricians serving HIV clinics.

Interconnectedness:

Interconnectedness implies both internal and external integration in this study and was measured by the extent to which HIV clinics collaborated with other departments and other organizations (Kimberly, 1978). This study measured interconnectedness as the frequency of HIV care practitioners' attending HIV forums or meetings at the 1) hospital; 2) provincial; 3) regional; and 4) national levels.

Organizational Slack:

Organizational slack refers to the amount of financial support and the frequency of technical support available for implementing the innovation (Kimberly & Cook, 2008; Subramanian & Nilakanta, 1996). This study measured organizational slack by asking the respondents whether prior to the adoption their HIV clinics 1) had several sources of budget available; 2) had enough physical space for HIV peer group activities; 3) had difficulty in getting financial support from the hospital board; and 4) had enough computers in the clinics.

Control Variables

Applying only theoretical constructs from Rogers' diffusion innovation perspective may provide limited capability of explaining the variance in the operational design and performance variables of the study. Thus, organizational attributes and contextual factors commonly used in other organization performance research, such as rate of adoption in the area, size, and HIV care practitioners' workloads (HIV patients-to-staff ratio), were also included in the analysis as control variables to examine alternative plausible explanations for the variability in hospital performance.

Rate of Adoption in the Area:

Implementation of the HIVQUAL-T model at the national level usually requires coordination at provincial and regional levels. At the regional level, coordination from the Offices of Disease Prevention and Control (DPC) is significant in distributing the information and providing training facilities for the HIVQUAL-T program. This study considered the regional adoption rate in 2007 among 12 DPC offices nationwide.

Rate of adoption could be also considered as organizational cohesion (Rye & Kimberly, 2007) to the environment. In this study, it was measured by the percentage of hospitals that adopted the HIVQUAL-T model by the year 2006, which would lead to the adoption decision-making in 2007 or 2008. Hospitals that are located in the regions with high adoption rates would have more opportunities to receive information about the use of HIVQUAL-T software and QI implementation, particularly those in the regions with many pilot implementers and trainers. Additionally, the rate of adoption in the area could entail institutional effect of organizations' decision making to adopt the innovation.

Hospital Size:

Hospital size was measured by number of beds in the year 2007, implying the capacity of the facility.

Workload:

Similarly, HIV care practitioners' workloads could affect innovation adoption in the sense that the practitioners who already had high workloads might not be willing to spend time for other activities in additional to providing the care. More specifically, the HIVQUAL-T

software requires the practitioners' time and effort to conduct self-assessment, write QI proposals, and implement QI activities. Workload was claimed to be one potential barrier to implementing the HIVQUAL-T model among the adopters. This study measured HIV clinic workload as nurse-to-patient ratio, by dividing number of nurses by the number of patients as of the year 2007. Number of full-time nurses was assigned a value of one for each full time person and number of part time nurses was assigned the value of 0.2 for each part-time person. Unlike other studies, this study did not count the unit of nurse staffing in the form of full-time equivalent staff for the reason that 1) full-time nurses in this setting refers to nurses who are responsible for only HIV clinic practice, regardless of the number of hours they work each day in a week, and 2) part-time nurses in this setting refers to nurses who are mainly working in different departments but have responsibility to assist HIV clinics at least once a week (mostly on the day that the clinic provides medication). For example, hospital A is serving 500 HIV patients, with 2 full-time nurses in its HIV clinic and 2 part-time nurses. Hospital B is serving 300 HIV patients, with 2 full-time nurses and 1 part-time nurse. Therefore, hospital A's HIV clinic's workload = (2+0.4)/500=0.0048 while hospital B's HIV clinic's workload = (2+0.2/300)=0.0073. High nurse-to-patient ratio implies smaller workload. The operationalization of the study variables is presented in Table 1.

Table 1. Operational Definitions of the Study Variables and Coded Items

Variables	Operational Definitions	Sources
Endogenous Variables		
Extensiveness	0 = No adoption; 1 = Adoption of PM; 2 = Adoption of PM+QI	Survey/ HIVQUAL-T results
HIV Services Performance	The extent that a hospital can provide eligible patients with clinical services measured by:	Survey/ HIVQUAL-T results
CD4	- Percentage of eligible patients receiving CD4 screening	
ARV	- Percentage of eligible patients receiving ARV treatment	
PCP	- Percentage of eligible patients receiving PCP prophylaxis	
Crypto	- Percentage of eligible patients receiving Crypto prophylaxis	
TB	- Percentage of eligible patients receiving TB screening	
Syphilis	- Percentage of eligible patients receiving Syphilis screening	
PAP	- Percentage of eligible patients receiving Cervical cancer screening	
VL	- Percentage of eligible patients receiving Viral load screening	
Exogenous Variables		
Latent Construct	*Question Items (5-points Likert Scale: 5 = Strongly agree ~ 1 = Strongly disagree)*	
Centralization	The degree to which HIV care practitioners can make independent decision pertaining HIV Clinic's activities:	Survey
Central 1	I usually participate in any decisions regarding the adoption of new programs such as HIVQUAL-T.	
Central 2	My willingness to implement any voluntary initiatives was considered important for HIV clinic's decision making.	
Central 3	There could be little action here until the head of department or medical supervisor approves a decision.	
Central 4	Even small matters had to refer to someone higher up for a final answer.	
Formalization	The degree to which HIV care practitioners' follow a formal organization chart and a written job description:	Survey
Formal 1	My decision on serving HIV patients usually followed the written statement protocol.	
Formal 2	The employees here were constantly being checked for rule violations.	
Formal 3	I usually worked beyond the formal job description.	
Formal 4	Under an agreement with physicians, nurses could provide care beyond their typical nursing practices when necessary.	
Organizational Slack	The amount of uncommitted resources devoted to an HIV clinic:	Survey
Slack 1	There were several sources of budget available for our HIV clinic.	
Slack 2	The hospital had enough space available for HIV peer support group activities.	
Slack 3	We usually had difficulty in getting supporting money from the hospital board.	
Slack 4	We had enough number of computers in our HIV clinics.	
Relative Advantage	The degree to which the HIVQUAL-T model is perceived to provide more benefits than do other quality management models:	Survey
Advantage 1	I thought that using HIVQUAL-T software would be more convenient than other performance assessment methods.	
Advantage 2	I thought that using HIVQUAL-T software would be less time-consuming than other performance assessment methods.	
Advantage 3	I believed that the HIVQUAL-T model would result in better HIV service quality.	
Advantage 4	I believed that the HIVQUAL-T model would help the hospital to obtain and maintain Hospital Accreditation (HA) status more easily.	

Variables	Operational Definitions	Sources
Observability	The degree to which information and results of the HIVQUAL-T implementation in other hospitals are available for the implementer in an HIV clinic:	Survey
Observe 1	It was easy for me to observe other hospitals using HIVQUAL-T software in their HIV clinics.	
Observe 2	I had plenty of opportunities to see the HIVQUAL-T model being implemented in pilot sites.	
Observe 3	It was visible how other hospitals using the model can improve their service in quality.	
Observe 4	Seeing pilot sites implementing HIVQUAL-T model made me feel more confident in putting it into use in my HIV clinic.	
Trialability	The degree to which HIV practitioners can try the HIVQUAL-T software before making decisions to adopt:	Survey
Trial 1	There were enough technical supports to help me try the HIVQUAL-T software.	
Trial 2	I was able to properly try it out.	
Trial 3	I had a great deal of opportunity to try the software.	
Trial 4	I was permitted to use HIVQUAL-T software on a trial basis long enough to see what it could do.	
Simplicity	The degree to which the HIVQUAL-T model is easy to understand and implement:	Survey
Simple 1	Learning the concepts of the HIVQUAL-T model was easy for me.	
Simple 2	It was easy for me to remember how to use HIVQUAL-T software.	
Simple 3	I believed that HIVQUAL-T software was user-friendly.	
Simple 4	I believed that I would not have difficulties in writing a QI proposal.	
Compatibility	The degree to which the HIVQUAL-T model fit well with hospital's values and needs	Survey
Compat 1	I thought that the HIVQUAL-T model was compatible with all aspects of the clinic's work.	
Compat 2	I believed that the HIVQUAL-T model was compatible with the clinic's needs of assessing HIV clinical care performance.	
Compat 3	I thought that using HIVQUAL-T model fill well with the way we like to work.	
Compat 4	I felt that HIVQUAL-T model was compatible with my past experience.	
Complexity	The level of expertise and knowledge of hospitals' personnel	Survey
Complex 1	Hospital category: 4 = University Hospital; 3 = Regional Hospital; 2 = General Hospital; 1 = Military Hospital, Community Hospital, or Other	
Complex 2	Availability of medical specialists in hospitals: 1 = Yes; 0 = No	
Complex 3	Availability of internal medicine physicians in hospitals: 1 = Yes; 0 = No	
Complex 4	Availability of pediatrician in HIV clinic: 1 = Yes; 0 = No	
Interconnectedness	The extent to which HIV care practitioners collaborate with other departments or other organizations in order to share information related to HIV care	Survey
Intercon 1	Frequency of HIV practitioner's attendance to HIV forums of meetings at hospital or community level	
Intercon 2	Frequency of HIV practitioner's attendance to HIV forums of meetings at provincial level	
Intercon 3	Frequency of HIV practitioner's attendance to HIV forums of meetings at regional level	
Intercon 4	Frequency of HIV practitioner's attendance to HIV forums of meetings at national level (6 = Once a month; 5 = Every two months; 4 = Every three months; 3 = Every six months; 2 = Once a year; 1 = Less than once a year)	

Variables	Operational Definitions	Sources
Control Variables		
Age	Age of HIV care practitioners (years) 1 = 18-25; 2 = 26-35; 3 = 36-45; 4 = 46-55; 5 = 56 or older	Survey
WorkHIV	Years of experience in HIV clinic	Survey
RegRate	Rate of adoption in region	HIVQUAL-T results
Size	The number of beds	Survey
Workload	Nurse-to-patient ratio in HIV clinic	Survey
Position	1 = Nurse; 2 = Physicians; 3 = Pharmacist; 4 = Pharmacy Technician; 5 = Public Health Technician; 6 = AIDS Coordinator; 7 = Other	Survey

Data Collection

With the cooperation from BATS, the URLs for the online questionnaire were accessible for all public hospitals in Thailand via two channels, including 1) BATS' website (http://www.cqihiv.com), which stated the needs for evaluating the HIVQUAL-T program, and 2) e-mail messages sent from BATS to Disease Control and Prevention (DPC) regional offices and to HIVQUAL-T coordinators or implementers nationwide.

Subsequently, the follow-up started one week later by telephone calls to HIV practitioners who were reported to be responsible for implementing performance measurement and quality improvement in hospitals' HIV clinics, in order to confirm that they had received the links. This follow-up focused only on the hospitals that met the inclusion criteria. In the cases for which the practitioners had not yet received any contacts from BATS, the researcher verbally explained the purpose of the study and asked whether the practitioners would voluntarily give responses. If so, the practitioners were asked to provide updated e-mail addresses to receive the links. All e-mails sent to the respondents included the introductory letter and the letter of consent approved by the University's Institutional Review Board. The second follow-up was done in the fourth week. The lists of all public hospitals in Thailand and their phone numbers were obtained from the National Health Security

Office (HNSO)'s telephone directory. This online survey was conducted and stored by using an online database service provider.

Due to the length and the requirements for some complex information regarding numbers of patients and service performance, the respondents were allowed access to uncompleted questionnaires to add or update their information, in order to provide the most accurate numbers as possible. Therefore, duplicated hospital identification numbers could occur in the dataset. Only the most recent information indicated by the latest access dates of each hospital ID was retained.

Methods of Analysis

Structural Equation Modeling

The contribution of innovation adoption to HIV clinical services performance in this study was modeled using the structural equation modeling method (SEM). Structural equation modeling is an extension of regression methods with causal specifications among the study variables. Its process contains two steps: validating the measurement model and fitting the structural model (Wan, 2002). SEM provides several advantages for analyses, compared with other multivariate analysis methods. First, SEM can deal with latent constructs derived from theoretical perspectives. It can take into account variables that have multiple related dimensions or observed indicators and uses confirmatory factor analysis as the tool to examine the measurement model of the constructs. Second, SEM allows building an analytical (causal) model with multiple exogenous and endogenous variables, for both observable and unobservable (latent) indicators. Third, it is the only methodology that is capable of examining relationships between latent variables (Byrne, 2001). Fourth, SEM allows the flexibility to incorporate measurement models, program impacts, and covariate effects simultaneously. Fifth, SEM

could incorporate measurement sub-models for different assessment levels (Baydar, Jamila, & Webster-Stratton, 2003). This study includes a number of latent constructs. Thus, the SEM is a powerful tool for measuring the relatedness among indicators associated with common constructs and then investigating the effects of exogenous latent variables on multiple endogenous variables.

Confirmatory Factor Analysis

In social sciences, most theories and models are formulated in terms of hypothetical concepts that are not directly measurable but are often measured by a number of indicators. In SEM, one generates a measurement model in order to describe how well the observed indicators could serve as a valid measurement instrument for a latent variable (Wan, 2002). In order to examine whether a theoretical latent construct can serve for common variations among its observed indicators, a confirmatory factor analysis (CFA) is used. It is essential that measurement models be validated before being included into a causal analysis in a structural model. The study includes multiple measurement models for both exogenous and endogenous variables that are to be validated using the CFA method. Both SEM and CFA were performed using AMOS 18.0. The measurement model of endogenous variable "HIV clinical services performance" proposed by this study is presented in Figure 2.

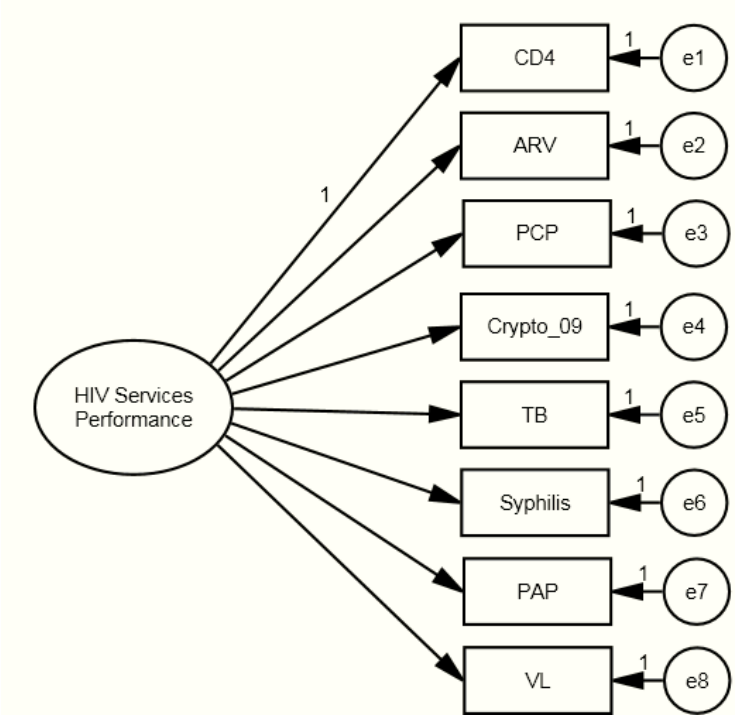


Figure 2. A Hypothesized Measurement Model of Endogenous Variable "HIV Ambulatory Services Performance"

Figure 3 presents the generic covariance structural model hypothesizing the impacts of HIV practitioners' individual characteristics indicated by five latent exogenous variables including relative advantage, compatibility, simplicity, trialability, and observability, on extensiveness of the HIVQUAL-T model implementation, with workload and rate of adoption in the area as control variables.

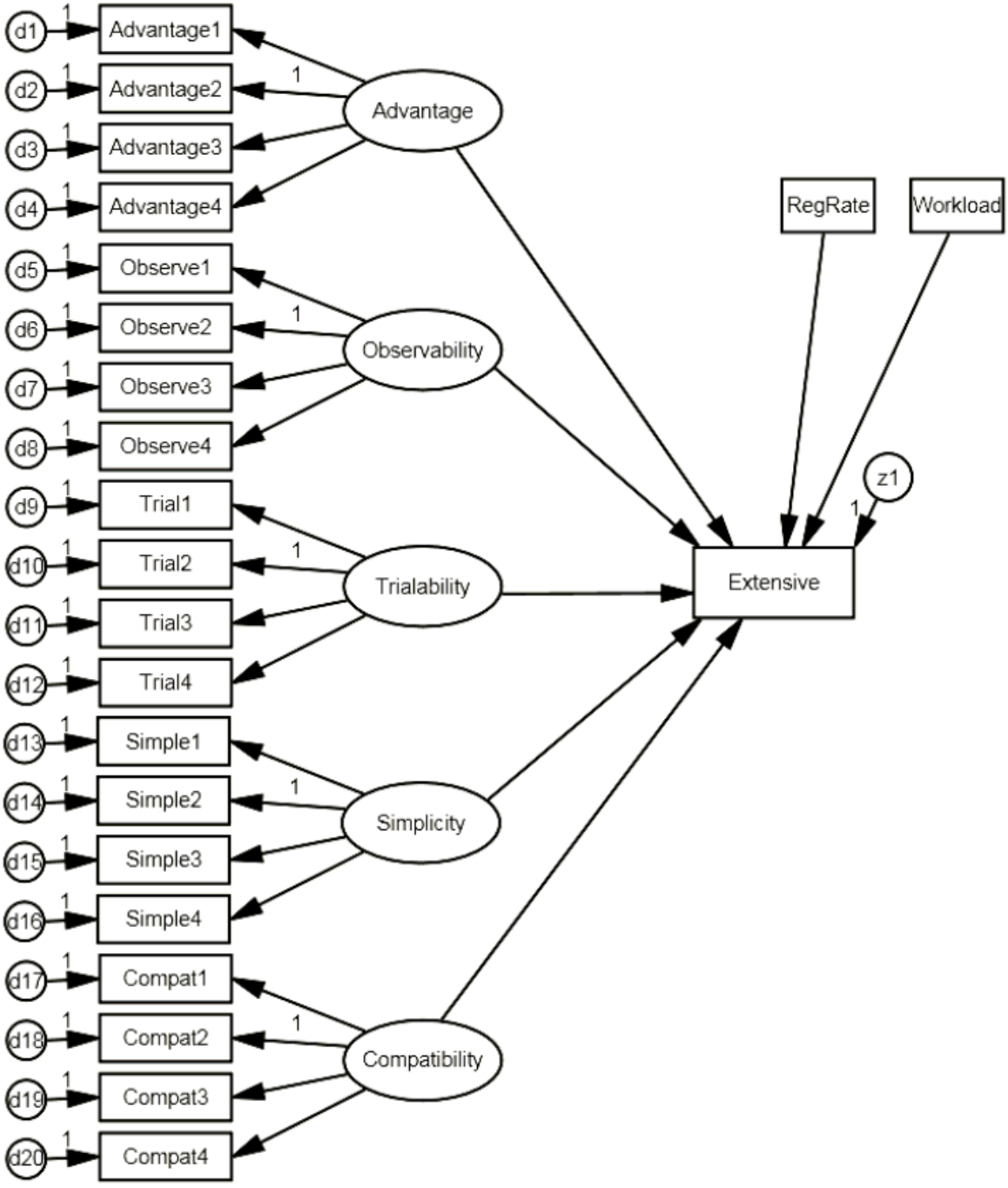


Figure 3. A Hypothesized Covariance Structural Model for the Impacts of Perceived Innovation Attributes on Extensiveness of HIVQUAL-T Model Adoption

From Figure 4, the proposed covariance structural model of innovation adoption and hospital's HIV ambulatory services performance presented the relationship between five latent exogenous variables of organization structural characteristics—centralization, complexity, formalization, interconnectedness, and organizational slack—and the endogenous variable, extensiveness of the HIVQUAL-T model implementation. In this model the relation of extensiveness of the HIVQUAL-T model implementation to hospital's HIV ambulatory services performance is also proposed, with additional control variables, including rate of adoption in the area, workload, and size.

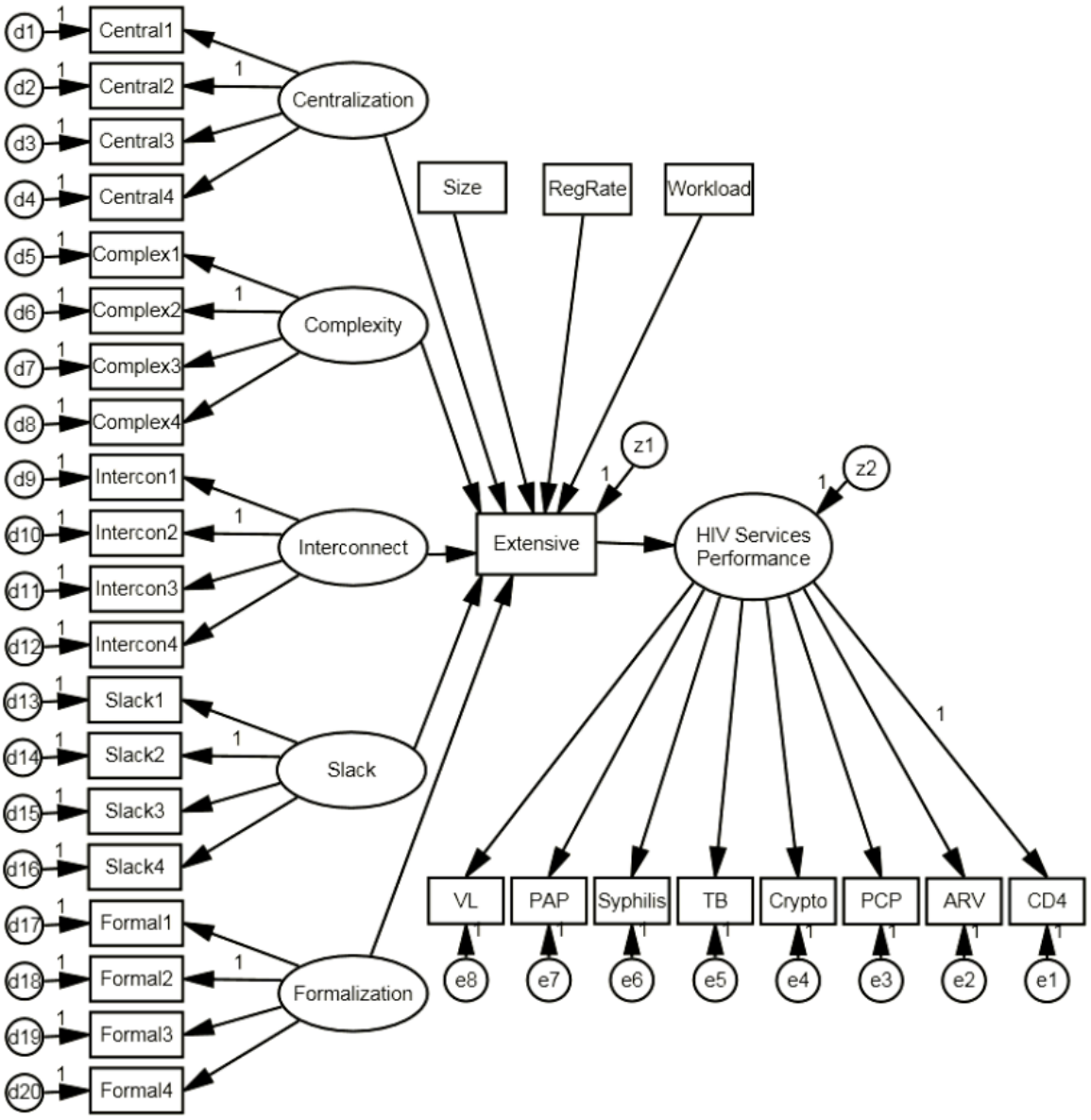


Figure 4. A Hypothesized Covariance Structural Model for the Impacts of Organization Structural Characteristics on Extensiveness of HIVQUAL-T Model Adoption and HIV Ambulatory Services Performance

Model Validation

After performing model specification using the structural equation modeling approach, it is necessary to assess model fit in order to ensure the appropriate interpretation of the theoretical framework. (Wan, 2002).

Criteria for Determining the Overall Fit of the Model

Several statistical means can evaluate how well a specified model fits the data. Consulting multiple fit statistics would help in considering different aspects of fit (Roberts, 1999). This study uses the Bentler (1990) chi-square statistics, the Jörekog & Sorbom (1986) Goodness-of-fit Index (GFI) and Adjusted Goodness-of-fit Index (AGFI), Steiger and Lind (1980) Root Mean Square Error of Approximation (RMSEA), the Normed Fit Index (NFI), Tucker-Lewis Index (TLI), and Hoelter's critical N (Albright & Park, 2009; Roberts, 1999; Wan, 2002). The criteria for determining the overall model fit, using the rule of thumb, as described by Wan (2002), are as follows:

χ^2 likelihood ratio (χ^2/df): A chi-square likelihood ratio tests the null hypothesis that the sample covariance matrix is drawn from a population characterized by the hypothesized covariance matrix. A small ratio indicates a better fit; however, there is no consistent standard for what is considered an acceptable model. This study considers the relative chi-square < 4 to indicate acceptable fit.

GFI & AGFI: The goodness of fit index is a measure of amount of variances and covariances jointly accounted for by the model. The adjusted goodness of fit index is an alternate GFI in which degrees of freedom are taken into account. Larger values indicate better fit. This study considers the GFI and AGFI > 0.9 to indicate acceptable fit.

RMSEA: The root mean square error of approximation measures the lack of fit compared to the saturated model. RMSEA of 0.05 indicates a good fit while RMSEA of 0.08 or less indicates an acceptable fit.

NFI: The Normed Fit Index is the difference between the independence model and the identified model's chi-square divided by the chi-square for the independence model. NFI > 0.90 indicates an acceptable fit while NFI > 0.95 indicates a good fit.

TLI: The Tucker-Lewis Index, in addition to NFI, takes into account the penalty for adding parameters. TLI > 0.95 indicates a good fit.

HOELTER: The Hoelter's critical N indicates the largest sample size for which one would accept the hypothesis that a model is correct. At 0.05 level of significance, a value equal to or greater than 200 is required.

Improving the Model Fit

To improve the goodness of the model fit, three steps would be applied in the analyses: 1) eliminating observed variables or indicators that do not have statistically significant contributions to the latent or endogenous variables; 2) removing indicators with small factor loadings; and 3) allowing measurement errors of observed variables to be correlated as suggested by the modification indices.

Chapter Summary

This is a lagged cross-sectional study that uses two main datasets, including Thailand's national HIV service performance data and survey data. The survey instrument developed in this study contains three major parts: 1) respondents' perceptions on innovation characteristics; 2) hospitals' structural characteristics, and 3) information on the implementation of the HIVQUAL-T model. Most measurements for latent constructs were validated by previous studies and some measurements were developed and based on the concepts proposed by other relevant studies. Data collection resulted in a 54% response rate. The hypothesized covariance structural models for the impacts of perceived innovation characteristics on extensiveness of adoption and the impacts of organization structural characteristics on extensiveness of adoption with the contributions to hospitals' HIV ambulatory services performance were presented.

CHAPTER FOUR: STUDY RESULTS

This chapter presents information about the characteristics of the respondents, characteristics of the sample hospitals, and descriptive statistics of each variable. The study was conducted in two major steps for data analysis, including confirmatory factor analysis for examining construct validity and structural equation modeling for examining the relationship between exogenous and endogenous variables, using AMOS 18.0. The study results as well as their interpretations are illustrated.

Data Preparation

Sample Data

The main dataset for this study was the data obtained through a random survey of 828 public hospitals operating under Thailand's Ministry of Public Health. This dataset excluded 58 pilot sites that participated in the HIVQUAL-T pilot implementation period as of 2005. Finally, from 770 non-pilot hospitals nationwide, a total of 381 hospitals responded, accounting for the response rate of 50%. This dataset was merged with the performance measurement results dataset in order to distinguish the adopters from non-adopters and identify their level of HIV ambulatory services performance.

Data Cleaning

This study examined two covariance structural models; thus, after the data cleaning process, two datasets were applied for the analyses: 1) a dataset for investigating only the impacts of innovation attributes perceived by HIV care practitioners on adoption-implementation behavior and 2) a dataset for investigating the impacts of hospitals' structural characteristics on adoption-implementation behavior and the implication of the extensiveness of the adoption on hospitals' HIV ambulatory services performance.

Missing data was handled by listwise deletion, which resulted in dropping 29 observations from the individuals' perceived innovation attributes dataset and 66 observations from the hospitals' structural characteristics dataset, of the original 381 observations, resulting in 352 completed observations for the former dataset and 315 observations for the latter. There seemed to be several missing items among the non-adopters who reported no experience of any types of performance measurement activities. Accordingly, they might not have been able to provide information regarding the performance measurement results and were thus removed from the dataset.

Descriptive Statistics

Characteristics of the Sample

Since this is an organizational-level study, the survey respondents were considered as representative of each hospital. All respondents are HIV care practitioners who reported being responsible for performance assessment activities in each hospital's HIV clinic. The majority of the respondents (79.8%) were nurse practitioners, while 1.1% were physicians, 1.1% were pharmacists, 1.8% were pharmacy technicians, 2.1% were public health officers, and 14.2% were HIV/AIDS

coordinators. Most of the respondents were 36–45 years old (48.0%), followed by 46–55 years old (26.7%), 26–35 years old (21.4%%), 18–25 years old (3.6%), and 55 years old or above (0.4%).

However, due to data collection problems pertaining to the internet-based survey, 70 respondents (19.9%) reported the inability to access the last page of the survey questionnaire, where they were asked about demographical characteristics. This, unfortunately, resulted in the failure to include demographical characteristics of the respondents into the structural model to investigate the impact of perceived innovation attributes on hospitals' adoption behavior. Thus, only the constructs of innovation attributes perceived by these HIV care practitioners and two control variables, rate of adoption in the region and HIV clinic workload, were included in the covariance structural model.

According to the hospitals' structural characteristics dataset, of 315 hospitals that reported their performance results, community hospitals accounted for a majority of the observations (85.7%), followed by general hospitals (7.2%), and regional hospitals (4.1%). The proportion of each type of hospital in the study was quite consistent with the proportion in the entire population (of 828 hospitals; 88.0% are community hospitals, 8.6% are general hospitals, and 3.0% are regional hospitals). Additionally, the proportion of the sample observation by disease prevention and control (DPC) region is not much different from the entire population, as shown in Table 2, indicating that this sample could be a representative for explaining the adoption behaviors of Thai hospitals nationwide.

Table 2. Percentage of Hospitals by Type and DPC Region

Category	Percent of sample (n=315)	Percent of population (N=828)
Type		
Regional Hospitals	4.1	3.0
General Hospitals	7.2	8.6
Community Hospitals	85.7	88.4
DPC Region		
DPC 1	3.8	3.7
DPC 2	5.4	5.7
DPC 3	9.5	9.2
DPC 4	5.4	6.9
DPC 5	8.3	9.4
DPC 6	14.6	14.0
DPC 7	9.5	11.1
DPC 8	6.3	5.0
DPC 9	4.8	5.6
DPC 10	11.4	11.6
DPC 11	14.6	9.1
DPC 12	6.3	8.8

Adoption Behavior

According to BATS' performance measurement results as of 2008, 632 hospitals (76%) had reported the use of the HIVQUAL-T software. However, it was found that there were 276 adopters (87.6%) out of 315 hospitals in the study dataset. This different proportion was due to missing data from several non-adopters who could not provide the information regarding hospitals' performance, as mentioned above. Among the adopters, 58 hospitals (18.4% of total respondents) reported using only the HIVQUAL-T software in either 2007 or 2008 or both, with no quality improvement activities in 2008 or 2009. Two hundred eighteen hospitals (69.2% of total respondents) reported the full use of the HIVQUAL-T model while 39 hospitals (12.4% of total respondents) reported no experience in implementing the model either in 2007 or 2008. The descriptive statistics for hospitals' adoption behavior is presented in Table 3.

Table 3. Extensiveness of the HIVQUAL-T Model Adoption of the Study Samples

	Dataset 1 (n=352)		Dataset 2 (n=315)	
Extensiveness	Frequency	Percent	Frequency	Percent
No adoption	54	15.3	39	12.4
PM adoption	68	19.3	58	18.4
PM adoption + QI implementation	230	65.3	218	69.2
Total	352	100	315	100

Descriptive Statistics of Latent Endogenous, Latent Exogenous, and Control Variables

Table 4 presents the means and standard deviations for latent constructs for perceived innovation attributes and control variables. Each construct has four indicators, mostly with minimum value of 1 or 2 and maximum of 5. The indicators for the construct: Relative Advantage have relatively larger mean values than other constructs, which could imply that hospitals may generally view the HIVQUAL-T model to be more advantageous than other performance measurement methods. Particularly, the item Advantage 1 stated that using the HIVQUAL-T software was more convenient than other methods (mean = 4.08, Std. = 0.710) and the item Advantage3 stated that the respondents believed that the model would result in better HIV services quality (mean = 4.14; Std. = 0.638).

Table 4. Descriptive Statistics for Variables for Perceived Innovation Attributes Model (n=352)

Key Variables	Minimum	Maximum	Mean	Standard deviation
Extensiveness of adoption	0	2	1.50	0.747
Relative advantage				
Advantage1	2	5	4.08	0.710
Advantage2	1	5	3.90	1.773
Advantage3	2	5	4.14	0.638
Advantage4	1	5	3.96	0.761
Observability				
Observe1	1	5	3.18	0.808
Observe2	1	5	2.44	1.053
Observe3	1	5	3.53	0.769
Observe4	1	5	3.38	0.892
Trialability				
Trial1	1	5	3.30	0.974
Trial2	1	5	3.03	1.083
Trial3	1	5	2.90	1.049
Trial4	1	5	2.83	1.046
Simplicity				
Simple1	1	5	3.72	0.684
Simple2	1	5	3.68	0.709
Simple3	1	5	3.63	0.781
Simple4	1	5	3.30	0.812
Compatibility				
Compat1	1	5	3.74	0.719
Compat2	2	5	3.91	0.617
Compat3	2	5	3.70	0.716
Compat4	2	5	3.73	0.682
Control variables				
Workload	0.00	1.20	0.033	0.074
Rate of adoption (RegRate)	0.30	0.72	0.243	0.230

Note**:** See Table 1. for detailed questions for each item.

From Table 4, an average workload, which was quantified by nurse-to-patient ratio, is 0.033 with 0.074 standard deviation. Smaller values indicate larger workload. A value of zero in nurse-to-patient ratio were found in the facilities that reported neither full-time nor part-time nurses serving in HIV clinics. It could be interpreted that some hospitals may assign their nurses to serve in several clinics with no specific responsibility for HIV care and they had already too much of a workload to take care of only HIV patients. Alternatively, it could imply that the hospitals may not have a

dedicated unit specifically for serving HIV patients. In this sense, hospitals' dedication to HIV care could be reflected by whether a hospital assigns an adequate number of personnel to serve HIV patients.

Descriptive statistics for the second dataset, as illustrated in Table 5, shows the average percentage of each item measuring the endogenous variable, HIV ambulatory services performance. Most items, except CD4, have a wide variation from zero to 100% of eligible patients receiving the services. As CD4 screening is considered as the frontline service to be provided to any HIV patients, the average percentage of patients receiving CD4 screening across hospitals is higher than other service categories (mean = 94.30, Std. = 11.792). A low average percentage of eligible patients receiving the services is found in cervical cancer screening for women (PAP smear) and viral load screening (mean = 65.19 and 62.99, respectively), implying that these two services may not be common among hospitals. A low PAP smear rate could be due to the procedure of the test, which may be undesirable under Thailand's cultural context. Low viral load screening could be due to its relatively high cost, which could be an important barrier in many poor-resource settings.

Table 5. Descriptive Statistics for Variables for Structural Characteristics Model (n=315)

Key Variables	Minimum	Maximum	Mean	Standard deviation
HIV ambulatory services performance				
CD4	16.00	100	94.30	11.792
ARV	0	100	73.74	23.819
PCP	0	100	89.34	20.580
Crypto	0	100	83.54	24.221
TB	0	100	80.35	29.243
Syphilis	0	100	92.10	20.190
PAP	0	100	65.19	38.493
VL	0	100	62.99	31.768
Extensiveness of adoption	0	2	1.57	0.703
Centralization				
Central1	1	5	3.84	0.992
Central2	1	5	3.95	0.804
Central3	1	5	3.38	1.072
Central4	1	5	3.95	0.894
Formalization				
Formal1	1	5	3.96	0.752
Formal2	1	5	3.93	0.916
Formal3	1	5	1.95	0.884
Formal4	1	5	2.86	0.899
Complexity				
Complex1	1	3	1.18	0.483
Complex2	0	1	0.20	0.401
Complex3	0	1	0.26	0.441
Complex4	0	1	0.19	0.393
Interconnectedness				
Intercon1	0	6	2.90	1.393
Intercon2	0	6	2.84	1.175
Intercon3	0	6	2.84	1.265
Intercon4	0	6	2.03	1.076
Organizational Slack				
Slack1	1	5	2.83	1.020
Slack2	1	5	3.00	1.236
Slack3	1	5	3.06	1.054
Slack4	1	5	3.56	1.138
Control variables				
Hospital size	10	1000	99.13	160.650
Workload	0.00	1.20	0.032	0.764
Rate of adoption (RegRate)	0.03	0.72	0.248	0.228

Table 5 also presents average values of the endogenous variable Extensiveness of adoption as consistent with the values from the first dataset (mean = 1.57, Std. = 0.703 and mean = 1.50, Std. = 0.747, respectively). Likewise, the average values of rate of adoption and workload are 0.248 and 0.032 with 0.072 and 1.20 standard deviations, respectively, which are close to the values presented in the other dataset. Most items measuring organization structures also have similar average values within the same construct. However, the construct 'Formalization,' which contains two items with reversed values (Formal3 and Formal4) shows inconsistent mean values as compared to two other items (mean = 1.95 and 2.86 for Formal3 and Formal4, respectively).

It was noticed that hospital size varies largely from 10 beds to 1000 beds with an average of 99.13 beds and a standard deviation of 160.650. This variation could depend on the type of hospital. Generally, regional hospitals could have at least 500 beds while general hospitals could have at least 120 beds. Community hospitals' size could vary from 10 to 150 beds.

Confirmatory Factor Analysis

The study applied three sets of constructs: 1) HIV ambulatory services performance; 2) organization structural characteristics; and 3) perceived innovation attributes. All items measuring the constructs are theoretically based and are illustrated in several measurement models. Confirmatory factor analyses were employed for examining construct validity. The items with insignificant factor loadings were removed from the measurement models while measurement errors were allowed to be correlated in order to obtain models that fit well with the data. The revised measurement models were later used to draw and examine hypothesized relationship among the exogenous and endogenous variables, using the structural equation modeling method.

HIV Ambulatory Services Performance

HIV ambulatory services performance is an endogenous latent variable that includes eight baseline HIV care and treatment indicators informed by the national guidelines for HIV clinical care and treatment and the HIVQUAL-T software. The eight items include CD4 counts screening (CD4); antiretroviral drug therapy for symptomatic patients or asymptomatic patients with CD4 ≤ 200 cells/μL (ARV); primary Pneumocystis Pneumonia prophylaxis for patients with CD4 ≤ 200 cells/μL (PCP); primary Cryptococosis prophylaxis for patients with CD4 ≤ 100 cells/μL (Crypto); tuberculosis screening (TB); syphilis screening (Syphilis); pap smear for women (PAP); and viral load screening (VL). For the HIVQUAL-T model adopters, the HIV ambulatory services performance information was obtained from BATS' HIV care performance dataset while the survey items asked non-adopters to provide their performance results by using the same calculation algorithms as used by the software: number of patients who received the service divided by number of patients eligible to receive the service. All items were measured as percentage of eligible patients who had received these baseline services from hospitals' HIV clinics as of 2009.

Correlation Analysis

A Pearson's correlation was performed in order to examine the association between each item in the construct. All items are correlated at < 0.05 level of significance. There existed a strong correlation between PCP and Crypto (r = 0.799), while VL had weak associations with most of the items.

Measurement Model of HIV Ambulatory Services Performance

The following diagram (Figure 5) with standardized regression weight illustrates the generic, one-factor measurement model of HIV ambulatory services performance, where the HIV Services Performance latent variable is manifested by eight observed variables. All factor loadings show C.R. > 1.96, indicating statistical significance. PCP and Crypto have large factor loadings of 0.92 and 0.83; thus, they appear to be the best indicators of HIV Services Performance. VL has relatively poor factor loading, suggesting that it may not be a good representation of HIV Services Performance, compared to other indicators. The model fit summary show a $\chi^2 = 287.553$ with 20 degrees of freedom, which results in $\chi^2/df = 14.377$ ($p < .000$). In addition, the Goodness of Fit Index (GFI) and Adjusted Goodness of Fit Index (AGFI) are small (0.798 and 0.636, respectively) while the Root Mean Square Error Approximation (RMSEA) is .206, indicating that this measurement model is a poor fit and needs a modification.

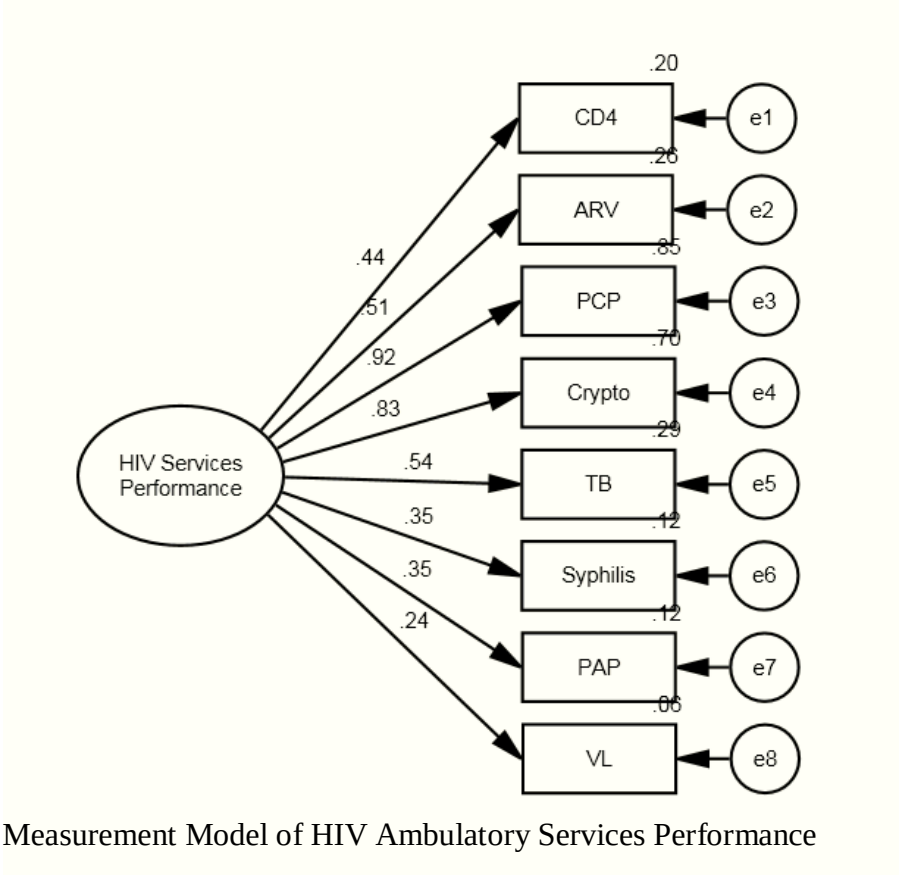


Figure 5. A Generic Measurement Model of HIV Ambulatory Services Performance

To improve the model performance, VL was removed from the model due to its poor factor loadings and explained variance. Besides, despite being the best indicators for HIV services performance, PCP and Crypto represent the same dimension of primary prophylaxis of opportunistic infections; additionally, as suggested by Pearson's correlation, they appear to be highly correlated (r = .799). Hence, for preventing possible multicollinearity issues and for data reduction, Crypto, whose variance is relatively less explained by the construct (R^2 = 0.70) as compared to PCP, was removed from the model. A revised measurement model of HIV ambulatory services performance is presented in Figure 6

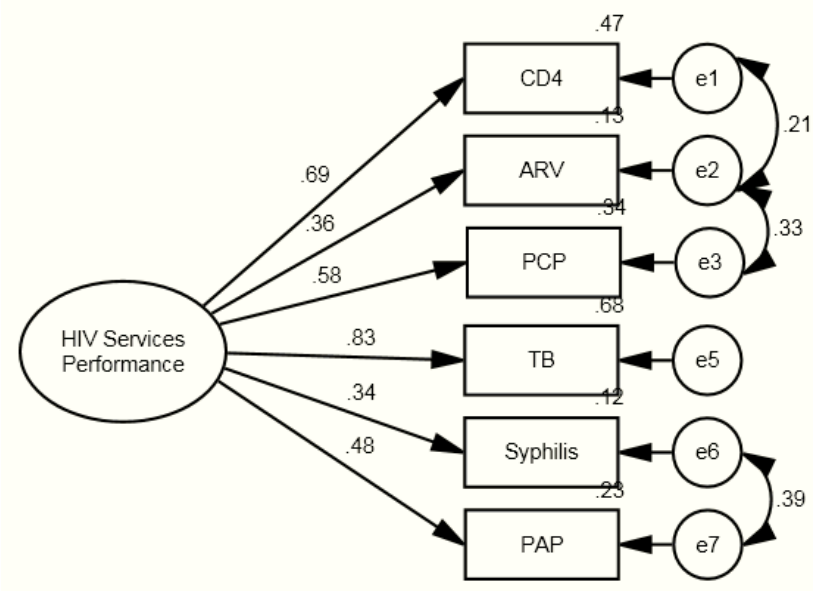


Figure 6. A Revised Measurement Model of HIV Ambulatory Services Performance

After removing Crypto, it appeared that TB became the best indicator for HIV Services Performance ($\lambda = 0.826$), followed by CD4 ($\lambda = 0.687$) and PCP ($\lambda = 0.582$). Modification indices suggested that ARV is closely related to PCP and CD4, which, practically, could be because both ARV and PCP services provision generally follow CD4 cell counts as the main criteria to identifying eligible patients to receive the services. Additionally, the measurement errors for Syphilis and PAP were allowed to be correlated with moderate correlation value ($\phi = 0.39$). As a result, the model performance was improved considerably with a $\chi^2 = 9.271$ with 6 degrees of freedom, which results in $\chi^2/df = 1.545$ with $p = .159$, too large to reject the null hypothesis of a good fit. The GFI and AGFI of .990 and .965 are large, as well as NFI and TLI, which are close to 1 (.980 and .982, respectively). Additionally, RMSEA is significant ($p = .042$) with PCLOSE = .543. HOELTER is larger than 200 at the 0.05 level of significance (HOELTER = 427). These multiple goodness-of-fit indices confirmed that the measurement model fit quite well with the data and could represent a good measure for HIV

ambulatory services performance in Thailand's HIV care setting. Parameter Estimates for the indicators of HIV ambulatory services performance are presented in Table 6.

Table 6. Parameter Estimates for the Indicators of HIV Ambulatory Services Performance

	Generic		Revised	
Items	Standardized Regression Coefficients	Critical Value	Standardized Regression Coefficients	Critical Value
CD4	0.443	*6.337	0.687	< >
ARV	0.506	*7.934	0.360	*5.786
PCP	0.920	*7.837	0.582	*8.550
Crypto	0.835	*6.558	--	--
TB	0.540	*4.969	0.826	*9.612
Syphilis	0.347	*4.997	0.341	*5.224
PAP	0.349	*3.666	0.480	*7.222
VL	0.236	*6.337	--	--
Goodness of Fit Statistics				
$\chi 2$	287.533		9.271	
Df	20		6	
$\chi 2$/df (p-value)	14.377 (0.000)		1.545 (0.159)	
GFI	0.798		0.990	
AGFI	0.636		0.965	
NFI	0.678		0.980	
TLI	0.567		0.982	
RMSEA	0.206		0.042	

Notes: -- Items were not included in the revised model.
<blank> indicates constrained items with a regression weight of 1.
*Critical ratio greater than 1.96 is considered statistically significant at the 0.05 level.

Perceived Innovation Attributes

Perceived innovation attributes, according to the diffusion of innovation theory, include five constructs: Relative Advantage, Observability, Trialability, Simplicity, and Compatibility. This study validated five measurement models for the five constructs. Each construct contains four items measured in dichotomous or ordinal scales.

Correlation Analysis

The results from Pearson's correlation showed that all items, both within and across constructs, were significantly correlated. Some items such as Advantage1 and Advantage2 ($r = 0.70$) and Trial2, Trial3, and Trial 4 ($r > 0.80 < 0.90$) were found to be strongly correlated, but the r-values were not yet high enough to ensure the multicollinearity problem. All items, thus, were retained, and the constructs were to be validated in the confirmatory factor analysis process.

Measurement Models of Perceived Innovation Attributes

The confirmatory factor analyses for the generic measurement models of the five constructs for perceived innovation attributes showed that all constructs were quite valid. The measurement model of observability (

Figure 7-C) indicated significant factor loadings of all items. The strongest indicator was Observe3 (whether it was visible to the prospect adopters how other hospitals using the model could improve their service quality), with standardized $\lambda = 0.73$, $R^2 = 0.53$. The model fit was obtained with $\chi^2 = 7.154/2$ df ($p = 0.28$), GFI and AGFI = 0.990 and 0.951, and RMSEA = 0.085. Simple2 (whether it was easy to remember how to use the HIVQUAL-T software) appeared to be the best indicator for the construct 'simplicity' (Figure 7-D), with standardized $\lambda = 0.91$, $R^2 = 0.83$. The model fit was acceptable with $\chi^2 = 7.131/2$ df ($p = 0.028$), GFI and AGFI = 0.990 and 0.952, and RMSEA = 0.086. Trialability (

Figure 7-E) was well represented by its four indicators. Trial3 (whether the prospective adopters had a great deal of opportunity to try the software) had the highest standardized factor loadings and variance explained by the construct ($\lambda = 0.96$, $R^2 = 0.92$). This measurement model fit

quite well with the data, with χ^2 = 2.304/2 df (p = 0.316), GFI and AGFI = 0.997 and 0.983, and RMSEA = 0.021. These three models did not require further validation; thus, they were ready to use in the structural model of the impacts of perceived innovation attributes on extensiveness of adoption.

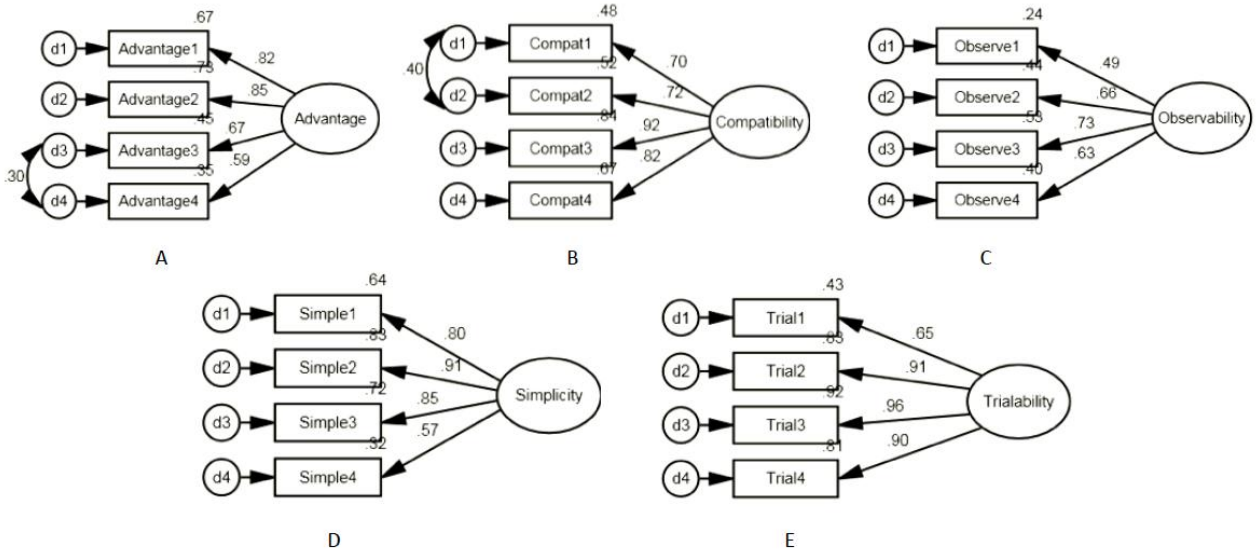


Figure 7. The Five Measurement Models of Perceived Innovation Attributes

Among the four items of relative advantage (Figure 7-A), Advantage2 (whether the HIVQUAL-T software seemed to be less time consuming than other performance measurement methods) appeared to be the best indicator (λ = 0.85). The modification indices suggested allowing the measurement errors of Advantage3 (whether the HIVQUAL-T model was believed to result in better service quality) and Advantage4 (whether the HIVQUAL-T model was believed to help hospitals to obtain and maintain accreditation status) to be correlated; nevertheless, the model fit was satisfied by few criteria (χ^2 = 10.995/1 df (p = 0.001), GFI and AGFI = 0.985 and 0.848, NFI = 0.981, and RMSEA = 0.169. The measurement model of compatibility (Figure 7-B) was validated

with all items with large and statistically significant factor loadings. Compat3 (whether the HIVQUAL-T model was perceived to fit well with the way HIV care practitioners like to work) had the strongest factor loading on the construct ($\lambda = 0.92$, $R^2 = 0.84$). The measurement errors of Compat1 (overall compatibility) and Compat2 (whether the model was compatible with the needs for assessing performance) were moderately correlated ($r = 0.40$). The model fit statistics was acceptable with $\chi^2 = 7.907/1$ df ($p = 0.05$), GFI and AGFI = 0.989 and 0.890, NFI = 0.990, and RMSEA = 0.140. Although the modification indices suggested more correlated errors for the models of relative advantage and compatibility, adding more parameters to be estimated would result in unidentified parameter estimates since the degree of freedom would be equal to zero. Therefore, further validation of these measurement models was not desirable. The detailed results of the validated models were presented in Table 7.

Table 7. Parameter Estimates for the Indicators of Perceived Innovation Attributes Constructs

	Parameter Estimates		Goodness-of-Fit Statistics				
Constructs/Items	Standardized Factor Loadings	Critical Value	$\chi 2$/df	p-value	GFI	AGFI	RMSEA
Relative Advantage			10.995/1	0.001	0.985	0.848	0.169
Advantage1	0.818	< >					
Advantage2	0.855	*14.426					
Advantage3	0.667	*12.258					
Advantage4	0.594	*10.724					
Compatibility			7.907/1	0.005	0.989	0.890	0.140
Compat1	0.695	*16.105					
Compat2	0.723	< >					
Compat3	0.916	*14.928					
Compat4	0.817	*14.496					
Observability			7.131/2	0.028	0.990	0.951	0.085
Observe1	0.487	*7.150					
Observe2	0.662	< >					
Observe3	0.728	*8.939					
Observe4	0.629	*8.589					
Simplicity			7.154/2	0.028	0.990	0.952	0.086
Simple1	.797	*18.469					
Simple2	.910	< >					
Simple3	.847	*20.107					
Simple4	.570	*11.478					
Trialability			2.304/2	0.316	0.997	0.983	0.021
Trial1	.655	*14.737					
Trial2	.913	< >					
Trial3	.961	*32.124					
Trial4	.898	*27.165					

Note: <blank> indicates constrained items with a regression weight of 1.
*Critical ratio greater than 1.96 is considered statistically significant at the 0.05 level.

Organization Structural Characteristics

This study considered five dimensions of organization structural characteristics as predictors for organizational innovativeness, according to the diffusion of innovation theory. These internal attributes contained both subjective and objective (perception) indicators. The five structural characteristics included Centralization, Formalization, Complexity, Interconnectedness, and Organizational slack. Each construct had four measurement items.

Correlation Analysis

The results from Pearson's correlation showed that the items within the constructs, Centralization, Complexity, Interconnectedness, and Organizational Slack, were positively correlated at > 0.05 level of significance. However, some items indicating formalization were negatively correlated, particularly the items with reversed coding. For example, Formal3 and Formal4 are negatively correlated with Formal1 and Formal2. These negative associations may contribute to the violation of construct reliability. Aside from these, there were no high correlations among the items; thus, multicollinearity among the indicators may not be an issue. The validity of all constructs could be examined by conducting confirmatory factor analysis.

Measurement Models of Organization Structural Characteristics

Confirmatory factor analysis was performed to examine the construct validity of organization structural characteristics. Figure 8 presents the measurement models for organization structural characteristics. The measurement model of organization structural characteristics indicated significant factor loadings for all items. Figure 8-A presents a revised model of organizational Complexity. After allowing the measurement errors of complex 1 (level of services indicated by hospital type) and complex4 (whether the hospital had a pediatrician serving in the HIV clinic) to be correlated, an acceptable model fit was obtained with a χ^2 of 2.585/1 df ($p = 0.108$), GFI and AGFI = 0.996 and 0.959, and RMSEA = 0.71. Complex2 (whether the hospital had medical specialists working on-site in 2007) appeared to be the best predictor for complexity ($\lambda = 0.83$), with 69% of variance explained by the construct. Likewise, the measurement model of Interconnectedness (Figure 8-B) was well represented by its four indicators. Intercon2 (how frequently HIV care practitioners attend HIV forums or meetings at the provincial level) appeared to be the best predictor for

Interconnectedness ($\lambda = 0.87$; $R^2 = 0.75$). Correlated measurement errors for Intercon3 and Intercon4 (frequency of attending HIV forums or meeting at regional and national level) improved the model fit with $\chi^2 = 1.774/1df$ ($p = 0.183$), GFI and AGFI = 0.997 and 0.972, and RMSEA = 0.050. The four indicators of organizational slack (Figure 8-C) also presented statistically significant factor loadings. Slack4 had the highest standardized factor loading ($\lambda = 0.53$). The measurement model of organizational slack fit well with the data without further validation.

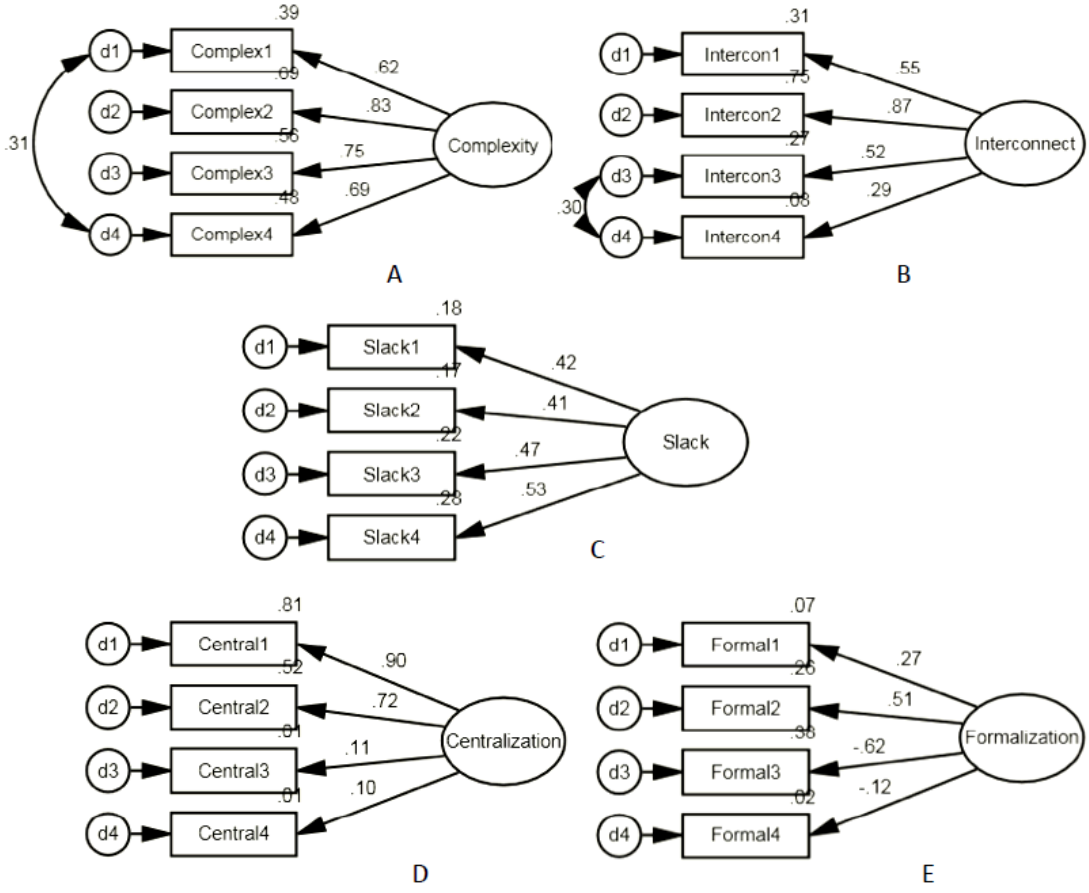


Figure 8. The Five Measurement Models of Organization Structural Characteristics

For the measurement model of Centralization (Figure 8-D), Central3 and Central4 were not statistically significant indicators, with C.R. < 1.96 and small standardized factor loadings ($\lambda = 0.115$ and 0.098, respectively). However, when Central3 and Cental4 were removed from the model, other indicators (Central1 and Central2) became insignificant. Interestingly, Formal3 and Formal4 had significant but negative factor loadings ($\lambda = -0.62$ and -0.12, respectively) on the construct 'formalization' (Figure 8-E), which resulted in a violation to the assumption of measurement reliability. Therefore, all items could not be valid measures for Centralization and Formalization in this study context and were not included into the structural model. The detailed results of the validated measurement models are presented in Table 8.

Table 8. Parameter Estimates for the Indicators of Perceived Innovation Attributes Constructs

	Parameter Estimates		Goodness-of-Fit Statistics				
Constructs/Items	Standardized Factor Loadings	Critical Value	$\chi 2$/df	p-value	GFI	AGFI	RMSEA
Centralization[a]			135.014/2	0.000	0.851	0.256	0.460
Central1	.900	*2.490					
Central2	.724	< >					
Central3	.115	1.849					
Central4	.098	1.577					
Complexity			2.585/1	0.108	0.996	0.959	0.071
Complex1	.621	*9.776					
Complex2	.832	< >					
Complex3	.745	*11.709					
Complex4	.692	*10.923					
Interconnectedness			1.774/1	0.183	0.997	0.972	0.050
Intercon1	.554	*5.833					
Intercon2	.867	< >					
Intercon3	.523	*5.732					
Intercon4	.287	*3.915					
Slack of Resources							
Slack1	.420	*3.597	2.778/2	0.249	0.996	0.978	0.035
Slack2	.407	< >					
Slack3	.469	*3.710					
Slack4	.527	*3.734					
Formalization[a]			5.285/2	0.071	0.992	0.960	0.072
Formal1	.266	*2.783					
Formal2	.508	< >					
Formal3	-.618	*-2.425					
Formal4	-.124	-1.504					

Note: <blank> indicates constrained items with a regression weight of 1.

[a]Construct was not revised and included in further analysis.

*Critical ratio greater than 1.96 is considered statistically significant at the 0.05 level.

Structural Equation Modeling

Two covariance structural models were built for conduction path analyses in order to investigate the influences of perceived innovation attributes and organization structural characteristics on the implementation of the HIVQUAL-T model and the impacts of the implementation on hospitals' HIV ambulatory services performance.

Influences of Perceived Innovation Attributes on HIVQUAL-T Model Adoption

SEM using AMOS 18.0 was employed for examining the relationship between a set of perceived innovation attributes and hospitals' extensiveness of the HIVQUAL-T model adoption, as shown in Figure 9. In this model, the endogenous variable, extensiveness of adoption (Extensiveness), is an observed variable that is influenced by five perceived innovation attributes constructs. The constructs were represented as five validated measurement models of relative advantage (Advantage), observability (Observe), Simplicity (Simple), Trialability (Trial), and Compatibility (Compat), each composed of four indicators.

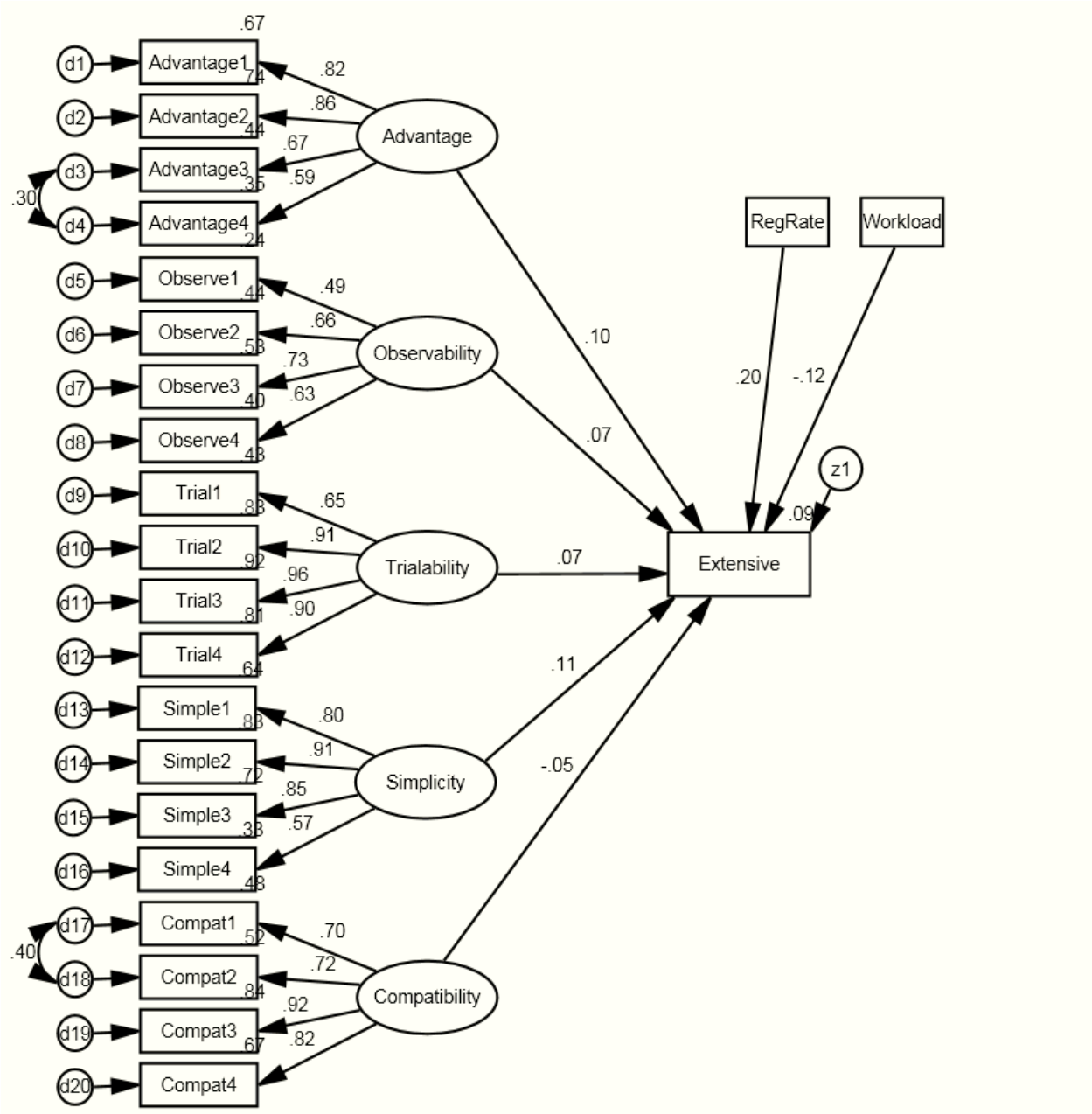


Figure 9. A Generic Covariance Structural Model of the Impacts of Perceived Innovation Characteristics on Hospitals' Extensiveness of the HIVQUAL-T Adoption

The path coefficients between perceived innovation attributes and extensiveness of adoption were estimated in order to examine the causal relationship among the set of exogenous variables and the endogenous variable. Table 9 illustrates standardized factor loadings, standardized path coefficients, and model fit statistics from the generic and revised covariance structural models. Parameter estimates from the generic model show that the path coefficients of Observability, Compatibility, and Trialability are not statistically significant (C.R. < 1.96 and *p*-value > 0.05), indicating that these three attributes did not contribute to HIV care practitioners' extensive implementation of the HIVQUAL-T model and were thus removed from the causal model. However, the level of significance of Advantage in the generic model was close to 0.05 (C.R. = 1.774); therefore it was retained in order to investigate its effect size in a less complex structural model. In addition, a measurement error (d3) of the construct Advantage appeared to be correlated with other measurement errors within the same construct, as well as other constructs; thus, the indicator Relative3 was removed from the model since it may not be a good measure for only a single construct.

Table 9. Parameter Estimates for the Analysis of Impacts of Perceived Innovation Characteristics on Extensiveness of HIVQUAL-T Model Adoption

Effect	Generic		Revised	
	Standardized Coefficients	Critical Value	Standardized Coefficients	Critical Value
Advantage on Extensiveness	0.097	1.744	0.112	*2.060
Observability on Extensiveness	0.067	1.128	--	--
Trialability on Extensiveness	0.073	1.406	--	--
Simplicity on Extensiveness	0.115	*2.134	0.138	*2.551
Compatibility on Extensiveness	-0.052	-0.969	--	--
RegRate on Extensiveness	0.203	*3.980	0.209	*4.112
Workload on Extensiveness	-0.122	*-2.401	-0.124	*-2.385
R^2	0.091		0.097	
Goodness of Fit Statistics				
$\chi 2$	867.560		91.381	
df	224		31	
$\chi 2$/df (p-value)	3.873 (0.000)		2.948 (0.000)	
GFI	0.794		0.951	
AGFI	0.747		0.913	
NFI	0.805		0.926	
TLI	0.827		0.927	
RMSEA	0.090		0.074	

Note: -- Constructs were not included in the revised model.

*Critical ratio greater than 1.96 is considered statistically significant at the 0.05 level.

The revised covariance structural model illustrated in Figure 10 presents statistically significant path coefficients of Simplicity and Relative Advantage (C.R. = 2.551 and 2.060, respectively), as well as the two control variables RegRate (C.R. = 4.112) and Workload (C.R. = -2.385). Rate of adoption in the region wherein hospitals were located appeared to be the strongest predictor of the extensive implementation of the HIVQUAL-T model ($\gamma = 0.209$), followed by perceived simplicity of the HIVQUAL-T model ($\gamma = 0.138$), workload ($\gamma = -0.124$), and perceived relative advantage ($\gamma = 0.112$). The results partially supported hypothesis H_1 that HIV care practitioners who perceived the HIVQUAL-T model to be simple and to have relatively greater advantage over other performance measurement methods were likely to put the HIVQUAL-T model into more extensive implementation. Unlike the study expectation, extensiveness of HIVQUAL-T

model implementation was negatively related to nurse-to-patient ratio (Workload), implying that HIV care practitioners with greater workload were more likely to extensively implement the HIVQUAL-T model. The four significant predictors accounted for 10% of the variation in extensiveness of the HIVQUAL-T model adoption.

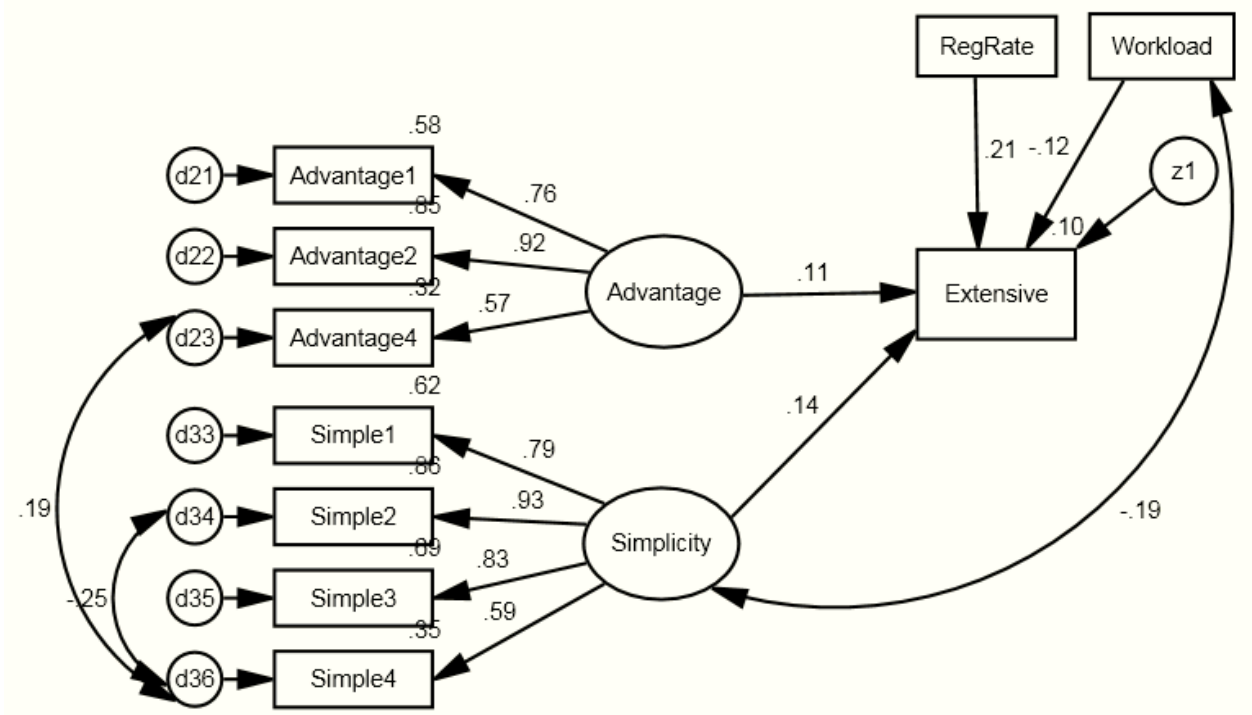


Figure 10. A Revised Covariance Structural Model of the Impacts of Perceived Innovation Characteristics on Hospitals' Extensiveness of the HIVQUAL-T Adoption

As suggested by the modification indices for improving model performance, the measurement errors were correlated between Simple2 and Simple4, and Simple4, and Advantage4. In addition, Simplicity and Workload were found to be negatively correlated ($\phi = 0.19$). The model's goodness-of-fit was acceptable with $\chi 2 = 91.381/31$ df ($p = 0.000$), GFI and AGFI = 0.951 and 0.913, NFI = 0.926, TLI = 0.927, and RMSEA = 0.074. Although it was possible to obtain better model fit by correlating more measurement errors, further revision did not result in any significant decrease of

the $\chi 2$ value. Therefore, without compromising model parsimony, this revised model could be considered as robust.

Influences of Organization Structural Characteristics on HIVQUAL-T Model Adoption and Organizational Performance

The implementation of HIVQUAL-T model was considered as organizational decision-making. Although this study assumed that HIV care practitioners may play an important role in the implementation process (both performance measurement and quality improvement), implementation at the organizational level should also rely on the organization's readiness for the innovation. Consequently, the extent to which organizational structure and operations regarding the innovation may lead to better performance is the main focus in this study.

The structural relationship of the Context-Design-Performance model is illustrated in a path diagram presented in Figure 11. In this model, three validated measurement models of organizational characteristics (the structural design dimension), namely Complexity, Interconnectedness, and Slack of Resources, were hypothesized to directly influence the observed endogenous variable, extensiveness of adoption (the operational design dimension), while an additional direct causal path was drawn from Extensiveness to the latent endogenous variable, HIV Services Performance, the final outcome of the path diagram (the performance dimension). RegRate, Size, and Workload were control variables representing additional context, structural design, and operational design dimensions. Each organization structural characteristics measurement model had four indicators, and the validated measurement model of HIV Services Performance contained six indicators.

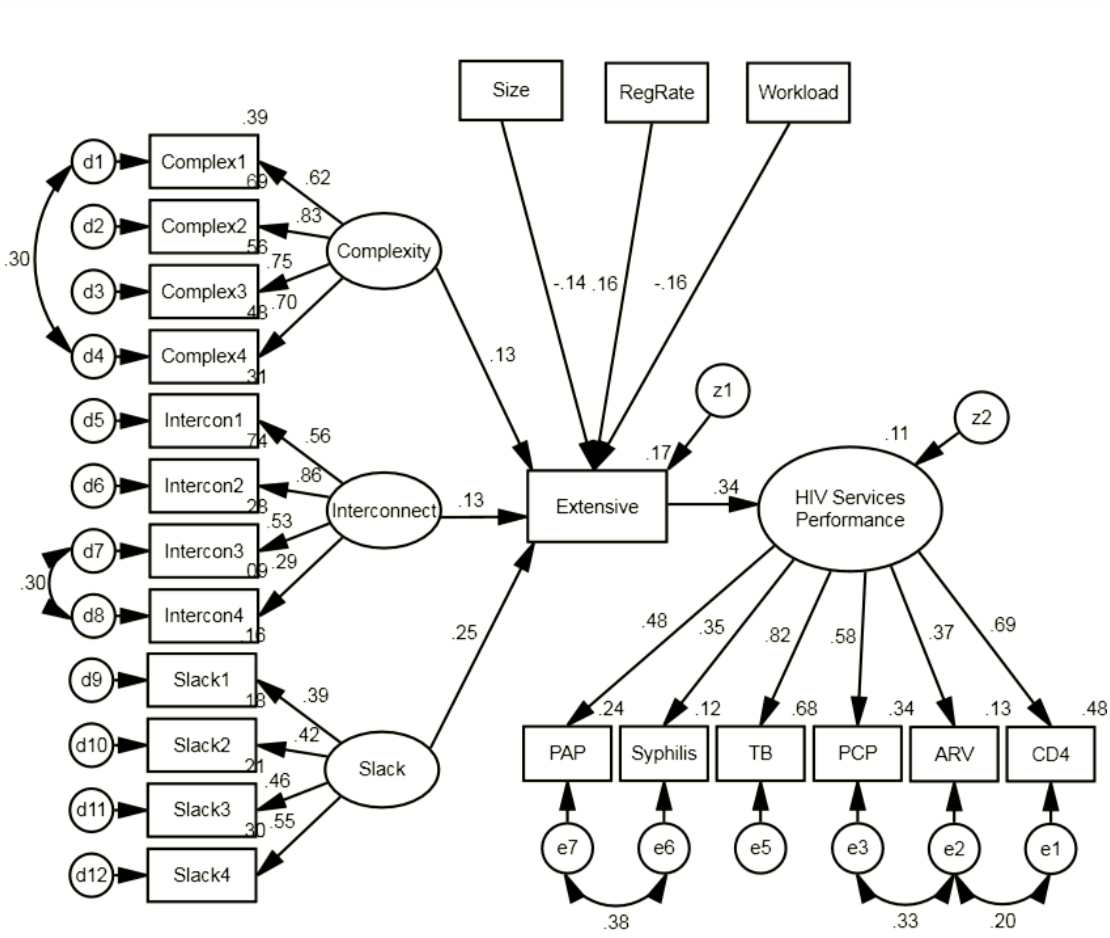


Figure 11. A Generic Covariance Structural Model of HIVQUAL-T Model Adoption

The path coefficients between organization structural characteristics, extensiveness of adoption, and HIV ambulatory services performance were estimated in order to examine the causal relationship among them. Table 10 illustrates standardized factor loadings, standardized path coefficients, and model fit statistics from the generic and revised covariance structural models. The parameter estimates from the generic model reveal that the path coefficients of the three structural design constructs—Complexity, Interconnectedness, and Slack—and the three control variables—

Size, RegRate, and Workload—were all statistically significant, as well as Extensive (C.R. > 1.96 and *p*-value < 0.05). However, the model fit statistics for the generic model suggested further modification by excluding Size from the model due to its high correlation with Complexity (ϕ = 0.95).

Table 10. Parameter Estimates for the Analysis of Impacts of Organization Structural Characteristics on Extensiveness of HIVQUAL-T Model Adoption and HIV Ambulatory Services Performance

Effect	Generic		Revised	
	Standardized Coefficients	Critical Value	Standardized Coefficients	Critical Value
Extensiveness on				
HIV Services Performance	0.338	*5.220	0.334	*5.167
Complexity on Extensiveness	0.133	*2.277		--
Interconnectedness on Extensiveness	0.128	*2.087	0.130	*2.092
Slack on Extensiveness	0.245	*2.850	0.254	*2.891
Size on Extensiveness	-0.143	*-2.727		--
RegRate on Extensiveness	-0.163	*3.095	0.168	*3.147
Workload on Extensiveness	-0.160	*-3.036	-0.159	*-2.970
R^2				
Extensiveness	0.167		0.135	
HIV Services Performance	0.114		0.112	
Goodness of Fit Statistics				
$\chi 2$	765.650		132.911	
df	201		113	
$\chi 2$/df (p-value)	3.809 (0.000)		1.176 (0.097)	
GFI	0.870		0.953	
AGFI	0.836		0.937	
NFI	0.625		0.858	
TLI	0.641		0.970	
RMSEA	0.095		0.024	

Note: -- Constructs were not included in the revised model.
*Critical ratio greater than 1.96 is considered statistically significant at the 0.05 level.

The revised model in Figure 12 presented standardized path coefficients of all predictor variables. The model explained 11.2% of the variation of HIV ambulatory services performance. Extensiveness of HIVQUAL-T model implementation seemed to have proportionate impact on the hospital HIV services performance (β = 0.334), implying that hospitals that implemented the model

more extensively demonstrated better performance in 2009; thus hypothesis 3 was supported. It was noticed that Complexity became insignificant after removing Size from the model, which could imply that the significant contributions of these two variables found in the generic model may be due to their multicollinearity. When only Size or Complexity was included, neither presented statistical significance at all. Therefore, H_{2a} was rejected.

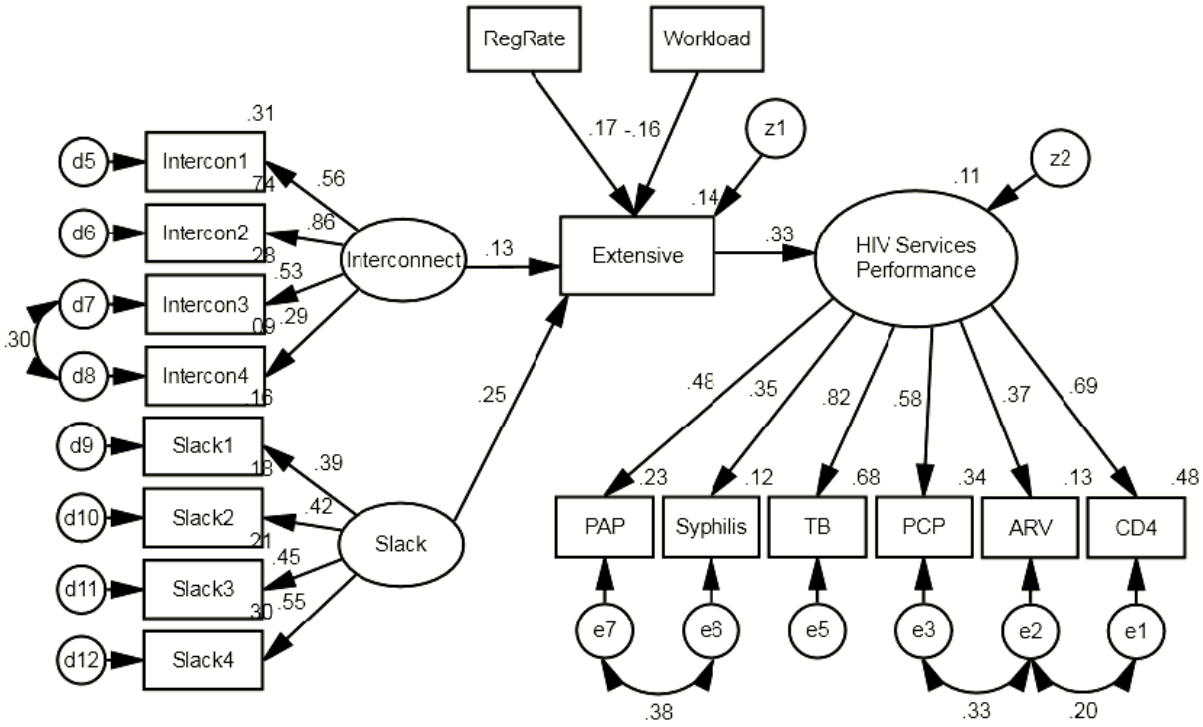


Figure 12. A Revised Covariance Structural Model of HIVQUAL-T Model Adoption and HIV Ambulatory Services Performance in Hospitals

Among exogenous variables, Slack appeared to be the strongest predictor of extensiveness of HIVQUAL-T model adoption ($\gamma = 0.254$), followed by RegRate ($\gamma = 0.168$), Workload ($\gamma = -0.159$), and Interconnectedness ($\gamma = 0.130$). Those five predictors accounted for 13.5% of the variation in

extensiveness of adoption. These results supported the sub-hypotheses H_{2c} and H_{2e} that hospitals with more complex structure had more interactions to both internal and external organization, and those with greater resources implemented the HIVQUAL-T model more extensively. The overall assessment of fit of the revised model suggested an adequate fit of model to the data with $\chi 2$ = 132.911/113 df (p = 0.097), GFI and AGFI = 0.953 and 0.937, NFI = 0.858, TLI = 0.970, and RMSEA = 0.024.

Quality Improvement Trends

After confirming the impacts of the HIVQUAL-T model by comparing the performance between adopters and non-adopters, the presentation of the improvement trends among adopters could give additional support to the research findings whether the model did indeed improve HIV ambulatory services quality across time. According to panel information from BATS' HIV care performance dataset, 353 hospitals reported their performance consecutively from 2007 to 2009 in all HIV care indicators. The descriptive analysis demonstrating changes in average score of HIV services performance according to the eight indicators showed rapid improvement of the service provision from 2007 to 2008 in all indicators and more improvement in most indicators in 2009. For example, an average percentage of eligible patients receiving viral load screening increased from 35.8% in 2007 to 78.3% in 2009, while an average percentage of eligible patients receiving cervical cancer screening (Pap smear) increased from 28.8% in 2007 to 69.6% in 2009. However, among some services for which average scores were relatively high, such as CD4 screening, PCP/Crypto prophylaxis, and ARV therapy, the increase rates from 2008 to 2009 appeared to decelerate. Figure 13 presents national's average performance score for all indicators used in this study.

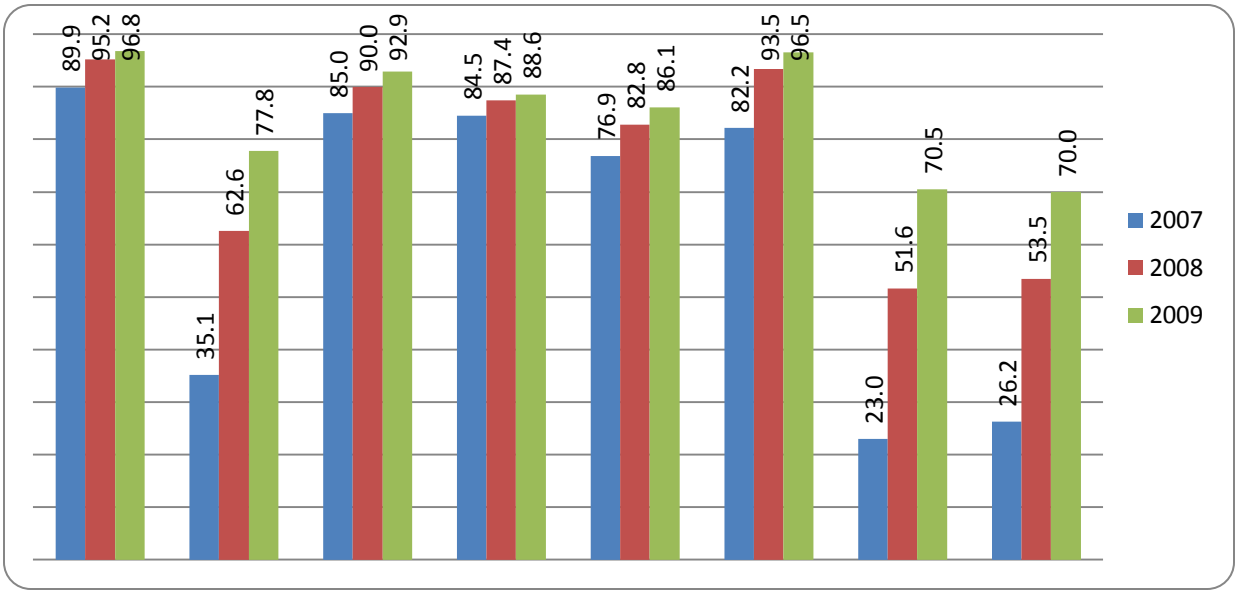


Figure 13. National Average Percentage of Eligible Patients Receiving HIV Care in Hospitals Implementing the HIVQUAL-T Model from 2007 - 2009

In order to confirm hospitals' improvement in HIV ambulatory service performance between the years 2007 and 2009, a non-parametric statistic for paired-samples with non-normally distributed data, Wilcoxon Signed Ranks test, was performed. The results rejected the null hypothesis that the median difference between the members of each pair is equal to zero ($p < 0.001$). The positive mean difference between the average scores of 2009 and 2007 indicated that the performance among HIVQUAL-T model adopters improved after two years of implementation. However, the results from multivariate analysis demonstrated that implementation of HIVQUAL-T model accounted for only 11% of the variation in performance; thus, it must be noted that this univariate analysis results may not be adequate to prove that the improvement among the adopters is solely due to the implementation of the HIVQUAL-T model.

Chapter Summary

The study employed structural equation modeling (SEM) to examine the determinants of the HIVQUAL-T model adoption and its impact on HIV ambulatory services performance. Confirmatory factor analysis (CFA) was used to validate the measurement models of endogenous and exogenous theoretical constructs. A total of 11 measurement models for the latent constructs, including one measurement model of HIV services performance, five measurement models of perceived innovation attributes, and five measurement models of organization structural characteristics, were examined. All items were found to be valid measures for their constructs, except the items measuring centralization and formalization. Each measurement model was validated to reduce its complex dimensionality and obtain model fit.

Two covariance structural models were developed in this study. The first model illustrated the hypothesized causal relationship between innovation attributes perceived by HIV care practitioners in hospitals and the HIVQUAL-T model adoption. It was found that two of five constructs of innovation attributes, perceived relative advantage and perceived simplicity, positively contributed to the extensiveness of the implementation of the HIVQUAL-T model. Thus, hypothesis 1 was partially supported.

The second model was based on the context-design-performance framework to systematically investigate the relationship between organization structural characteristics and extensiveness of the HIVQUAL-T model implementation in hospitals, and their relations to hospitals' HIV ambulatory services performance. Two structural characteristics; interconnectedness and organizational slack, appeared to have significant influence on hospitals' extensiveness of the HIVQUAL-T model implementation, which supported hypotheses 2c and 2e. In addition, control variables including rate

of adoption in a region and HIV clinic workload also significantly contributed to hospitals' extensive implementation of the model. Hospitals located in the region that had higher adoption rate were found to implement the model more extensively. However, higher HIV clinic workload, unlike the study expectation, led to more extensive implementation of the model. Most importantly, the extensiveness of the HIVQUAL-T model implementation was found to have positive impact on hospitals' HIV ambulatory services performance; therefore, hypothesis 3 was supported.

Overall, the study findings suggested that the degree to which hospitals would use the HIVQUAL-T model to assess their performance and then apply the performance results to conduct activities to improve their quality of HIV clinical services depended on both HIV care practitioners' perceptions about the difficulty and advantages of implementing the model and the degree of hospitals' interactions with others in terms of exchanging ideas and obtaining resources, internally and externally. The HIVQUAL-T model was found to be a quality improvement initiative that could improve hospitals' HIV ambulatory services performance in this study setting.

CHAPTER FIVE: DISCUSSION

Based on diffusion of innovation theory, this study extended the focus from the determination of factors associated with individual and organizational adoption of an innovation to the extent that the innovation could reach its expected consequences. By using a survey instrument and Thailand's HIV care performance dataset, HIV ambulatory services performance was measured by multiple indicators according to baseline HIV care and treatment protocols while perceived innovation characteristics and organization structural design were measured by multiple survey items. Most measurement models of the constructs were confirmed by the obtained data. Hospitals' adoption-implementation behavior was proven to be the result of individual perceptions on innovation and organization structure and acted as an operational design factor that directly linked to performance. This chapter provides the discussion of major findings, theoretical and methodological issues drawn from research process and results, implications to policy and practice, limitations, and directions for future research.

Major Findings

This study conducted a two-fold analysis. First, confirmatory factor analysis was performed for validating the measures of each theoretically based construct. Second, path analysis was performed to examine both the impacts of perceived innovation attributes on hospital's extensiveness of adoption and the impacts of organization structural characteristics on hospital's extensiveness of adoption with its contribution to improvement of HIV clinical services performance. The major findings of the three research questions are as follows:

Research Question 1: To what extent do innovation attributes, as perceived by HIV care practitioners, contribute to the variation in HIVQUAL-T model adoption among hospitals?

The study assumed that a hospital's decision to adopt HIVQUAL-T performance measurement software and further conduct quality improvement projects may depend on how HIV care practitioners who directly deal with these activities assess this HIV quality improvement tool prior to putting it into practice. The results indicated a significant positive relationship between two of the five perceived innovation attributes constructs—perceived simplicity and perceived relative advantage—and the extent to which hospitals implement the HIVQUAL-T model. These two exogenous variables, along with two control variables—rate of adoption in region and workload—accounted for 10% of the total variance in the extensiveness of HIVQUAL-T model adoption. As indicated by the study result, the adoption is more likely when individual practitioners assess and find the innovation to be easy to comprehend and operate and also worthwhile to implement.

In regard to relative advantage, which is usually found to be a significant contributing factor for innovation adoption, this result could confirm the findings of previous studies considering perceived innovation characteristics, such as Hung et al. (2010), Scott et al. (2008), Jerayaj et al. (2006), and Aubert and Hamel (2001). In addition, perceived simplicity was demonstrated as a significant predictor of organizational-level adoption in this study, while some previous studies found insignificant contribution (Damanpour & Schneider, 2008; Hung et al).

In spite of their statistically insignificant impacts, observability and trialability appeared to have positive influences, while compatibility, not as expected, showed a negative coefficient. It was noticed that the modification indices for the generic model suggested intercorrelations among all perceived innovation attributes constructs, which would result in significant decrease in χ^2 value. For

example, simplicity and trialability seemed to be strongly correlated. It was probable that the inability to detect the impacts of trialability was due to a multicollinearity problem. This questionable observation was found to be possible when the impact of each construct on the dependent variable was tested individually and yielded a statistically significant relationship between trialability and extensiveness of adoption.

The insignificant impact of observability could be due to the complex structure of the HIVQUAL-T model. Observability of the HIVQUAL-T model comprises at least three dimensions: the use of HIVQUAL-T software, quality improvement implementation, and the model's benefits in better HIV services performance, as seen from pilot implementers. The HIVQUAL-T model is similar to TQM, which is usually found to be less concrete (Projogo & Sohal, 2003; Rye & Kimberly, 2007; Young et al, 2001); thus, its operation may be less visible to others and its ability to generate visible results may be limited (Weiner et al., 2006). Additionally, the assessment of innovation benefits may not contribute to organizational-level decision making in the context that is subjected to a certain level of institutional influence, particularly in a health care setting that is considered to have a high degree of professionalism (Shortell & Kaluzny, 2006). As demonstrated in the structural model, rate of adoption in a region had the strongest contribution, which could imply that decision makers may adopt the model because they 'know' that other hospitals in the same area are using the model, not because they 'see' how this model worked in other hospitals.

The study results, similarly to other studies, still could not confirm the impact of compatibility on innovation adoption (Jerayaj et al., 2006); the direction of impact was negative. Since the HIVQUAL-T model is quite innovative in Thailand's HIV care setting, where there has been little experience in developing performance assessment software and implementing quality

improvement, practitioners may not be able to 'match' the features of the model with their previous experiences and working styles.

Research Question 2: To what extent do hospital structural characteristics contribute to the variation in HIVQUAL-T model adoption among hospitals?

In the attempts to develop measures for hospital structural characteristics variables, this study failed to validate two of the five constructs—centralization and formalization. Eventually, three constructs—complexity, interconnectedness, and slack of resources—were examined as determinants of organizational adoption of the HIVQUAL-T model. The study findings confirmed significant impacts of organizational interconnectedness and slack of resources, together with the control variables rate of adoption in region and workload. These significant variables accounted for 14% of the variation in extensiveness of HIVQUAL-T model adoption. Slack of resources appeared to make the strongest contribution to extensiveness. As indicated by the study results, HIVQUAL-T model adoption is more likely among hospitals that had more physical resources obtained from both internal and external sources for HIV-related activities and were more open to internal and external communication.

Organizational slack, in this study, was deemed to be a very significant contributing factor in explaining extensiveness of the HIVQUAL-T model adoption. According to Rogers (2003), organizational slack plays an important role, particularly for adoption of innovations that are higher in cost. In fact, performance measurement using the HIVQUAL-T software can be conducted at no cost; however, quality improvement activities require substantial commitment and efforts from both practitioners and hospitals, together with financial and technical support from external governmental and non-governmental funders. Hospitals that have more resources for their HIV clinics, thus, may

be more ready to move beyond performance measurement to quality improvement, compared to those that partially adopted or never adopted the model. Consistent with Kimberly and Cook's findings (2008), hospitals' slacks, such as adequacy of physical space, budgets, and use of computers for HIV service-related activities, were considered to be good measures for organizations' readiness for organizational change, which is influenced by implementation of innovations.

Significant influence of organizational interconnectedness could confirm the existence of both an internal and external social system of HIV care. A higher degree of internal network reflected by hospital-level meetings and external networks reflected by provincial, regional, and national level meetings could stimulate the flows of ideas about the importance of performance measurement and quality improvement using the HIVQUAL-T model. Interconnectedness may imply openness of organization in the sense that hospitals have mechanisms that allow information about the innovation to enter the hospitals (Kimberly, 1978) and allow HIV practitioners to obtain information via the involvement of professional associations (Damanpour & Schneider, 2008). Consequently, these aspects would facilitate the HIVQUAL-T model adoption.

The impact of complexity in this study was ambiguous due to its strong intercorrelation with hospital size. Removing either of them resulted in an insignificant path coefficient, indicating that neither complexity nor hospital size exerted significant influence on extensiveness of the HIVQUAL-T model implementation despite their close relations, consistent with other studies' findings (e.g., Baldridge & Burnham, 1975). Measured primarily by the degree of specialization, organizational complexity in this context may not well predict the HIVQUAL-T model-related actions. Since the model generally emphasizes the improvement of the HIV ambulatory service delivery system, HIVQUAL-T operations put more focus on access to care, not direct clinical decisions such as

assigning ARV drug regimens or OI medications. Therefore, non-medical HIV care practitioners, such as hospital public health officers or HIV/AIDS coordinators, could conduct performance measurement and quality improvement with less degree of specialized practices.

Research Question 3: Do different levels of HIVQUAL-T model adoption contribute to the variation in HIV ambulatory care and treatment services performance among hospitals?

The ultimate purpose of this study was to evaluate the effectiveness of the innovation, in other words, to examine the extent that the HIVQUAL-T model could attain its goal of improving quality in HIV ambulatory services. The confirmatory factor analysis for the focal endogenous variable HIV ambulatory services performance demonstrated a compact set of six HIV care indicators—CD4 screening, ART, PCP prophylaxis, TB screening, STDs screening, and PAP smears for women—for a single overall quality construct. These indicators were associated with each other but did not exhibit too strong an intercorrelation. The relationships among them could imply that they are the output of a single functional system so that efforts to improve quality should focus on characteristics of the system (Wilson et al., 2007). In improving such a system, extensive implementation of the HIVQUAL-T model was proven to be a significant factor, accounting for 11% of the variation in HIV ambulatory services performance among public hospitals in Thailand. The study results point out that it is imperative for HIV care facilities to measure their performance in order to inform quality improvement initiatives specifically for individual clinics.

Quality management models such as HIVQUAL-T are outcome based, and quality improvement is encouraged by performance assessment results with valid measures (Lilford, Brown, & Nicholl, 2007). Hospitals reported to implement quality improvement following the results from performance measurement exhibited better HIV ambulatory services performance than those reported

to be partial adopters or non-adopters, while partial adopters exhibited better performance as compared to non-adopters. Although partial adopters did not officially report quality improvement activities, the qualitative information obtained from the survey showed that many of them implemented QI without submitting proposals to BATS and NHSO, while some of them showed their intention to implement QI in later years. This finding suggested that these partial adopters were active in improving quality but they might not be ready yet to complete the whole model in the early adoption period. At any rate, organizational readiness could be a potential factor for organizational adoption of innovation and better quality.

Theoretical and Methodological Issues

Diffusion of Innovation Theory

The results obtained from this study confirmed that attributes of innovation as perceived by intended users do influence innovation adoption. As mentioned, individual perception toward the innovation was assumed in this study to derive from HIV care practitioners' assessment. A question here is to what extent could all innovation characteristics, as proposed in this theory, be assessed? For some types of innovation, simplicity, relative advantage, and compatibility may be relatively easier to estimate at the stage of introduction without trying them out or seeing results from earlier adopters, while for other types of innovation, prospective adopters may have to try and observe the use of the innovation before deciding whether the innovation is desirable for them.

In the case of the HIVQUAL-T model implementation, the existence of a strong positive correlation between simplicity and trialability or among other constructs may also imply overlapping conditions for such assessment. Those who had tried the performance measurement software would

be more familiar with it and would find that the software was easy to use, while this perception could be the opposite for those who had less chance to try it out. Furthermore, the complex structure of the HIVQUAL-T model that includes quality improvement implementation may make the model less trialable and observable in nature. Such an invisible part of the innovation may not be easy to assess before actual practice. Merely trying the performance measurement software may not confirm that quality improvement implementation would be compatible with the practitioners' working styles and experiences. Considering this information, perceived innovation attributes could be examined at a single point of time regarding their co-existence with each other or as sequential order when they are deemed to be consequences of the others. As suggested by Aubert and Hamel (2001), relative advantage could be determined by compatibility and ease of use.

The conceptions and measures of those attributes formulated by previous studies, due to conventional factor analysis methods, were considered as aggregated components of the constructs without taking into consideration possible intercorrelations among them (e.g., Agarwal & Prasad, 1997; Compeau et al., 2007; Moore & Benbasat, 1991; Hsu et al., 2007; Yang et al., 2009). This study anticipated that confirmatory factor analysis using SEM approach might somehow capture such relationships, which could contribute to a more precise understanding of these theoretical constructs.

As the study findings demonstrated, all five perceived innovation attributes appeared to be intercorrelated, and such intercorrelation had resulted in the inability of the model to detect their actual impacts on the endogenous variable unless each construct was regressed separately. This finding led to an assumption that the five innovation attributes are not independent of each other and thus pointed out an option to re-conceptualize them as a multiple-factors attribute. For instance, instead of developing a single-factor measurement model for each construct separately, it may be

possible to build a five-factor measurement model for desirability of innovation attributes. However, this proposition is not yet conclusive, since the results were drawn from only one study in one unique context; hence confirmation of the aforementioned intercorrelation is required.

Although organization structural characteristics constructs are all theoretically based, it was found to be difficult to measure some characteristics of organizational structure in this study. The failure to validate the measurement models of centralization and formalization in spite of adjusting their measures from previous studies in non-health care organizations (e.g., Aiken & Hage, 1966; Auh & Menguc, 2007; Dewar et al., 1980; Hage & Aiken, 1967), to some extent helps confirm the uniqueness of health care settings, where professionalism and specialization play significant roles in decision-making and practice.

In regard to centralization, the average value of HIV care practitioners' autonomy to make decisions is quite high in every item, yet they appeared not to act in the same direction. Their participation in decision making to adopt and implement an innovation does not mean that they do not have to receive approval from supervisors. Likewise, formal HIV care and treatment protocol is mandatory in HIV care settings; nevertheless, non-medical HIV care practitioners such as HIV coordinators reported that they often provided some types of clinical care when necessary. These characteristics of HIV care in Thailand, therefore, may not be compatible with the measurement items. The development of centralization and formalization measures should thus put more consideration into organizational culture across different settings.

Interestingly, it was found that two significant predictors, interconnectedness and adoption rate in region, implied an organization's embeddedness in a social system. This finding supported Rogers' statement that system norms tell individuals what behavior they are expected to perform;

thus, the system has a direct effect on diffusion (2003). An exchange of knowledge and institutional forces could stimulate innovation adoption. In addition, a significant contribution of organizational slack expresses the extent that organizations could obtain resources from internal and external environments. Although innovation theory does not put its emphasis mainly on contextual and environmental forces, organization structural characteristics proposed to associate with adoption under this perspective not only do point up organizational inertia but also already encapsulate organizational openness to environmental impacts. This observation is also consistent with findings from Marathe et al. (2007) and Naranjo-Gil (2009) that adopters were more sensitive to environment than to organizational factors.

Most importantly, this study applied a distinctive way of measuring innovation adoption and its effectiveness with lagged cross-sectional design, with which hospital performance was assessed after intervention implementation period. The HIVQUAL-T model, similar to other quality management initiatives such as total quality management, is considered a holistic approach to quality improvement, based on its identification of underlying causes of poor performance. Due to the uniqueness of the model, it was essential to consider the adoption-implementation as a multiple-steps practice, where the adopters may not be able to complete a whole process (performance measurement and quality improvement) under some conditions. Therefore, this study employed a diffusion of innovation perspective not only to predict adoption behaviors but also to assess organizational readiness to adopt and fully implement the innovation. The operational measurement of extensiveness of adoption may shed some light on how to capture actual levels of implementation, particularly those of administrative innovations that involve multiple activities to achieve expected outcomes.

Context-Design-Performance Framework

This study considered the application of SEM to be most suitable for an investigation of a 'social system' suggested by a diffusion of innovation perspective. The study adopted and applied the contingency perspective-based 'Context-Design-Performance' analytical framework to portray the time-ordered relationship between each component. The results from path analysis, consistent with Wan's findings (2003), has confirmed the time-ordered process hypothesized by this framework, when organizational design was considered to encompass two sequential components, structural design and operational design, which finally lead to outcome. This relationship could be portrayed as Figure 14.

Figure 14. Conceptual Linkages between Context-Structural Design-Operational Design-Performance

A significant contribution of rate of adoption in region implied that hospitals were prone to contextual influence, which worked in accordance with organizational structure to stimulate organizational operations (i.e., organizational decision-making and practices). Eventually, organizational operation was proved to act as a mediating factor or an intervention for improving organizational performance.

Although this study did not include direct linkages between structural design and performance, the examination of those linkages was conducted in order to get some hints for possible

development of the context-design-performance model for future research. An additional path analysis performed to investigate the direct relationship between all structural variables and organizational performance presented significant contribution of organizational slack to hospitals' HIV ambulatory services performance, while complexity, interconnectedness, size, and workload were not found to be significant. Additional contribution of organizational slack in the tested model increased the proportion of variation in HIV care performance from 11% to 17%.

It should be noted that organizational slack in this study context was measured by adequate budget from internal and external sources, physical space, and equipment availability, particularly for HIV clinics. Therefore, this structural aspect of hospitals would have an impact on performance in accordance with the HIV clinics' operations. Hospitals that have a higher degree of dedication to HIV care are thus more likely to provide better services. This finding indicates that structural characteristics may have direct influences on organizational performance when a structural aspect is closely related to a particular performance dimension. This observation is consistent with other studies in considering the relationship between structure and performance, in that some organization structural characteristics presented significant direct impacts only on some features of organizational performance, but indirectly on others through organizational practices (Keats & Hitt, 1988; Mark, Salyer, & Wan, 2003; Wan, 2003).

As this study was limited in its measurement of structural characteristics of health care organization (i.e. centralization and formalization), while such inertia may also exercise influence as organizational slack of resources, further examination of the direct effects of validated constructs of organizational structure on organizational performance may improve the meaningful use of the C-D-

P model, where a direct causal relationship could be depicted from structural design to performance as shown in Figure 14.

The C-D-P model, as employed in this study, was proved to be valuable in determining the sequential relationship of all components in an entire social system in which organizations are embedded and influenced. The findings have highlighted the importance of understanding this interrelationship at both a macro and micro level, by which organizational structure and its interaction with environmental circumstances would stimulate and enable appropriate practices and finally lead to an improvement of outcomes. In addition, structural characteristics that have direct influence on performance could act as a mediator between context and organizational performance as well. This relationship could imply the importance of environment in determining quality at an aggregated stage, as could be seen from Thailand's HIV care environment, where the government's vigorous intervention might improve overall quality of HIV care at the national level. Thus, achieving better quality of health care and services is a complex task for which the involvement of all stakeholders in a social system, including policy makers, organizational administrators, practitioners, and patients, is fundamental.

Implications to Policy & Managerial Practices

'HIVQUAL' Implementation in the Context of Thailand

The national-level adoption and implementation of the HIVQUAL-T model in Thailand implies the MOPH's strong commitment to improve quality of HIV care. Rogers (2003) stated that the fastest rate of adoption stems from authority decisions. The model's adoption rate is very rapid: 76% of total hospitals (632 hospitals) in Thailand have already implemented at least the HIVQUAL-

T software at the second year of the nationwide scaling up period. Although the Bureau of AIDS, TB, and STIs (BATS) expected that the expansion of the HIVQUAL-T system could cover 900 hospitals in 2011, several issues pertaining the implementation of this initiative at the national level should be considered.

Over a hundred of the survey respondents provided a number of insightful comments on the implementation of the HIVQUAL-T model, comments that were consistent and explanative to the study's quantitative analysis results. In fact, all respondents, regardless of adopter or non-adopter status, agreed on the advantages of the HIVQUAL-T model for evaluating and improving HIV ambulatory service performance but mentioned several barriers to implementing the program at both macro and micro levels. These barriers are presumed to be due to the uniqueness of Thailand's HIV care context while some of them are similar to those of the HIVQUAL-US implementation (Drainoni et al., 2002; Warner et al., 2004;).

First, the HIVQUAL-T initiative in Thailand, probably because of its early period of nationwide implementation, appeared to focus mainly on two core components of the model, namely, performance measurement and quality improvement. Nevertheless, emphasis on the third core component of infrastructure development seemed to be limited. Guidance and financial support for building capacity to interpret performance data and implement QI processes is still essential, particularly for partial and non-adopters. Therefore, provincial public health, regional NHSO, and ODPC offices may act as active facilitators for interactive group learning with experienced implementers to provide updated information and training to encourage extensive and meaningful use of the model. More focus should be put on hospitals in regions with low adoption rate, where HIVQUAL-T-related activities were reported to be minimal. On-site monitoring to provide technical

support may also stimulate the use of the model. The emphasis on capacity building is imperative for the sustainability of the use of HIVQUAL-T, which the implementers are expected to independently use and integrate into their routine practice in the end.

Secondly, HIVQUAL-T software and its measurements are becoming more and more complex. Pilot implementers and early adopters are more familiar with using the software because they started this initiative from less complicated versions, while newer or prospective adopters would start from the most complex ones (for example, HIVQUAL-T v.2.0 used during pilot implementation had only six core indicators while the current HIVQUAL-T v.5.0 includes all core indicators plus a variety of disease screenings, health promotion, and mental health assessment measures). As simplicity was found to be a significant factor for individual-level adoption, it should be taken into consideration that the HIVQUAL software was built to reduce review burden and generate facility-specific reports (Agins et al., 2004); thus, its application should be made simple to attract more prospective users and the requirements should be matched with the hospital's level of capacity. As suggested by the respondents, trainings on using the software should be provided on a regular basis in order to refresh and update their knowledge, at least once a year. In addition, some indicators could be made optional, particularly for community hospitals with low capacity of providing complex medical care and costly prophylactic medicine such as MAC prophylaxis (Wanleepong, Kulsomboon, & Ningsanond, 2010).

Third, some implementers reported having difficulty in understanding items measuring HIV care among adopters due to the complex nature of HIV care and ambiguous questions asked by the software, which may lead to unreliable results or the implementers' inability to complete the assessment. In addition, QI implementation was perceived to be complicated in terms of writing

proposals, performing activities, and evaluating the outcomes. This issue could provide the proposition to the MOPH to develop a truly complete package of HIVQUAL-T in order to ensure the meaningful use and accurate understanding of the model, in particular its conception of measuring and improving HIV care quality. In developing quality measures, specification, scientific strength, reliability, validity, and interpretability of the measures should be carefully examined before actual use (McGlynn & Asch, 1998).

Fourth, organizational leadership and commitment are consistently reported to be potential barriers to quality improvement initiatives at the organizational level (Warner et al., 2004) and that failing applies to the context of HIVQUAL-T implementation without exception. This study believed that HIV practitioners might play an important role in the step of measuring their performance, while the implementation of QI activities relies more on organizational-level decision-making. This proposition is supported by the statements from both current and prospective implementers about the negligence from hospital boards or physicians to put focus on HIV care, particularly among hospitals that do not have a dedicated unit for HIV care. Some practitioners reported that they were not usually allowed to participate in any HIV-related training unless their names were indicated in official invitation letters sent to hospitals. Additionally, despite obvious assessment results provided by nurses, physicians or hospital boards may not approve or supply physical supports for QI activities for some particular domains. For the effectiveness of this implementation in such centralized and formalized setting, MOPH may use its bureaucratic channel of communication and enforcement by officially announcing a policy on assessing and improving HIV care quality to exert more pressure on hospital directors nationwide in responding to this initiative.

Last, although the influence of workload on extensiveness of HIVQUAL-T model adoption was the reverse of the result expected by the study hypotheses, workload is indeed reported by the respondents as a significant barrier to the implementation. The positive impact of workload on adoption found in the quantitative analysis may have occurred because HIV care practitioners who had already implemented the model were those who could claim to have additional duties apart from their typical job description. In this sense, workload issue could be critical to the sustainability of the model and may lead to inactivation or disengagement of innovation (Drainoni et al., 2002). The MOPH's leadership in giving recognition such as rewarding or providing incentives to HIV care practitioners or hospitals may be a way to increase the implementers' satisfaction in performing this quality improvement initiative.

HIV/AIDS Informatics: A Potential in Thailand's HIV Care Setting

With both external supports from international organization and internal collaboration, Thailand now has a strong environment for monitoring, evaluating, and improving quality of HIV care using information technology. Several database systems have been developed for monitoring and evaluation of HIV-related programs and services in different HIV/AIDS populations (e.g. MSM HIV prevention program, National AIDS Program (NAP) database for HIV symptomatic and AIDS case reporting system, HIVQUAL-T, Perinatal HIV Outcome Monitoring system (PHOM), CHILD monitoring system, computerized STI records, and so on; see National AIDS Prevention an Alleviation Committee, 2010) However, there is reported to be some overlapping information across the systems that appeared to result in substantial workload for HIV care practitioners responsible for data collection and entry, as indicated by the respondents.

For example, the NAP electronics database contains a variety of modules for monitoring HIV services from registration to authorization of second-line ARV drugs to PMTCT, covering about 60% of registered ART patients in Thailand, while the rest are reported through other systems (National AIDS Prevention and Alleviation Committee, 2010). Simultaneously, HIVQUAL-T covers most aspects of NAP with additional HIV care indicators not mandated by NHSO guidelines, such as PAP smear for women (Wanleepong et al., 2010) while it is charged with evaluating the performance of HIV services provided to the overall population, not only patients receiving ARV. In addition, hospital-level electronic medical records called HOSxP are claimed to contain all medical information for every patient receiving care from hospitals, which could provide general information for monitoring matters as well. Recently, the latest version of HIVQUAL-T software (v.5.3) was adjusted to connect with the NAP database for a more efficient data management process (BATS, 2011).

The fragmentation of HIV information systems raised the necessity for the integration and development of Thailand's HIV/AIDS informatics to make monitoring and evaluation easier with quality data generated from different sources. The integration of information systems would create an HIV/AIDS data warehouse as a relational database for evidence-based medicine and care management. This integration would lead to efficiency in collecting and entering data for performance measurement as well as in saving costs of developing new systems and raising the effectiveness of provincial, regional, and national level outcome reporting and benchmarking for further improvement (Lee & Wan, 2003; Mettler & Rohner, 2009; Wan, 2002).

Limitations and Direction for Future Research

The study has several limitations that should be considered. The first limitation is in regard to the characteristics of research data. Although the sample was claimed to be a good representative of the study population, the information from non-adopters was limited. As reported previously, most observations removed from the analysis was due to missing information of non-adopters' performance results. The small proportion of non-adopters in this study may lead to interpretation bias of their poor performance as compared to the adopters. In addition, the majority of public hospitals in Thailand are community hospitals, accounting for more than 85% of the population, while general and regional hospitals account for only 15%. Hospitals in each category appeared to have substantial differences in terms of size and level of specialized care provided; therefore, multiple group analysis according to each hospital category might be more suitable for detecting such differences.

Second, the measurement of variables used in this study should be applied with caution. Despite its multidimensional nature, hospitals' HIV ambulatory services performance was measured by only six clinical service indicators and those may not be an absolute representation of quality measures. HIV care is considered multifaceted care, which could involve several levels of measurement. For example, HIV status monitoring encompasses CD4 and viral load screening, and opportunistic infection prophylaxis includes both primary and secondary prophylaxis as sub-dimensions in relation to different diseases. Further development of measurement models for each category of care with detailed indicators would provide better understanding of HIV clinics' quality improvement choices and behaviors.

Although most theoretical constructs were validated in this study, the confirmatory factor analyses demonstrated many overlapping aspects of perceived innovation attributes. Furthermore, two main structural characteristic constructs were found to be invalid. This situation may be due to the item questions, which were adapted from other studies unrelated to the health care setting. Since health care organizations are unique, particularly in terms of professionalism and specialization, the measurements for organization structural characteristics such as centralization and complexity should be developed specifically for the health care setting.

The operationalization of adoption variable as ordinal instead of dichotomous was believed to cover the two main phases of HIVQUAL-T model but at the expense of losing clear impacts of the determinants of innovativeness. Similar to what were noticed by many innovation researches, some characteristics of innovation and organization may present significant influence on one step of the initiative and have no effect on others. The perceptions of innovation characteristics prior to adoption decision-making may differ from the perceptions after the adoption, when adopters have had more chances to try the innovation. For example, some adopters may have adopted the software because it looked simple in the first place but later found that the actual use was not like what they had expected. In such a case the implementation could be inactive after the first year trial. On the other hand, some adopters may not have difficulty in using the software but may have limitations in writing and reporting quality improvement projects. Since this study viewed HIVQUAL-T model implementation as a longitudinal process, the factors derived from innovation perspectives could also be examined during the post-adoption period to determine the continuity of the implementation.

Third, this study was somewhat restricted to a theoretical framework; thus it may leave out other possible confounding factors associated with innovation adoption. The inclusion of more

environmental, organizational, and managerial factors employed by other empirical studies related to innovation adoption in healthcare organizations would likely reduce error variance in the study and provide a more realistic explanation of organizational decision-making and performance. The improvement in quality regardless of HIVQUAL-T model adoption may occur due to a dynamic HIV care environment in which the government's emphasis on quality improvement became stronger during these few years. Thus, organizational and HIV care practitioners' attitudes and commitments on providing quality of HIV care services could also be potential factors in quality improvement.

Last, despite the use of a lagged cross-sectional design with non-adopters as the control group to capture the impacts of the innovation in a time-ordered manner, the interpretation of this study is not yet conclusive. The lagged cross-sectional design may not be able to cover actual lagged effects with the variation of time. Performance in this study is limited to the consequence of using a single intervention; however, the increase in performance scores across years found among 3-year adopters in this study could not be considered a pure impact of the HIVQUAL-T model. Moreover, while HIVQUAL-T performance measurement software can identify the deficiencies of each category of HIV clinical services, the quality improvement projects using such assessment results could not be executed to address all deficiencies at a single time or in a year or two, particularly in the case for which several insufficiencies of service were found during the first year of the assessment. Therefore, a longitudinal analysis to identify the actual lagged effects of this quality management initiative, with other possible factors facilitating its implementation and quality improvement, is recommended.

Conclusion

The HIVQUAL model developed by NYS Department of Health, AIDS Institute was claimed to be a feasible way to monitor HIV care and one that can be adjusted for differences in guidelines, resources, and health care models (Agins et al., 2004). It could be considered as an evidenced-based quality improvement initiative, of which the measurement and focus can be adjusted to different settings. Shortell, Rundall, and Hsu (2007) saw quality management as an interdisciplinary approach that combines evidence-based medicine and evidence-based management together with scientific methodology. Using those facts, the adjustments of the model could make it culturally compatible with the values of health care professionals. This study has provided extensive analyses of the overall process of the HIVQUAL-T model initiative in Thailand, from considering HIV care practitioners' perception toward this innovation, to investigating organizational readiness in adopting and extensively implement the model, to demonstrating the effectiveness of this implementation in terms of improving HIV ambulatory services performance, in the hope that the lessons learned from Thailand would be a useful model for other developing countries in improving the quality of HIV care at any level.

Chapter Summary

The analysis of the investigation of factors determining the extensiveness of the HIVQUAL-T model adoption and its contribution to HIV ambulatory services performance provides several suggestions for successful implementation of the model at both the hospital and national levels. First, the focus on hospital-level capacity building is encouraged in order to enhance the meaningful use of this initiative, while the promotion of the use of the model should target low adoption areas. Second,

there should be a modification of the HIVQUAL-T model in order to make it more user friendly and less complex. Third, the specification, scientific strength, reliability, validity, and interpretability of the measures should be carefully examined before actual use. Fourth, organizational leadership and commitment to HIV care should be stimulated. Fifth, practitioners' dedication to HIV care should be recognized through rewarding or incentive mechanisms. The quantitative and qualitative information obtained from this study demonstrated Thailand's potential in developing HIV care information system integration to improve efficiency in data collection and utilization and effectiveness of reporting and benchmarking activities.

Several limitations of this study include limited access to non-adopters' performance information, the small proportion of general and regional hospitals, validity of theoretical constructs used in the study, and exclusion of possible confounding factors associated with adoption and performance. Future research with the inclusion of factors and development of constructs specific to healthcare organizations is encouraged, as well as a longitudinal design for capturing the HIVQUAL-T model's lagged effects on HIV ambulatory services performance.

APPENDIX A:
INSTITUTIONAL BOARD APPROVAL LETTER

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Exempt Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Natthani Meemon**

Date: **August 05, 2010**

Dear Researcher:

On 8/5/2010, the IRB approved the following activity as human participant research that is exempt from regulation:

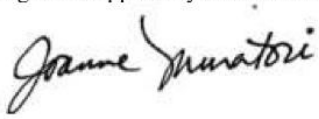
Type of Review:	Exempt Determination
Project Title:	Evaluation of a Quality Improvement Initiative for HIV Clinical Service in Thailand
Investigator:	Natthani Meemon
IRB Number:	SBE-10-07049
Funding Agency:	
Grant Title:	
Research ID:	N/A

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Joseph Bielitzki, DVM, UCF IRB Chair, this letter is signed by:

Signature applied by Joanne Muratori on 08/05/2010 02:12:25 PM EDT



IRB Coordinator

APPENDIX B:
EXPLANATION OF RESEARCH

University of Central Florida

EXPLANATION OF RESEARCH

Title of Project: Evaluation of a Quality Improvement Initiative for HIV Clinical Service in Thailand

Principal Investigator: Natthani Meemon

Other Investigators: -

Faculty Supervisor: Dr. Thomas T.H. Wan

You are being invited to take part in a research study. Whether you take part is up to you.

- The purpose of the research is to investigate your perceptions on the implementation of HIVQUAL-T model, a quality improvement initiatives for HIV clinical service in your organization.
- Participants will be asked to fill out an online survey to participate in this study. This study is anonymous and will take place in Thailand.
- The time needed to fill out the survey is 20 minutes.

Study contact for questions about the study or to report a problem: If you have questions, concerns, or complaints, please contact, Natthani Meemon, Ph.D. Candidate, Public Affairs Doctoral program, College of Health and Public Affairs, (407) 823-0822 or by e-mail at natthani@knights.ucf.edu or Dr. Thomas T.H. Wan, Faculty Supervisor, Public Affairs Doctoral Program, College of Health and Public Affairs, at twan@mail.ucf.edu.

IRB contact about your rights in the study or to report a complaint: Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). This research has been reviewed and approved by the IRB. For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901.

APPENDIX C:
LETTER OF REQUEST FOR INFORMATION AND APPROVALS FROM THAILAND'S MINISTRY OF PUBLIC HEALTH DEPARTMENT OF DISEASE CONTROL

University of Central Florida

Doctoral Program in Public Affairs

November 5, 2010

Department of Disease Control
Ministry of Public Health
Thanon Tiwanond
Amphoe Muang
Nonthaburi 11000
THAILAND

RE: Request for Information Regarding HIV Clinical Care Performance Measurement

Dear Director General:

I am writing this letter to thank you for facilitating the data collection for Ms. Natthani Meemon's dissertation research, entitled "Evaluation of Quality Improvement Initiative for HIV Clinical Care in Thailand". She has just completed her pilot test of the survey questionnaire. In performing preliminary analysis on the outcome measures of HIV care and treatment, she has gained substantial insight about the complexity of measurement issues pertaining to outcomes research. She is confident that she will demonstrate the utility of administrative and survey data for assessing quality improvement activities associated with HIV clinical care. Upon completion of the survey, she will be able to validate her research models. Your assistance for gathering survey data is greatly appreciated. If you have any questions about her study, please do not hesitate to contact us at (twan@mail.ucf.edu or 407-823-2678).

Respectively submitted,

Thomas, T.H. Wan, Ph.D., MHS
Professor of Public Affairs, Health Management & Informatics, and Medicine
Associate Dean for Research

College of Health and Public Affairs
3280 Progress Drive • Orlando, FL 32826-0544 • (407) 823-0170 • FAX: (407) 823-0744

APPENDIX D:
SUMMARY TABLE OF THE APPLICATION OF INNOVATION PERSPECTIVE IN HEALTH SERVICES RESEARCH

Summary of Health Services Research on Innovation Adoption and Organizational Performance

Year/Authors	Title	Unit of Analysis	Independent Variables	Significant Findings
Aubert & Hamel (2001)	Adoption of smart cards in the medical sector: the Canadian experience	Health professionals and practitioners	- Five innovation attributes suggested by Rogers (1995) - Image - Information - Involvement - Mandatoriness - Membership - Quality of the support - Satisfaction	- Perceived usefulness, compatibility, and information positively contribute to perceived relative advantage. - Relative advantage is the most important factors to adoption.
Durcharme et al. (2007)	Innovation adoption in substance abuse treatment: Exposure, trialability, and the clinical trials network	Clinical Trials Network programs	- Exposure to clinical trails - Organizational characteristics	- Direct exposure to buprenorphine clinical trials, treatment programs offering detoxification services, access to physicians, proportion of focal clients treated in the program positively associated with adoption.
Escarce et al. (1995)	Diffusion of Laparoscopic Cholecystectomy among general surgeons in the U.S.	Surgeons	- Competitiveness of practice - Health care market characteristics	- Surgeons in more competitive practice settings and markets adopted the innovation earlier. - Free-for-service payment and competitive market are associated with early adoption. - The informational advantages of group practice hasten the adoption among surgeons in single-specialty but not multispecialty groups.
Folland (1987)	Advertising by physicians: behavior and attitudes	physicians	- demographical characteristics	- The advertisers are significantly younger than their peers. - Advertising is more prominent among physicians in larger group practices, primary care physicians, and in prepayment contract.
Hikmet et al. (2007)	The role of organizational factors in the adoption of	Hospitals	- Organizational characteristics (size,	- Hospital size has strongest effect on overall HIT, clinical, and strategic adoption.

Year/Authors	Title	Unit of Analysis	Independent Variables	Significant Findings
	HIT in Florida hospital		system membership, tax status, geographical location)	- Stand-alone, for-profit hospitals are likely to adopt administrative and strategic HIT.
Hillmand & Schwartz (1985)	The adoption and diffusion of CT and MRI in the U.S.: A comparative analysis	MRI units in the U.S.	- Technical uncertainty - Clinical advantage - Cost - Perceived profitability - Reimbursement policy - Market competition	- Clinical advantage, cost, market competition, reimbursement policy and profitability positively contribute to the adoption. - Technical uncertainty negatively contributes to the diffusion of CT and MRI.
Hung et al. (2010)	Critical factors of hospital adoption on CRM system: Organizational and information system perspectives	Hospitals	- Size - Staff's IS capabilities - Innovation of senior executives - Knowledge management capabilities - Relative advantage - Complexity	- Hospital size, staff's IS capabilities, innovation of senior executive, knowledge management capabilities, and relative advantage affect the CRMS adoption.
Johnson et al. (1998)	The impact of formalization, role conflict, role ambiguity, and communication quality on perceived organizational innovativeness in the cancer information service	Individual practitioners in CIS network organizations	- Formalization - Role Conflict - Role Ambiguity - Communication Quality	- Formalization has both direct and indirect impacts on communication quality through role conflict and role ambiguity. - Communication quality has positive association with innovativeness.
Kaluzny, Glasser, Gentry, & Sprague (1970)	Diffusion of innovative health care services in the U.S.: A study of hospitals	Hospitals	- Location - Rural-urban nature of community - % Poverty - Type of hospital control - Hospital size	- Greater implementation is associated with large voluntary hospitals, located in metropolitan areas, and in Northeastern states. - Hospitals within the low and medium poverty categories show early implementation of rehabilitation services.
Kaluzny, Veney, & Gentry (1974)	Innovation of health services: A comparative	Hospitals and health department	- Hospital size - Composition of	- The more high-risk services provided the more such services an organization is likely

Year/Authors	Title	Unit of Analysis	Independent Variables	Significant Findings
	study of hospitals and health departments	in NY	organization (cosmopolitan-oriented, degree of training) - Formalization	to innovate. - Composition variables are central to innovation for low-risk services. - Size positively correlates with high-risk service in health department and low-risk services in hospitals.
Kimberly (1978)	Hospital adoption of innovation: The role of integration into external informational environments	Hospitals	- Hospital integration mechanisms - Structural constrains	- Number of paid outside speakers, M.D. publication, hospital reimbursement for travel, and formally differentiated unit have positive effects on innovation.
Kimberly & Evanisko (1981)	Organizational innovation: The influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations	Hospitals	- Individual characteristics - Organizational characteristics - Contextual factors	- Hospital administrator's educational level, committee participation, involvement in medical activities, chief of medicine's involvement in administrative activities, centralization, size, functional differentiation, competition, size of city and age positively contribute to the adoption of technological innovation. - HA cosmopolitanism, HA educational level, hospital size, and competition positively contribute to the adoption of administrative innovation.
Knudsen, Roman, Johnson (2003)	Organizational compatibility and workplace drug testing: Modeling the adoption of innovative social control practices	Individual workers	- Type of industry - Size of industry - Rules orientation - Presence of employee assistance program - Machine control	- Compatibility (as measured by rules orientation, presence of employee assistance program, and mechanization) is associated with the adoption of drug testing. - The adoption of drug testing varies across industries and by establishment size.
Kovach, Morgan, Noonan, & Brondino (2008)	Using principles of diffusion of innovation to improve nursing home care	Nurses working in nursing homes	Innovation (STI: Serial Trial Intervention principle)	- Use of STI principle is associated with increased assessment in response to behavior change, increased administration of analgesics, and residents' decrease in

Year/Authors	Title	Unit of Analysis	Independent Variables	Significant Findings
				behavioral symptom. - The development on a facility action plan for and conduct staff education concerning the STI could lead to sustainability of the practice.
Meyer, Johnson, & Ethington (1997)	Contrasting attributes of preventive health innovations	Individual members of health organizations in a network	- Five perceive innovation attributes suggested by Rogers (1995) - Adaptability Riskiness - Acceptance	- Innovation characteristics perceived by individuals are different across contrasting preventive health innovations.
Moch & Morse (1977)	Size, centralization, and organizational adoption of innovations	Hospitals	- Size - Functional differentiation - Centralization	- Functional differentiation contributes to adoption. - Innovations compatible with interests of low-level decision makers are likely to be adopted in large, specialized, functionally differentiated, and decentralized hospitals.
Naranjo-Gil (2009)	The influence of environmental and organizational factors on innovation adoptions: consequences for performance in public sector organizations	Hospitals	- Organizational strategies - Firm size, - Uncertainty - Market concentration	- Organizations that combine technical and administrative innovations increase their performance. - Prospector strategy has positive impact on administrative innovation. - Firm size has positive impact on technological innovation. - Environmental uncertainty and market concentration positively associated with both types of innovation.
Panzano (2001)	Moving from the diffusion of research results to promoting the adoption of evidence-based innovations in the Ohio mental health	Mental health provider organizations	- Perceived risk of adopting - Capacity to manage or absorb risk - Propensity to take risk	- A decision to adopt is more likely when an organization has capacity to manage downside risk (e.g. slack resources are available) and when the organization has a past history or propensity to take risks.

Year/Authors	Title	Unit of Analysis	Independent Variables	Significant Findings
	system			
Scott et al. (2008)	Factors influencing the adoption of an innovation: An examination of the uptake of the Canadian Heart Health Kit (HHK)	Physicians	- Five perceived innovation attributes suggested by Rogers (2003) - Barriers to use - Individual characteristics	- Relative advantage, observability, and years of experience positively associated with intention to use the HHK. - The context within which adoption decisions are made affects the adoption process.
Smythe (2002)	Reputation, public information, and physician adoption of an innovation	Physician	- physician's acquired information - durability of reputation - physician's aversion to risk - uncertainty over impact on reputation	- Physician uncertainty is driven by the durability of reputation, aversion to risk, and ability to acquire information. - Uncertainty negatively contributes to innovation adoption. - The belief that innovation is reputation enhancing have positive impact on initial adoption.
Tung, Chang, & Chou (2008)	An extension of trust and TAM model with IDT in the adoption of the electronic logistics information system in HIS in the medical industry	Nurses	- compatibility - perceived usefulness - perceived ease of use - trust - perceived financial costs	- Compatibility, perceived usefulness, perceived ease of use, and trust have positive influence on intention to use. - Perceived financial cost has negative influence on intention to use.
Walston & Kimberly (2001)	Institutional and economic influences on the adoption and extensiveness of managerial innovation in hospitals: The case of reengineering	Hospitals	- Economic pressure - Demand uncertainty - Rate of adoption in area - Timing - Size - Network linkage	- Higher costs and a vulnerability to managed care contracting, rate of adoption in area positively contribute to adoption. - Greater HMO penetration and profit margins have negative impact on adoption. - Greater market competition and higher relative costs positively contribute to more extensive program implementation. - No. of physician-hospital activities, adoption of reengineering, and extensiveness of implementation are correlated.
Yang, Yu, & Yang (2009)	E-Health service in Taiwan-The role of organizational	Individual employees	- Compatibility - Personal	- Compatibility and personal innovativeness indirectly contribute to attitude via perceived

Year/Authors	Title	Unit of Analysis	Independent Variables	Significant Findings
	innovativeness		innovativeness - Organizational Innovativeness - Perceived usefulness - Perceived ease of use	usefulness and ease of use. - Organizational innovativeness has direct impact on attitude.
Young, Charns, & Shortell (2001)	Top manager and network effects on the adoption of innovative management practices: A study of TQM in a public hospital system	Hospitals	- Personal characteristics (top manager) - Network/ institutional arrangement	- Age of hospital director has negative impact on TQM adoption. - Hospital director's possessions of a graduate degree and prior exposure to TQM, and cumulative number of adopters in the area and network have positive association to adoption. - The impacts vary across different adoption periods.

APPENDIX E:
SURVEY INSTRUMENT (ENGLISH TRANSLATION)

HIVQUAL-T Model Adoption Questionnaire

HIVQUAL-T Adoption Questionnaire

HIVQUAL-T Model has been nationally introduced to HIV clinics across Thailand in 2007. The model comprises two main components: performance measurement (PM) using HIVQUAL-T software and quality improvement (QI) implementation following the performance assessment results. This questionnaire contains two elements including (1) basic questions about the respondent's personal and organizational characteristics and (2) the respondent's perception on the HIVQUAL-T Model PRIOR to the decision to use the HIVQUAL-T software and to implement QI projects.

PLEASE ANSWER THE FOLLOWING QUESTIOINS:

1. Hospital Code (Five digits):

2. Hospital Category

- ○ Univesity Hospital
- ○ Regional Hospital
- ○ General Hospital
- ○ Military Hospital
- ○ Community Hospital
- ○ Other:

(please specify)

3. Number of Beds:

4. Number of HIV ADULT patients receiving services in HIV clinic in 2007:

5. Number of nurse practitioners serving in HIV clinic full time in 2007:

6. Number of nurse practitioners serving the HIV clinic part time in 2007:

7. Did you have medical specialists working in the hospital in 2007?

- ○ Yes
- ○ No

HIVQUAL-T Model Adoption Questionnaire

8. Did you have internal medicine physicians working in the hospital in 2007?

- ○ Yes
- ○ No

9. Did you have pediatrician serving in HIV clinic in 2007?

- ○ Yes
- ○ No

10. Until the year 2007, how often did you attend HIV forums or meetings at hospital or community level?

- ○ Once a month or more
- ○ Every two months
- ○ Every three months
- ○ Every six months
- ○ Once a year
- ○ Less than once a year or no meetings at hospital/community level

11. Until the year 2007, how often did you attend HIV forums or meetings at provincial level?

- ○ Once a month or more
- ○ Every two months
- ○ Every three months
- ○ Every six months
- ○ Once a year
- ○ Less than once a year or no meetings at provincial level

HIVQUAL-T Model Adoption Questionnaire

12. Until the year 2007, how often did you attend HiV forums or meetings at regional level?

- ○ Once a month or more
- ○ Every two months
- ○ Every three months
- ○ Every six months
- ○ Once a year
- ○ Less than once a year or no meetings at regional level

13. Until the year 2007, how often did you attend HIV forums or meetings at national level?

- ○ Once a month or more
- ○ Every two months
- ○ Every three months
- ○ Every six months
- ○ Once a year
- ○ Less than once a year or no meetings at national level

HIVQUAL-T Model Adoption Questionnaire

Please rate your level of agreements regarding the following statements

The statement will reflect your perceptions in the year 2007, BEFORE your decision to USE or NOT TO IMPLEMENT the HIVQUAL-T software and Quality Improvement projects.

1. (Centralization)

Before deciding to adopt or not adopt the HIVQUAL-T model in our HIV clinic,

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
I usually participate in any decisions regarding the adoption of new programs such as HIVQUAL-T.	○	○	○	○	○
My willingness to implement any voluntary initiatives was considered important for HIV clinic's decision making.	○	○	○	○	○
There could be little action here until the head of department or medical supervisor approves a decision.	○	○	○	○	○
Even small matters had to refer to someone higher up for a final answer.	○	○	○	○	○

2. (Formalization)

Before deciding to adopt or not adopt the HIVQUAL-T model in our HIV clinic,

My decision on serving HIV patients usually followed the written statement protocol.	○	○	○	○	○
The employees here were constantly being checked for rule violations.	○	○	○	○	○
I usually worked beyond the formal job description.	○	○	○	○	○
Under an agreement with physicians, nurses could provide care beyond their typical nursing practics when necessary.	○	○	○	○	○

3. (Slack of Resources)

Before deciding to adopt or not adopt the HIVQUAL-T model in our HIV clinic,

There were several sources of budget available for our HIV clinic.	○	○	○	○	○
The hospital had enough space available for HIV peer support group activities.	○	○	○	○	○
We usually had difficulty in getting supporting money from the hospital board.	○	○	○	○	○
We had enough number of computers in our HIV clinics.	○	○	○	○	○

HIVQUAL-T Model Adoption Questionnaire

Please rate your level of agreements regarding the following statements

The statements will reflect your perceptions in the year 2007, BEFORE your decision to USE or NOT TO IMPLEMENT the HIVQUAL-T software and Quality Improvement projects.

1. (Relative Advantage)

When I was first introduced with the HIVQUAL-T program,

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
I thought that using HIVQUAL-T software would be more convenient than other performance assessment methods (e.g. use of other software, calculation by hands or calculator, etc.)	○	○	○	○	○
I thought that using HIVQUAL-T software would be less time-consuming than other performance assessment methods (e.g. use of other software, calculation by hands or calculator, etc.)	○	○	○	○	○
I believed that the HIVQUAL-T model (HIVQUAL-T software and Quality Improvement implementation) would result in better HIV service quality.	○	○	○	○	○
I believed that the HIVQUAL-T model would help the hospital to obtain and maintain Hospital Accreditation (HA) status more easily.	○	○	○	○	○

2. (Observability)

Even though I had not implemented the HIVQUAL-T model,

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
It was easy for me to observe other hospitals using HIVQUAL-T software in their HIV clinics.	○	○	○	○	○
I had plenty of opportunities to see the HIVQUAL-T model being implemented in pilot sites.	○	○	○	○	○
It was visible how other hospitals using the model can improve their service quality.	○	○	○	○	○
Seeing pilot sites implementing HIVQUAL-T model made me feel more confident in putting it into use in my HIV clinic.	○	○	○	○	○

3. (Trialability)

Before deciding whether to use HIVQUAL-T software in our HIV clinic,

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
There were enough technical supports to help me try the HIVQUAL-T software.	○	○	○	○	○
I was able to properly try it out.	○	○	○	○	○
I had a great deal of opportunity to try the software.	○	○	○	○	○
I was permitted to use HIVQUAL-T software on a trial basis long enough to see what it could do.	○	○	○	○	○

HIVQUAL-T Model Adoption Questionnaire

4. (Simplicity)

Before deciding whether to implement the HIVQUAL-T model in our clinic,

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Learning the concepts of the HIVQUAL-T model was easy for me.	○	○	○	○	○
It was easy for me to remember how to use HIVQUAL-T software.	○	○	○	○	○
I believed that HIVQUAL-T software was user-friendly.	○	○	○	○	○
I believed that I would not have difficulties in writing a QI proposal.	○	○	○	○	○

5. (Compatibility)

Before deciding whether to adopt the HIVQUAL-T model,

	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
I thought that the HIVQUAL-T model was compatible with all aspects of the clinic's work.	○	○	○	○	○
I believed that the HIVQUAL-T model was compatible with the clinic's needs of assessing HIV clinical care performance.	○	○	○	○	○
I thought that using HIVQUAL-T model fit well with the way we like to work.	○	○	○	○	○
I felt that HIVQUAL-T model was compatible with my past experience.	○	○	○	○	○

HIVQUAL-T Model Adoption Questionnaire

Please answer the following questions

You will be asked about the information regarding the use of HIVQUAL-T software and the implementation of your quality improvement projects.

1. In 2007, how many computers did you have in your HIV clinic?

2. When did your clinic start using the HIVQUAL-T software?

- ○ Before 2007
- ○ 2007
- ○ 2008
- ○ 2009
- ○ 2010
- ○ Our clinic has not yet used the HIVQUAL-T software.

3. Have you implemented any Quality Improvement (QI) projects regarding the HIVQUAL-T results during the year 2007-2009?

- ○ Yes
- ○ No

4. Please identify what QI projects have you implemented during the year 2007-2010.

	CD4/VL	ART	OI prophylaxis	TB screening	STIs screening	PAP smear
2007	☐	☐	☐	☐	☐	☐
2008	☐	☐	☐	☐	☐	☐
2009	☐	☐	☐	☐	☐	☐
2010	☐	☐	☐	☐	☐	☐

Other (please specify)

5. What year did you receive financial supports for QI implementation from NHSO of other organizations?

- ☐ 2007
- ☐ 2008
- ☐ 2009
- ☐ 2010
- ☐ Never receive financial support for QI implementation

HIVQUAL-T Model Adoption Questionnaire

6. If you are NOT USING HIVQUAL-T software, what methods are you using for your clinical service evaluation?

- ☐ Performance Measurement software developed by the hospital or HIV clinic
- ☐ Performance Measurement software developed by other organizations
- ☐ Simple calculation using basic software (such as MS Excel, SPSS, etc.)
- ☐ Calculation by hands or calculator
- ☐ We never measure our HIV clinic performance

Other (please specify)

HIVQUAL-T Model Adoption Questionnaire

THIS PAGE IS ONLY FOR THOSE WHO HAVE NOT BEEN USING HIVQUAL-T SOFTWARE UNTI...

Please provide an approximated percentage of eligible patients receiving care in 2009 according to the following indicators.

1. How many percentage of eligible patients receiving the following services in your clinic in 2009?

CD4 screening (CD4)	
Viral Load screening (VL)	
Antiretroviral drug therapy (ART)	
PCP prophylaxis (PCP)	
Crypto prophylaxis (Crypto)	
TB screening (TB)	
Sexually transmitted infections screening (Syphillis)	
Cervical cancer screening (PAP)	

HIVQUAL-T Model Adoption Questionnaire

General Information

Please provide general information.

1. Which one of the following best describe your job?

- ○ Physician
- ○ Pharmacist
- ○ Nurse Practitioner

Other (please specify)

2. Which one of the following best describe your age range?

- ○ 18-25
- ○ 26-35
- ○ 36-45
- ○ 46-55
- ○ 56 or older

3. Until the year 2010, how long have you been working in HIV clinic(s)?

4. Please feel free to share any additional comments you have about the HIVQUAL-T model in the box provided below:

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