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**A MODEL FOR TELEMEDICINE ADOPTION:
A SURVEY OF PHYSICIANS IN THE PROVINCES OF QUEBEC
AND NOVA SCOTIA**

Dragos Vieru

A Thesis
In
The Faculty
of
Commerce and Administration

Presented in Partial Fulfillment of the Requirements
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ABSTRACT

A Model for Telemedicine Technology Adoption: A Survey of Physicians in the Provinces of Quebec and Nova Scotia

Dragos Vieru

The primary goal of this study is to evaluate and predict factors that could affect physicians' adoption behavior of Telemedicine technology. Based on the theoretical foundations of some of the most recognized technology acceptance models in the academic world, a model is proposed and then empirically tested. A sample of 390 physicians that were, at the time of the survey, either already using or about to use Telemedicine technology were selected to test a number of hypotheses. The Partial Least Square (PLS) method of structural equation modeling was used to assess the relationships between perceptions and behavioral intention to adopt Telemedicine. The outcomes of the study revealed that Perceived Usefulness has a strong and positive impact on physicians' adoption behavior and that Perceived Ease of Use is significantly related to Perceived Usefulness.

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1. INTRODUCTION

The healthcare industry is now starting to grasp the impact that information technologies can have on reshaping its activities, as witnessed by other industries in the last ten years. Telemedicine is one of the most revolutionary information systems to be integrated into healthcare services in the last hundred years. It became an important part of the healthcare milieu long before Information Systems (IS) practitioners realized what it was or how important it would be in future.

In the literature there are several definitions of Telemedicine that have largely been modified in step with access to tele-technology. In 1975 Bird gave the following definition of Telemedicine: "Telemedicine is the practice of medicine without the usual physician-patient physical confrontation, but instead via an interactive audio-video communication system" (as in Bashshur, Sanders, Shannon 1997, p. 19). Industry Canada defines Telemedicine as "the use of communications and information technology to deliver health and healthcare services and information over large and small distances" (Picot 1998a, p.9). With the advent of Internet/Intranet technologies, Telemedicine can be perceived as a set of communication modalities that allow for the transmission of medical data, video images and audio between physicians and other healthcare providers. These technologies apply to clinical areas such as radiology, dermatology, pathology, surgery, cardiology, home healthcare and to teaching (teleconferencing - Continuing

Medical Education). Some of the benefits of Telemedicine include the ability of bringing healthcare services to the patient, reducing the time it takes to make diagnosis and treatment decisions and improving the continuity of care.

1.1 History of Telemedicine

The first Telemedicine experiments date back to the early 1960s (Dardelet 1999) when the National Aeronautics and Space Administration incorporated this technology into their space program to monitor the medical well being of astronauts taking part in Mercury and Gemini flights. In the seventies, NASA collaborated with Indian health services and the Papago Indian tribe to initiate a project that used Telemedicine to provide medical services to reservations in remote locations (Kuszler 1999).

Today, Telemedicine is no longer limited to the transmission of images from remote Indian villages or orbiting spacecrafts. To help eradicate common problems such as difficult access, rising costs and poor quality of healthcare, Telemedicine is on the road to becoming an integral part of medical practice worldwide; and because the price/performance index is no longer a prohibitive factor, Telemedicine is quickly becoming the rising star of the medical milieu at the dawn of the twenty-first century (Wooton 1997).

1.2 Telemedicine in Canada

In Canada, Telemedicine could be the solution to its medical woes namely access and costs. Telehealth technology has a major role to play in the plans endorsed by health ministers across the country to amalgamate and redistribute medical services in cities and local communities. For example, since 1996, at the Hospital for Sick Children in Toronto, over five hundred patient consultations have been conducted to sites in Northern Ontario, the rest of Canada as well as around the world (Picot 1998a). In Quebec a paediatric cardiology network links four University Centers with over thirty sites in the province. Nova Scotia has a Telemedicine network connecting all forty-three hospitals for teleradiology, teledermatology and teleconferencing (Filler 1999). In Montreal, at the McGill University Health Centre (MUHC) - which encompasses four major teaching hospitals on the island - an Intranet solution for teleradiology is being implemented in order to create a "film-free" environment.

Picot (1998b) distinguishes five broad components of Telemedicine in Canada:

- 1) Medicine at a distance (represents real time interactive video-conferencing between a patient and a caregiver or consultant)
- 2) Information transfer over networks (electronic health records and databases)
- 3) Public and community health information networks
- 4) Telemonitoring, tele-homecare and emergency networks
- 5) Tele-education (CME) and multimedia applications for professionals

To move Telemedicine from its present state to the next plateau, where it will become an industry standard, it will be necessary to develop public policies on this subject. Institutions and providers need incentives to make modifications to their present activities. Herein lies the fodder for naysayers to rally against the modernization of tried and true medical practice.

1.3 Users' Implementation Concerns

Telemedicine can be a double-edged sword, as it can provide a means for institutional survival or the path to professional failure, depending on how it is presented to the buying population and how it is implemented.. Deciding to implement Telemedicine technology can be a healthcare information technology manager's crowning glory or biggest mistake. When deciding to implement such a system, an IS manager must take into account key items and issues left unresolved by some, if not most, systems integrators. Recognizing the usefulness of Telemedicine is not reason enough to encourage health professionals to use it. The following factors may affect their willingness or reluctance to adopt this technology (Bashshur *et al.* 1997):

- 1) Usefulness: the perception of a differential advantage with respect to the new technology.
- 2) Compatibility: physicians must perceive a certain compatibility, which means that Telemedicine will fit in with their daily work style.

- 3) Complexity: this factor depends on the level of difficulty or ease of use, linked to the understanding and usage of innovation.
- 4) Visibility: refers to the opportunity to share clinical results and other by-products of the new technology with colleagues.
- 5) Replacement: physicians' perception of being replaced by automation.

Our research is designed to provide academics and practitioners alike with a pragmatic explanation of key factors affecting the adoption of Telemedicine.

The general research question this paper examines is: what are the key factors that influence physicians' adoption of a new technology, namely Telemedicine?

Bashshur *et al.* (1997) stated that one of the reasons that Telemedicine system implementations have failed in the past was the lack of physicians' acceptance of the new technology. He mentioned that other reasons were related to the poor quality of the technology and premature funding termination. In most cases, a physician's decision to use or not to use the technology available to him has been self-motivated. It is likely to remain the same in the near future. With the emergence of province-wide telehealth networks it is crucial to address the physician technology adoption issue.

In this paper we propose a model of a user adoption model of Information Technology (IT) that is applicable to physicians. The proposed model combines a

modified version of the Technology Acceptance Model (Davis 1989) with aspects of the Diffusion of Innovations Theory (Rogers 1995), in this way taking into account additional factors that might affect physicians' attitudes towards Telemedicine. The study validates this model by examining the adoption of Telemedicine technology among physicians from rural areas in the province of Nova Scotia and physicians from a large urban medical facility in Montreal, Quebec. This study also addresses a pragmatic managerial need: avoiding the pitfalls of implementing Telemedicine, stemming from millions of dollars invested into developing Telemedicine programs by federal and provincial governments in recent years. The success of Telemedicine requires an adopting organization to address both technological and managerial challenges. The rest of the paper is structured as follows: in chapter 2, we review theories and models of user acceptance of information technology and try to show that the existing models do not have enough explanatory power when used in a health care milieu. In chapter 3, a model applicable to physicians will be proposed along with a set of hypotheses that will be used to test the determinants of adoption of Telemedicine. In chapter 4, the pre-test and sample selection will be discussed. In chapter 5, we will present the data analysis followed by the discussion of the results. In the last two chapters we will discuss the study's limitations, the implications of our findings on healthcare organizations and proffer advice on how to avoid some of the pitfalls of instituting this new technology. Finally, recommendations for future research will be proposed.

2. LITERATURE REVIEW

In our study the term "information technology" (IT) will be often used instead of the term "information system" (IS) which refers to a system that collects, processes, stores, analyzes and transmits information. In addition, IT includes the hardware and the network architecture side of IS. Usually users do not express their opinions about a device but rather about its underlying system or purpose; therefore we will use the terms IT and IS throughout the entire study.

For the past decade, researchers have tried to create conceptual models that encompass the main factors that influence users to accept new technologies. Many times, academics have debated the issue of whether IT is actually accepted by its intended users. Without acceptance, voluntary users will seek alternatives and forced users will show dissatisfaction and inefficiency in their job performance; therefore many of the presumed benefits of the IT will be negated (Dillon and Morris 1996).

In this chapter we will review different approaches to user acceptance as they apply to IT implementation. In doing so, we will analyze literature that pertains to areas of innovation diffusion and IT/IS implementation, where the concept of the acceptance of new technology has been addressed. The review emphasizes research that has tried to shed light on the determinants of user

acceptance, as this concept has been tackled theoretically and empirically in the academic literature on IT implementation. Finally we will address studies that pertain to Telemedicine technology acceptance. Most of the research done on this topic was not done at the academic level, but instead following industry standards and were limited in scope and scale (Hu, Chau, Sheng and Tam 1999).

2.1 The Concept of IT Acceptance

The literature has suggested that user acceptance is a critical factor for IT adoption. User acceptance can be defined as: "the obvious willingness within a group to use IT for the tasks it is designed to support" (Dillon and Morris 1996, p. 4). Even though this definition conceals the fact that a certain information system may be used for purposes other than those intended by the designers (e.g. using e-mail for personal purposes), in essence, the acceptance theory considers these aspects insignificant (Sheppard, Hartwick and Warshaw 1988). Academic literature agrees that the process of user acceptance of any new information technology can be modeled and empirically tested. Reluctance of users to accept IT is a crucial hindrance to the success of the implementation of any new information system; user acceptance has been viewed as the pivotal factor in determining the success or failure of any IS project (Davis, Bagozzi and Warshaw 1989).

For the past twenty-five years, researchers have studied issues related to this topic and tried to find predictors that would explain user acceptance of IT. Factors

such as user involvement in system development (Hartwick and Barki 1994) or the process by which technology is implemented and diffused (Moore and Benbasat 1991) cannot fully explain the variance in acceptance. Therefore we decided to look for research that used models that encompass more than one variable that would affect or explain user acceptance.

Several years ago, practitioners, especially IS managers, relied on wielding their authority to ensure that technology was adopted and used by their personnel; failing this, financial rewards were promised (Doll, Hendrickson and Deng 1998). Recently the new trend of aligning IT strategy with the business vision forced companies to rely more and more on IT. This fact raised concerns about the methods of designing and implementing information systems that are supposed to be adopted by users (Green 1998).

In most of the studies we looked at, the concept of acceptance had its roots in the Diffusion of Innovations Theory (Rogers 1995; see also the editions in 1962, 1977 and 1983). We start our review with this theory because it gives a very broad perspective of user acceptance of innovations and then we will narrow our scope down to more specific theoretical models that provide a better fit for our study goal.

2.2 The Diffusion of Innovations Theory (DIT)

The innovation decision process leading to institutionalization of usage may be conceptualized as a sequence of steps where an individual goes from initial perception of an innovation, to the development of an attitude toward it, to a decision to adopt or reject it, to using it and finally reinforcing the adoption decision (Rogers 1995). Rogers defines adoption as "...the decision to make full use of an innovation as the best course of action available" (Rogers 1995, p.21). He posited that the following five factors affect innovation adoption:

- Relative advantage (the degree to which a new technology is perceived as offering improvements over the existing one)
- Compatibility (its consistency with existing social norms, past experiences and work style)
- Complexity (the degree to which the new technology is easy to use and learn)
- Trialability (the possibility to experiment with an innovation prior to actually using it)
- Observability (the extent to which a new IT's outcomes are clear)

The Diffusion of Innovation Theory offers a conceptual framework for approaching acceptance at a global level and considers perceptions as antecedents to the decision to adopt innovation. In the literature there are few studies that try to apply Rogers' factors in a context specific to IT.

Extending Rogers' characteristics to a more appropriate context for IT, Moore and Benbasat (1991) described the development of an instrument that could be used to assess users' perceptions of adopting a new IT. Their study's outcomes showed that relative advantage, compatibility, complexity (ease of use), trialability and observability were the main characteristics that influenced the decision to adopt an IT innovation. They also identified two constructs beyond Rogers' classification, namely Image and Voluntariness of Use, which proved to have an impact on one's decision to accept innovation. Image is defined as "the degree to which use of an innovation is perceived to enhance one's image or status in one's social system" and Voluntariness of Use as "the degree to which use of the innovation is perceived as being voluntary, or of free will" (Moore and Benbasat 1991, p.195).

Hebert (1994) included in her research model constructs such as image, relative advantage, compatibility, result demonstrability and voluntariness. This study was conducted in a healthcare milieu and tried to assess nurses' intention to adopt new IT. The author used an instrument that was validated and tested by Moore and Benbasat (1991), but modified to suit her needs. The outcomes of the study showed that her research model, based on the diffusion of innovations theory, was supported. Compatibility, result demonstrability and relative advantage were the strongest predictors of intention to accept technology. This study pinpoints one very important fact for healthcare providers: while the IT may improve the efficiency of healthcare professionals, it will not diminish their role as care providers.

In another study conducted at a Fortune 500 corporation, Agarwal and Prasad (1998) used only three parameters from the DIT: compatibility, relative advantage and complexity. The authors tried to demonstrate that a moderating variable, namely personal innovativeness, existed, that affects the relationship between the three constructs and the dependent variable - intention to adopt IT. Of the three, compatibility was the only one found to have been significantly influenced by the personal innovativeness of the adopter.

The Diffusion of Innovations Theory provides a solid foundation for developing conceptual models that assess the impact of new IT on users, over time. Unfortunately, the theory does not explain how to avoid the pitfalls of user reluctance of adopting a new technology. As researchers try to find factors that may apply to the IT field, they have started looking outside of the DIT and into social psychology theories instead.

2.3 The Theory of Reasoned Action (TRA)

Fishbein and Ajzen proposed the Theory of Reasoned Action in 1975 in the social psychology literature. It defines the relationships between beliefs, attitudes, social norms, intentions and behavior (see figure 2.1). They posit that an individual's behavior is determined by the intentions to perform the behavior in question. The stronger the intention is, the more the individual is expected to try and eventually accept new technology. The main difference between DIT and TRA is that Rogers' constructs are based on perceptions of the innovation itself, whereas

Fishbein and Ajzen's model examines the perception of actually using the innovation (Moore and Benbasat 1991). Attitudes towards an object can often differ from attitudes towards a particular behavior concerning that object (Fishbein and Ajzen 1975).

The Theory of Reasoned Action is based on two independent constructs that influence intention. The first is the Attitude toward the Behavior and this is defined as "the individual's positive or negative evaluation of performing the particular behavior of interest" (Ajzen 1988, p.117). The second construct, the subjective norm, is "the person's perception that most people who are important to him, think he should or should not perform the behavior in question" (Fishbein and Ajzen 1975, p.302). The subjective norm is generated by the relationship between the perceived expectations of particular individuals or groups and the user's propensity to comply with these expectations.

The Theory of Reasoned Action also postulates that the antecedents of attitudes and subjective norms are comprised of a number of external variables (see figure 2.1). These are the beliefs that are defined as "the individual's subjective probability that performance of a given behavior will result in a given consequence" (Fishbein and Ajzen 1975, p.12).

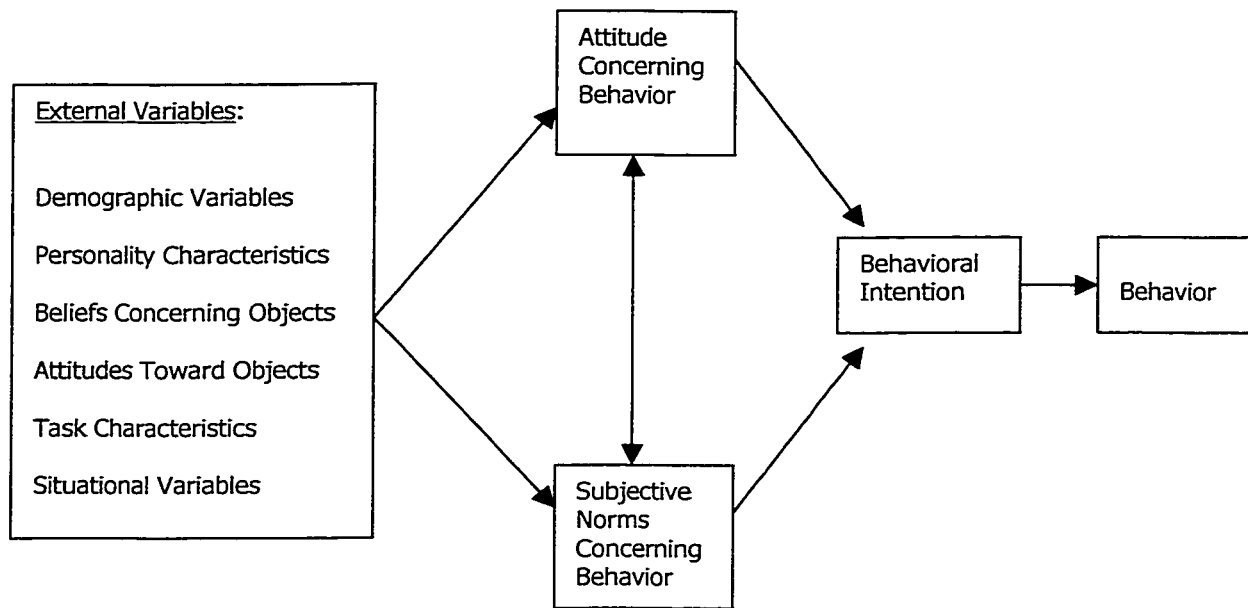


Figure 2.1
The Theory of Reasoned Action (from Sheppard *et al.* 1988)

In their meta-analysis of the application of TRA, Sheppard *et al.* (1988) found that the theory is robust within the parameters Fishbein and Ajzen set and the model appears to be applicable even in situations such as:

- The person's behavior is not completely under his/her own will.
- The intentions are assessed before users have all the information in order to form a confident intention.
- Individuals are not forced to choose amongst alternative behaviors.

The Theory of Reasoned Action is seen in the academic literature as a general model that can be used in the behavioral sciences. Some authors have tried to use it in the information systems field. In their study, Hartwick and Barki (1994), tried to explain the antecedents of the two main independent variables of the TRA model: attitude and subjective norms. They tried to empirically demonstrate the benefits of user involvement in information systems development that would help assure success when implementing new IT. The authors used user involvement as an antecedent of attitude concerning behavior and subjective norms. Their modified TRA model was successfully tested on members of the Canadian Information Processing Society. In their study, Hartwick and Barki like Sheppard *et al.* (1988), stress the fact that attitude and subjective norms are weighted differently for mandatory and voluntary users. Voluntary users care less about others' opinion and more about the attitude. Mandatory users rely heavily on the normative construct and less on attitude.

Loch and Conger (1996) posit in their study that TRA is inadequate for explaining ethical behavior involving the use of computers. They propose modifications to the model by adding individual characteristics such as self-image, de-individuation and computer literacy. The results of the study support these statements.

Karahanna, Straub and Chervany (1999) used TRA mixed with some of the theory of innovation diffusion's constructs. In this way, the authors tried to overcome the shortcomings of both theories. The study does not aim to test the applicability of TRA but merely to find an adequate model to explain MS Windows based applications acceptance.

After examining the TRA model, one salient conclusion emerges: the model has strong support in the general IT environment, however its predictive validity becomes unclear if the behavior being studied is not under full volitional control of the user (Chang 1998). Although volitional control is more likely to be applicable to some types of information systems (where the use of IT is not mandatory) than to others, personal proficiency in computer usage and external factors can hinder the performance of any behavior.

2.4 The Theory of Planned Behavior (TPB)

While TRA proved to be a reliable model in most of the studies that examined user acceptance, other theoretical perspectives have also been used. The Theory of Planned Behavior (Ajzen 1988) is an extension of TRA and attempts to overcome the problem of volitional control found in the latter; Ajzen did this by adding another construct to the model: Perceived Behavior Control (PBC) (see figure 2.2). This new construct predicts behavior intention and behavior. PBC refers to "the perceived

ease or difficulty of performing a behavior and it is assumed to reflect past experience as well as anticipated impediments and obstacles” (Ajzen 1988, p.132). TPB postulates that attitude, subjective norms and PBC are direct determinants of intentions that have a positive impact on behavior.

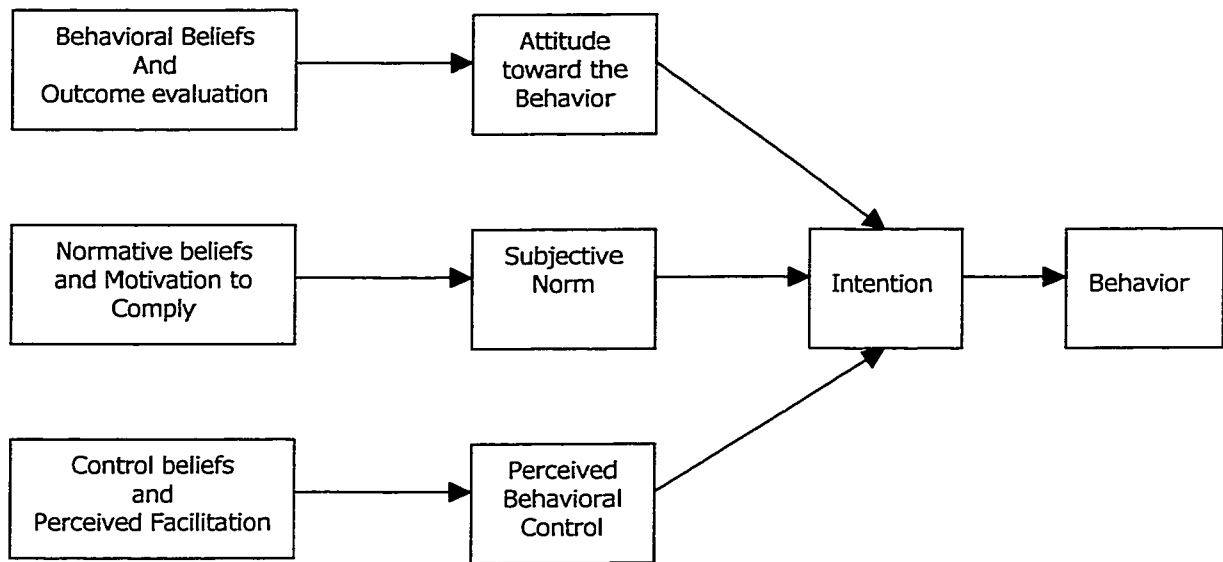


Figure 2.2
The Theory of Planned Behavior (adopted from Mathieson 1991)

Not many researchers use TPB in its original form. In the field of IS, Taylor and Todd (1995a) applied a decomposed TPB (see figure 2.3). They suggested that perceived usefulness, perceived ease of use and compatibility were antecedents of attitude. The authors postulated that subjective norms have as antecedents peer influence and superiors’ pressure; they also add self-efficacy, resource-facilitating conditions and technology-facilitating conditions as determinants of PBC. Self-efficacy, which has its roots in the Social Learning Theory (Bandura 1977), is

perceived as “the belief that one has the capability to perform a particular behavior” (Compeau and Higgins 1995, p.189).

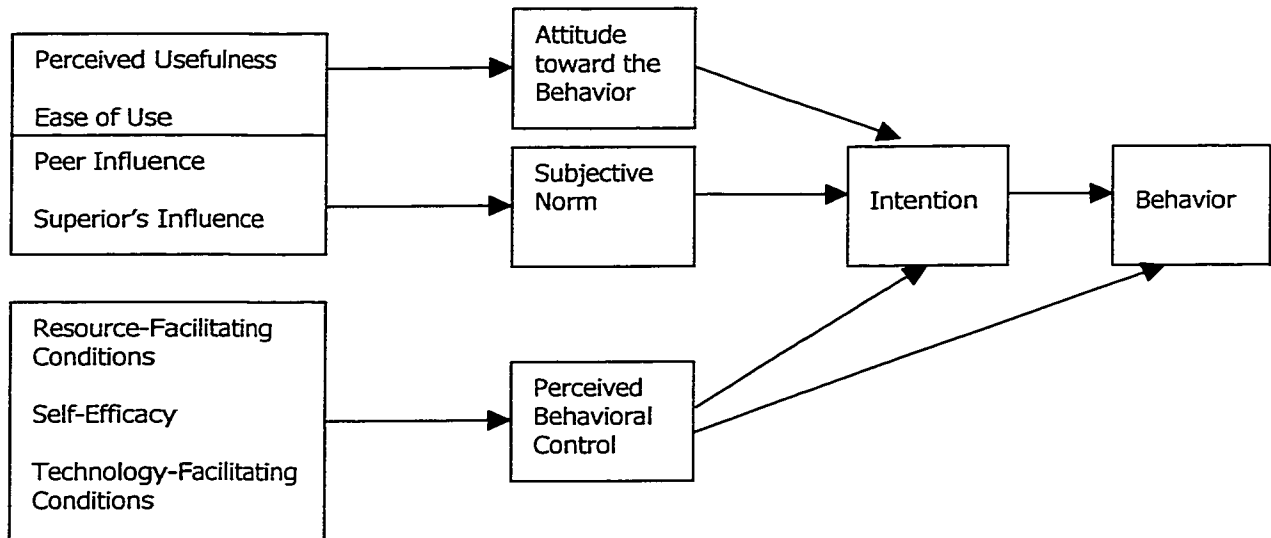


Figure 2.3
The Decomposed Theory of Planned Behavior (from Taylor and Todd 1995a)

TPB has not been studied as thoroughly as the Technology Acceptance Model (TAM), which will be discussed in the following section. Many studies have attempted to compare the two models (Mathieson 1991; Taylor and Todd 1995a) in order to determine which one would be a better predictor of user acceptance of IT. Taylor and Todd concluded that TAM was more appropriate in situations where the study’s goal was to predict IT usage or behavioral intention to use. The decomposed TPB was better when trying to understand the antecedents of intention and in this respect the model has more explanatory power.

2.5 The Technology Acceptance Model (TAM)

Ajzen (1988) defined TRA as a general model. The IS literature shows that a number of IT-specific models have been derived from TRA. One of these, which is the most widely used by MIS researchers, is the Technology Acceptance Model. This model, developed by Davis (1989), proposes a method of evaluating user acceptance by assessing users' beliefs, attitudes, intentions and "actual computer adoption behavior". TAM adapted the generic TRA to the particular domain of user acceptance of computer technology. Davis postulated that behavioral intention to use IT was predominantly correlated with usage. The main goal of TAM is to predict IT acceptance and shed light on design problems of new IS before users adopt the system (Dillon and Morris 1996).

TAM uses a set of two variables (Perceived Ease of Use and Perceived Usefulness) employed in many computer technology acceptance contexts. This model was found to be much simpler and easier to use by most researchers and to be a more powerful model for establishing the variables influencing user acceptance of computer technology. TAM has proven to be successful in predicting and explaining usage across a variety of new technologies (Adams, Nelson and Todd 1992; Igbaria 1993; Szajna 1996; Chang 1998).

Within this model, Davis (1989) defines the two constructs that are of "primary relevance to computer acceptance behaviors"(see figure 2.4):

- 1) Perceived Usefulness (PU) is “the degree to which a person believes that using a particular system would enhance his/her job performance” (p. 320).
- 2) Perceived Ease of Use (PEOU) is “the degree to which a person believes that using a particular system would be free of effort” (p. 320).

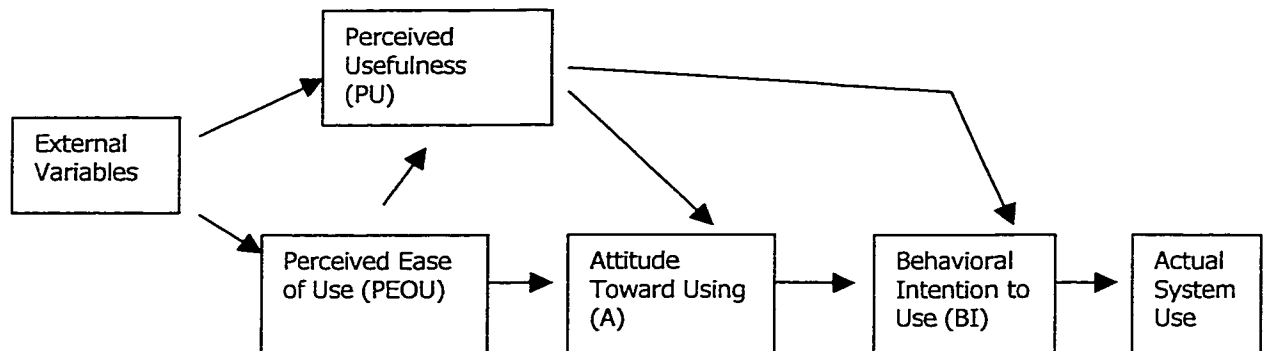


Figure 2.4
The Technology Acceptance Model (from Davis 1989)

Attitude (A) is defined as the positive or negative feelings towards the IT. Behavioral intention to use the system (BI) is modeled as a function of attitude and usefulness and determines the actual use.

TAM has some significant differences from its base model, TRA. The most important one is the non-inclusion of the subjective norm construct. Davis *et al.* (1989) defended this change by saying that in their empirical work, they found that the use of the studied technology was more of a personal nature than dependent on social influences. The authors did not find that the construct had an impact on BI. The second difference between the two models is the direct link, in TAM, between

usefulness (a belief) and intention. Hence, TAM contradicts TRA, which postulates that attitude mediates the relationship between beliefs and intentions. In practice, this means that a user will adopt new IT if he/she thinks it will enhance his/her job performance, even if the user dislikes the new system. A third difference is the positive relationship between PEOU and PU, which means that if one perceives a new system as being easy to handle then the perceived usefulness of that system will increase. Davis (1993) stated that the reverse is impossible.

TAM has been validated in many studies since 1989. Davis *et al.* (1989) empirically tested the model in a longitudinal study of 107 MBA students' intention to use a new software package. The results largely supported TAM. Between the two important independent variables, PU was found to have a more powerful influence on users' intentions. TAM has been found to be strong when used in assessing the acceptance of different technologies (Adams *et al.* 1992; Mathieson 1991). Mathieson compared TAM with TBP and found that the former was better at predicting the intention to use a spreadsheet software.

Davis (1993) conducted an empirical study on 153 corporate email users and showed that TAM accounted for 36% of the variance in usage; perceived usefulness was found to have a powerful effect directly and indirectly through attitude on actual use (58%).

In a study aimed at confirming the construct validity and reliability of TAM, Segars and Grover (1993) proposed that Davis' original usefulness construct would be better modeled as two factors: effectiveness and usefulness. They targeted 118 email users from ten different organizations. The results confirmed that for this type of technology, a three-belief model is more appropriate than the two-belief, original one.

In another study that confirmed the validity of TAM, Igarria, Zinatelli, Cragg and Cavaye (1997) used Davis' model to study personal computing acceptance factors in small firms. The outcomes proved that PEOU is a prevailing factor in explaining PU and system usage and that PU has a significant impact on system usage. The authors determined that management support and external support are antecedents of PEOU and PU.

Doll *et al.* (1998) were the first to assess the equivalence of Davis' constructs across sub-groups of students based on type of application used, experience with computers and gender. The study's outcomes are important from a practical point of view. They proved that TAM's two main constructs, PEOU and PU, are partially invariant across type of application and computing experience. One salient conclusion was that TAM could be used as suggested by Davis *et al.* (1989) for evaluating decisions made during the early stages of the process of system development, in which potential users can have well shaped beliefs about PEOU and

PU, despite the fact that they do not have any application-specific experience. This conclusion weighed heavily in our approach to constructing our research model.

Many studies can be found in the IS literature that use an enhanced or simplified version of TAM, depending on the technology being studied. Igbaria (1993) used a modified version of TAM in a corporate environment. The dependant variable from the original model was replaced with user acceptance of new IT and the PEOU construct was changed to computer anxiety. The results showed that the model was reliable and that computer anxiety was proven to be the most important determinant of PU.

Thompson, Higgins, and Howell (1991) used a modified construct of PU to test the conceptual model of utilization of personal computers in a corporate environment. They split the original construct into two different independent variables; the first, near-term job fit, is designed to measure the extent to which an individual believes that using a personal computer can enhance his job performance, while the second, long term consequences of use, is designed to measure outcomes that have a payoff in the future, such as improving one's career prospects or social status.

Researchers have found that actual use, as a construct, is hard to assess by self-reported measurements. Subramanian (1994) used predicted future usage of a

new technology in a study of 179 professionals and in a similar environment, Chau (1996) postulated that BI is a better dependent variable than actual use. These different approaches take into account when the study in question was done: before or after the system was accepted and users had hands-on experience with it.

While Davis (1989; see also Davis *et al.* 1989; Davis 1993) did not emphasize any specific factors that could be essential in explaining user acceptance, other authors suggested different outcomes. Szajna (1996) empirically evaluated a revised TAM using students as her target population; she measured PEOU and PU at the pre-implementation stage and at the post-implementation stage and found that the differences in the intention-usage relationship for the pre- and post-implementation versions make an argument for the consideration of a new component associated with TAM: experience.

In their study using 786 students, Taylor and Todd (1995b) stressed the fact that no previous empirical tests of TAM had taken into account the degree of computer literacy of the users. They also questioned the fact that the determinants of IT usage were the same for experienced and inexperienced users of a system. The results confirmed that PU and attitude correlated more significantly with BI for experienced users than for inexperienced ones. They also mentioned how the importance of the two concepts, PEOU and PU, was seen differently by experienced and inexperienced users.

In their study, using students as their research population Venkatresh and Davis (1996) adopted the concept of Computer Self-Efficacy from Compeau and Higgins (1995) and it proved to have a significant impact on PEOU. The authors posited that training programs aimed at improving users' computer self-efficacy could lead to increased user acceptance. Jackson, Chow and Leitch (1997), using an extended TAM (TAME) model, demonstrated that user involvement and other psychological factors such as situational involvement, intrinsic involvement, argument for change and prior use have an important effect on PEOU and PU. Geffen and Straub (1997) based their research on the fact that most of the previous studies using TAM did not take into account the subjects' gender. They did not find that gender difference had an impact on use and PEOU. Lucas and Spitler (1999) added social norms and user performance to the original TAM. Their study's outcomes confirm that in an environment with multi-functional workstations used by knowledgeable workers, the two variables not included in TAM are of the utmost importance. Agarwal and Prasad (1999) confirmed that individual differences (level of education) had a serious impact on PU and PEOU. Using the same approach, Venkatresh (1999) postulated that training had a crucial effect on PEOU.

In the last five years, many researchers have tried to prove that TAM, enhanced with certain other constructs, is the model best suited to explore and explain user acceptance of new IT. Currently more and more academics realize that an all-encompassing model is hard to build. At the same time they recognize that

every model they create has as a foundation, TAM. The emergence of this model represents the turning point in academics' and practitioners' endeavors to understand and predict user acceptance of new IT.

2.6 Telemedicine Acceptance Literature

In the literature, only a few studies have been done to assess the impact of Telemedicine on the actual or potential users of this particular technology. Most of the studies on Telemedicine that we found, focused on the technological development, clinical application or benefits of this technology and its financial impact on ever shrinking hospital budgets (Hu, *et al.* 1999). In their study, Grigsby, Kaehny, Sandberg, Schlenker and Shaughnessey (1995) examined issues such as cost, cost-effectiveness and effects on patient management. The authors concluded that the demonstration of the cost-effectiveness of Telemedicine remains a task to be accomplished by researchers, several years in the future.

In Norway, Halvorsen and Kristiansen (1996) indicated that Telemedicine, especially teleradiology might be justified as a means to increase equity in access to high quality healthcare in remote communities. Other researchers tackled the effectiveness of the management of this technology, which is an important decisional factor in the process of implementing a telehealth network (Sheng, Hu, Wei and Ma (1999); Paul, Pearlson and McDaniel (1999).

Only a few studies have approached the problem of physician acceptance of Telemedicine and most of them are of little academic value due to their limitation in scope and scale. The authors of these studies concentrated solely on certain medical specialties, used small sample sizes and formulated hypotheses without a theoretical foundation (Allen, Hayes, Sadasivan, Williamson and Wittman 1995; Mairinger, Gable, Derwan, Mikuz and Ferer-Roca 1996; Mitchell, Mitchell and Disney 1996; Gschwendtner, Netzer, Mairinger and Mairinger 1997; Wooton 1997; Mairinger, Netzer, Shoner and Gschwendtner 1998; Flowers 1999). As an example, Allen *et al.* 1995, reported on a study of oncologists' satisfaction with a teleoncology system. The authors used three physicians as the study population and as they noted, the sample size was too small to use as anything more than a pre-test study. Specific responses to the questionnaire were directed more towards frustration with the equipment and whether all relevant information had been transmitted. However, the overall rating of Telemedicine was favorable.

Only recently, have two different teams of researchers approached this subject in an academic fashion. One, Succi and Walter (1999), proposed an extended TAM to investigate physicians' acceptance of Telemedicine. They argued that, unlike middle managers or MBA students who had been used as the target population in most IT acceptance studies, physicians enjoy authority and prestige in their environment. Information systems, in general, improve many users' - including physicians' - job performance. However certain technologies, like

Telemedicine, could to a certain extent, codify expert knowledge owned only by professionals. Certain physicians may see this process as a threat to their expertise. From here stems the problem of physician reluctance to accept Telemedicine.

The authors proposed a model that takes into account additional factors that could affect physicians' attitude toward Telemedicine. They introduced a new factor, Perceived Usefulness towards Professional Status. Unfortunately the authors did not empirically test the model.

The second team, Hu *et al.* 1999 used data obtained from physicians in selected hospitals in Hong Kong, to assess the explanatory force of TAM in the case of physician acceptance of Telemedicine technology. The study's outcomes showed reasonable support for the utilization of TAM as a research model. The authors suggested that there is a need for adding other constructs to the model or integrating it with other IT acceptance models, in order to enhance its explanatory power in the healthcare milieu. These kinds of modified or integrated research models can provide a more thorough explanation of our understanding of IT acceptance by physicians.

We examined four major user acceptance models in this literature review. The first one, Rogers' Diffusion of Innovations Theory, provides the context in which a researcher can explore the impact of IT over time but explains very little about user acceptance.

The second, the Theory of Reasoned Action has a robust, underlying theory but once applied outside its original boundary conditions (predicting non-voluntary behavior and assessment of intentions before users had full information that would help to create a confident decision), its validity weakens.

The third, the Theory of Planned Behavior, has been less empirically tested and is usually compared to TAM (Mathieson 1991; Taylor and Todd 1995a) or to TRA (Chang 1998). Every time this comparison was made, TAM was proven to have a more powerful explanatory power.

The fourth, the Technology Acceptance Model, in comparison with all the models studied in this literature review, is superior because of IT specificity, a strong theoretical basis and wide empirical support. An extended TAM, as proven by other studies, may be more appropriate for our research context. Venkatresh and Davis (1996) added the construct of computer self-efficacy to the original TAM; Jackson *et al.* (1997) also integrated new constructs, such as user involvement and other psychological factors. Agarwal and Prasad (1999) added user differences as their

modification to Davis' original model. Davis (1993) himself suggested that over time, additional factors should be added to his model.

Our study tries to meld the existing user technology acceptance literature, Telemedicine research and practitioner goals. In this way we aim to make a contribution to IT acceptance/adoption research by extending the validity and applicability of existing research models to healthcare providers. We chose Telemedicine technology adoption as our research topic, because of the significant growth of IT investment in healthcare organizations across the globe, and especially in Canada.

3. RESEARCH MODEL AND HYPOTHESES

3.1 The Research Model

The proposed model, pictured in figure 3.1, attempts to answer the general research question: what are the key factors that influence physicians' decision to adopt Telemedicine technology?

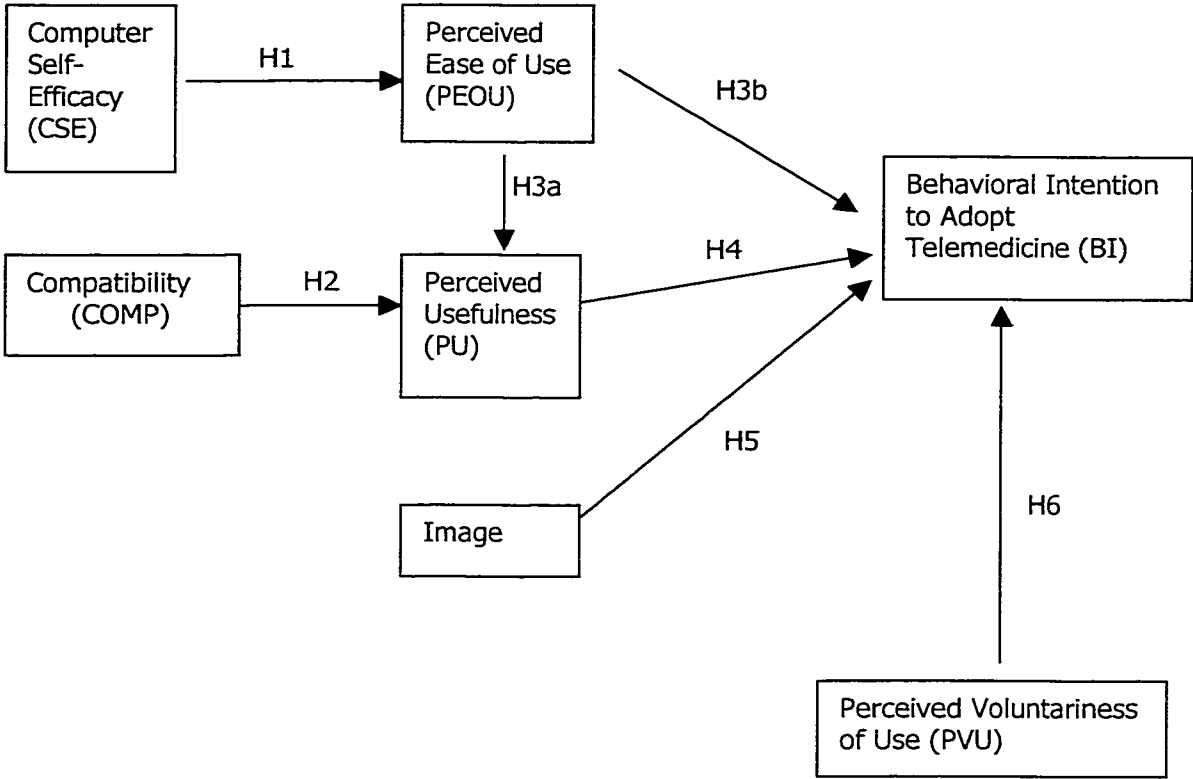


Figure 3.1
The Research Model (extended TAM)

The theoretical model for the study combines constructs taken from the Technology Acceptance Model (Davis 1989) and constructs from the Diffusion of Innovations Theory (Rogers 1995) in a complementary manner. The underlying foundation for our model is a simplified TAM. There are a few differences between our model and Davis' original model. The first difference is that the Attitude construct has been removed in order to simplify the model (Davis *et al.* 1989; Chau 1996; Igarria *et al.* 1997). While empirically testing his original model, Davis *et al.* (1989) found, in the outcomes of their studies, that the Attitude-Behavior relationship was non-significant. They therefore removed the Attitude construct from their original model.

The second difference is that we added a link between Perceived Ease of Use (PEOU) and Behavior Intention to Adopt (BI). This was done because other empirical studies found a significant relationship between these two constructs (Moore and Benbasat 1991; Chau 1996).

We chose to use a different approach from the traditional one, when user acceptance of a new technology is being assessed. According to other researchers' suggestions (Chau 1996; Jackson *et al.* 1997; Agarwal and Prasad 1999) we used BI as a dependent variable instead of actual use. This was done because TAM hypothesizes that behavior intention is the major determinant of usage behavior (Davis 1989). This is the third difference. When end user perceptions are captured

prior to adoption, the dependent variable should be the intention to adopt rather than the intention to use. According to TAM, studies need to be specific with regards to the target behavior of interest (Davis 1989). In our case, the study's goal is to examine adoption; hence the dependent variable should be intention to adopt or adoption behavior.

Another difference is the inclusion of the Computer Self-Efficacy (CSE) construct in our model as an antecedent of PEOU. Davis *et al.* (1989) suggested that the perception of self-efficacy could be an explanation for the effect of PEOU on BI. In their study, Venkatresh and Davis 1996 empirically tested this notion by assessing the relationship between CSE and PEOU. The findings supported the authors' hypothesis that computer self-efficacy is a determinant of perceived ease of use.

Finally, three more constructs, namely Compatibility, Image and Perceived Voluntariness of Use (PVU) were included in our model. These constructs originated from literature on the Diffusion of Innovations Theory. This theory, as shown in the literature review, provides a set of attributes that could affect an individual's opinion on the innovation, prior to adoption. In their study, Moore and Benbasat (1991) found that Compatibility, Image and PVU were among the other main characteristics that were identified as having a significant impact on the decision to adopt an IT innovation. In our study, Compatibility is seen as the degree to which adopting an

innovation is consistent with the existing socio-cultural values and beliefs and prior and present experiences (Rogers 1995). As postulated by Moore and Benbasat (1991) it is unlikely that individuals would view an innovation as useful if it is not compatible with their work style. The Image construct encompasses the perceptions that adoption of the technology may enhance one's status in one's social system (Moore and Benbasat 1991). In our study, this pertains to the physician's belief that his perceived professional status may be altered by the adoption of Telemedicine technology. PVU was added to the model to assess whether or not the adoption of Telemedicine is entirely voluntary. As shown in Moore and Benbasat's study we want to examine the impact that PVU has on intention to adopt.

3.2 Research Hypotheses

In our study, Telemedicine technology adoption is seen as a physician's psychological state with regard to his/her intention to use this particular technology.

The target technology was Telemedicine in general, rather than specific telehealth programs such as teleradiology, telesurgery etc. The reason behind this decision was that Telemedicine is still in the adoption stage, which makes it difficult to assess user technology adoption based on specific Telemedicine technologies. Nevertheless, the outcomes of our study will provide academics and practitioners alike insights relevant to technology adoption in general and Telemedicine in

particular. The following hypotheses will be tested in order to attain this paper's goal:

H1: A user's Computer Self-Efficacy is positively linked to his/her perception of Telemedicine's ease of use.

As shown in Figure 3.1, we posit that Computer Self-Efficacy is positively related to PEOU. This assumption follows from the outcomes of Venkatresh and Davis' (1996) study, which proved that CSE accounted for thirty percent of the variance in PEOU.

H2: Compatibility affects the perception of Telemedicine Usefulness in a positive manner.

We argue that the belief formation process is influenced by the user's socio-cultural values and work style. Moore and Benbasat (1991) and later Karahana *et al.* (1999) demonstrated that Compatibility is an important factor that affects a user's perception of IS usefulness.

H3a: Perceived Ease of Use has a positive impact on Perceived Usefulness of Telemedicine.

H3b: Perceived Ease of Use is positively linked to Behavioral Intention to Adopt Telemedicine.

The two propositions are based on suggestions made by Davis *et al.* (1989). They argued that the Attitude construct does not have a significant relationship with BI but that PEOU has a direct impact on BI. This hypothesis has also been validated in other studies (Chau 1996; Jackson *et al.* 1997). H3b was formulated taking into account that the easier a system is to use, the greater the perception that the technology being adopted will support the user's professional needs is (Jackson *et al.* 1997).

H4: The level of Perceived Usefulness is positively associated with Behavioral Intention to Adopt Telemedicine.

Using the same logic as for H3, we posited a direct relationship between PU and BI. This proposition has been empirically tested and validated by Davis *et al.* (1989) and Adams *et al.* (1992).

H5: The Image or perceived professional status is positively associated with Behavioral Intention to Adopt Telemedicine.

H6: The level of Perceived Voluntariness of Use has a positive relationship with Behavioral Intention to Adopt Telemedicine.

These last two hypotheses were formulated following recommendations from Moore and Benbasat (1991). The authors found in their meta-analysis that there is support for considering Image as a separate factor that influences BI. They also argued that Perceived Voluntariness of Use is an important attribute when consideration also has to be given to whether the potential users are free to adopt or reject a new technology. This study's outcome showed moderate support for PVU's and Image's relationship with BI.

Table 3.1 Review of Studies linked to the proposed research model

Author	Model/ Subjects	Relation to Telemedicine study	Proposed model's variables						Observations		
			CSE	PU	PEOU	Image	Compatibility	PVU		BI	
Davis 1989	TAM 1. IBM developers using PROFS, XEDIT 2. MBA students	TAM proved to be a strong foundation for a model that assess physician acceptance of new IT		x	x					x	- Developed Perceived Ease of Use, Usefulness scales. - PEOU impacts on Actual Use mainly through PU.
Davis et al. 1989	TAM, TRA MBA students	Simplified TAM empirically tested		x	x					x	- Attitudes have little impact on BI - Relatively simple models can predict acceptance well
Moore and Benbasat 1991	Extended Diffusion of Innovations Theory	Innovations attributes that will be used in a complementary manner with TAM				x		X	x		- Developed an instrument to assess users' perceptions of adopting a new IT. - Outcomes showed that relative advantage, image, compatibility, triability, voluntariness and observability, were the main characteristics that influenced the decision to adopt an IT innovation.

Author	Model/ Subjects	Relation to Telemedicine study	CSE	PU	PEOU	Image	Compatibility	PVU	BI	Observations
Adams et al. 1992	TAM 1. Email and voicemail in corporations 2. Office packages by students	TAM validity and reliability confirmed		x	x				x	- PEOU and PU are reliable and valid - LISREL models provided poor fit
Venkatresh and Davis 1996	TAM with external variables Students	Included self-efficacy	x	x	x					- Results confirmed that Self-efficacy is a determinant of PEOU before and after hands on experience
Chau 1996	Extended TAM Corporate users	Used BI instead Actual use								- Attitude is taken out of the model in order to simplify it. - Introduces Triandis' perceived consequences
Hu et al. 1999	TAM Physicians from Hong Kong	First time that TAM is used to assess physicians' acceptance of Telemedicine		x	x				x	- Findings showed moderate support for TAM
Karahana et al. 1999	TRA + Rogers' attribute Corporate users	Model melds PEOU, PU and BI factors with Rogers' attributes	x			x	x	x		- All Innovations' attributes are basis for pre-adoption user attitude

4. METHODOLOGY

4.1 Sample Population

The data for this correlational study were gathered by means of a survey questionnaire administered to physicians in pre-selected specialties who practice medicine in healthcare institutions in the provinces of Québec and Nova Scotia. Initially we tried to focus our study in the province of Québec, where a telehealth network, which will connect 32 healthcare sites, is on the verge of being implemented. In November 1999, Ms. Carole Tétreault, manager of medical imaging and cardiology for the MUHC, advised us that due to unforeseen technical problems with the implementation of the system, physicians province-wide were already being asked for their opinions on many various aspects of Telemedicine by CEFRIO (Centre Francophone d'Informatisation des Organizations) and would probably not be amenable to answering an academic survey.

In the province of Québec, we chose physicians working within the MUHC in Montréal (which, at the time, was not yet part of the Québec Telehealth Network), as our respondents. This institution was chosen because the MUHC is not only a healthcare provider, but also a teaching hospital and a world-renowned medical research institution. Here an Intranet solution for teleradiology and teleconferencing based on ATM technology is being implemented. All four MUHC sites will be able to hold teleconferences involving physicians and researchers alike.

We contacted emergency medicine, surgery, orthopaedic, oncology, respirology, urology and radiology departments and we were provided with lists of physicians that totaled 260 names. The choice of physicians from the MUHC was based on the likelihood of their involvement with Telemedicine programs in the near future. The medical specialties that were targeted in this study were chosen because they will probably be among the first to implement and use Telemedicine technology.

Healthcare institutions in Nova Scotia were targeted because of the newly implemented Telemedicine network that links 43 sites throughout the province. According to Dr. Michael Allen, Director of Community Programs at Dalhousie University, Continuing Medical Education, this infrastructure constitutes the second largest Telemedicine network implemented in North America and should be a reference model for other hospital IS managers in Canada.

Following telephone and e-mail discussions with Dr. Allen, he agreed to forward our questionnaire to Dr. Dan Reid, chair of the Nova Scotia Telehealth Network Advisory Board who would review the appropriateness of the content and eventually give us permission to send it to 140 physicians; these physicians had participated in at least one Continuing Medical Education (CME) session via teleconferencing; because this was the selection criterion, the respective specialties of the physicians was not an important factor.

4.2 Operationalization of Constructs

The use of a model that combines elements from TAM with elements from Diffusion Innovation Theory was advantageous because of its well-validated constructs (Davis *et al.* 1989; Moore and Benbasat 1991; Venkatresh and Davis 1996; Hu *et al.* 1999)(see table 4.1). Preliminary measurements of our model's variables were obtained from the above mentioned studies using a five point Likert scale with values ranging from 1 - *strongly disagree* to 5 - *strongly agree*. Most of the constructs' items were re-worded to fit the technology being studied, namely Telemedicine.

Table 4.1
Scale Reliabilities

Construct*	Scaled Variables	Questions	Cronbach's Alpha (from literature)			
			Davis et al.	Moore and Benbasat	Hu et al.	Venkatresh and Davis
Perceived Ease of Use (5)	PEOU	Q1 – Q4, Q17	.93		.79	
Perceived Usefulness (7)	PU	Q5 – Q11	.97		.89	
Compatibility (3)	COMP	Q12 - Q14		.86		
Image (2)	IMAGE	Q15, Q16		.79		
Computer Self-Efficacy (8)	CSE	Q18a - Q18h				.81
Perceived Voluntariness of Use (2)	PVU	Q19, Q20		.82		
Behavioral Intention to Adopt (4)	BI	Q21 - Q24	.84		.86	

* - The numbers in the brackets represent the number of items in the scale

Computer self-efficacy (CSE) was operationalized using Compeau and Higgins' (1995) instrument. The original instrument had ten items and used a Guttman scale; the authors empirically tested and validated it. The instrument was later re-used by Venkatresh and Davis (1996). They re-tested its reliability and found a Cronbach's alpha equal to 0.81. In our questionnaire, physicians were asked to indicate agreement or disagreement with the eight statements of the CSE construct.

Based on original constructs from TAM, Perceived Ease of Use and Perceived Usefulness were adopted from Hu *et al.* (1999) who used them to test Telemedicine acceptance among 421 physicians from hospitals in Hong Kong. In our model, PEOU was operationalized in 5 items and PEU in 7 items.

The Behavior Intention to Adopt Telemedicine construct, which was composed of 4 items, was based on Davis' original construct and modified to make it relevant to Telemedicine.

Image, Compatibility and Perceived Voluntariness of Use were based on Moore and Benbasat's (1991) instrument and adopted from Karahanna *et al.* (1999). The latter successfully tested and validated these constructs in a study of Windows applications adoption at a large financial institution in the USA. In our questionnaire the three dimensions were operationalized with 2-, 3-, 2- item scales respectively.

The final version of the questionnaire that encompasses the operationalized constructs discussed in this chapter can be found in Appendix 1.

4.3 Data Collection and Sample

We decided to utilize a user-reporting approach for our data collection, which we considered to be appropriate for assessing physicians' intention to adopt Telemedicine technology. This method of gathering data has been extensively used in the academic literature and has been proven to be effective (Szajna 1996). This approach is more appropriate in situations where perceptual measures are more accurate than objective ones (Melone 1990).

A pre-test was administered to 10 physicians from five different specialties (general surgery, emergency medicine, oncology, orthopedic surgery and radiology). We chose ten names at random from the list of 260 physicians from the MUHC (these 10 physicians were eliminated from the final list). We met with each one individually and explained the scope of the study. They were asked to provide feedback pertaining to the length of the instrument, the format of the scale, construct validity and question ambiguity. They were also asked to mention any factors that might influence their intention to adopt Telemedicine technology that might have been omitted in the questionnaire. A number of suggestions were made regarding the wording of particular items and special terminology used in their profession was provided. We used their feedback to fine-tune our final

questionnaire. In order to enhance the accuracy of the responses, we provided (at the beginning of the questionnaire) a working definition of Telemedicine and common examples of Telemedicine technologies.

With satisfactory face validity, the final instrument was administered via mail, to 390 physicians in Nova Scotia and Quebec (MUHC). The survey was accompanied by a cover letter stating the nature and purpose of the study. Participation was voluntary and confidentiality and anonymity were assured. The physicians were asked to respond within two weeks of receipt of the package.

Of the 390 questionnaires distributed, 129 (87 from the MUHC and 42 from Nova Scotia) were completed and returned. Two from the MUHC were rejected because of too many unanswered questions, leaving 127 for our data analysis. This represents a 32.5 percent response rate. As a group, respondents averaged 16.5 years in practice in their specialty area (17.7 in NS and 16 in MUHC). Among the respondents the male-to-female ratio was approximately 7:1. There was not a significant difference regarding the intention to adopt Telemedicine among physicians from the two data sources (MUHC and NS), but differences among physicians from the same source (especially from NS) categorized according to their job tenure were observed (see figure 4.1).

	MUHC			Nova Scotia		
	Job tenure (years)			Job tenure (years)		
	1-10	11-20	>20	1-10	11-20	>20
Intention to Adopt mean value (Likert scale)	3.62	3.52	3.57	3.47	3.30	3.28

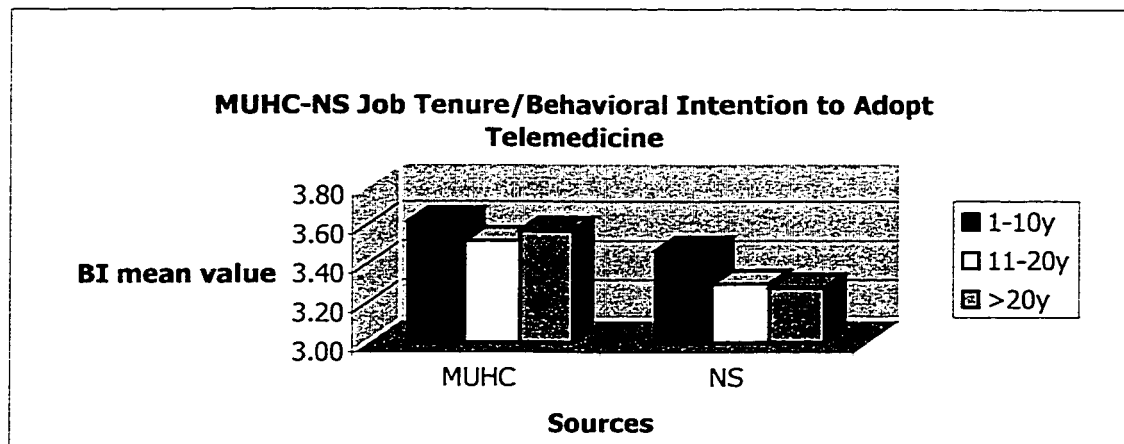


Figure 4.1
The relationship between Job tenure and Behavioral Intention to Adopt Telemedicine

Evaluation of Non-response bias – Non-response bias is a potential source of error in survey studies, therefore this issue has to be addressed. The potential bias was assessed in this study by comparing the early and late respondents. Early respondents were considered those who had completed and returned the questionnaire within the initial two-week deadline, whilst late respondents were those who returned it after the specified time frame. We found that 68 of the 127 respondents were early respondents. No significant differences were found

between early and late respondents regarding their answers to the questionnaire (see table 4.2), suggesting that the threat of non-response bias would not be a factor.

Table 4.2
Analysis of Non-response Bias (t-test for Equality of Means)

Dimension/Measure	Significance (2-tailed)
Behavioral Intention to Adopt (BI)	p = 0.257
Computer Self-Efficacy (CSE)	p = 0.051
Compatibility (COMP)	p = 0.429
Perceived Ease of Use (PEOU)	p = 0.130
Perceived Usefulness (PU)	p = 0.116
Image (IMAGE)	p = 0.490
Perceived Voluntariness of Use (PVU)	p = 0.661

5. DATA ANALYSIS AND RESULTS

Descriptive statistics for all variables are presented in Table 5.1.

Table 5.1
Descriptive Statistics

Questions	Mean ⁽¹⁾	Standard deviation	Min	Max
Q1	4.189	1.060	1	5
Q2	3.827	1.135	1	5
Q3	3.792	0.994	1	5
Q4	3.945	0.986	1	5
Q5	3.536	1.012	1	5
Q6	2.725	1.407	1	5
Q7	2.672	1.513	1	5
Q8	3.159	1.223	1	5
Q9	3.288	1.268	1	5
Q10	3.244	1.173	1	5
Q11	3.748	1.008	1	5
Q12	3.079	1.145	1	5
Q13	3.157	1.171	1	5
Q14	3.079	1.124	1	5
Q15	2.397	1.118	1	5
Q16	2.449	1.278	1	5
Q17	2.669	1.065	1	5
Q18A	3.392	1.117	1	5
Q18B	3.574	0.995	1	5
Q18C	3.033	1.107	1	5
Q18D	2.926	1.115	1	5
Q18E	2.770	1.119	1	5
Q18F	3.443	1.013	1	5
Q18G	3.740	0.948	1	5
Q18H	4.089	0.941	1	5
Q19	3.800	1.282	1	5
Q20	3.942	1.267	1	5
Q21	3.960	0.924	1	5
Q22	3.825	1.090	1	5
Q23	3.089	1.242	1	5
Q24	3.043	1.398	1	5

(1) Likert-type scale varying from 1 to 5

Our research model was analyzed using Partial Least Squares (PLS). The PLS procedure is a statistical method that was developed for the analysis of latent variable structural models involving multiple constructs with multiple indicators. PLS is a second-generation multivariate technique that allows for the testing of the psychometric properties of the scales used to measure a variable, as well as the strength and direction of the relationships among variables (Cassel, Hackl and Westlund 1999). PLS was developed to accommodate small size samples (contrary to LISREL) as long they are ten times larger than the number of items contained in the most substantial construct (Chin, Marcolin and Newsted 1996). The data do not have to be normally distributed when using this technique.

PLS is comprised of two sets of equations: 1) The assessment of the measurement model and 2) The assessment of the structural model. The former implies the calculation of the item reliability, convergent validity and the discriminant validity. The latter entails determining the appropriate nature of the relationships (paths) between the measures and constructs. The estimated path coefficients indicate the sign and the power of the relationships while the item's weights and loadings indicate the strength of the measures (Hulland 1999; Croteau and Bergeron 1999).

The computer program used for this analysis was PLS Graph developed by Chin and Fee (1995).

5.1 Assessment of the Measurement Model

The testing of the measurement model includes the estimation of the reliability coefficients of the measures and of the convergent and discriminant validity of the research instrument.

Item reliability (construct unidimensionality): shows whether the indicators measure this construct only. We used the guidelines recommended by Hair, Anderson, Tatham and Black (1992) to determine the significance and relative importance of the factor loading of each item. They suggested that only items with loading equal or greater than 0.50 were very significant. Therefore, we kept only these items for inclusion in the scales. The initial and final number of items per construct is shown in table 5.2.

Table 5.2
Construct Reliability (CFA - first version)

Constructs	Initial # of items	Final # of items	Rho $\rho^{(1)}$
PEOU	4	4	0.98
PU	7	7	0.90
COMP	3	3	0.96
IMAGE	2	2	0.91
CSE	8	5	0.70
PVU	2	2	0.91
BI	4	4	0.87

$$(1) \rho = \frac{\left(\sum_{i=1}^n \lambda_i\right)^2}{\left(\sum_{i=1}^n \lambda_i\right)^2 + \sum_{i=1}^n \text{Var}(\xi_i)}, \text{ where } \text{Var}(\xi_i) = 1 - \lambda_i^2 \text{ and } \lambda = \text{item loading in each construct}$$

Convergent validity: to assess convergent validity (the degree to which items that should be related to a construct are in reality related) we used the *rho* coefficient. Its value is determined by the respective loading of items (Croteau and Bergeron 1999). The criterion established by Nunnally (1967) pertaining to the reliability of the construct is that any construct having a *rho* value equal or greater than 0.70 should be kept. We abided by this criterion. The *rho* values are presented in table 5.2.

Discriminant validity (the degree to which each construct is unique): in order to assess the discriminant validity of the measures, two aspects have to be verified:

- 1) If the items associated with a construct correlate more highly with each other than with items associated with other constructs in the model.
- 2) If the Average Variance Extracted (AVE) calculated for each measure is higher than all the variances shared between the measures and superior to 0.50 (Fornell and Larcker 1981).

Discriminant validity was not confirmed for the construct PU. Its AVE was smaller than the variance shared with the construct Compatibility (see table 5.3). Therefore an Exploratory Factor Analysis (EFA) was performed using the software SPSS version 8 (see table 5.4).

Table 5.3
Discriminant Validity (CFA - first version) ⁽¹⁾

	PEOU	PU	CSE	COMP	BI	IMAGE	PVU
PEOU	<i>0.67</i>						
PU	0.39	<i>0.59</i>					
CSE	0.19	0.20	<i>0.46</i>				
COMP	0.29	<u>0.64</u>	0.12	<i>0.89</i>			
BI	0.22	0.41	0.11	0.45	<i>0.84</i>		
IMAGE	0.05	0.24	0.10	0.16	0.17	<i>0.83</i>	
PVU	0.04	0.04	0.00	0.08	0.08	0.03	<i>0.63</i>

⁽¹⁾ Diagonals represent the average variance extracted (AVE), while the other matrix entries represent the shared variance. The underlined value is the variance shared between two constructs higher than AVE.

Table 5.4
Exploratory Factor Analysis – Rotated Component Matrix⁽¹⁾

	Factor					
	1	2	3	4	5	6
Q14	0.882					
Q13	0.862					
Q11	0.815					
Q10	0.790					
Q12	0.786					
Q9	0.737					
Q8	0.723					
Q5	0.664					
Q16		0.879				
Q15		0.806				
Q17		0.641				
Q7		0.581				
Q1			0.867			
Q4			0.827			
Q3	<i>0.614⁽²⁾</i>		0.633			
Q2			0.526			
Q18H				0.875		
Q18G				0.842		
Q18F				0.756		
Q19					0.896	
Q20					0.876	
Q18E						0.889
Q18D						0.825

⁽¹⁾ Rotation converged in 8 iterations

⁽²⁾ Factor 1 (with Q3 $\alpha=0.93$; without Q3 $\alpha=0.93$)
 Factor 2 (with Q3 $\alpha=0.83$; without Q3 $\alpha=0.75$)

The EFA revealed a few interesting results:

First, the construct Compatibility disappeared and its related items added to those of the construct Perceived Usefulness.

Second, the construct Computer Self-Efficacy was split into two different constructs (factors). According to Marakas, Yi and Johnson (1998) p. 128 "self-efficacy is a composite of numerous factors, each of which serve to have a direct effect on the final individual judgment and on the relationship of that judgment to the actual performance". Extrapolating this definition to CSE the authors have constructed a model of CSE that displays the multi-faceted nature of this construct as well as the great variety of known antecedent variables associated with the forming of CSE perceptions. We compared their model's factors with the two factors derived from our initial CSE construct and we found that the first one (questions 18f, g and h) represents the Situation Support (SS) construct and the second one (questions 18e and d) represents the Perceived Effort and Persistence (PEP) construct. The former determines the users' perceptions regarding the appropriateness of the training approach and IS support, while the latter assesses the amount of perceived effort necessary to complete a computer related task (Marakas *et al.* 1998). Both constructs have been empirically proven to be facets of CSE (Bandura and Shunk 1981).

The two questions related to PEP (questions 18d and e) were conceived so that the more confidence the user has (less effort) in his/her abilities to perform the

computer related task, the higher he/she will score on the Likert scale. Taking into account the two major modifications, hypothesis 1 will be assessed twice: once for the Situational Support construct and a second time for the Perceived Effort and Persistence construct.

We thus proceeded with the new assessment of the measurements; the discriminant validity was successfully verified this time (see table 5.5; also see in table 5.6 the values for the *rho* coefficients).

Table 5.5
Discriminant Validity (CFA - revised version) ⁽¹⁾

	PEOU	PU	CSE	COMP	BI	IMAGE	PVU
PEOU	<u>0.675</u>						
PU	0.399	<u>0.689</u>					
IMAGE	0.099	0.345	<u>0.685</u>				
SS	0.053	0.068	0.070	<u>0.714</u>			
PVU	0.029	0.063	0.057	0.001	<u>0.829</u>		
BI	0.234	0.494	0.260	0.059	0.084	<u>0.641</u>	
PEP	0.096	0.062	0.050	0.072	0.005	0.041	<u>0.801</u>

⁽¹⁾ Diagonals represent the average variance extracted (AVE), while the other matrix entries represent the shared variance. The underlined value is the variance shared between two constructs higher than AVE.

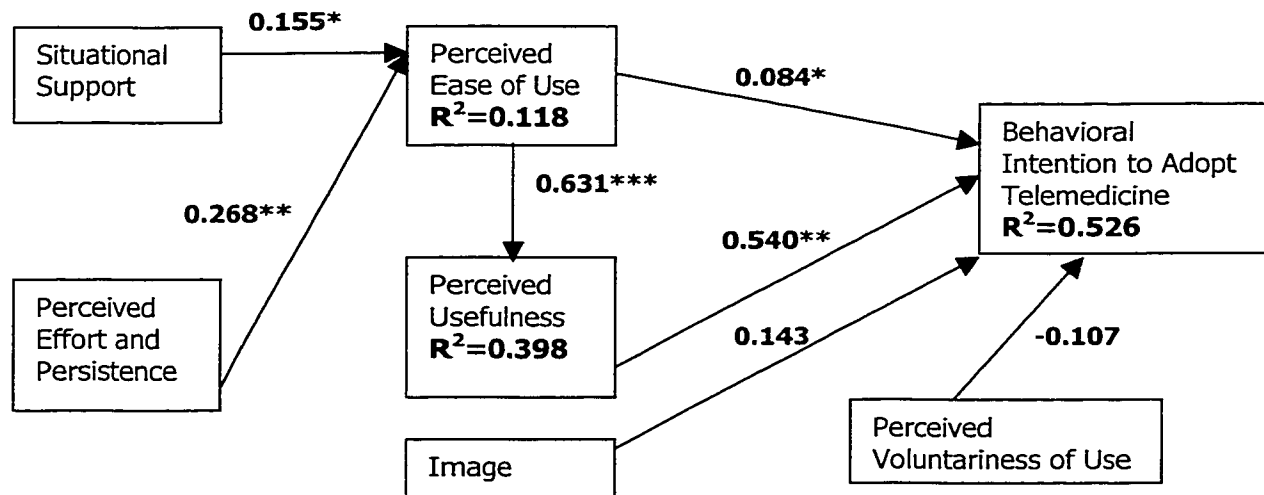
Table 5.6
Construct Reliability (CFA – revised version)

	Constructs						
	PEOU	PU	IMAGE	PEP	SS	PVU	BI
Rho(ρ)	0.89	0.88	0.87	0.88	0.88	0.90	0.87

5.2 Assessment of the Structural Model

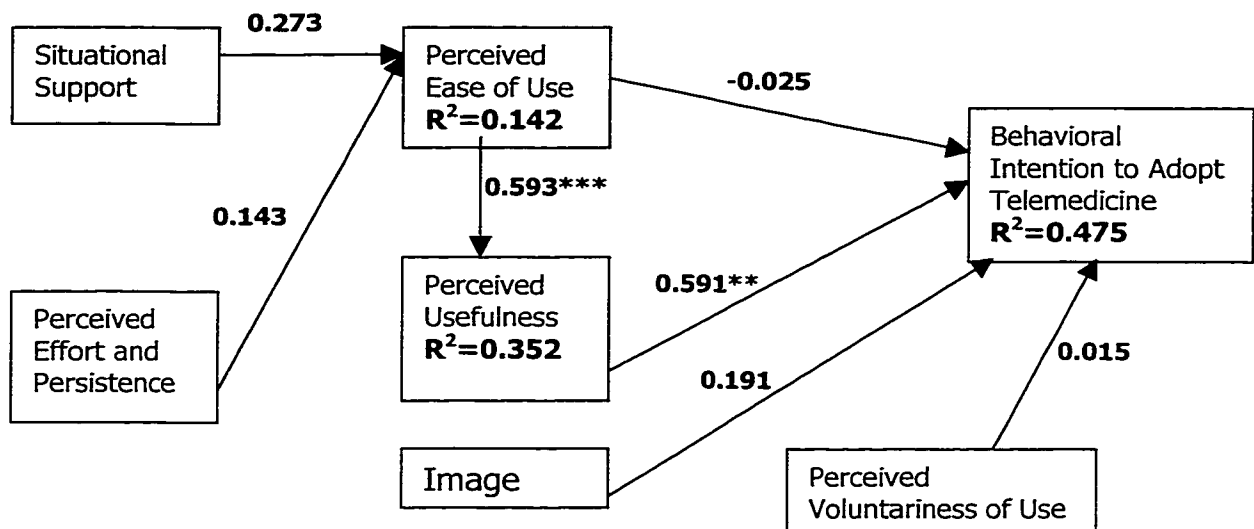
We evaluated the structural model three times: first with the overall sample ($n_1=127$), then with the Nova Scotia sample ($n_2=42$) and finally with the sample from the MUHC ($n_3=85$). To test the estimated path coefficients for their statistical significance, t-statistics were calculated using a non-parametric test of significance, namely Jackknifing (Wildt, Lambert and Durand 1982). The test of the structural model included the estimating of the path coefficients and R^2 , which is used to assess the proportion of the variance in the endogenous variable that can be accounted for by the antecedents.

The test results are presented in figures 5.2a, b and c. Our result analysis will be structured according to the three different sample sizes (1- Overall, 2- Nova Scotia and 3- MUHC).



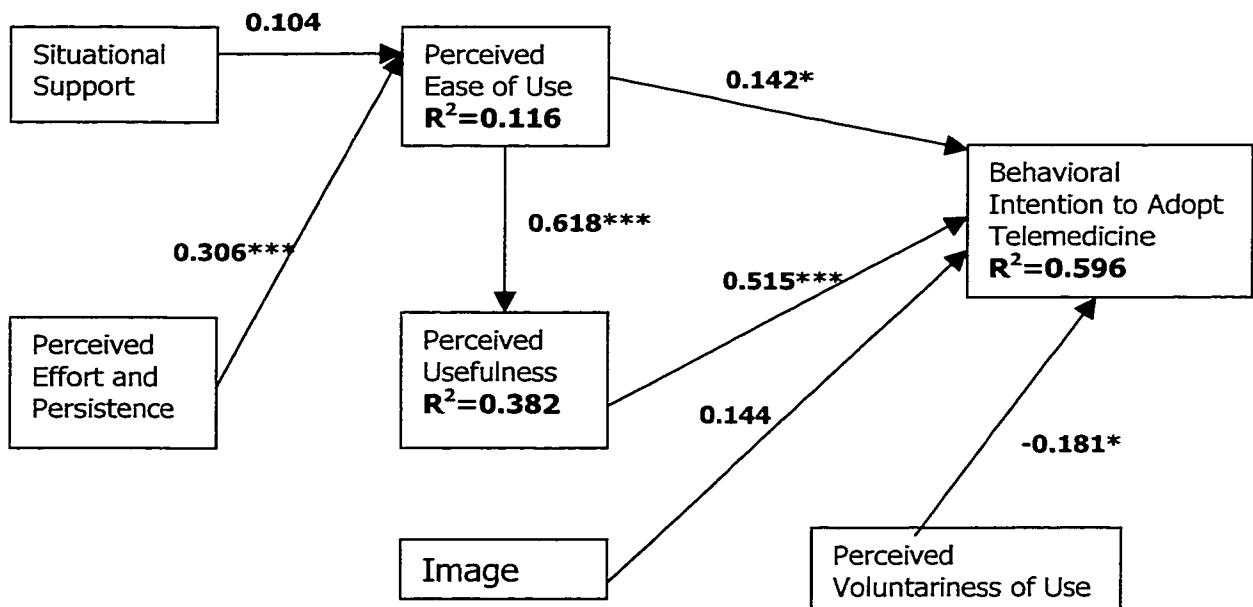
One-tail T-test *: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$

Figure 5.2a Model Path Coefficients and Significance (MUHC+NS; $n=127$)



One-tail T-test *: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$

Figure 5.2b Model Path Coefficients and Significance (NS; n=42)



One-tail T-test *: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$

Figure 5.2c Model Path Coefficients and Significance (MUHC; n=85)

Hypothesis 1 tested the double relationship between Situational Support and Perceived Effort and Persistence with Perceived Ease of Use. For the former relationship, among the three samples, only the overall one confirmed that there is a positive and significant relationship between the two constructs (Path₁=0.155; $p < 0.05$). The other two tests revealed no significant relationships. For the latter relationship, the overall sample and the one from the MUHC confirmed the significance and the sign of the relationship (Path₁=0.268; $p < 0.01$, Path₃=0.306; $p < 0.001$). For the NS sample the relationship was not significant even though it showed a positive sign.

Hypothesis 2 tested for a positive and significant relationship between Compatibility and Perceived Ease of Use. The exploratory factor analysis showed that the construct Compatibility has been eliminated from the model, therefore the hypothesis was not confirmed.

Hypothesis 3a referred to the possible existence of a positive relationship between Perceived Ease of Use and Perceived Usefulness; all three samples confirmed this in an impressive manner (Path₁=0.631, Path₂=0.593, Path₃=0.618; $p < 0.001$).

Hypothesis 3b, which referred to a positive and significant relationship between Perceived Ease of Use and Behavioral Intention to Adopt was confirmed only by the overall and MUHC samples (Path₁=0.084, Path₃=0.142; $p < 0.05$). For the NS

sample the relationship appeared with a negative sign, even though there was no significance shown.

Hypothesis 4 tested the relationship between Perceived Usefulness and Behavioral Intention to Adopt. A positive and very significant relationship was observed for all three samples (Path₁=0.540, Path₃=0.515; $p<0.001$ and Path₂=0.591; $p<0.01$).

Hypothesis 5 referred to a possible positive and significant relationship between Image and Behavioral Intention to Adopt. None of the three samples showed any significant relationship between these two construct, even though a positive sign was observed.

Hypothesis 6 tested for the existence of a positive impact of Perceived Voluntariness of Use on Behavioral Intention to Adopt. For the overall and NS samples we did not find any significant relationship although in the former case a negative sign was observed. For the MUHC sample a significant and negative relationship was found (Path₃=-0.181; $p<0.05$). The direction of our hypothesized relationship was therefore reversed in the MUHC sample, meaning that with an increased freedom to choose, physicians at this institution would be less likely to adopt Telemedicine.

6. DISCUSSION

In this study TAM was modified to include additional constructs, namely Image and Perceived Voluntariness of Use, taken from the Innovations Diffusion Theory (Rogers 1995), and Computer Self-Efficacy, which has its roots in the Social Learning Theory (Bandura 1977). We tried to create a conceptual model that would better predict and explain physician adoption of Telemedicine technology. The utility of this model was evaluated based on data collected from 127 physicians. Our model appeared to have moderate power to explain physicians' attitude toward adoption of a new technology compared to other technology acceptance studies. Perceived Ease of Use and Perceived Usefulness together accounted for 52.6 percent of the variance in intention to adopt (overall sample).

6.1 Influence of Perceived Ease of Use

Previous confirmatory studies of TAM found that PEOU influences both Usefulness and Behavioral Intention to Adopt. Our findings were slightly different. PEOU was found to be a factor with little significance in affecting BI in two instances (overall and MUHC samples), while for the NS sample there was no significance. For the second relationship (the one with Perceived Usefulness) the original findings of TAM were completely confirmed in all three instances. The first part of the PEOU results can be explained by the fact that physicians are professionals that, due to their general competence, intellectual and cognitive capacities, can adopt new

technologies more quickly than the students used in most TAM studies. Another explanation, simpler but more plausible, could be that physicians don't usually have the time to spend learning how to use a new system, even if it is easy to use.

6.2 Influence of Perceived Usefulness

Perceived Usefulness was found to be the most significant factor affecting Behavioral Intention to Adopt for all three samples, which is in agreement with what TAM postulates. This outcome suggests that physicians have the propensity to concentrate on the usefulness of Telemedicine in their daily activities. Therefore, for Telemedicine to be adopted, decision makers have to prove that this technology serves the needs of modern healthcare.

6.3 Influence of Image and Perceived Voluntariness of Use

These two constructs showed no significant impact on BI except in one instance - the MUHC sample. For this sample, contrary to our hypothesis, PVU proved to have a negative and slightly significant impact on Behavioral Intention to Adopt. This result may be explained by the fact that at the MUHC, physicians carry a heavier load than their counterparts in Nova Scotia, as they must also involve themselves in academic activities since the MUHC is the teaching center for McGill University. These physicians therefore have less time to assess new technologies

indirectly related to their work and they probably prefer that someone else do the legwork for them.

6.4 Influence of Situation Support

This variable had only a small significant impact on PEOU and this only for the overall sample. This implies that even though there are some concerns, physicians believe that they have the ability to perform well if given the right resources regardless the complexity of Telemedicine technology.

6.5 Influence of Perceived Effort and Persistence

Perceived Effort and Persistence was found to have a significant impact on PEOU in two instances (overall and MUHC) and no significance in the Nova Scotia sample. The former result can be explained by the fact that facing a novelty, physicians will relate their effort spent in prior experiences to their perception Telemedicine ease of use. The latter result may be explained by the fact that physicians had already attended at least one training session in Teleconferencing (Continuing Medical Education) therefore previous training may affect the relationship between PEP and PEOU.

7. LIMITATIONS OF THE STUDY

This research has several limitations. First, the dependent variable, Behavioral Intention to Adopt was assessed by self-reporting. Even though this approach has been used in many previous studies, some researchers have opined that some more behavior-oriented measures, such as choice behavior, should be used instead (Szajna 1996).

Second, responses to this study were voluntary, therefore prone to self-selection biases; only physicians who were interested in Telemedicine technology likely filled in the questionnaire. The small rate of response might also be related to the fact that Telemedicine is in the early adoption stage.

Third, after the exploratory factor analysis, two new constructs emerged: Situational Support and Perceived Effort and Persistence. These had been previously regarded as precedents of computer Self Efficacy (Marakas *et al.* 1998). Our literature review found no evidence of any studies that considered these two constructs as precedents of PEOU.

8. CONCLUSIONS AND RECOMMENDATIONS

The goal of this research was to improve our understanding of the adoption of Telemedicine technology among physicians. Our model has important implications for academics as well as for IS practitioners. A number of important findings emerged from this study. The outcomes imply the following conclusions:

- Once again, Perceived Usefulness has been proven to have a strong impact on Behavioral Intention to Adopt. Therefore more work needs to be done by IS practitioners to leverage the physicians' perception of Telemedicine usefulness. Hospital decision makers will have to create more opportunities for physicians to voice their opinions on the choice of information technologies. This way, the healthcare professionals will have a more active role in the decision-making process when evaluating and implementing new technologies. These physicians need to be reassured that technology will never replaced their hands-on expertise.
- Contrary to the original TAM findings, PEOU did not have a direct significant impact on Behavioral Intention to Adopt in this study. PEOU had an important indirect effect on BI through PU.
- This study has shown that a possible modification of TAM can create a model that has a stronger explanatory power of users' adoption of a new technology.

More research needs to be done to further confirm the validity of the model presented in this study. Davis *et al.* (1989) claimed that the construct Perceived Ease of Use may have a more important effect on Behavioral Intention to Adopt when assessed in an environment with more difficult information systems. Longitudinal studies that examine how beliefs of the same user evolve over time would also provide a more thorough test of how the determinants of Behavioral Intention to Adopt Telemedicine, namely PEOU, PU, PVU and Image change over time.

It would also be interesting to introduce other factors into the model. Several recent IT adoption studies have included, in their modified TAM, additional variables such as prior usage and experience (Taylor and Todd 1995b), user characteristics (Igbaria *et al.* 1997), objective usability (Venkatresh and Davis 1996) and intrinsic motivation (Venkatresh 1999).

While the findings of this study apply only to physicians, the generalizability of these outcomes vis-à-vis other professionals remains to be determined. Future research needs to address this issue. Finally, the applicability of alternative models is also a worthwhile research question. The Theory of Planned Behavior (Ajzen 1988) or the Social Network Theory (Robertson 1989) may provide new insights to our understanding of IT adoption.

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APPENDIX 1:

TELEMEDICINE ADOPTION SURVEYS (English and French versions)

April 2000

Dear Dr. «LastName»,

Subject: A Survey on Telemedicine Technology Adoption

I am a graduate student at Concordia University, completing a Master of Science in Administration degree. I am preparing to conduct research for my thesis, which is being supervised by Dr. Anne-Marie Croteau. I would like to understand, explain and predict physician acceptance/adoption of Telemedicine technology.

Telemedicine involves the use of technologies and telecommunications to transmit medical data, video images and audio, between physicians and other healthcare providers. These technologies include tele-imaging diagnostics (teleradiology, teledermatology, telepathology), telesurgery, telecardiology and teleconferencing (CME).

I strongly value your views on this topic. This two-page questionnaire should take no more than 10 minutes to complete. You are not obliged to complete it. The answers and comments you provide will be kept strictly confidential and anonymous.

I would like to thank you in advance for your time and help in this matter. I would ask you to return your duly filled questionnaire within the next two (2) weeks to the departmental secretary using the enclosed envelope.

Best regards,

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TELEMEDICINE ADOPTION SURVEY

Telemedicine involves the use of technologies and telecommunications to transmit medical data, video images and audio, between physicians and other healthcare providers. These technologies include tele-imaging diagnostics (teleradiology, teledermatology, telepathology), telesurgery, telecardiology and teleconferencing (CME).

Please answer all the questions. **There are no good or bad answers.** Indicate your first impression. Please circle the number that best represents your opinion. For any item that is not applicable to your situation, please circle *NA (not applicable)*.

Should you be interested in receiving a copy of the executive summary please contact me.

<i>highly disagree</i>		<i>neutral; no agreement no disagreement</i>		<i>highly agree</i>	<i>not applicable</i>
1	2	3	4	5	NA

- | | |
|---|---------------------|
| 1. Learning to operate the computer to use Telemedicine would likely be easy for me. | 1 2 3 4 5 NA |
| 2. If I were to adopt Telemedicine it would be easier for me to access images using this technology rather than regular films. | 1 2 3 4 5 NA |
| 3. If I were to adopt Telemedicine it would be easy to use. | 1 2 3 4 5 NA |
| 4. Learning to operate telemedicine would be easy for me. | 1 2 3 4 5 NA |
| 5. Using Telemedicine could improve the care I give my patients. | 1 2 3 4 5 NA |
| 6. If I were to adopt Telemedicine I could see more patients out of the hospital. | 1 2 3 4 5 NA |
| 7. If I were to adopt Telemedicine I could work more from home. | 1 2 3 4 5 NA |
| 8. Using Telemedicine would increase my efficiency as a physician. | 1 2 3 4 5 NA |
| 9. Telemedicine would be an improvement in the area where I see most of my patients (e.g. ICU, Emergency Department etc.). | 1 2 3 4 5 NA |
| 10. Using Telemedicine will make it easier to do my job. | 1 2 3 4 5 NA |
| 11. If I were to adopt Telemedicine, I would find it useful in my job. | 1 2 3 4 5 NA |
| 12. If I were to adopt Telemedicine, it would be compatible with most aspects of my work. | 1 2 3 4 5 NA |
| 13. If I were to adopt Telemedicine, it would fit my work style. | 1 2 3 4 5 NA |

<i>highly disagree</i>		<i>neutral; no agreement no disagreement</i>		<i>highly agree</i>	<i>not applicable</i>
1	2	3	4	5	NA

- 14.** If I were to adopt Telemedicine, it would fit well with the way I work. **1 2 3 4 5 NA**
- 15.** If I were to adopt Telemedicine I would gain more prestige amongst my peers. **1 2 3 4 5 NA**
- 16.** Using Telemedicine will be a status symbol in my Department. **1 2 3 4 5 NA**
- 17.** Telemedicine requires greater emphasis on quality standards of my work activities. **1 2 3 4 5 NA**
- 18.** I could use Telemedicine technology...
- a. ...if I had prior usage of similar technologies. **1 2 3 4 5 NA**
 - b. ...even if I had never used a technology like it before. **1 2 3 4 5 NA**
 - c. ...if I only had the built-in "help" function for assistance. **1 2 3 4 5 NA**
 - d. ...even if there was no one around to tell me what to do as I go. **1 2 3 4 5 NA**
 - e. ...even if I only had the software manuals as reference. **1 2 3 4 5 NA**
 - f. ...if I had seen someone else using it before trying it myself. **1 2 3 4 5 NA**
 - g. ...if I could call the help desk if I got stuck. **1 2 3 4 5 NA**
 - h. ...if someone showed me how to use the system beforehand. **1 2 3 4 5 NA**
- 19.** The Department director does not require me to adopt Telemedicine. **1 2 3 4 5 NA**
- 20.** Although it might be helpful, adopting Telemedicine is certainly not compulsory in my job. **1 2 3 4 5 NA**
- 21.** If I were to adopt Telemedicine, I would use it to perform different tasks, clinical and non-clinical (CME). **1 2 3 4 5 NA**
- 22.** I intend to adopt Telemedicine technology when it becomes available in my department. **1 2 3 4 5 NA**
- 23.** Over the ensuing months (if possible) I plan on experimenting Telemedicine. **1 2 3 4 5 NA**
- 24.** Over the ensuing months (if possible) I plan to regularly use Telemedicine. **1 2 3 4 5 NA**

PLEASE PROVIDE SOME BACKGROUND INFORMATION FOR OUR ANALYSIS

What is your specialty (e.g. Radiology, Surgery, Emergency, etc)? _____

How many physicians work in your department? _____

How long have you been practicing? _____

Please indicate your gender: F H

Please return this questionnaire by using
the self-addressed stamped envelope included herewith.

Thank you for your collaboration

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Avril 2000

Cher Dr. «LastName»,

Sujet: Sondage sur l'adoption de la télémédecine

Je suis étudiant à l'université Concordia et je complète une maîtrise en sciences de l'administration. Dans le cadre de ma recherche, supervisée par Madame Anne-Marie Croteau, je cherche à expliquer l'acceptation et l'adoption de la télémédecine.

La télémédecine implique l'utilisation des technologies et des télécommunications pour transmettre des données médicales, des images vidéo et des données audio entre médecins et autres fournisseurs de soins médicaux. Ces technologies incluent les images télé-diagnostiques (téléradiologie, télédermatologie, télépathologie), la téléchirurgie, la télécardiologie et la téléconférence (éducation médicale continue - EMC).

J'apprécierais grandement connaître votre opinion sur ce sujet. C'est pourquoi je vous invite à compléter ce questionnaire ci-joint, qui ne prendra que 10 minutes de votre temps. Il va de soi que vous n'êtes pas tenu(e) de le compléter. De plus, vos réponses ainsi que vos commentaires seront gardés strictement confidentiels.

J'aimerais vous remercier à l'avance du temps que vous prendrez pour remplir ce questionnaire. Je vous demanderais de le retourner dûment complété à la secrétaire départementale en utilisant l'enveloppe ci-jointe adressée à mon nom d'ici les deux (2) prochaines semaines.

Cordialement,

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<i>fortement en désaccord</i>		<i>neutre; pas d'accord pas de désaccord</i>		<i>fortement d'accord</i>		<i>Non applicable</i>
1	2	3	4	5		NA

- | | | | | | | |
|---|----------|----------|----------|----------|----------|-----------|
| 14. Si j'adoptais la télémédecine, elle conviendrait à la façon dont je pratique la médecine. | 1 | 2 | 3 | 4 | 5 | NA |
| 15. Si j'adoptais la télémédecine, je gagnerais du prestige auprès de mes pairs. | 1 | 2 | 3 | 4 | 5 | NA |
| 16. Utiliser la télémédecine me donnerait un statut d'innovateur dans mon département. | 1 | 2 | 3 | 4 | 5 | NA |
| 17. La télémédecine nécessite une plus grande attention aux standards de qualité de mon activité professionnelle. | 1 | 2 | 3 | 4 | 5 | NA |
| 18. Je pourrais utiliser la télémedecine... | | | | | | |
| a. ...si je m'étais déjà servi d'une technologie similaire. | 1 | 2 | 3 | 4 | 5 | NA |
| b. ...même si je n'ai jamais utilisé une telle technologie auparavant. | 1 | 2 | 3 | 4 | 5 | NA |
| c. ...même si je n'avais que la fonction d'aide incorporé pour m'assister lorsque je l'utiliserais. | 1 | 2 | 3 | 4 | 5 | NA |
| d. ...même si je n'avais personne d'autre pour me dire quoi faire, pas à pas. | 1 | 2 | 3 | 4 | 5 | NA |
| e. ...même si je n'avais que le manuel d'instructions du logiciel comme référence. | 1 | 2 | 3 | 4 | 5 | NA |
| f. ...si j'avais déjà vu quelqu'un d'autre l'utiliser avant de l'essayer moi-même. | 1 | 2 | 3 | 4 | 5 | NA |
| g. ...si je pouvais contacter le centre de support en cas de problèmes. | 1 | 2 | 3 | 4 | 5 | NA |
| h. ...si quelqu'un me montrait comment opérer le système. | 1 | 2 | 3 | 4 | 5 | NA |
| 19. Le directeur de mon département ne m'oblige pas à adopter la télémédecine. | 1 | 2 | 3 | 4 | 5 | NA |
| 20. Même si adopter la télémédecine pouvait m'être utile, ce n'est certainement pas obligatoire pour ma pratique médicale. | 1 | 2 | 3 | 4 | 5 | NA |
| 21. Si j'adoptais la télémédecine, je l'utiliserais pour accomplir différentes tâches cliniques et non-cliniques. | 1 | 2 | 3 | 4 | 5 | NA |
| 22. J'ai l'intention d'adopter la télémédecine quand elle deviendra disponible dans mon département. | 1 | 2 | 3 | 4 | 5 | NA |
| 23. J'ai l'intention d'essayer la télémédecine au cours des prochains mois (si possible). | 1 | 2 | 3 | 4 | 5 | NA |
| 24. J'ai l'intention d'utiliser la télémédecine de façon régulière au cours des prochains mois (si possible). | 1 | 2 | 3 | 4 | 5 | NA |

VEUILLEZ, S'IL VOUS PLAÎT, NOUS FOURNIR LES INFORMATIONS SUIVANTES POUR FINS D'ANALYSE DÉMOGRAPHIQUE

Quelle est votre spécialité (ex. Radiologie, Chirurgie etc.)? _____

Combien de médecins travaillent dans votre département? _____

Depuis combien de temps pratiquez-vous? _____

Sexe: F H

Veillez retourner le questionnaire à votre secrétaire départementale en utilisant l'enveloppe ci-jointe adressée à mon nom.

Merci beaucoup pour votre collaboration.

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