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Why do people use or not use an information technology: an interpretive investigation on the adoption and use of an electronic medical records system

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WHY DO PEOPLE USE OR NOT USE AN INFORMATION TECHNOLOGY:

AN INTERPRETIVE INVESTIGATION ON THE ADOPTION AND USE OF AN ELECTRONIC MEDICAL RECORDS SYSTEM

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University.

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Abstract

WHY DO PEOPLE USE OR NOT USE AN INFORMATION TECHNOLOGY: AN INTERPRETIVE INVESTIGATION ON THE ADOPTION AND USE OF AN ELECTRONIC MEDICAL RECORDS SYSTEM

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A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University.

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In the literature of information technology acceptance, much empirical evidence exists that is inconsistent with Technology Acceptance (TA) Models. The purpose of this study is to find out why the extant TA models fail to predict in reality as they purport to in theory. This research argues that the extant literature has not been able to explain how individuals actually form their perceptions about using an information technology. Since

past research attempting to do this has been unsuccessful or empirically refuted, this research uses an interpretive case study to investigate the experiences of professionals' adoption and use of an information technology. In particular, this study focuses on the adoption of an Electronic Medical Records System in a healthcare setting. The results of this interpretive investigation show that the interpretive understanding by the traditional TA models researchers is based on the faulty presumption that the people in the organizations are "monolithic users" or "rational decision makers". This research provides a new interpretive understanding on the adoption and use of an information technology. The adoption and use of an information technology is an emergent phenomenon resulting from the interaction between the technology and the social actors' different roles. Based on the interpretive understanding, a new positivist understanding is suggested.

CHAPTER 1 Introduction

1. 1 Research Problem

In the field of Information Systems, many models have been used or developed to predict users' behaviors in adopting an information technology. These models include the Technology Acceptance Model (TAM) (Davis, 1989), TAM 2 (Venkatesh and Davis, 2000) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003). In the view of these Technology Acceptance models, individuals first form their perceptions about usefulness and ease of use in using an information technology, then based on their evaluations of the benefits and costs of the use, they make rational decisions in adopting the technology. However, many empirical studies have found that the constructs such as perceived usefulness, perceived ease of use, attitude, social influences, and facilitating factors are not significant. Researchers could not explain adequately why these constructs are not significant. Many positivist studies have been done to refine and revise the TA models. These attempts have been unsuccessful or empirically refuted. (Hu et al., 1999; Jackson et al., 1997; Keil et al., 1995a; Legris et al., 2003; Szajna, 1996; Taylor et al., 1995a; Taylor et al., 1995b).

The inconsistent results from these empirical studies provide the starting point for the investigation in this research. This research applies to the extant technology acceptance

models in general, not just the Technology Acceptance Model itself. Therefore, in this study I refer to these models as TA models. These TA models tend to assume that adopting an information technology is an individual's exercise of his or her rationality. This assumption reflects the researchers' own world view and their understanding of an information technology. This view and understanding however might not be shared by the human subjects in the field. Indeed, many technology acceptance researchers have recognized the fact that the TA models have not been able to explain satisfactorily how individuals actually form their perceptions about using an information technology (Karahanna and Straub, 1999, Venkatesh and Davis, 1994; Venkatesh et al. 2003). Although IS researchers could continue to conduct more rigorous positivist research by developing better instruments or measurements to refine the TA models, an interpretive study provides a unique perspective to help strengthen the positivist research (Lee, 1991). An interpretive study investigates the experiences of people's adoption and use of an information technology from the "life world" of the human subjects. Such an investigation can result in an improved interpretive understanding, which can help researchers effectively refine or revise positivist theories or models. Better information technology can then be designed and effective organizational IS implementation practices can be introduced (DeLone and McLean, 1992; Taylor and Todd, 1995; Venkatesh et al., 2003; Wixom and Todd, 2005).

1.2 Research Goal and Research Questions

The goal of this research is to provide an improved and empirically validated interpretive understanding of people's adoption and use of information technology in

organizations. This understanding will help explain why the extant TA models fail to predict as they purport to. Although this investigation might present evidence contradictory to what the models suggest, the goal of this interpretive investigation is not to falsify the extant TA models. This interpretive study aims at gaining an understanding of how individuals in organizations understand themselves and their organization, including how they understand their experiences in interacting with an information technology.

Accordingly, the following research questions guide this study: 1. What is the interpretive understanding of people's adoption and use of an information technology? 2. How can this interpretive understanding help explain why the extant TA models fail to predict as they purport to?

To answer the research questions, this research conducts an interpretive case study on the adoption and use of an Electronic Medical Records (EMR) System in a healthcare setting. An EMR System is a computer application that helps medical professionals enter, store and retrieve patients' records data. The study of an Electronic Medical Records System is based on the following considerations:

1. As an emergent IS business application in healthcare settings, Electronic Medical Records System (EMR) is not an extremely technologically-challenging system. One can expect that the extant TA models would easily predict the users' behaviors in adopting an Electronic Medical Records System if there were no flaws in these models. If empirical evidence proves that these models fail to predict, it is mandatory to ask ourselves the questions: What is the inconsistent evidence telling us? What is wrong with the TA models? Information Systems researchers need to

rigorously develop better models and theories to explain the inconsistencies in the empirical evidence.

2. The EMR System represents a major trend in health information technology innovation (Chiasson and Davidson, 2004). Only limited number of studies have been conducted on the adoption of EMR and little is known about the impact of the technology on organizations as well as on individual professionals. This study can then provide practical lessons for the development and implementation of this new information technology.

1. 3 Organization of the Dissertation

This current chapter identified a research problem in the technology acceptance literature. This led to the research questions explored in this research.

Chapter 2 contains an overview of the technology acceptance literature, and provides a rationale for this research. More specifically, it identifies and discusses the inconsistent empirical evidence in the technology acceptance research.

Chapter 3 presents the research methodology used in conducting this study. The method of case study, data collection, and data analysis will be discussed.

Chapter 4 presents the detailed interpretive investigation process. In this process, the scientific concepts of social structure and culture are used to resolve the identified anomalies.

Chapter 5 synthesizes the findings from this interpretive investigation. It then presents a new interpretive understanding of the EMR system use in the organization.

Chapter 6 is the conclusion, where the theoretical and practical implications of this study and issues regarding the generalizability of this case study are discussed.

CHAPTER 2 Literature Review

This chapter reviews the technology acceptance literature. The major purpose is to overview the major TA models and to make explicit their major assumptions. Another purpose of this review is to present evidence to show that these models have consistently failed to predict as they purported to in many empirical studies.

2.1 The Extant TA models and Theories

Many theories and models have been developed or used to study information technology acceptance. These models include: The Theory of Reasoned Action (Fishbein et al., 1975), the Technology Acceptance Model (Davis, 1989) and extended TAM (Venkatesh and Davis, 2000), the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003), the Motivational Model (Davis, et al, 1992), the Theory of Planned Behavior (Ajzen, 1991), the model combining TAM and the Theory of Planned Behavior (Taylor and Todd, 1995), the Model of PC Utilization (Thompson, et al, 1991), the Innovation Diffusion Theory (Rogers, 1995) and the Social Cognitive Theory (Bandura, 1986). In the following subsections, I will discuss each of these models and theories.

2.1.1 The Theory of Reasoned Action

In the view of the Theory of Reasoned Action (TRA) (Figure 1), an individual's behavior intentions determine his or her actual behavior. Behavior intention is in turn determined by the individual's attitude toward this behavior and subjective norms with regard to the performance of this behavior (Fishbein and Ajzen, 1975).

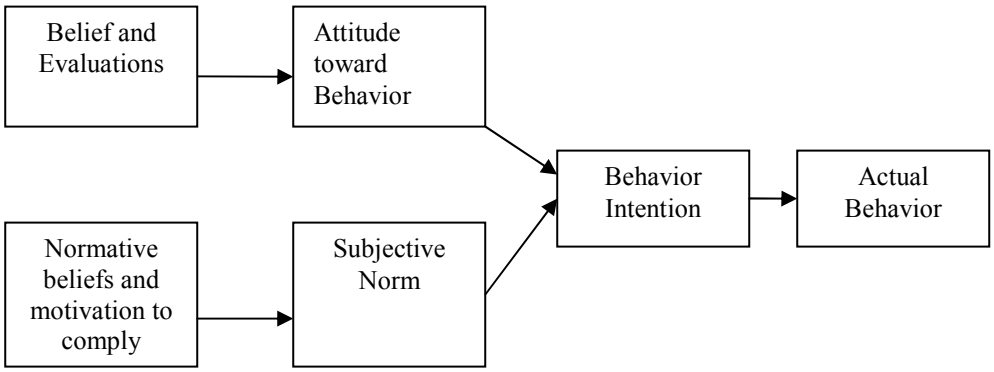

Figure 1. The Theory of Reasoned Action (Fishbein and Ajzen, 1975)

The Theory of Reasoned Action is based on the assumption that individuals are rational decision makers who constantly calculate and evaluate the relevant behavior beliefs in the process of forming their attitude toward the behavior. Fishbein and Ajzen (1975) define attitude as "an individual's positive or negative feelings (evaluative affect) about performing the target behavior" (p. 216). Individuals form attitudes toward a behavior by evaluating their beliefs through an expectancy-value model. For each attitude toward a behavior, individuals multiply the belief strength by the outcome evaluation and then sum the entire set of resulting weights to form the attitude. Subjective norm is another important construct in TRA. Fishbein and Ajzen (1975) define subjective norm as "the

person's perception that most people who are important to him think he should or should not perform the behavior in question" (p. 302). Individuals multiply the normative belief strength by the motivation to comply with that referent, and sum the entire set of resulting weights to determine their behavioral intention.

2.1.2 Technology Acceptance Model and Its Extensions

Based on the Theory of Reasoned Action, Davis (1989) develops the Technology Acceptance Model to find out what factors cause people to accept or reject an information technology (Figure 2). He suggests that perceived usefulness and perceived ease of use are the two most important individual beliefs about using an information technology. Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (p.320). The definition of perceived usefulness is based on the expectancy-value model underlying the Theory of Reasoned Action. Perceived ease of use is defined as "the degree to which a person believes that using a particular system would be free of effort" (p.320). These two behavioral beliefs, perceived usefulness and perceived ease of use, then lead to individual behavior intention and actual behavior. Davis finds that perceived usefulness is the strongest predictor of an individual's intention to use an information technology.

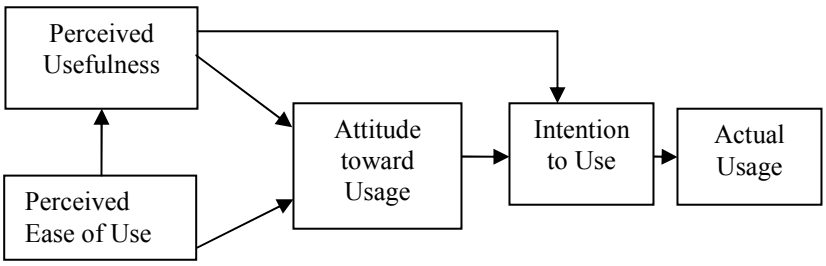

Figure 2. The Technology Acceptance Model (TAM) (Davis, 1989)

In the Information Systems field, researchers have widely used the Technology Acceptance Model to study the adoption of various technologies and TAM has arguably become the most influential theory in the IS field. Researchers have also extended TAM (Wixom and Todd, 2005). For instance, some researchers introduce many other factors to the model, such as subjective norm, perceived behavioral control, and self-efficacy (Hartwick and Barki, 1994; Mathieson et al., 2001; Taylor and Todd, 1995). Other researchers introduce additional belief factors from the diffusion of innovation literature, such as trialability, visibility, or result demonstrability (Agarwal and Prasad, 1997; Karahanna et al., 1999; Plouffe et al., 2001). Some researchers introduce external variables or moderating factors to the two major belief constructs (perceived usefulness and perceived ease of use), such as personality traits and demographic characteristics (Gefen and Straub, 1997; Venkatesh, 2000; Venkatesh and Morris, 2000).

Figure 3 shows the various TAM extensions. We can clearly identify the core positions of the two belief constructs: perceived usefulness and perceived ease of use. Therefore, we can say that the structure and main assumptions of these models remain the same as those of the Technology Acceptance Model (TAM).

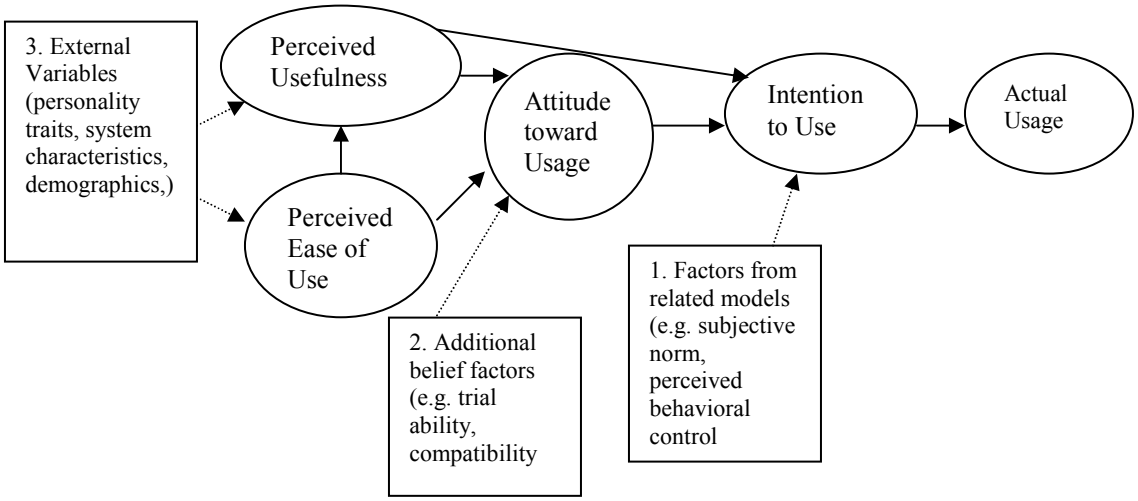

Figure 3. The Extensions to TAM (adapted from Wixom and Todd, 2005)

Next, I discuss a widely known extended TA model called TAM2. Venkatesh and Davis (2000) develop TAM2 by adding social influences (subjective norm, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, and perceived ease of use) to predict the adoption of an information technology (Figure 4).

Venkatesh and Davis (2000) use the construct of subjective norm to capture social influences. Their definition of subjective norm is consistent with that in TRA (Fishbein and Ajzen 1975, p.302). TAM2 suggests that in mandatory contexts, subjective norm has a direct effect on intention through the mechanism of compliance. If an individual perceives that an important social actor has the ability to punish nonbehavior or reward behavior, the social influence of compliance effect will occur (French and Raven, 1959; Kelman, 1958; Warshaw, 1980). In voluntary contexts, social influences can influence intention indirectly through the mechanism of internalization and identification. Internalization refers to the

process when an individual incorporates the important referent's belief into his or her own belief structure (Kelman, 1958; Warshaw, 1980). Identification means that an individual can gain a membership in a social group or achieve a higher status within the group by performing a behavior (Blau, 1964; Kelman, 1958; Kiesler and Kiesler, 1969; Pfeffer, 1982).

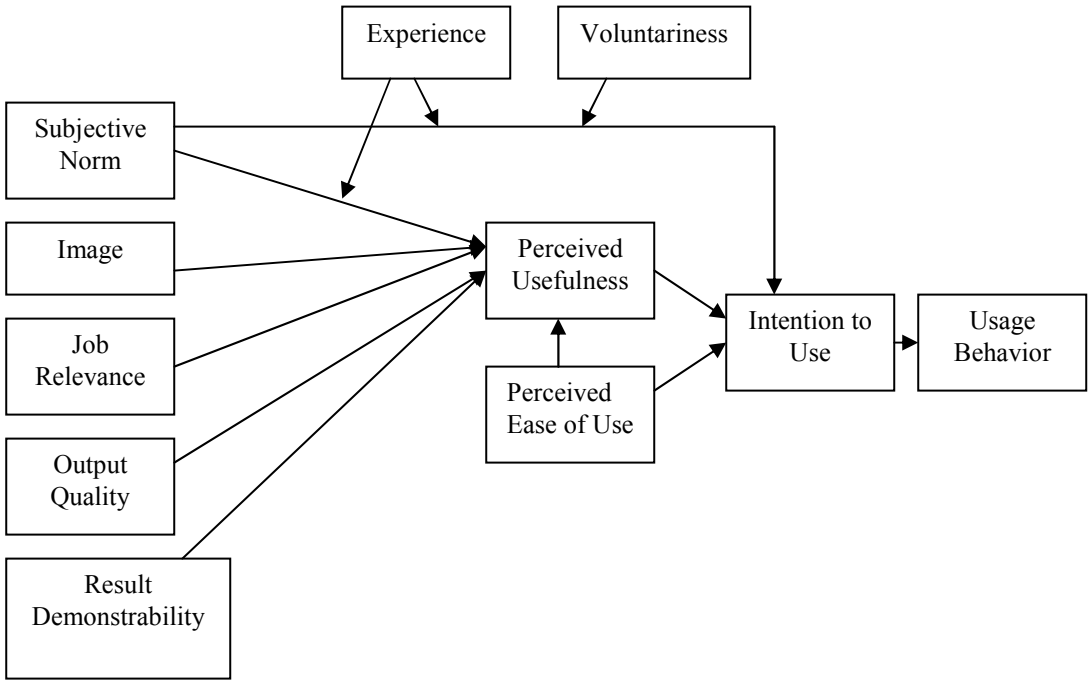

Figure 4. The Extended Technology Acceptance Model (TAM2) (Venkatesh and Davis, 2000)

TAM2 theorizes that there are four cognitive instrumental determinants of perceived usefulness: job relevance, output quality, result demonstrability, and perceived ease of use. TAM2 retains perceived ease of use from TAM as a direct determinant of perceived usefulness. The theoretical groundings for the other three determinants are from three major areas: the work motivation theory (Vroom, 1964), the action identification

theory from social psychology (Fishbein and Ajzen, 1975), and task-contingent decision making from the behavioral decision theory (Beach and Mitchell, 1978, 1998). These three areas converged on the mental representation (Venkatesh and Davis, 2000), which links the higher-level goals to individual's specific instrumental actions. TAM 2 theorizes that "people use a mental representation for assessing the match between important work goals and the consequences of performing the act of using a system as a basis for forming judgments about the use-performance contingency (i.e., perceived usefulness)"(p.191). Based on the theories on the mental matching process, a potential user's judgment of job relevance goes through a compatibility test (Venkatesh and Davis, 2000). Job relevance is defined as "an individual's perception regarding the degree to which the target system is applicable to his or her job" (p.191). TAM2 posits that job relevance has a positive effect on perceived usefulness. Output quality is another determinant of perceived usefulness. Output quality refers to an individual's perception about how well the system performs the tasks. Venkatesh and Davis (2000) suggest that judgments of output quality take the form of a profitability test, "in which, given a choice set containing multiple relevant systems, one would be inclined to choose a system that delivers the highest output quality" (p.192). TAM2 posits that output quality has a positive effect on perceived usefulness. Result demonstrability is the third determinant of perceived usefulness. It is defined as the "tangibility of the results of using the innovation" (Moore and Benbasat, 1991, p.203). TAM2 posits that result demonstrability has a positive effect on perceived usefulness.

2.1. 3 The Motivation Model

Davis et al. (1992) apply the motivational theory to study information technology adoption and use. The Motivation Model suggests that individuals' behavior is based on extrinsic and intrinsic motivations. Extrinsic motivation is defined as the perception that users want to perform an activity "because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself, such as improved job performance, pay, or promotions" (Davis et al., 1992, p. 1112). Perceived usefulness, perceived ease of use, and subjective norm are examples of extrinsic motivation.

Intrinsic motivation relates to perceptions of pleasure and satisfaction from performing the behavior (Vallerand, 1997). Users want to perform an activity "for no apparent reinforcement other than the process of performing the activity per se" (Davis et al., 1992, p. 1112). Computer playfulness and enjoyment are examples of intrinsic motivation (Davis et al., 1992; Venkatesh, 2000).

2.1.4 The Theory of Planned Behavior

The Theory of Reasoned Action (TRA) is used to predict an individual's behavior only in a real voluntary situation, not in a mandatory context. Ajzen (1991) develops the Theory of Planned Behavior (TPB) to extend TRA to consider the mandatory situation (figure 5). He adds a new construct of perceived behavioral control in TPB. Perceived behavioral control is defined as "the perceived ease or difficulty of performing the behavior" (Ajzen 1991, p. 188). In the context of IS research, perceived behavioral control is defined as "perceptions of internal and external constraints on behavior" (Taylor and Todd 1995, p. 149).

The Theory of Planned Behavior (TPB) is similar to TRA in that TPB also assumes that individuals are rational decision makers. Individuals assess perceived behavior control using a method similar to the expectancy-value model. For each in a set of control beliefs, individuals multiply the belief's strength by the perceived power of the control factor. TPB has also been widely applied to understand the individual acceptance and use of different technologies (Harrison et al., 1997; Mathieson 1991; Taylor and Todd 1995b).

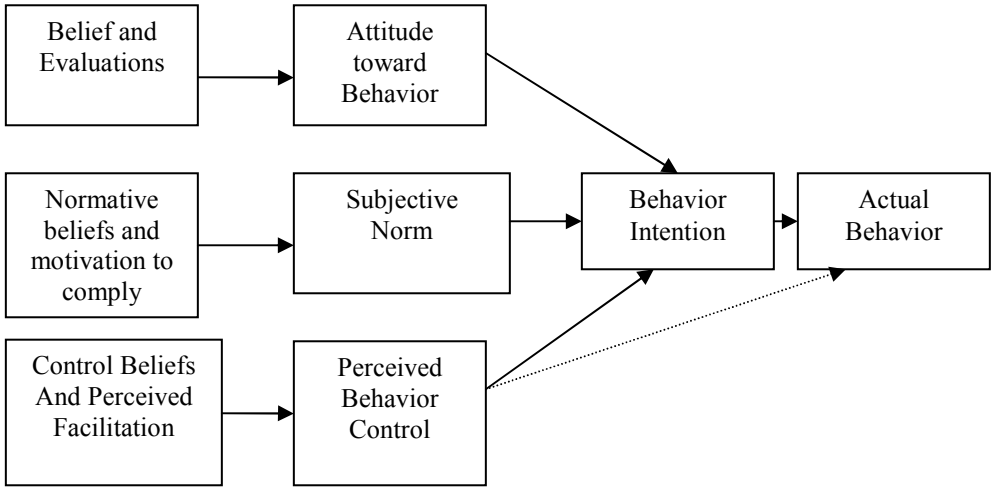

Figure 5. The Theory of Planned Behavior (Ajzen, 1991)

2.1.5 Combined TAM and TPB

Taylor and Todd (1995) develop a hybrid model by combining the predictors of TPB with the constructs of perceived usefulness and ease of use from TAM (Figure 6). This model is also called the Decomposed Theory of Planned behavior because the belief structure is decomposed in the model. The attitude is decomposed to include perceived usefulness, perceived ease of use and compatibility. The normative belief structure

includes peer influence and superior influence. The control belief structure includes self-efficacy, resource facilitating conditions and technology facilitating conditions.

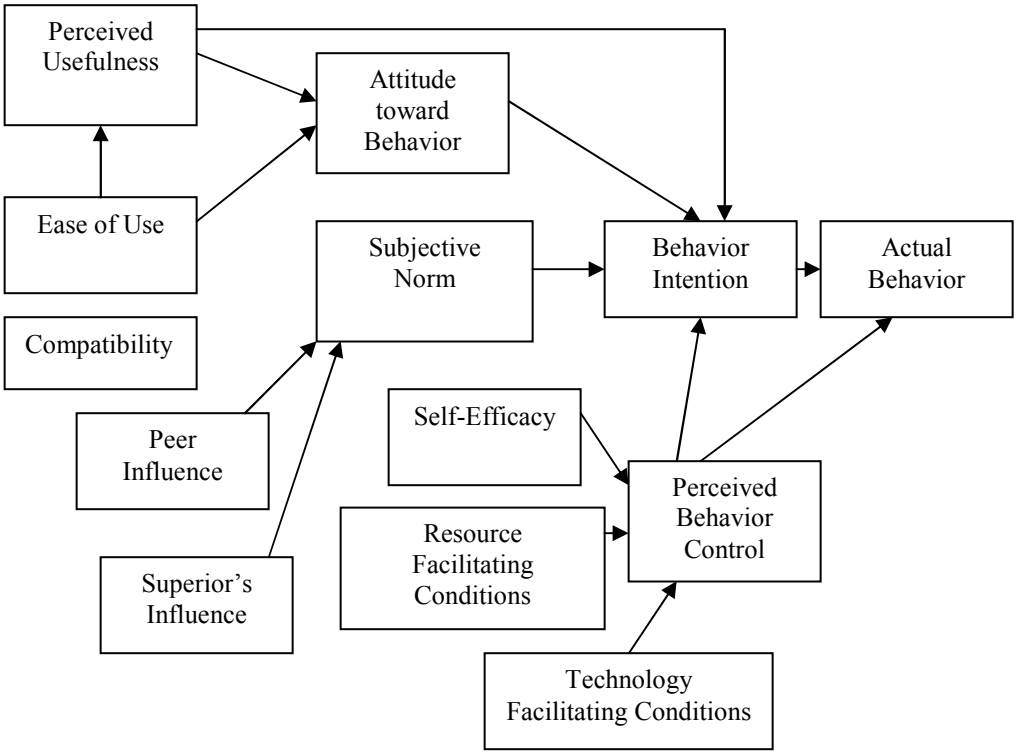

Figure 6. Combined TAM and TPB (Taylor and Todd, 1995)

2.1.6 The Model of PC Utilization

Triandis' (1977) theory of attitudes and behavior is a competing perspective to TRA and TPB. Triandis (1980) makes a distinction between cognitive and affective components of attitudes. Beliefs belong to the cognitive component of attitudes. "Behavior is determined by what people would like to do (attitudes), what they think they should do (social norms), what they have usually done (habits), and by the expected consequences of their behavior" (Thompson et al., 1991, p.126).

Thompson et al. (1991) refine Triandis' model to predict PC utilization behavior (Figure 7). The major constructs in the model and their definitions include:

- **Job-fit:** "the extent to which an individual believes that using [a technology] can enhance the performance of his or her job" (p. 129).
- **Complexity:** "the degree to which an innovation is perceived as relatively difficult to understand and use" (p. 128).
- **Long-term consequences**: "Outcomes that have a pay-off in the future" (p. 129).
- **Affect Towards Use:** "feelings of joy, elation, or pleasure, or depression, disgust, displeasure, or hate associated by an individual with a particular act" (p. 127).
- **Social Factors:** "individual's internalization of the reference group's subjective culture, and specific interpersonal agreements that the individual has made with others, in specific social situations" (p. 126).
- **Facilitating Conditions:** "provision of support for users of PCs may be one type of facilitating condition that can influence system utilization" (p. 129).

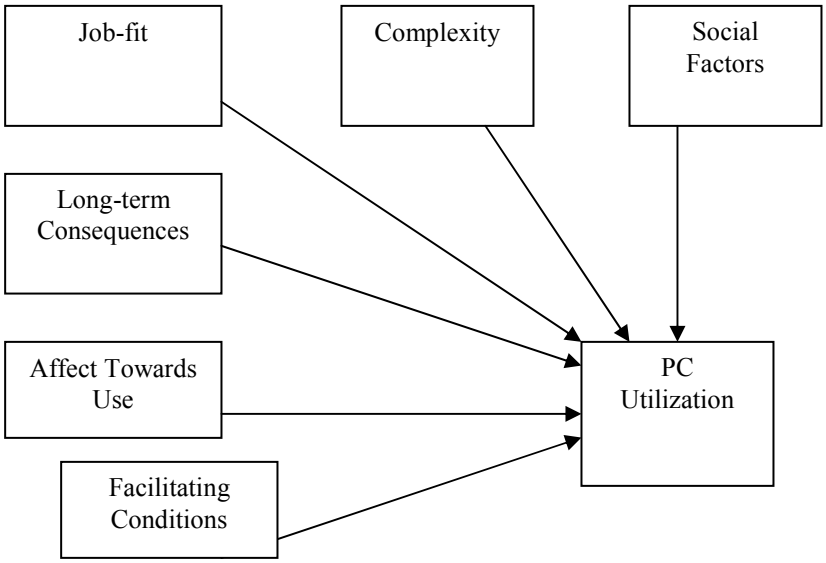

Figure 7. The Model of PC Utilization (Thompson et al., 1991)

2.1.7 The Innovation Diffusion Theory

The Innovation Diffusion Theory (Rogers, 1995) has been used to study a variety of innovations. Rogers identifies five attributes of an innovation that influence the adoption and acceptance behavior: relative advantage, complexity, compatibility, trialability, and observability. In the Information Systems field, Moore and Benbasat (1991) expand this attributes set to study information technology acceptance. The set includes:

- **Relative Advantage**: "the degree to which an innovation is perceived as being better than its precursor" (p. 195).
- **Ease of use**: "the degree to which an innovation is perceived as being difficult to use" (p. 195).
- **Image**: "The degree to which use of an innovation is perceived to enhance one's image or status in one's social system" (p. 195).

- **Visibility:** The degree to which one can see others using the system in the organization.
- **Compatibility**: "the degree to which an innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adopters" (p.195).
- **Results Demonstrability:** "the tangibility of the results of using the innovation, including their observability and communicability" (p. 203).
- **Voluntariness of Use:** "the degree to which use of the innovation is perceived as being voluntary, or of free will" (p. 195).

Innovation diffusion research regards individuals' perceptions about these characteristics of an information technology as important factors in influencing an individual's acceptance behavior (Agarwal and Prasad, 1997, 1998; Karahanna et al., 1999; Plouffe et al., 2001).

2.1.8 The Social Cognitive Theory

The Theory of Planned Behavior (TPB), the Technology Acceptance Model (TAM), and the Innovation Diffusion Theory assume that there are only unidirectional causal relationships among the major variables in their models. In contrast, the Social Cognitive Theory (Bandura, 1986) suggests that environmental factors, personal factors (in the form of cognitive factors, affective factors etc.), and behaviors are determined reciprocally. An individual's cognitive competences influence the behavior of using a technology, and the successful interactions with the technology also influence the cognitive perceptions (Compeau et al., 1999).

The Social Cognitive Theory (SCT) gives prominence to the concept of self-efficacy (Compeau et al., 1999). Self-efficacy is defined as the judgment of one's ability to use a technology to accomplish a particular job or task (Compeau and Higgins, 1995). Outcome expectations, including personal and performance-related ones, are major cognitive factors in influencing users' behavior (Compeau and Higgins 1995). Personal-related outcome expectations are concerned with individuals' esteem and sense of accomplishment. Performance-related outcome expectations are concerned with job-related outcomes. SCT posits that self-efficacy influences both personal and performance-related outcome expectations (Compeau and Higgins 1995). Affect and anxiety are the two affective factors. Affect refers to an individual's liking for a particular behavior (e.g., computer use). Anxiety refers to an individual's anxious or emotional reaction in performing a behavior (e.g., using a computer).

2.1.9 The Unified Theory of Acceptance and Use of Technology (UTAUT)

Based on the most significant constructs from the above eight theories and models, Venkatesh et al. (2003) formulate a new model called the Unified Theory of Acceptance and Use of Technology (UTAUT). UTAUT suggests that three constructs are the main determinants of intention to use an information technology. The three constructs are performance expectancy, effort expectancy, and social influence. All of them are comprised of the most influential constructs of the eight models or theories discussed above. These three constructs are defined as follows:

- **Performance expectancy** is defined as "the degree to which the user expects that using the system will help him or her attain gains in job performance" (p. 447).

This new construct has five root constructs: perceived usefulness (from TAM/TAM2, Combined TAM and TPB), extrinsic motivation (from the Motivational Model), relative advantage (from the Innovation Diffusion Theory), and outcome expectations (from the Social Cognitive Theory).

- **Effort expectancy:** "the degree of ease associated with the use of the system" (p. 450).
- **Social influence:** "the degree to which an individual perceives that important others believe that he or she should use the new system" (p. 451).

Venkatesh et al. (2003) also find that the influence of facilitating conditions on usage is moderated by age and experience of the individual. They define facilitating conditions as "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (p. 453).

As a survey instrument incorporating the most influential constructs from the eight technology acceptance theories and models, UTAUT shares other TA models' major assumptions.

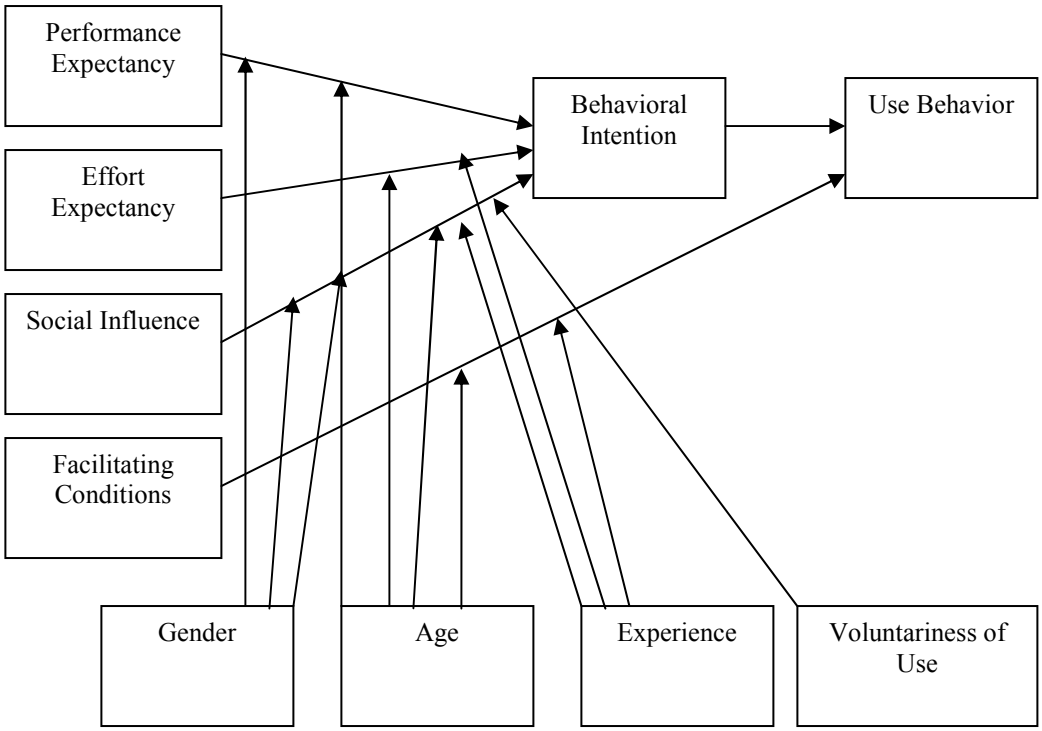

Figure 8. The Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003)

2.2 Evidence Inconsistent with Extant TA models

Next, I will discuss the evidence that is not consistent with what the extant TA models and theories predict. Legris et al. (2003) perform a qualitative meta-analysis on TAM. They find that TAM fails to predict in many studies (shown in Table1). In its original version, TAM has the following components: Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitude (AT), Behavior Intention (BI) and Actual Use (U). Based on these five components, 10 relations are examined by Legris et al. (2003):

(1) PEOU-PU; (2) PU-AT; (3) PEOU-AT; (4) PU-BI; (5) PEOU-BI; (6) AT-BI; (7) AT-U; (8) BI-U; (9) PEOU-U; and (10) PU-U.

Table 1 Where TAM Failed to Predict *(*Adapted from Legris et al., 2000*)*

Author	**PEOU-PU**	**PU-AT**	**PEOU-AT**	**PU-BI**	**PEOU-BI**	**AT-BI**	**AT-U**	**BI-U**	**PEOU-U**	**PU-U**
Davis et al.(1989) Post Training			No							
Subramanian(1994) Voice mail Customer dial-up	 No No									
Taylor and Todd(1995a)						No				
Keil et al. (1995)									No	
Taylor and Todd (1995b) With experience Without experience						 No No				
Jackson et al. (1997)	No	No		No		No				
Bajaj and Nidumolu (1998)	No	Reverse								No
Gefen and Keil(1998)									No	
Lucas and Spitler (1999)				No	No				No	No
Hu et al.(1999a)	No		No							
Szajna (1996) Pre-implementation Pos-implementation									 No No	 No No

No indicates that the relation is found to be non-significant and reverse indicates that the relation is found to be significant but negative.

We can see from the table 1 that there are inconsistent or even contradictory empirical results for all major relations in TAM.

The following subsection discusses in detail the inconsistent evidence with regard to the major constructs in the extant TA models and theories. These major constructs include perceived usefulness, perceived ease of use, attitude, social influences, and facilitating factors.

2.2.1 Perceived Usefulness

The TA models posit that perceived usefulness is the strongest predictor of an individual's intention to use an information technology (Davis, 1989; Venkatesh and Davis, 2000; Venkatesh et al., 2003). However, Jackson et al. (1997) found no relation between perceived usefulness and attitude. Bajaj and Nidumoulu (1998) even find evidence to the contrary- "[u]sefulness will *negatively* affect the attitude towards using the IS" (emphasized by the original authors) (p. 221).

Jackson et al. (1997) and Lucas and Spitler (1999) find no empirical evidence to support the relation between perceived usefulness and behavior intention. Jackson et al. (1997) report: "[T]he finding of a nonsignificant relationship between perceived usefulness and behavioral intention is surprising" (p. 379).

Szajna (1996), Lucas and Spitler (1999), and Bajaj and Nidumoulu (1998) find no empirical support for the relation between perceived usefulness and actual use. For instance, Lucas and Spitler (1999) report: "The variables that researchers most frequently study in this model are not significant in our research" (p.303).

2.2.2 Perceived Ease of Use

The TA models suggest that perceived ease of use has a significant influence on perceived usefulness, behavior attitude, intention, and actual use (Davis, 1989; Mathieson, 1991; Moore and Benbasat, 1991). On the relation between perceived ease of use and perceived usefulness, Davis (1989) suggests that: "from a causal perspective, the regression results suggest that ease of use may be an antecedent of usefulness, rather than a parallel, direct determinant of usage" (p. 334). In UTAUT, Venkatesh et al. (2003) use the construct of effort expectancy to capture the concepts of perceived ease of use (TAM/TAM2), complexity, and ease of use. Effort expectancy is defined as "the degree of ease associated with the use of the system" (p. 450).

However, many other researchers find no empirical evidence to support the relation between perceived ease of use and perceived usefulness (Chau and Hu, 2001; Bajaj and Nidumolu, 1998; Hu et al., 1999; Jackson et al., 1997; Subramanian, 1994). For instance, Chau and Hu (2001) report that "contrary to the assertion of TAM and the findings reported by some prior research (e.g., Venkatesh, 1999), perceived ease of use was not found to have any significant effects on perceived usefulness or attitude" (p. 712).

Agarwal and Prasad (1997), Keil et al. (1995a), Gefen and Keil (1998), Lucas and Spitler (1999), and Szajna (1996) find no empirical evidence to support the relation between perceived ease of use and actual use. Agarwal and Prasad (1997) report that "ease of use, which has been observed to be a significant predictor of acceptance in a wider variety of research (Davis, 1989; Mathieson, 1991), did not appear as a significant

determinant" (p.572). Keil et al. (1995a) conclude that "no amount of ease of use (EOU) will compensate for low usefulness" (p.89).

Davis et al. (1989) find no evidence to support the relation between perceived ease of use and attitude in the post training period. Hu et al. (1999) find no evidence to support the relation between PEOU and attitude either.

Chau (1996), Hu et al. (1999), Lucas and Spitler (1999), Subramanian (1994) find no relation between perceived ease of use and behavior intention. Chau (1996) reports "…there is no significant, direct relationship between perceived ease of use of the technology and intention to use. In other words, whether or not the technology is easy to use influences the user's intention to use only indirectly via the perception of near-term usefulness. This finding concurs with that of the original TAM but contradicts the results obtained in many previous studies (e.g., Lu et al., 1994; Moore and Benbasat, 1991), where ease of use was a significant determinant of intention to use a computer technology" (p. 197).

2.2.3 Attitude toward Using Technology

Attitude toward using technology refers to an individual's overall affective reaction to using a system (Venkatesh et al., 2003). This construct is closely related with four constructs in the existing models: attitude toward behavior (TRA, TPB/DTPB, C-TAM-TPB), intrinsic motivation (MM), affect toward use (MPCU), and affect (SCT). In some models, such as TRA, TPB/DTPB, and MM, the attitude construct is among the strongest predictors of behavior intention (Davis et al., 1989; Fishbein and Ajzen, 1975; Venkatesh et al., 2003). For instance, Chau and Hu (2002) find that attitude "appeared to be the

second most important determinant of a physician's intention for accepting telemedicine technology" (p. 307). However, in other models, such as C-TAM-TPB, MPCU, and SCT, the construct of attitude is not significant. For instance, Taylor and Todd (1995a, b), Thompson et al. (1991), and Jackson et al. (1997) find no empirical support for the relationship between attitude and behavior intention. Jackson et al. (1997) report that "the lack of support for P5, the effect of attitude on behavioral intention, is somewhat puzzling…" (p.379). Venkatesh et al. (2003) suggest that since the effect of attitude has been captured by the performance and effort expectancies and therefore, attitude has no significant effect on users' behavioral intention.

2.2.4 Social Influences

Venkatesh and Davis (2000) use the construct of subjective norm to capture social influences in their model of TAM2. TAM2 suggests that in mandatory contexts, social influences have a direct effect on intention to use. However, researchers find that social influences have inconsistent roles in the empirical studies. Some researchers have reported empirical evidence to suggest that this construct is significant (Hartwick and Barki, 1994; Karahanna and Straub, 1999; Lu et al. (2005); Lucas and Spitler (1999); Taylor and Todd, 1995). For instance, Lucas and Spitler (1999) report that "organizational variables such as social norms and the nature of the job are more important in predicting the use of technology than are users' perceptions of the technology" (p. 304). The study by Lu et al. (2005) finds that social influences from social networks and the sense of image play important roles in shaping individual's perceptions of usefulness and ease of use. In a

meta-analysis of the technology acceptance model, Schepers & Wetzels (2007) also find that social norms are important in influencing users' attitude towards use.

However, many other studies report evidence to prove the construct of subjective norms to be non-significant (Chau and Hu, 2001; Davis et al., 1989; Dishaw and Strong, 1999; Mathieson, 1991). Dishaw and Strong (1999) report: "subjective norms are not important in understanding individual choices to use IT" (p. 15). Lewis et al. (2003) find no empirical support for the expected relation either.

Venkatesh et al. (2003) suggest that social influences are "more likely to be salient to older workers, particularly women, and even then during early stages of experience/adoption" (p. 469). However, knowing these contingencies cannot help much in explaining the equivocal results reported in the literature. We need to understand why social influences only work for some people but not for others.

2.2.5 Facilitating Conditions

Many studies have suggested that facilitating conditions affect use, either directly or through behavioral intention (Thompson et al., 1991; Taylor and Todd, 1995). Venkatesh et al. (2003) define facilitating conditions as "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (p. 453).

However, many other empirical studies find the facilitating conditions to be non-significant (Gallivan et al., 2005; Karahanna and Straub, 1999; Mawhinney and Lederer, 1990). For instance, Gallivan et al. (2005) find no evidence to support the relation between facilitating conditions (such as training) and technology usage. Karahanna and Straub

(1999) report that “surprisingly, facilitating conditions such as the availability of training and support for the use of information technology had no impact on perceptions of ease of use or usefulness of E-mail”(p. 1999). Igbaria et al. (1997) and Thompson et al. (1991) also find a non-significant relation between usage and the facilitating conditions such as training and technical support.

Venkatesh et al. (2003) suggest that the influence of facilitating conditions on usage is moderated by age and experience of the individual. However knowing these contingencies cannot help much in providing any meaningful guidance to implementation practices.

2.3 Summary

In this chapter, I provided a review of the technology acceptance literature. I tried to make explicit these assumptions underlying these TA models and theories. More importantly, I identified a significant body of literature that reports inconsistent results with these models. (Table 2 presents additional evidence to show that the extant technology acceptance models have consistently failed to predict as they purported to). These are the inconsistencies these theories and models cannot easily explain. This study is therefore designed to explain these inconsistencies by using an interpretive case study.

Table 2. Additional Evidence Showing Where the TA models Fail to Predict

Author	PEOU-PU	PEOU-U	PEOU - BI	AT - BI	Social Influences	Facilitating Conditions
Chau and Hu (2001)	No					
Hu (2001)	No					
Agarwal and Prasad (1997)		No				
Subramanian(1994)			No			
Chau (1996)			No			
Hu et al. (1999)			No			
Venkatesh et al. (2003)				No		
Hartwick and Barki (1994)					Yes	
Karahanna and Straub (1999)					Yes	
Lu et al. (2005)					Yes	
Lucas and Spitler (1999)					Yes	
Taylor and Todd (1995)					Yes	
Schepers & Wetzels (2007)					Yes	
Chau and Hu (2001)					No	
Davis et al.(1989)					No	
Dishaw and Strong (1999)					No	
Mathieson (1991)					No	
Gallivan et al. (2005)						No
Igbaria et al. (1997)						No
Mawhinney and Lederer (1990)						No
Karahanna and Straub (1999)						No
Thompson et al. (1991)						No
Taylor and Todd (1995)						Yes

No indicates that the relation was found to be non-significant; **Yes** indicates that the relation was found to be significant.

CHAPTER 3 Research Methodology

The goal of this research is to provide an improved and empirically validated interpretive understanding of how individuals actually form their perceptions about using an information technology in an organization. Such an understanding can help explain why the traditional TA models fail to predict as they purport to. Based on Lee's (1991) integrated framework for the positivist and interpretive approaches, I discuss the value of examining information technology adoption from an interpretive perspective. I then present the interpretive case study method, the site selection and data collection, and data analysis approach.

3.1 Lee's Integrated Framework

The positivist approach advocates that the social sciences should follow the methods of the natural sciences to explain human behaviors. This approach regards "logical positivism" as the only legitimate philosophical grounding for the social sciences. Therefore, it suggests that the methods such as statistical analysis, hypothesis testing are the best for conducing social science studies. The interpretive approach on the other hand, regards that the subjects in social studies are fundamentally different from the physical reality examined by the natural sciences (Lee, 1991). This approach suggests that social

sciences researchers have to deal with human beings' subjective understandings or perceptions. Therefore, the methods of the natural sciences are not adequate for the social sciences. Instead, the methods such as ethnography, hermeneutics, and phenomenology are more appropriate for the social sciences.

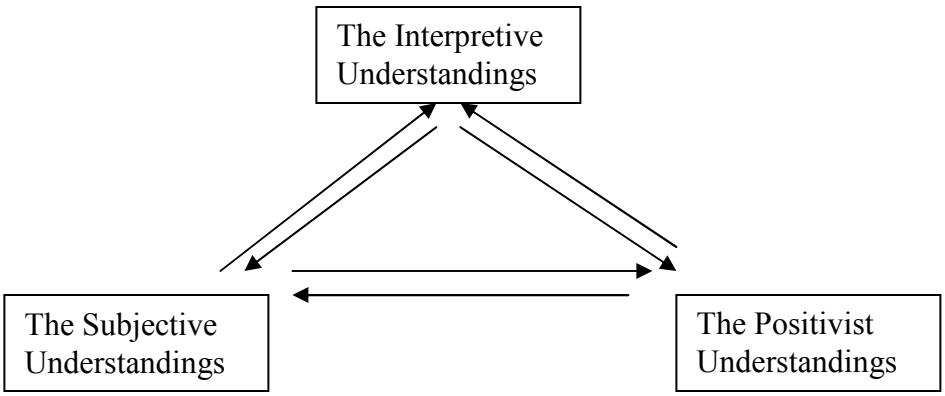

Figure 9. The Integrated Framework for the Positivist and Interpretive Approaches (Lee, 1991)

Lee (1991) develops an integrated framework to combine the two approaches, positivist and interpretive, to help better conduct social sciences studies (Figure 9). This framework "calls for each approach to play an active role in strengthening the other in a truly collaborative research effort, as opposed to one that merely allows the two approaches to maintain a peaceful but separate co - existence" (pp. 342-343). In this framework, the subjective understanding is the observed human subjects' common sense and everyday meanings that they use to construct their daily life realities. Natural scientists do not have to deal with the subjective understanding because in the natural sciences, the subjective understanding does not exist or we can say it "goes to zero" (Lee, 2004, p. 9). Researchers develop their interpretive understanding based on the subjective

understanding. The conceptual understanding created and tested by the researchers to explain the empirical reality is called the positivist understanding.

The interpretive understanding belongs to the researchers and it bases itself on a reading of the actual subjective understanding held by the observed human subjects (Lee, 1991). Interpretive researchers do not regard the subjective understanding as biased, but focus on studying how the human subjects form their subjective understanding. Therefore, an interpretive inquiry allows the researchers to obtain an improved interpretive understanding. Based on the improved interpretive understanding, the researchers can develop a revised positivist understanding that can better predict the human subjects' behaviors.

The TA models are instances of the positivist understanding. Based on the empirical evidence in the literature, we can see that the extant TA models consistently fail to predict as they purport to. This study argues that is because the positivist understanding is based on a faulty interpretive understanding. To correct this error, we need to go back and investigate the process of developing the positivist understanding. That means we need to carefully interpret the individuals' subjective understanding and make the interpretation process explicit.

Interpretive research examines organizational events from the "life world" in which "common-sense thinking and human meanings arise" (Lee, 1991, p.348). Interpretive research then has the advantage of discovering the underlying factors that influence individuals' adoption and use of an information technology. An interpretive qualitative inquiry allows researchers to obtain and evaluate rich qualitative data that quantitative

research approaches find impossible to obtain. In other words, an interpretive research can not only provide the subjective understanding and interpretive understanding necessary for the positivist investigations, but also provides valuable insights which quantitative or positivist studies cannot attain easily (Lee, 1991; Schutz, 1962; Trauth and Jessup, 2000; Walsham, 1995). The goal of this research is to provide an improved and empirically validated interpretive understanding of individuals' use or non-use of an information technology. Both subjective and interpretive understandings are extremely important for this study. As a result, an interpretive qualitative inquiry is most appropriate for addressing the research problem and answering the research questions.

3.2 Interpretive Case Study

IS literature contains a significant number of interpretive case studies, covering different topics and issues (Boland & Day, 1989; Markus, 1983; Orlikowski, 1991, 1993; Walsham, 1993, 1995; Zuboff, 1988). Orlikowski and Baroudi (1991) identify case study, following survey and lab experiment, as the third most widely used research method in the IS field. By making significant use of contextual data, case studies can help answer "how?" and "why?" questions (Yin, 1989; Walsham, 1995). Case studies can be both positivist (Benbasat et al., 1987; Miles and Huberman, 1994; Yin, 1994) and interpretive (e.g. Boland & Day, 1989; Zuboff, 1988). These two approaches have different ontological and epistemological stances. Ontology is concerned with the worldview on reality and epistemology is concerned with the nature of knowledge claims (Hirschheim and Klein, 1989; Walsham, 1995). With respect to ontology, the positivist approach adopts a stance of realism, which regards that the real world is an objective presence and it exists independent

of its observers (Hirschheim and Klein, 1989). Based on the fundamental concepts from phenomenological sociology, hermeneutics, and ethnography, the interpretive approach adopts a stance of nominalism, which regards that the world reality is not given but socially constructed (Berger and Luckmann, 1967). Since the goal of this study is to explore the subjective meanings of the human subjects, this study selected the interpretive case study approach.

Lee's integrative framework suggests that interpretive research can complement positivist research. Therefore, Lee's idea of interpretivism can be categorized as a view of "weak social constructivism" (Orlikowski and Baroudi, 1991). Some interpretive researchers may oppose Lee's (1991) integrative view on the ground that Lee's view might "confuse and conflate contradictory epistemological positions" (Walsham, 1995, p. 382). These researchers actually hold a "strong constructivism" view (Orlikowski and Baroudi, 1991, p. 16). I believe that the ideas on ontological, epistemological issues are socially constructed, and they should be open for further development and improvement (Lee, 2004). Based on the idea of "weak social constructivism", Lee's integrative framework represents a "philosophical imagination" (p. 7), which is critical for the advancement of information systems research. Therefore, I chose to follow the view of "weak social constructivism" in this study.

Different interpretive case studies have followed different traditions of social constructivism. For instance, Boland & Day (1989) and Lee (1994) draw on hermeneutics and Zuboff (1988) on phenomenology. In conducting this interpretive case study, I consciously draw from several different interpretive studies (Lee, 1994; Walsham, 1995).

Although Walsham (1995) might support a "strong constructivism" view, I regard it as legitimate to draw from him for research methodology ideas. Doing so is also consistent with the published literature of interpretive research (Trauth and Jessup, 2000; Walsham and Sahay, 1999). For example, Trauth and Jessup (2000) draw from ethnography and hermeneutics to achieve breakdown resolution or hermeneutic circle. Walsham and Sahay (1999) use ethnographic criteria to assess their interpretive case study, even though their study is not a work of ethnography.

3.3 Data Collection

In choosing the research sites for this study, I considered the following factors: the organization's proximity to the researcher and the access to the sites. Since this research studies the Electronic Medical Records Systems in health care settings, healthcare organizations that have adopted and implemented the system represent optimal research sites.

Several potential research sites had been identified including an orthopedic clinic and a hospital affiliated with a research university. The chosen site was the orthopedic clinic and it was a small business run by eight doctors. This site was chosen initially as a "pilot study" site. As I progressed in my study, I realized that as an interpretive case study, it would need much in-depth analysis. Having a deep understanding of the data collected would be more important than gathering more data from another case site. I also realized that the findings in one setting cannot be generalized to other settings that I have not observed (I will discuss the generalizability issue of this case study in detail in Chapter 6). Therefore, it is not imperative to conduct another case study in order to achieve the

research goals of this study. The proposed "pilot study" became the main study in this research as a result.

In the remainder of this dissertation, the research site will be referred to as Alpha Clinic. The doctors and medical assistants at the clinic provided community-based services to the local area. The premise was located on the ground floor of a large building. There were several consulting-rooms, a waiting room, a meeting room, and offices for the doctors and staff members. Each doctor had an office and the medical assistants shared a large office with cubicle dividers separating them. There were four full-time receptionists (operational personnel), four financial personnel, eight doctors, and fourteen nurses (medical assistants). There was one office administrator in charge of the daily operation of the clinic. In the fall of 2005, the clinic acquired and implemented an EMR system called Delta EMR. This study adopts the working definition of EMR by Walter and Lopez (2008):

> *Electronic Medical Records (EMR) systems are computer systems that allow you to create, store, edit, and retrieve patient charts on a computer. These systems facilitate the organization and rapid retrieval of information by serving as digital repositories for physicians' notes and laboratory results as well as patients' problem lists, medications, allergies, and essential socio-demographic and contact data (p. 209).*

The sources of evidence in this study include interviews and direct observations. Interviews are the primary data sources for this case study because it is "through this method that the research can best access the interpretations that participants have regarding the actions and events which have or are taking place, and the views and aspirations of themselves and other participants" (Walsham, 1995, p. 78). I also observed the doctors'

and medical assistants' work practices and their interactions. The private nature of patient consultations means that I could not gain entry to doctor-patient consultation sessions to observe how they used or did not use the EMR system. However, I was able to observe how the medical assistants and doctors used the EMR prior to and after the consultations.

The medical assistant head (referred as M.A. head) helped arrange my interviews with the medical assistants. The M.A. head was responsible for all the assistants' work schedule. The medical assistants were told that their participation was voluntary and confidential. The medical assistants were very willing to make appointments with me after being told that the researcher was a Ph.D. student doing research on the EMR system. The scheduling of interviews with the doctors took me more time. The doctors were extremely busy professionals. Most saw an average of 30-40 patients a day in a typical clinical day. It was not easy to schedule an appointment with them to conduct an interview. The M.A. head hesitated to help arrange the interviews with the doctors since she had no authority over the doctors. So I talked directly to the doctors to make interview appointments.

Construction of the interview guide is based on the following considerations: First, as shown in Chapter 2, many relationships between the major constructs in the extant TA models have empirical results inconsistent with what they have purported to. It is then reasonable to ask interview questions to probe why these inconsistencies occur. In the traditional positivist studies, especially using survey as the method of research, when these inconsistencies occur, researchers could only provide their speculations. By conducting an interpretive case study, this research can provide rich data to help understand the inconsistencies. Only by soliciting additional information can this study provide subjective

understanding of the participants beyond what the extant TA models have suggested. In this way, this study gains a better grasp of the subjective understanding of the human subjects in the field. Based on the more accurate subjective understanding, the study then provides good basis for refining existing or developing new theories (Lee, 1991). The interviews began with a generic question that allowed the human subjects to describe freely their experiences and express their feelings about the adoption and use of the EMR system: "Could you please tell me your experiences and feelings about using the EMR system?" Then more specific questions were asked to solicit subjects' rich stories. In the interviews, the interviewees were asked to elaborate on the "yes" and "no" answers.

Second, the interview guide was used only as a pool of possible interview questions to be used. With this interview guide at hand, I could go to the field doing interviews better prepared. Not all of the questions in the interview guide were asked in each interview session. The focus was on soliciting additional information. The interview guide is included in the appendix.

Third, in forming the interview questions, I did not use the scientific language familiar only to the IS research community. Instead, I used the natural language that participants can easily understand. The interview questions were primarily based on the instruments developed and used by previous researchers (Davis, 1989; Torkzadeh and Doll, 1999; Venkatesh et al., 2003). The wording of the questions is consistent with that used in survey questions in traditional TA studies. Although the major purpose of this study is not to measure and test theories, proven measurement instruments were used wherever possible. Thus, this interpretive research did not ignore the existing positivist

work. This is consistent with the spirit of Lee's integrated framework (1991), which advocates that the positivist and interpretive research approaches can be "mutually supportive, rather than mutually exclusive" (p. 342).

Fourth, the literature review in chapter two has articulated the major assumptions held by the extant TA models. These assumptions are questionable. Several questions were then constructed to probe whether these assumptions might be right or wrong. Table 3 presents this type of interview questions.

Table 3. Interview Questions to Probe Why the Assumptions Might be Wrong

The Extant Theories From the Literature	**Theory's Questionable Assumption(s)**	**Interview Questions to Probe Why the Assumption(s) May be wrong**
The Technology Acceptance Model (TAM) And Extended TAM(TAM2)	1. The acceptance and use of technology is an individual phenomenon.	1. Do you think using the EMR system is effective for your organization or for your work? Why or why not?
The Theory of Reasoned Action (TRA)	2. Individuals are rational decision makers who are constantly calculating and evaluating the relevant behavior beliefs in the process of forming the attitude toward the behavior.	2. When you decide whether or not to use Electronic Medical Records System, do you ask yourself the question "is it a cost-effective solution for my work?" Why or why not?
The Motivational Model (MM)	Same as the TRA	Same as the questions for TAM
The Theory of Planned Behavior (TPB)	Same as TRA	Same as the questions for TRA
Combined TAM and TPB	Same as TAM and TPB	Same as the questions for TAM and TPB

The interviews took place between August 2007 and October 2007. Three doctors, eight medical assistants, and two receptionists were formally interviewed. These one-to-one interviews were conducted in the meeting rooms at the clinic. The clinic professionals were asked to describe in depth their experiences in using the EMR system in their work. The average interview lasted for 40-50 minutes. Tape-recording was used in the interviews because it would be difficult to capture the data by note-taking only (Walsham, 1995). The interviews were then manually transcribed and prepared for data analysis. The administrator and several other medical assistants and doctors were also informally interviewed. During these informal interviews, I did not use tape-recording. Instead, immediate after the interviews, I made notes of the important information. After a pattern of information redundancy was established, I stopped interviewing more participants.

I would describe my background as a researcher as follows: I am male in my mid-thirties. I am enrolled in a PhD program at a southeastern US university, majoring in Information Systems. Before this study, I was not familiar with the work practices of medical professionals and I had no previous experience of working with the EMR system either. Since I was not playing any role in the field organization, my role in the research was an "outside observer" (Walsham, 1995), which means I have no "direct personal stake in various interpretations and outcomes" (p. 77).

3.4 Data Analysis Approach

To analyze the data, I used myself as a sense-making instrument to understand the life world of the participants. I let the data "speak" to me and developed the interpretive understanding inductively. Then I looked at the data deductively by using a published

framework (values framework by Kohli & Kettinger, 2004) to interpret the data. This practice of combining inductive and deductive reasoning is consistent with the published interpretive research literature in the IS field (Schultze, 2000; Taruth and Jessup, 2000; Walsham and Sahay, 1999). For instance, Schultze (2000) suggests: "analysis thus entails a juggling of induction, i.e., interpreting the data using situated and subjective knowledge, and deduction, i.e., applying objectified methods, frameworks, and theories to the data" (p. 25).

From the data compiled during the case study, I identified several apparent anomalies that the extant TA models might find hard to explain. These anomalies are also called absurdities. Kuhn (1977) describes the important role of "apparent absurdities" in helping interpret data:

> *When reading the works of an important thinker, I look first for the apparent absurdities in the text and ask yourself how a sensible person could have written them. When you find an answer, I continue, when those passages make sense, then you may find that more central passages, ones you previously thought you understood, have changed their meaning(p. xii).*

In her well-known book *Men and Women of the Corporation*, Kanter (1977) states:

> *This study represents primarily a search for explanation and theory rather than just a report of empirical research. I was interested in understanding a complex social reality and its impact on the people who experienced it. I wanted to develop concepts that would make sense out of the actions of people located in different parts of organizational worlds. With Michel Crozier, I wanted to demonstrate that everyone is rational, that everyone within an organization, no matter how silly or irrational their behavior seemed, was reacting to what their situation made available, in such a way as to preserve dignity, control, and recognition from others. Throughout the hierarchy, people had in common the fact of being limited by their organizational circumstance. Finally, I wanted to develop concepts with a dynamic flavor: how processes and cycles were set in motion which bounded and limited people's options (p. 331).*

In the information systems field, Trauth and Jessup (2000) also regard "….the anomaly as the vehicle for focusing attention and gaining better understanding of the information in context" (p. 57). In this study, I made the assumption that no person behaves in an irrational way. When I found some of the behaviors did not make sense to me, I would not simply dismiss them as irrational ones. Instead, I would say that I have identified anomalies which reminded me that I had not fully understood these people yet. I would then try to resolve these anomalies by constructing a bigger picture in which the human subjects' behaviors become rational to me (Lee, 2004). To construct such a bigger picture, I try to "piece together people's words, observations, and documents into a coherent picture expressed through the voices of the participants" as suggested by Trauth and Jessup (2000, p. 54).

Lee (2004) suggests that "an information system is the result of an information technology enabling an organization, as much as an information system is the result of an organization enabling an information technology" (p. 12). In other words, an information system is emergent from the interactions between the social system and technical system. Besides technical systems, social systems exist in organizations. When there is a failure to find the right answer in one system, one needs to look at another system or higher level - the whole system. Based on the understanding of the "bigger picture", I develop an improved interpretive understanding. Then I develop a revised positivist understanding to refine and help strengthen the extant TA models.

3.5 Summary

In this chapter, I discussed the research methodology used in this study. After discussing the value of examining the information technology adoption and use from an interpretive perspective, I then presented the interpretive case study method, the site selection, data collection and analysis approach.

CHAPTER 4 Interpretive Investigation

This chapter presents a detailed interpretive investigation process. Two scientific concepts, social structure and culture, are used to guide the interpretive investigation. This investigation helps resolve several apparent anomalies that the extant TA models find hard to explain.

4. 1 Social Structure

Social structure of an organization describes how role relations are structured in its reality, including the formal and informal network. Barley (1986) defines social structure as the "patterned action, interaction, behaviors, and cognition" (p. 79) that constitutes the taken-for-granted aspects of social life in an organization. The concept of social structure does not describe behaviors themselves, but how social roles relate to each other in a systematic way. It is a system that assigns people into different "slots" of roles. Different social roles accomplish different tasks in an organization or a community. Individuals move in or move out of the organization. However, the social structure changes slowly or remains unchanged. Individuals' behaviors reflect the existence of the social structure. On the other hand, the individuals, as social agents, enact the social structure with their behaviors. People know what they are allowed to do and what they need to do in order to play their roles. Each of the roles has its obligations and rights. The concept of social

structure is therefore not only about abstract, formal relations that constrain day-to-day action in social settings, but also is "an emergent property of ongoing action" (Barley, 1986, p. 79).

Nadel (1957) distinguishes between nonrelational and relational roles in a theory of social structure. Non-relationship roles include formal duties and behavioral regularities, obligations, expectations, skills, and tasks. Relational roles include interactions, dependencies, and expectations between roles. Drawing from Nadel (1957), Barley (1990) outlines a role-based approach to investigate the alignment of technology and social structure. He posits that changes in technology are most likely to have their most immediate impact on non-relational elements, such as tasks and skills. The change in the non-relational elements subsequently brings changes to the relational aspects of roles:

> *Since few tasks are truly independent, however, one's work is likely to influence with whom one interacts as well as how one relates to others. For this reason, technically induced change in the nonrelational aspects of a role are prone to alter the role's relational elements. Altered tasks may narrow or expand the range of one's role set, shift the nature of one's dependencies, or affect the frequency and content of typical interactions. In fact, since nonrelaional roles largely comprise solitary actions, one cannot properly speak of technically induced social change until a technology has begun to affect relationships. Therefore, if a technology is to occasion social change, modifications in the nonrelational elements of a role must spill over into the role's relational aspects (Barley, 1990*, p. *69).*

Barley (1990) begins his analysis of the alignment of technology and social structure by looking at how a technology is introduced into an organization. He then traces its impact on users across levels of social analysis. Barley is able to demonstrate how social structure change does or does not occur in the organization. Davidson and Chismar (2007) draw from Barley's role-based model and extend the micro-level analytic approach

to account for the influence of change in the macro-institutional environment. They find that the social structure change associated with a computerized physician order entry (COPE) system emerges from the cumulative influence and interaction of institutionally triggered and technology-triggered change processes.

Besides Barley's role-based model, other theoretical perspectives have been proposed to study the relationship between technology and organization, such as structuration theory (DeSanctis and Poole, 1994; Orlikowski, 1992), actor network theory (Walsham, 1997), and practice lens (Orlikowski, 2000). These theories posit that human actions are not determined by prevailing social structures or technologies; instead, technology and social structure are either embodied or enacted by technology users. Although Giddens (1984) and Emirbayer and Mische (1998) essentially remove the traditional distinction between agency and structure, all these perspectives have pointed toward human agency, which emphasize human agency over social structures and technological features. Fuchs (2001) argues against the turn toward agency views, suggesting that agency would have little meaning independent of social influence. Fuchs therefore calls for a renewal of interest in social structures to account for seemingly individual behaviors in organizations.

In this research, Barley's (1990) framework is used to look at the social structure at Alpha Clinic. Focus is placed on the nature of relationship dependencies, the frequency, and content of typical interactions among the social roles in the organization. Figure 10 shows the logic of the social structure at Alpha Clinic. At Alpha Clinic, major social roles included: the CEO, the Board Members/doctors, administrator, medical assistants,

operational personnel, and financial staff. The administrator and operation support personnel were not included in the figure because they were not directly involved in using the EMR system for their jobs. Within this social structure, each of the roles communicated with all other roles. The thickness of the lines indicates the frequency of interaction between the two roles. We can see a network or web type of structure among the people who were directly involved in using the EMR system. The medical personnel arranged themselves into a set of clans. Each clan was composed of a doctor and several supporting medical assistants. Within each clan, the board member, in his role as a doctor, worked closely with his medical assistants. There was no supervision or intervention from the non-medical personnel or other clans. Table 4 presents the formal and informal rules of behaviors for the different roles at Alpha Clinic.

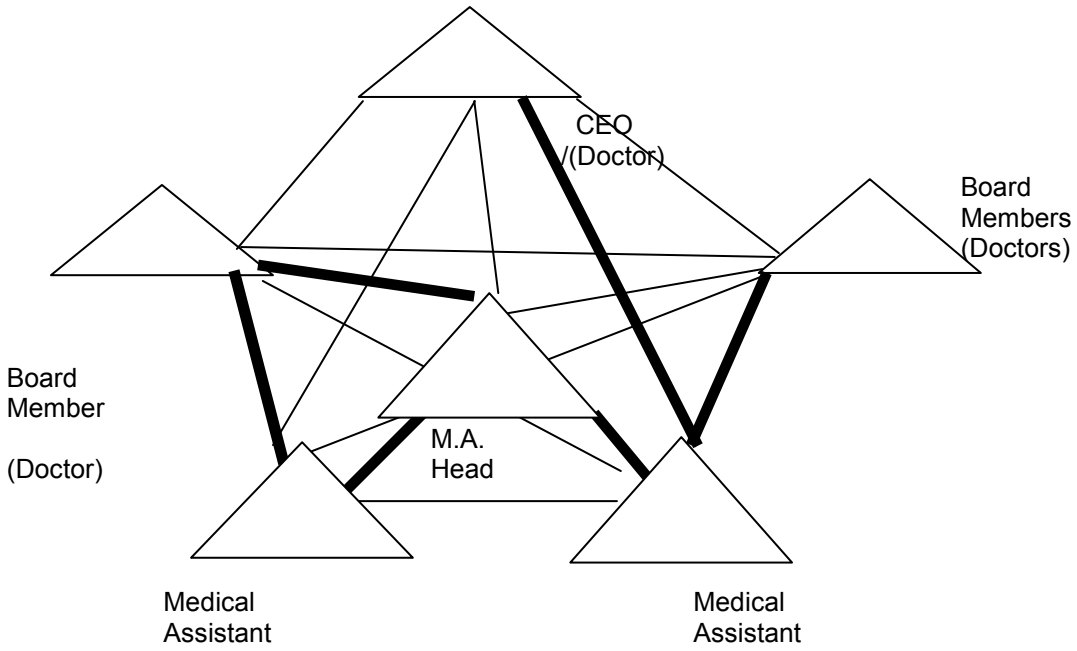

Figure 10. Social structure at Alpha Clinic

Table 4. Formal and Informal Rules of Behaviors At Alpha Clinic.

Role	Formal Rules of Behaviors	Informal Rules of Behaviors
CEO/Doctor	The CEO was expected to act in the interest of the clinic. He was supposed to provide leadership and vision for Alpha Clinic development.	He was not allowed to intervene how his colleagues practice medicine.
Board Member (Doctor)	Board members were supposed to follow the decisions made on the board meetings.	All the board members were expected to respect the authority of the CEO and to show support to the CEO. No doctor was allowed to intervene with how his colleagues practiced in the clinic.
Administrator	Reported to the board and managed the operation of the clinic.	He was not allowed to intervene with how these doctors and medical assistants practiced medicine in the clinic.
Medical Assistant Head	Managed the medical assistants' work	Acted as a medical assistant too; Behaved in the interest of the medical assistants.
Medical Assistant	They were not allowed to do the job tasks beyond their job responsibilities. The medical assistants were supposed to carry out the administrator's order on the administrative issues	They were not allowed to challenge the authority of the doctors.

4.2 Culture

IS researchers have suggested that information technology is not culturally neutral. It symbolizes a host of different values driven by underlying assumptions (Coombs et al., 1992). There are many different definitions of culture. Sackmann (1992) discusses how

culture has been framed in various studies as ideologies, coherent sets of beliefs, basic assumptions, shared sets of core values, and the collective will. Pettigrew (1979) suggests that culture include language, ideology, rituals, myths, and ceremony. Schein (1985a, 1985b) suggests a three-level model of culture. First, basic assumptions are at the core of culture, representing cognitive structures or interpretive schemes that people use to make sense of ongoing events, activities, and human relationships. The basic assumptions form the basis for collective action (Van Maanen and Barley, 1985). Second, values represent espoused beliefs, explaining why people behave in a certain way. At the third level, culture is manifested through artifacts, including technology, art, language, ritual, and ceremony.

For the purpose of this research, culture is defined as a system of shared meanings among people, an ensemble of people's belief, worldview, and values. As an unwritten rule or control mechanism in a community (Geertz, 1973), culture governs people's behaviors and social interaction. Since people in the same culture share similar cultural history, they share the same culture as a common code. They use this common code, a system of meanings, to make sense of events and behaviors of other people. This cultural knowledge enables people to know how to act toward each other and anticipate how others react.

4.3 Anomalies Identification and Resolutions

The remainder of this chapter is organized following the significant causal relations suggested in the TA models: intention to use leads to actual behavior, perceived ease of use leads to perceived usefulness, perceived ease of use leads to perceived usefulness and intention to use. The TA models give rise to several apparent anomalies that these models

themselves cannot explain easily. Based on the subjective understanding, I resolved these anomalies by using the concepts of social structure and culture.

4.3.1 Anomaly One "Intention to Use and Actual Behavior"

The TA models give rise to the anomaly that intention does not lead to actual behavior. The doctors at Alpha Clinic had intention to use the EMR system. It was voluntary for them to invest their money in acquiring and implementing the system. However, they did not use the system as they expected as the doctors still depended much on paper charts in their daily work. The relation *f* in Figure 11 is highlighted and tested. It was found to be invalid. The doctors seemed to behave irrationally. Their behavior intention did not lead to the actual use, as the TA models have purported to. What is the explanation for this anomaly? Let us take a look at the subjective understanding of the social actors involved.

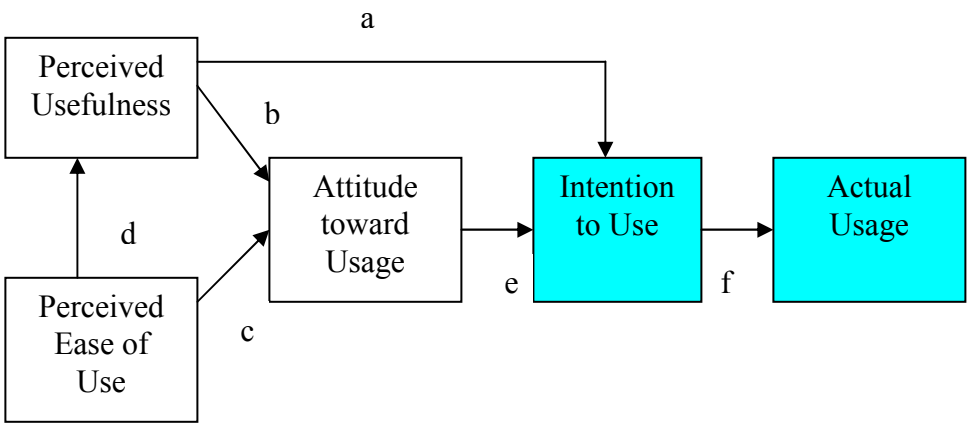

Figure 11. The Technology Acceptance Model (TAM) (Davis, 1989)

One doctor reflected on the board members' motivation of deploying the EMR system:

> *We have examined our reasons for using EMR which are twofold: One was trying to see whether we can find a way to get rid of dictation and outsource transcription because transcription was getting costly. One was the cost issue. The second is to move from paper office to paper-less office where you don't have things got lost. There were a lot of repetitions. With the EMR that part was gone. You have all charts in one place and it is easier to get access to them. We think the future of charting has to be electronic format and we'd better use EMR. These are the thoughts that we have to start using EMR. It is not mandatory to use EMR.*

It is evident that information technologies were highly valued by the doctors. The doctors' faith in technology and their belief that technology could solve their organizational problems played an important role in their decision to adopt the new information technology- the EMR system.

Some of the medical assistants shared the doctors' view:

> *Our doctors like things faster and [more] convenient. They see a lot of patients. So I think their initial motivation for EMR was that they can be more efficient. The system makes things faster. You do not have to pull up paper charts. If you see 50 or plus patients a day, there is a lot of dictation. If you can enter into the system most of the information when you see the patients, you can cut down on time having to memorize each patient and making a lot of notes on their account form. In that sense, it has done its job. It is their goal to see a lot of patients more efficiently and have thing run smoothly. They enjoy having high tech things. All of them do. They will have a PAC system, digital X-Ray system. We hope that will further improve our efficiency.*

However, some medical assistants did not quite agree. For them, adopting EMR system was just a necessity: "The clinic has to adopt EMR because we ran out of space for the paper charts." There was a huge room for storing the paper charts at the clinic; however, it seemed that it was not enough for the paper charts. In the hallway, there were piles and

piles of paper charts. Apparently, storing the paper charts was a huge problem for the clinic. Therefore, based on my observation, the medical assistants' reasoning for the clinic's adoption of the EMR system was plausible.

Before the adoption of the EMR system, the doctors and administrator did their homework to search for an "ideal" technology. They attended professional conferences and contacted software vendors to learn about different systems. After one year's research, they finally chose one called Delta EMR. After its implementation, the doctors found that using it did not really bring them much value. For them, using the EMR system was still "very labor intensive". The doctors must input detailed examination and diagnosis notes into the system. They could choose either to type or use the speech recognition function to enter the notes orally. Alpha Clinic chose to adopt Delta EMR primarily because it had the speech recognition function. However, this function was not satisfactory. It had a high error rate. Most of the doctors spoke English with strong Asian accents and this added to the problem. One doctor explained:

> *The speech recognition can pick up background noise and it is not picking up [our speech] very well. Because we have medical assistants going back and after [we are] done with the dictations and they [need to] edit these dictations, there is no value to the EMR systems because you are doing the same thing as transcription.*

One nurse also said,

> *The system needs to adapt a little bit more to the change of their voice. At the end of the day, the doctors' voice might change because they get tired, especially in the afternoons. If you speak perfect English, the machine can easily pick up your voice, but if you have a strong accent, it is hard.*

For the first few months, the doctors tried hard to learn to use the system. However, after more than one year's use, the speech recognition function's error rate was still too high. When the system mistakenly entered the doctors' words, the doctors had to speak to the speaker "scratch it" in order to delete the wrong words. The doctors then had to repeat what they had said. When they had to repeat too many times, the doctors became frustrated with the system. Most of them then gradually stopped using the speech recognition function for entering their notes. They switched back to use paper charts or wrote notes on pieces of paper, expecting to find time to enter the notes into the EMR system afterwards. One doctor explained:

> *If I have a new patient, I do the exam and enter the whole information for the record. I can do it, I can create it in four or five minutes, without using voice recognition, just use my typing skill, I can type 30 words a minutes. I sometimes have five or six patients waiting in the room. I do not have the time. I make short hand notes…. Now I try to finish my new patient's notes while I am still at the room with the patients. My first impression about the patients and everything is there. For follow up patients, I put down on a paper and transcribe it later.*

Other doctors shared the same feeling:

> *The odds are that I will come back and do it later. But it did not work that well. It takes up my personal time to catch up with my dictation. To spend time with my family, [or to] do the dictation, I will choose to spend time with them.*

> *If you've got these two steps, you increase your work. Your compliance goes down, and you get lazy. You may wait a week and you get behind of your work but you cannot find the time. So that is the environment which is not right.*

Based on the doctors' comments, we can see that using the EMR system to enter notes became a huge burden in their work and personal life. Some of the doctors believed that the investment on EMR system simply had no value. It was a failure in the decision-

making. The doctors were paying for the system but they themselves did not directly feel the benefits of using it in their work. The doctors not only shared their frustration among themselves, but also openly expressed their dislike of the EMR system. One doctor even told his medical assistants that he just wanted "to get rid of the system right away".

Other doctors still had their faith in the technology and had the "intention" to use it more: "[We] might need to see less number of patients, so that [we] can make sure the charts are completed at the end of clinic day." However, the intention to use the EMR system could not easily lead to actual use. At the time of this research, Alpha Clinic was preparing to open another office site and expand its business in the community. Therefore, instead of seeing fewer patients, the doctors would see more. They might find it more difficult to finish their medical records entry using the EMR system in a timely manner.

The medical assistants however did not share the frustration of the doctors. Several medical assistants mentioned that at a Christmas party, they gave a T-Shirt to the doctors as a gift. On the T-Shirt, there printed a raffle ticket, and the words on the tickets read as "scratch it." For the medical assistants, it was somewhat funny to see that the doctors had to struggle with the speech recognition function of the EMR system by saying "scratch it" many times a day. For the doctors, it did not seem to be funny at all. The implementation of EMR was just like scratching a raffle ticket. There were just too many uncertainties involved in adopting an information technology.

Next, I use the scientific concepts of social structure and culture to resolve the anomaly: why the intention to use the EMR system did not lead to actual use? At Alpha Clinic, the doctors were acting not only as doctors, but also as board members of the clinic.

In the process of adopting the EMR system, the doctors were making the decision primarily in their roles as board members, the business owners of the clinic. Unlike the doctors working for big hospitals, the doctors at the clinic had to attend to such issues as cost saving, operation management and so on. After the implementation of the EMR system, the doctors themselves became the actual users of the system. At this stage, they were primarily acting in their roles as doctors. They diagnosed and examined patients, prescribed treatments, and conducted surgery. Using the EMR system required the doctors to enter detailed diagnosis notes and treatment plan information into the system. Entering medical record notes required the doctors to use their typing skills and other computer expertise. For instance, they needed to create different templates of forms for recording different diseases. Therefore, the use of EMR system had an impact on the doctors' tasks and skills, the non-relational aspects of their work role.

The medical assistants also used the EMR system. They used it to enter some preliminary information about the patients. The medical assistants could easily retrieve the information from the EMR system, which could greatly improve their work efficiency. Typical comments by the medical assistants are: "I like it. It makes our life easier." "It is a time-saver. I would not go back to paper chart. Without the EMR, I do not know how to work now." A doctor remarked:

> *Nursing assistants use it to mostly enter some preliminary information. Later, they enter the prescriptions and authorization. They can do that much easier. They can read the physicians' message and when they got patients call, they can access the patients' chart much easier. They can know what the patients are talking about. So I think they have reaped more benefits in term of time savings, efficiency and less redundancy compare to us.*

After implementing the EMR system, three transcribers were transferred to be triage assistants. They were responsible for interviewing patients and entering preliminary medical data when patients first visited the clinic. The medical assistant head explained:

> *We used to have three transcriptionists and their job got changed because they did not have as much transcription to do from the doctor dictated with the hand held microphone. What we did is that we switched them over to what we called triage. What they do is… They take in the new patients. When the patients come in, they interview with them and take their past medical history. They no longer did the transcription. They just do the patients intake. We did not get rid of anybody. We just switched their job.*

We see how the use of EMR system influenced people's tasks and skills, the non-relational aspects of different work roles. This change then had impact on the relational aspects of different work roles in the clinic. Medical regulations required the doctors to produce detailed medical notes. The doctors could not pass the task of writing notes to their medical assistants. One nurse said, "If the doctors could ask us to write the medical notes, they would ask us to do it." The nurse smiled while she said this; however, cynicism is evident in her comment. The nurse was pointing out an unwritten rule in the social structure at Alpha Clinic: The doctors simply passed anything tedious off to the medical assistants. The doctors had the right and power to ask the medical assistants to perform various tasks, as long as it was allowed by relevant laws and regulations. However, the regulations on medical records prohibited the doctors from passing the work of entering medical records notes to the medical assistants. Before the EMR adoption, there were transcribers doing the dictation work for the doctors. After that, there were no more transcribers. The transcribers became the triage assistants. The doctors had to spend more

time entering the notes themselves. As a result, the doctors had to do more "secretary type" of work. This situation was not what the doctors liked and it was unexpected by them before the implementation of the system. The introduction of the EMR system threatened to change the traditional social structure in the clinic. It is clear that the use of the EMR system in the clinic led to "the changes in the division of labor and patterns of dependency among the actors involved" (Orlikowski, 1989, p. 207).

The doctors then found ways to work around the EMR system. When they were seeing patients, the doctors chose not to enter the detailed discussion and treatment part of the notes. They just left these items blank in the EMR system. The software company did not expect this type of behaviors when they designed the EMR. The EMR system allowed this to happen. More importantly, the doctors were able to do so because of the existing social structure and culture in the clinic. There were no supervisors above them to regulate how they practiced, including when and how to write medical records. The CEO was one of the doctors as well. All the doctors were practicing medicine individually. All of them had their own specialties. Since it was not an acceptable behavior to intervene in other colleagues' way of practicing, all the doctors enjoyed a high degree of autonomy. In a partnership, it was in the interest of these board members to get along with each other. The medical assistants worked under the supervision of the doctors. The assistants were not allowed to challenge the authority of the doctors. The administrator was hired by the doctors and had no supervising power over the doctors either; therefore, the administrator was not allowed to determine how the doctors should use the EMR system. Thus the doctors could work around the EMR system without any immediate consequences.

By using the scientific concepts of social structure and culture, one can resolve the apparent anomaly: Why did the behavior intention fail to lead to the actual use? The answer lies in the fact that the doctors were playing double roles at the same time, one as the board members (business owners) and the other as doctors. As board members, they needed to consider the operational issues such as cost saving and improving the work efficiency of the staff. Therefore, the motivation of the doctors' to adopt the EMR system was to achieve the organizational goals. Their second role as practitioners required them to use the EMR software heavily. They needed to feed the system with the diagnosis notes and prescriptions. They would find a way to work around the EMR system and could do it without consequences. Although they were still "using" the system, they were using it in an awkward way.

In addition to the two roles of doctors and board members, they were also playing different domestic roles. They were expected to spend time with their family members. If they had to use their personal time to catch up with the documenting work after their clinic hours, it would significantly cut down on their personal time. The doctors' behaviors related with the adoption and using of the EMR system were then determined by their multiple social roles both within and outside of the organization. Because the doctors needed to play their different social roles at the same time, their intention to use the EMR system had not turned into actual usage, at least not in the way as the doctors and the software company expected.

There is an additional explanation for the anomaly. The improvement of the speech recognition function of the EMR system could help turn the doctors' intention to use into

actual use. However, this might be only a minor contributing factor that could lead to the doctors' use of the EMR system. Only improving the speech recognition function of the EMR system might not change the doctors' behaviors in using the EMR system. The reason is that the doctors might not want to record their detailed diagnosis into the system in front of their patients. This point will be further explored later in this chapter.

4.3.2 Anomaly 2 - "No Intention to Use and Actual Behavior"

Next, I tested the relation *f* in the TAM model the second time (as shown in Figure 11 on page 50). The TA models give rise to the anomaly that actual behavior happened even without intention to use. After implementing the EMR system for several months, most of the doctors did not like using the system and apparently had no intention to use it; however, they still kept the system and used it although they had reasons and the power to stop using it. This is an apparent anomaly from the perspective of the TA models, as they would posit that if users have no intention to use, they will not use the technology. I try to understand the doctors' behaviors by closely looking at their subjective understanding. One doctor complained about the EMR system's lack of modularity:

> *I think the biggest issue is that the system I use does not have modularity. For example, if today I don't like my system, I try a new software system, I said ok I want to go with the new system, but I can't because I need to make sure all the records transferred to the new system and the system can talk to the new system.*

> *…We were very aware of the problems but it is not something that you can easily go back and change the track because it is very costly. You put a lot of money into EMR and you struggle with it, learn it and go with it, you know.*

We can infer from the doctor's comments that the sunk cost of investing on the EMR system was a major reason that the doctors did not stop using it. This finding is consistent with the results of studies on project escalation (Keil et al., 1995b). The doctors continued using the EMR system, although in an awkward way. After two years' implementation, the EMR system had been institutionalized in the organization. Many of their patients' medical records were transferred and stored in the system. It was simply too difficult to switch back to using paper charts entirely or to another EMR system. In addition, Alpha Clinic signed a two-year contract with the software company to use the EMR system. The doctors were bound by the contract to use the EMR system for at least two years. Therefore, they were business owners who had the role of "legal party" to play, not only as individual medical professionals.

The social structure at Alpha Clinic can help explain the anomaly. The EMR system could not directly improve their work efficiency; however, the doctors could not easily discontinue using the system at the clinic. They were not the only people in the organization using the technology. The medical assistants also used it. The doctors also recognized that fact that "[the medical assistants] have reaped more benefits in term of time savings, efficiency and less redundancy…" The medical assistants were satisfied with the EMR system because it did help them in their work routine. "The EMR system can help find the patients' files more quickly." The triage assistants interviewed the first-time patients and recorded their medical history, allergy information, demographic and contact information. This work process saved the doctors' time in writing medical records. The EMR system could be used as a good organizing tool. With the productivity improvement

of the medical assistants, the doctors, as the business owners of the clinic, could greatly benefit from having the EMR system, whether they were fully aware of it or not.

Based on the above discussion, we can see that the doctors, as medical practitioners, might have no intention to use the information technology. However, as business owners, they had to consider the consequences of replacing an information technology with a new one and the sunk cost of implementing the EMR system. Considering the benefit the clinic could gain from having the system as an organizational tool, the doctors might regard continuing to use the EMR system as rational. In sum, the doctors' use of the EMR system was the result of the balancing effort of the doctors (board members) between their double roles.

4.3.3 Anomaly 3 "Perceived Ease of Use and Perceived Usefulness"

The TA models also give rise to the anomaly that perceived ease of use has no effect on perceived usefulness (relation *d* as highlighted in Figure 12). Most medical assistants and doctors agreed that the EMR system was "straightforward and easy to use". The doctors could easily design their customized templates based on different disease cases. Typical comments by the medical assistants and doctors include:

> *It is a point and click system. If you have any type of computer experience, it is not a difficult system.*
>
> *I think it is user-friendly for the doctors and for us as far as the exams are put together and you can look at and see exactly without opening each exam and you can see what happened exactly. You can navigate to see the various messages without opening every single thing. That is really user-friendly.*

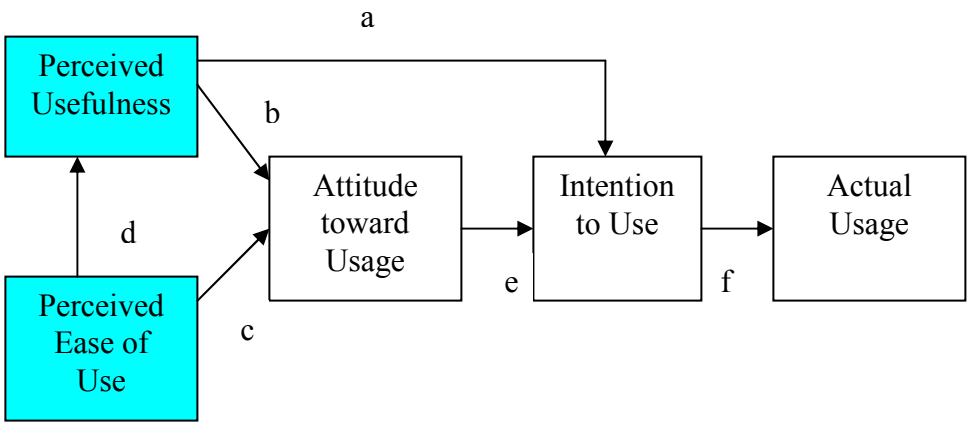

Figure 12. The Technology Acceptance Model (TAM) (Davis, 1989)

However, the "easy to use" technology did not make the doctors feel it as useful as they expected. This empirical finding contradicts the extant TA models which suggest that perceived ease of use has influence on perceived usefulness. I had encountered an apparent anomaly here. What is the explanation for this anomaly then?

A doctor compared the EMR system to a dictation machine.

> *When I used to use dictation [machine], if I lag behind, I just have to sit down for half an hour or forty minutes and then I can catch up. With the computer, I cannot do that. Like yesterday, I had some chart job to finish and then I came here and my computer suddenly cannot get the IP address and cannot synchronize my computer to the server and upload my chart. I had to call the technical person and he will come in next morning. So that evening I cannot catch up. There is no IP connection, and we cannot download your work.*

One medical assistant also complained:

> *One negative thing about the system is that, you have to click five different times to close the windows and log out of the exam. There are too many steps. If you just click one or two times to get out of the exam, it would be better.*

From the above comments, we can see that for the doctors and medical assistants, perceived ease of use also means flexibility of use. Unfortunately, that is a disadvantage of

the EMR system compared with paper charts and dictation machines. Furthermore, the technology could not easily adapt to institutional regulations changes. A medical assistant provided his perspective:

> *We are supposed to save paper. Doctors say you need to add antibiotic, and I put it in, send it straight from here to the pharmacy, whatever pharmacy you tell me. But in VA, you cannot, unless it goes from computer to computer. If it goes from my computer to a fax machine in a pharmacy, you cannot. It is illegal …Now starting from October, they even change the rules even more. You have to have a special paper. You cannot fax, print. Right now, we are printing the prescription. The doctor signs it. If you have a special paper, if somebody wants to changed it and copy it on a copier, it will not show up. It has to be a special paper. The EMR, technology is not keeping up with that change. With today's technology, people are forging and so [the regulators] come up with a special paper to keep that from happening. That will it harder for us because we have to go back to the old prescription that we used to give to the patients. EMR is supposed to save paper, so we have to go back using paper again.*

I found that the concept of "perceived ease of use" was too narrowly defined in traditional TA models. They ignored many social and institutional factors. Ease of use means more than just "user friendly" or "easy to use" interface. It also means that the technology should integrate with different social roles' working practices. This is a lesson relearned. Consistent with some previous research, I found that "perceived ease of use" is not the antecedent of "perceived usefulness" (Bajaj and Nidumolu, 1998; Chau and Hu, 2001; Hu et al., 1999; Jackson et al., 1997; Subramanian, 1994). Furthermore, "perceived ease of use" cannot compensate for lack of "usefulness" (Keil et al., 1995a).

It seemed that the EMR system was responsible for the doctors' dissatisfaction with the EMR system. However, one medical assistant said, "They always complain about that, even before we had the EMR system." If it was the unsatisfactory speech recognition

function of the EMR system that caused the doctors' dissatisfaction with the system, then why did they complain before adopting the EMR system? This is another anomaly I encountered.

After reflection, I realized that the EMR system itself might not be directly responsible for the doctors' dissatisfaction. Instead, the task of taking medical records itself might be. Some doctors do not regard the notes taking popular work to do at all, especially writing the detailed description part of the medical record. The doctors were result-oriented professionals and a "hands-on" culture at Alpha clinic was obvious. One doctor commented,

> *...the patients are more concerned about the outcomes, you know. How long they have to wait in the waiting room, what kind of services they got from a certain physician, how they were treated in the front office by other staff, what the outcome of our diagnosis for them? Did we cure their pain? Did we improve their function? These are the outcomes they are concerned [with].*

One medical assistant's comment confirmed the doctors' preference of "seeing the patients":

> *If my doctor is not putting his hand on his patients, in other words, seeing patients, and doing things, he does not feel he is doing his job. So, sitting there, and dictating into the machine what he just did, takes away the time of his putting his hand on the patients. He would rather be touching the patient than doing all the paper work: dictating and typing.*

The doctors understood that their major goal as doctors was to achieve good medical results for their patients. For them, taking medical records could not directly contribute to their core task of treating patients. Therefore, they complained about the task of taking medical records even before the adoption of EMR System. After adopting the system, they did not regard using it very helpful for their daily work either.

By looking at the interaction between the clinic and the software company, I found an alternative way to resolve the anomaly that perceived ease of use has no effect on perceived usefulness. In the process of selling the EMR system to the clinic, Delta Software Company's sales people "did everything they could" to get the contract with the clinic. The salespeople from Delta Software Company told the doctors that the learning curve of the using Delta EMR system would be only half a year. The salespeople's words had influenced the doctors into thinking that the software would be easy to use. As a result, the doctors had an unrealistically high expectation of what the EMR could do for them. They formed a distorted perception of ease of use too. One doctor provided the following comment when he looked back at the process of selecting the EMR software:

> *The way they [the salespeople of the software company] show the product and demonstrate when they try to sell their product, it looks very easy…because they are all trained to speak in a certain manner. [When] to pause, to do all that. But that is not the real life, you know. When you work in the real environment, you have all the problems come in.*

After the implementation of the EMR system, the doctors found that using the EMR system was not as easy to use as the software company's salespeople had told them. The software company's relation with the clinic changed dramatically after the clinic entered into the contract. Before Alpha Clinic adopted the EMR system, the clinic held most of the power as a prospective client. After the implementation, the power locus shifted to Delta Software Company. The administrator of the clinic told me the following story. The software company provided server maintenance service to the clinic. Once the clinic requested some upgrade service from Delta Software Company and got declined. Alpha Clinic subsequently refused to pay the monthly server hosting fee to Delta Software

Company, which in return threatened to cut off the server service to the clinic. Eventually the issue was settled after negotiation. Following the incident, the administrator started to have a very negative opinion about the software company and the EMR System. He said that he might suggest to the board members that they should switch to another software company's product after the contract with Delta Software Company expired. Although the administrator was not directly using the EMR system, his words should carry some weight in terms of EMR system selection and future usage decisions.

In sum, by looking at the social structure and culture, and the interaction between the clinic and the software company, we can resolve the apparent anomaly: why perceived ease of use does not lead to perceived usefulness? For the doctors, using the EMR system had not directly improved their working efficiency because it could not help patients get better medical results. Their social roles as doctors determined that using the EMR system to enter medical notes would not be regarded as useful to help improve their individual performances. The social dynamic of their role change from prospective users to actual users helped show how the professionals in the clinic formed and changed their "perceived ease of use" in the process of their interacting with an information technology.

4.3.4 Anomaly 4 "Perceived Ease of Use and Behavior Intention/Actual Usage"

The TA models give rise to the anomaly that perceived ease of use does not lead to behavior intention and actual usage. The relationships *c-e-f, d-b-e-f, and d-a-f* were tested and found not valid.

After the doctors encountered the high error rate problem with the speech recognition function, they complained to Delta Software Company. The technical

personnel from Delta Company suggested an "easy" way to solve the problem – using the Microsoft Word application to record the doctors' voices. One doctor explained:

> *There was a technical guy came and say that you can create a word file for a certain words because the computer cannot pick up and have many repetitions. Then what you do is that you say that word and link it to the [Microsoft]word file and so because there is a high frequency of the word the link, the computer will start to learn to start recognizing [the word]. But for me, that is not my job. I am a surgeon, you know. That is the job for the guy who makes the software. All he needs to do is to advance the level where I, as an end user, can pick up and do my reading. I should be able to say ok this is the type format of the word. This is the voice command for that word. And I would be able to say ok, that is a high frequency word. It can automatically create a word file. If I do all kind of this stuff to create my thing, what is the job for the software guy? I am talking as an end user, you know. If there is something very simple for somebody who does software all day long, but it is not my cup of tea, you know.*

For the doctor, using Microsoft Word application was indeed an "easy" task. However, this solution did not lead to the doctor's intention to use and actual use. This is an apparent anomaly because perceived ease of use (PEOU) does not lead to behavior intention (BI) and actual usage as the TA models suggest (Figure 13).

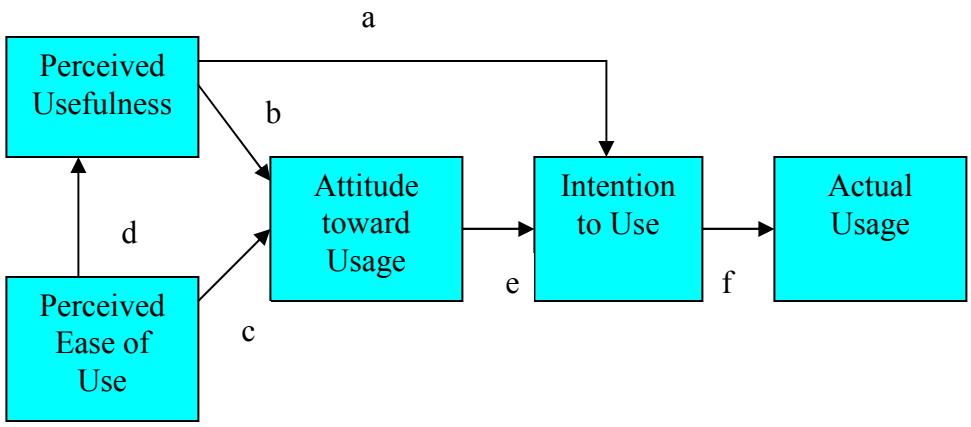

Figure 13. The Technology Acceptance Model (TAM) (Davis, 1989)

After reflection, I realized that I had uncritically taken a technological imperative view in my understanding of the construct of perceived ease of use. In other words, the technological imperative assumption is responsible for the anomaly. The technological imperative view suggests that technology drives the behaviors of individuals (Markus and Robey, 1988). When this view is used as the basis for an interpretation of rational behaviors, people in an organization need to adapt themselves to the requirements of technology and there is no need to adapt technology to the requirements of people or organizations. Therefore, when the technology is perceived to be easy to use, users will use it. However, this assumption turns out to be problematic as shown in this EMR adoption case. The normal and rational behaviors based on the technological imperative perspective would have included the doctors getting involved in English improvement courses to help them speak better and "standard English" or the doctors create Microsoft Word files to better use the speech recognition function of the EMR as the software company technician suggested. However, these behaviors did not happen. There was no behavioral change from the doctors in responding to the implementation process. The technological imperative perspective cannot help us to resolve the anomaly. Actually this perspective is responsible for the anomaly to occur and causes me, as an outsider, to feel puzzled. I rejected the technological imperative for my use in interpreting the participants' behaviors and tried to seek a better interpretation by looking at the social structure and culture in the clinic.

When the software company personnel suggested to the doctors the "easy" solution of inserting Microsoft Word files, this suggestion actually aroused strong feelings from the

doctors. “It is not MY cup of tea.” The cynicism is evident in this doctor’s comment. The doctors did not regard using the seemingly “easy” tool as a necessary way to do their “core” job – treating the patients. As the clients of the software company, they believed that it was the job of the software company to make the system easy to use. Therefore, even if they regarded the task of creating a Microsoft Word file as easy, they did not do it. The doctors’ social role as “medical professionals” determined that they would not regard using Microsoft Word file to solve the data entering problem to be consistent with their social identity. As we have discussed in anomaly one, the social structure in the clinic determined that the doctors chose to use paper charts or write on papers as a way to work around the system.

Many previous studies found no significant relation between perceived ease of use and behavior intention either (Bajaj and Nidumolu, 1998; Chau, 1996; Chau and Hu, 2001; Hu et al., 1999; Jackson et al., 1997; Subramanian, 1994). However, they could not explain why it was not significant. Some researchers suggested that professionals, such as doctors, were a highly educated group of people, and they could easily learn how to use the technology (Chau, 1996). Therefore, for these professionals, ease of use is not a significant factor influencing their technology usage behaviors. This case study found that this explanation is not satisfactory. The complicated interaction between the social roles and the technology provides a better explanation.

4.3.5 Anomaly 5: Facilitating Factors not Useful?

The TA models give rise to the anomaly that facilitating factors such as training and technical support did not affect use. The software company provided training to the

doctors and medical assistants at the time of the implementation of the EMR system. However, the training did not impact the doctors' intention to use the EMR system.

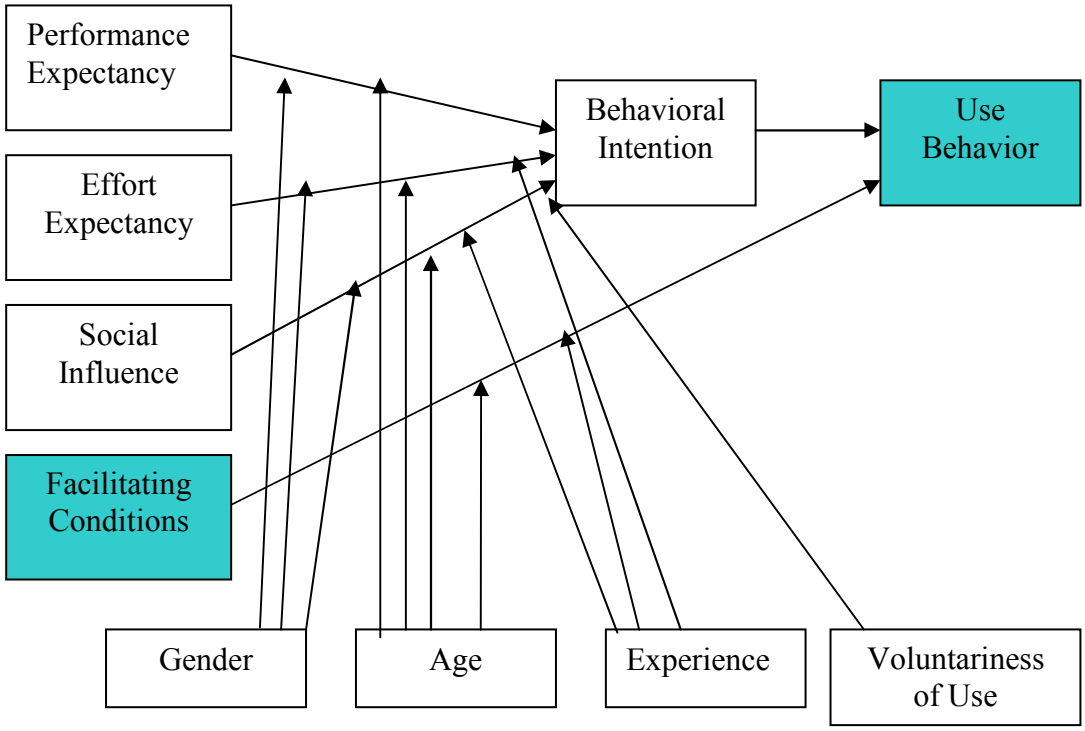

Figure 14. Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003)

The doctors received a week's training from the software company's training personnel. The medical assistants received three days of training. The doctors would use more features of the EMR system than their assistants according to the design of the EMR system. However, some of the doctors were not serious enough in learning how to use the EMR system. One doctor commented on his experience of receiving the training:

> *I should have paid more attention to learn how to use the system. I never made good notes and read the notes. I forgot certain steps. You know…*

The doctors were well-respected professionals in the western society and they were also the owner of the business. The training session was just a part of the contract obligation for the software company. The training personnel from the software company were not in a position of making the doctors seriously study how to use the system. The administrator and the medical assistants did not have the authority to force the doctors to learn the EMR system either. More importantly, the doctors did not regard using EMR system to deal with medical records as an important task for them in the first place. They thought that they were too busy to devote much time to learning how to use the system. Therefore, although Delta Software Company provided more training to the doctors than to the medical assistants, the training proved to be less effective than what was expected. It is no wonder some of the doctors claimed that the learning curve of using Delta EMR would be two years long.

The training personnel from Delta Software Company believed that the medical assistants did not need to "learn more than they needed in their work" about using the EMR system. The medical assistants therefore received less training than their doctors. However, the software company's decision might be unwise. One medical assistant was always enthusiastic toward learning more about the EMR system. He commented:

> *We have not got a lot of training… They only showed us the piecemeal. So by asking questions, I learned how I do this, how I do that. How everybody is related with the EMR. Ok, that is the part you are going to use, but when you started to use it, it is not that true. You need to be able to know how the information was gathered, and when it is gathered, how it is got input there, which is really has a lot of things to do with the patients and the way you set it up. I don't know it. They try to keep the privacy or I mean every program I worked at, not only here, but also at Fort Green, they only let you know a little bit, like they want to keep it a top secret. You cannot learn all about the system. Even this system, I am pretty sure that there are*

tons of stuff that may make our life easier and faster. But it costs money to teach people and time. They are just ok with it and skip them, and just give them the very minimum. [If the medical assistants] need it, then they ought to learn them on their own and ask questions.

The doctors also interacted with the medical assistants on technical issues in using the EMR system. For example, the medical assistants' ability to use the EMR system effectively had direct impact on the doctors' work. One nurse described one of her unpleasant experiences with the EMR system. She got only very basic training to use the EMR system when she joined the clinic. Once she was using Delta EMR system, she closed a window from the computer screen, believing that she was only closing her nursing note file. However, she mistakenly deleted the doctor's medical notes. This doctor had to reenter the notes and he was of course not happy with her. From this incident, it is obvious that the EMR system in an organization is not only an individual work tool, but also an organizational tool that may have impact on the relations of the social roles in organizations. The interdependent working relationship between the doctors and medical assistants also suggests that more comprehensive EMR system usage training for the medical assistants might be necessary, even important for the successful implementation of the system.

Technical support was available from Delta Software Company. Once the users in the clinic encountered any technical problems, one triage nurse acted as the coordinator and she would contact the software company's technical support department for help. She then provided technical support to both the doctors and medical assistants in the clinic.

The triage nurse wished that the software company could provide more detailed technical training so that she would be able to solve more technical problems by herself. She wanted to be an "empowered" user. The knowledge about how to fix technical problems would enable her to be a better technical coordinator for the EMR system. However, her wish was never realized:

> *...At Delta, they have a support team. If we have any problems, we call them and they can log in to our system and solve a lot of problems for us. They know where to go and what to do. For some problems, I can solve them, but for some, I cannot. So I use them quite a lot. The problem is that every time I call in, there is somebody new to answer my question. Sometimes, they cannot answer my question. It is frustrating for me because I do not just want you to fix it, but tell me why it is and so that the problem would not happen again or I can fix it. They did not tell me why, and what the big problem is. I am the go-to person for Delta and if there is any problem people will go to me and I will go to call Delta. It is a triangle. I have to dial the number, wait on line, and let them log in to our system. I wish I could just fix it.*

To summarize, facilitating factors such as training and technical support are not an "objective things" as the TA models suggest. Rather, they are socially constructed processes in which people interact with each other. The content, frequency, quality and results of these interactions are shaped by the expectations and sense-making processes of different social roles involved. Therefore, the impact of these facilitating factors upon the adoption and usage of information technology is much more complicated than the TA models posit.

4.3.6 Anomaly 6: A Success or a Failure?

We have to ask ourselves this question: Is the implementation of the EMR system at Alpha Clinic a success or a failure? The TA models assume that the individuals'

adoption of information technology will ultimately lead to organizational IS success. It seemed that the doctors at Alpha Clinic were "using" the EMR system; then why did they think that it was a failure? This is an apparent anomaly.

Some of the doctors were not happy with the EMR system, believing that it was a waste of money. One doctor commented:

> *After two years of using EMR, I still think my writing skills and speaking skills are much faster than my typing skills. From my childhood, I learned to organize my thoughts and write things in short hand or speak out things. I am still much faster. I am not [of] a generation that grows up from childhood sitting at computer and organizing my chart and type. I just do not have that mind. I organize my thoughts as I write, you know. Maybe the next generation will be better. That is the things that I am struggling with.*
>
> *I think the investment is very costly. The long-term benefit has to wait to see. We are losing money…When you are given a new technology, and it may takes more time than that, I might say that I might spend less money for transcription, but my time has value too…If you put a value on my time, maybe I am not having a benefit out of it..*
>
> Another doctor commented:
>
> *The system is getting slow. It is just two years since we have got this system, if you need an upgrade already, it seems to not be a very well designed system. We know what our capacity is expected to be. The system is supposed to meet that capacity. In that sense, the system fails. It is not able to handle it. It has not been to the point that it crashes all the time but the capacity is lacking.*

Most of the medical assistants were happy with the EMR system, and they thought that the clinic had made the right decision to implement it. Their typical comments on this issue include: "So it is a great thing. … I use it all the time. I cannot live without it now." Why did the medical assistants and the doctors have such different evaluations of the "same" EMR system? This is another apparent anomaly.

This anomaly was resolved by revising the extant TA models' assumption that an information technology is a monolithic tool to all users. Instead, the EMR system means differently to different social roles in the organization. The doctors and medical assistants used the same package of the EMR system, but different features. More importantly, these "users" have different roles. The "same" technology means different things to them. The extant TA models fail to recognize this fact and give rise to the anomaly.

In Schein's (1985a, 1985b) three-level model of culture, values represent espoused beliefs, explaining why people behave in a certain way. In the remainder of this chapter, I use the values held by the doctors as the interpretive lens to resolve the anomalies identified in the section. Along with Schultze (2000), I believe that using an established framework in a published work to interpret the data would give this analysis more credibility. Kohli & Kettinger (2004) suggest four values that doctors generally hold: economic values, altruistic values, legalistic values and status values. These values form the ultimate rationale for doctors' behaviors. I used this framework to look at the data deductively and found the first three values could help better interpret the doctors' behaviors.

First, when I infer the theory-in-use by the doctors as being theory of economic values, it would allow me to understand some of the doctors' behaviors. The economic saving is one of the major reasons for the clinic to implement the EMR system. The doctors used to dictate their medical record notes and then have them transcribed by the transcribers. With the implementation of the EMR system, the clinic had hoped to save on the cost of transcription, storing the paper charts and shipping the paper charts between

different clinical sites. The doctors used the educational videos embedded in the EMR system to show their patients information about their disease. Then the doctors could charge the patients for the educational sessions. Interestingly, I found that Delta Software Company even reminded doctors of the billing code for the educational sessions at its web site.

However, the doctors were only partially satisfied with the economic benefits of using the EMR system. The doctors were concerned about the high costs of initial software purchase and system maintenance, along with the intangible time cost incurred to their work and family life. They were spending valuable time entering the notes into the EMR system. For them, the cost saving benefits had not been fully realized. In fact, one of the doctors at Alpha Clinic believed that they were losing money by using the EMR system:

> *We don't have an in-house IT person right now. We hire a person on contractual basis. I think the cost is around $ 20,000 a year, just for support. Just a labor cost… The technology is good, but technology is very costly…But you say, you can save money by using it, I said, NO. If I was in a business, was looking at the bottom line, I would be shooting myself in the foot by doing what I am doing.*

Using the EMR system had not improved the doctors' individual working efficiency. For many doctors, notes-taking was not a part of "practicing medicine". Notes-taking was something that had to be done and could not generate revenue. When time was short, the doctors chose to deliver patient care instead of writing the notes. The doctors were not willing to spend their "billable hours" on writing the notes. For them, it was also in the interests of patients for the doctors to devote more time to "patient care". Patients had waited for a long time to be seen. They would not be happy if the doctors spent more time entering notes than talking to them. By spending time with patients, the doctors could

build up rapport and trust with their patients. In the long run, it might bring more economic benefits to the clinic as a result of a bigger client base. The doctors at Alpha Clinic apparently wanted to spend as little time on writing notes as possible. This explained why the doctors chose to write short notes on pieces of paper and worked around the EMR system.

If we use the economic values as the theory-in-use to interpret the doctors' behaviors with regard to using the EMR system, we can see that it has a negative impact on the doctors' economic benefits. Therefore, we can say that it is rational for the doctors to work around the EMR system by not entering the detailed notes into the system in a timely manner. And that is why the doctors regarded using the EMR system as a failure. Using IT is always regarded as the ultimate goal in the TA models. The TA models tend to uncritically assume that using information technology is always beneficial to the user regardless of the context. However, this assumption proved to be wrong in this case.

Economic value itself is not enough to explain all the behaviors of the subjects. At this point, other behaviors, which previously appeared normal or unproblematic, no longer appeared so. For instance, if the theory of economic value is the theory-in-use by the doctors, the normal and rational behaviors of the doctors would be rushing patients in and out of the consultation sessions. The more patients they see, the more money they could make. However, some doctors spent extremely long time in the consultation sessions with their patients. For them, practicing medicine seemed not be a "money-making" business at all. We have heard one doctor's comment before:

The technology is good, but technology is very costly…But you say, you can save money by using it, I said, NO. If I was in a business, was looking at the bottom line, I would be shooting myself in the foot by doing what I am doing.

I realized that I encountered another apparent anomaly here. Why did not the doctors think they were "in a business" when they were the business owners of the clinic? There could be two plausible explanations for this anomaly. One is that the doctors talked in a way inconsistent with their own beliefs. Another is that I had not successfully understood the meaning behind their behaviors yet. I chose the latter explanation and sought to interpret the doctors' behaviors differently. "Economic value" therefore ceased to exist as the only basis of my interpretation.

Altruistic value is another plausible theory-in-use for the basis of my interpretation. Altruistic value means that these doctors' behaviors are driven primarily by the goal of helping patients and they are working for the best interest of others, rather than working for money only. By looking at the bigger picture of their work context and the nature of patient care, I can infer that some of the doctors' behaviors can be attributed to altruistic value. Adopting the EMR system in the clinic is partially driven by the altruistic goal of pursuing patients' interest. The doctors in the clinic believed that the electronic medical charts would be the future direction of development. In the long run, electronic medical records might be beneficial for their patients. Although the doctors were paying for the EMR out of their own pockets and they might lose money in adopting the EMR system, they still believed that they held the promise of future development of hospital information systems. One doctor commented:

> *You can download the report into my chart if you want to. I can scan the paper chart and keep it. All the medical records can be better handled in electronic form. If I really want to, I can keep a patient's record into a disk. That is the future of the medical records. In theory, this can be done in the future. If you leave this state and go to somewhere else, you can take it with you. That is the future direction EMR should go. Electronic Health Records would enable the patient to take his information with him. Everybody else keeps the record. I see a lot of patients, and [sometimes] they do not remember what surgery they had. And that helps.*

The doctors' altruistic values can help us understand why they were willing to spend half or one hour with the patients, communicating with them and providing consultation. Doctors need to be responsible for their patients. Doctors need to document their encounter details, diagnosis, progress reports, and results. The information in medical records can be beneficial to patients, as well as to the advancement of medical sciences. Using altruistic value as my interpretive lens, I can have a different understanding of the previous comment by the doctor:

> *The technology is good, but technology is very costly…But you say, you can save money by using it, I said, NO. If I was in a business, was looking at the bottom line, I would be shooting myself in the foot by doing what I am doing.*

Although the doctors were actually business owners, they did not regard themselves as pure business persons. They understood themselves as medical professionals that helped patients. That is why they were still keeping the EMR system although it was "like shooting myself in the foot".

Next, I used the legalistic values of the doctors to interpret the doctors' behaviors. Medical records are important legal documents because when there is a malpractice lawsuit, medical records become important legal evidence. Doctors are required by

practice regulations to write accurate medical records and ensure the integrity of the records. The legalistic aspect of medical notes is always on the minds of doctors. One doctor at Alpha Clinic remarked:

> *You have to rely on someday some of the records to be [able to] stand up the screening at the court by the attorney. They might say, doctor, you have examined the patients and created the templates and all the templates are all the same. How can we be sure that when you examine this, what you see is exactly what you see?*

Doctors are concerned that the medical records might turn against themselves when there is potential malpractice. The records will be brought into court. Doctors need to protect themselves by providing justifications for their diagnosis, treatments, and decisions. Their medical records need to "look good" in court. If they fail to do that, doctors' credibility will be in danger.

In talking about his feelings on the "paperless office", a medical assistant described the culture of "need to protect yourself" in medical organizations:

> *Everybody wants a copy of everything. Everybody is paranoid. I need to have a copy of that. You do not need to have it. The patients want to have it, the billing people want to have it, the system wants to have it. Everybody wants to have a copy of stuff. It is in the system. We could have saved tons of paper if we save the copies. Human nature! Everybody wants to protect their own back. When I started here, somebody, some patients told the doctor and said you have not done so and so, I said, right here, on this day, I called you, tell you to do so and so. It is not just my words. You have to be able to show that you did it. This is just the way the society is. It is everywhere and all the time. If you do not have something written down… The same is true for the insurance companies. If the patients go to the insurance and said the doctor did not do anything. The insurance company would believe the patients if you did not write it down. So it has to be documented. If you give the patient some medicine, you need to write it because if you did not write it, it means you did not do it. Unfortunately, the society expects and there is no more trust. You just need to protect yourself.*

Because of the nature of health care industry, the work carried out in a clinic has much legalistic consequences. Berg and Bowker (1997) provide good insights on the legalistic aspect of keeping medical records:

> *In extant medical work, this legal story is simultaneously the story produced for the insurance companies' interest; it legitimates the actions performed as well as their costs. These are particular kinds of stories. The legal record should not contain inconsistencies or lacunae (Bowker 1994). It should not refer to things that "just happened." Everything has to be explicable and justifiable. If the patient died, it was despite the full operation of due process; if a test was performed, it was because there was a clear-cut medical indication. The outcome of the legal record (the moral of the story) is the meta-affirmation that the medical system is fully penetrated and underwritten by the legal system, that the doctors did everything that they could…*
> *(p. 524).*

Electronic Medical Records Systems have been expected to provide "an unmediated picture of doctors' thoughts and produce an untainted, complete, error-free document…" (Berg and Bowker, 1997, p. 523). This suggestion assumes that the medical notes in the EMR system would be accurate and "objective" reflections of work carried out in medical settings. In reality, recorded notes are not objective representations of facts and events (Berg and Bowker, 1997). The EMR system has not helped the dream of the unmediated medical record to materialize either. Many medical decisions made by doctors are difficult to evaluate by outsiders. Furthermore, there is little external control over the actions of doctors. Doctors are autonomous professionals and the culture among them is a clan-like one (Kohli & Kettinger, 2004). Doctors have the control of how they practice medicine, including when and how they write up their notes. Even if they lag behind on their notes-taking for weeks, or months, nobody would intervene to force them to catch up.

More importantly, nobody can actually control what doctors enter into the EMR system many days after they actually see the patients. In fact, using the EMR system provides doctors with a good excuse for not entering the records in a timely manner.

I am not suggesting that doctors would deliberately covering up something by using the EMR system. However, when doctors try to write medical records that "look good," the "objectiveness" of medical records could be very doubtful.

In summary, based on the economic, altruistic, and legalistic values of doctors, we can better understand the doctors' behaviors with regard to the use of the EMR system. In this sense, the use of the EMR system is an emergent phenomenon resulting from the technology's interaction with the multiple roles of the doctors as business owner, medical professionals, and societal men.

4.4 Summary

In this chapter, I presented a detailed interpretive investigation process. From the data in the case study, apparent anomalies that the extant TA models would find hard to explain were identified. I resolved these anomalies by employing the scientific concepts of social structure and culture. In next chapter, I will provide a synthesis of the results of this interpretive investigation.

CHAPTER 5 Discussion

In this chapter, I provide a synthesis of the results of this interpretive investigation. This research is guided by the following research questions: What is the interpretive understanding of people's use or non-use of an information technology in organizations? How can this interpretive understanding help explain why the extant TA models fail to predict as they purport to? The findings from this investigation are related to the extant technology acceptance literature in order to answer these questions.

This discussion first recapitulates the major findings in this study. Following that, I discuss how Lee's (1991) framework is used in this study to help revise and strengthen the TA models. Lastly, I discuss how to evaluate the validity of this interpretive investigation.

5.1 Major Findings

A major finding of this research is that behavior intention is not a reliable predictor of human behaviors in the adoption of an information technology. As presented in Chapter 4, I tested the relation between behavior intention and actual behavior. The TA models give rise to the anomalies that intention does not lead to actual behavior and that actual behavior can happen even without the behavior intention. In other words, people do not use an information technology even if they initially have the intention to use it. On the other hand, the actual use of an information technology does not necessarily mean that

users have the intention to use it. As this study found, many complex organizational factors come in between behavior intention and actual use. The TA models' suggestion that behavior intention (BI) has a direct effect on actual usage is either wrong or too simplistic. The doctors' different social roles within and outside of the organization have proved to be an important factor in influencing their adoption of the EMR system. At the same time, even when the doctors, as medical practitioners, might have no intention to use the information technology, their social role as business owners of the clinic determined that they could not easily stop having the EMR system. Therefore, although the doctors still used the system at the clinic, it did not necessarily mean they had the intention to use it. Behavior intention is thus not a reliable factor in predicting information technology adoption behaviors.

The TA models also give rise to the anomaly that perceived ease of use (PEOU) does not lead to perceived usefulness (PU). Although the doctors thought that the EMR system was "straightforward and easy to use", they did not think it as useful as they had expected. Based on my interpretive investigation, I found that the EMR system itself was not directly responsible for the doctors' dissatisfaction. Their social roles as doctors determined that using the EMR system to enter medical notes would not be regarded helpful for improving their individual work efficiency and effectiveness. Furthermore, the social dynamic of role change from prospective users to actual users influenced how these professionals in the clinic formed and changed their "perceived ease of use" of the EMR system.

The TA models also give rise to the anomaly that perceived ease of use (PEOU) does not lead to behavior intention (BI) and actual usage. This anomaly was illustrated by the example of using the Microsoft Word application in an attempt to address the high error rate problem of the speech recognition function. Using Microsoft Word was perceived by the doctors to be easy; however, this perception did not lead to doctors' behavior intention and actual use. My interpretive investigation showed that the doctors' self identification as "medical professionals" lead to their perception of using Microsoft Word file to solve the data entering problem as inconsistent with their social identity. The doctors then chose to use paper charts or write on pieces of paper as a way to work around the system.

I also found that facilitating factors such as training and technical support are not "objective things" as the TA models suggest. Rather, these facilitating factors are socially constructed processes in which people interact with each other. The content, frequency, quality, and results of these interactions are shaped by the sense-making processes of different social roles involved. Therefore, the impact of these facilitating factors upon the adoption and usage of information technology is much more complicated than the TA models posit.

Lastly, I found that the economic, altruistic, and legalistic values of doctors can help us better understand the doctors' behaviors with regard to their use of the EMR system. The adoption and use of the EMR system is an emergent phenomenon resulting from the technology's interaction with the multiple roles of the doctors as business owner, medical professionals, and societal men.

5.2 Revising the Interpretive Understanding

Lee's (1991) integrated framework combines the positivist and interpretive approaches to help better conduct social science studies. To recapitulate, this framework consists of three levels of understanding: the subjective understanding, the interpretive understanding, and the positivist understanding. The subjective understanding is the common sense and daily understanding held by the human subjects. The interpretive understanding is the researchers' interpretation of the subjective understanding. The positivist understanding refers to conceptual understanding created and tested by the researchers to explain the empirical reality. The interdependent relationship among these three different understandings allows researchers to combine the positivist and interpretive approaches to better conduct social sciences studies.

The TA models are instances of positivist understandings. In this study, I found that the extant TA models have failed to predict the information technology adoption behavior. I argue that the positivist understanding contained in these models is based on a faulty interpretive understanding. The root reason for this faulty interpretive understanding is that previous researchers have not accurately captured the subjective understanding held by the human subjects in their studies. The solution I took was to provide a reading of the actual subjective understanding held by the doctors, medical assistants, and administrator working in the organization. This reading took the form of an interpretive case study. I focused on studying the process of how they form the subjective understanding. I was thus able to discover the underlying factors that influence individuals' behaviors such as the adoption and use of an information technology.

The extant TA models are primarily concerned with how individuals would expect to improve their work efficiency and performance with the aid of an information technology. The "rational decision maker" assumption is implicit in the extant TA models. The "rational decision maker" assumption is deeply rooted in western society's tradition of believing in the power of technology. According to the assumption, doctors would be understood as "users". They are simply rational decision makers who are expected to use the EMR system to improve their work efficiency. As individual users, they determine what they want to do, including whether or not to use the information technology and how to use it. This case study proved that the "rational decision maker" assumption was wrong. Consequently, when we used the TA models to explain the human subjects' behaviors, we encountered many anomalies. The appearance of resistant behavior with regard to the use of the EMR system in the clinic would then seem surprising to an outside observer.

Based on the reading of the actual subjective understanding held by the users, including the doctors, medical assistants, and administrator working at Alpha Clinic, I conclude that the adoption of the EMR system is not a single act of rational decision making as the TA models suggest. Rather, it is an emergent phenomenon resulting from the interaction between the technology and the social actors' different roles. "User" is in reality not a monolithic concept as suggested in the existing TA models. These "users" play different social roles in the social structure and sometimes simultaneously play different roles. For different social roles, there are different rationalities, or rationales for their behaviors. The most important aspect of my revised interpretive understanding would be the professionals' need to balance their different social roles. This "balancing roles"

interpretive understanding can help us better understand the doctors' behaviors. For instance, the doctors decided to implement the EMR system not because they liked it and expected it to improve their work efficiency or performance, but because they, as board members of the clinic, had to play the role as business owners. Those organizational objectives, such as cutting the cost of transcribing, solving the charts storage problem, were the major motivation for them to acquire and implement the EMR system. In their role as doctors, the doctors themselves had to use the EMR system heavily. They needed to feed the system with detailed diagnosis notes and prescriptions. Therefore, their social role as doctors determined that they would find ways to work around the EMR system. In addition to their organizational roles as board members and doctors, they also needed to balance their roles outside the organization, interacting with their family members, the software company, the regulatory agency, patients, and potentially with legal personnel, such as lawyers and judges. In other words, they needed to play their role as "whole human beings" in the society. In interacting with the EMR system, they needed to consider economic and legal aspect of the system, in addition to its usability. In sum, their use or non use of the EMR system is therefore an emergent phenomenon resulting from the technology's interaction with the multiple roles of the doctors as business owner, medical professionals, and societal men.

5.3 Revising the Positivist Understanding

Based on the revised interpretive understanding, "the adoption of an information technology is not a single act of rational decision making, but an emergent and ongoing

phenomenon", I revise the positivist understanding on the adoption and use of an EMR system (Figure 15).

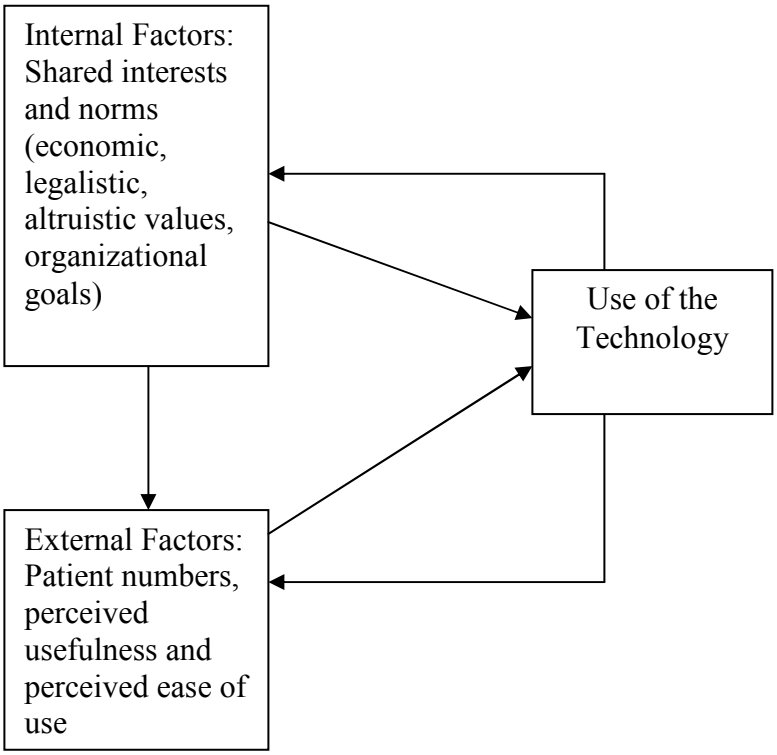

Figure 15. The New Technology Acceptance Model

The new interpretive understanding leads to a new theoretical explanation: the adoption and use of an EMR system in a clinic is determined by internal factors and external factors. The internal factors include the shared interests of the organizational members and norms. These interests include the economic, altruistic, and legal values held by the doctors as well as the organizational goals. The external factors include the patient consultation numbers and perceived usefulness and perceived ease of use. The more patients the doctors have to see, the less likely the doctors would use the EMR system in the clinic. The perceived usefulness and perceived ease of use retain the essence of the

extant TA models. This new theoretical explanation places a heavy emphasis on the explanatory power of the internal factors. In other words, the adoption and use of the EMR system is largely determined by how the doctors balance their different social roles. The external factors are determined in large part by the internal factors.

Consistent with the Social Cognitive Theory (Bandura, 1986; Compeau et al., 1999), this new technology acceptance model suggests that internal and external factors and behaviors are determined reciprocally. The internal and external factors determine the usage behaviors and the actual use of the information technology has an impact on the internal and external factors. For instance, the adoption and use of an Information Technology has an impact on the shared interest of the professionals and on the number of patients the doctors can see in a clinical day. After the adoption and use of the technology, the professionals form their new perceptions of using the information technology. Their experienced ease of use and experienced usefulness leads to new perceived usefulness and perceived ease of use. By recognizing these feedback relationships, this new model has embedded the interpretive understanding generated from this study: The adoption of an information technology is not a single act of rational decision making, but an emergent and ongoing phenomenon.

The new technology acceptance model must undergo three tests (Lee, 1991). The first test would ensure that the subjective understanding is embedded in the positivist understanding. In other words, the new positivist understanding needs to account for the subjective meanings of the observed human subjects. Since I built the subjective meanings

held by the doctors directly into the "balancing roles" theory, the subjective understanding was therefore contained in the theory.

The second test would ensure that this study was successful in performing the task of embedding. Based on the new positivist understanding, I would specify the actions of the medical professionals. Then I explicitly assessed whether or not the real medical professionals would find these actions understandable. In other words, I used the method called "member checking" (Trauth and Jessup, 2000, p. 68). Several doctors who worked in similar healthcare settings were informally interviewed. Their responses were positive and improved my confidence in the validity of my revised interpretive understanding and positivist understanding. In addition, I used the method of "triangulation" (Trauth and Jessup, 2000, p. 66) in order to contribute to the validity of the positivist understanding. Triangulation can provide "corroborating evidence" from different sources. For example, I not only observed the behaviors of the doctors and nurses, but also expanded my literature review. I then triangulated these different data sources of information. I found that I had built a coherent justification for the proposed positivist understanding. As a result, through triangulation, the proposed framework apparently passed the second test.

The third test would "indicate whether or not the positivist understanding is confirmed, based on controlled empirical testing" (Lee, 1991, p. 360). This test would include rigorous empirical test using the positivist research procedures. As this task is beyond the scope of the current study, future positivist studies are needed to test the validity of this positivist understanding.

The new technology acceptance model proposed in this study represents only one example that illustrates how positivist understanding can be developed based on a revised interpretive understanding. This study makes no claim that this is the only or the best model that can be developed based on the revised interpretive understanding. However, the general lesson for the future technology acceptance models is that, we cannot ignore the fact that in the extant TA models the two constructs, "perceived ease of use" and "perceived usefulness", are too narrowly defined. The construct of perceived ease of use not only means the user interface and the ease of learning, but also means how using the technology can integrate with the current work practices in the organization. Also we have to redefine the construct of perceived usefulness to account for the impact of internal actors such as the shared interests of the organization members and norms.

5.4 Validating the Interpretive Study

Researchers have recommend sets of criteria for evaluating the validity of interpretive studies. Three criteria were selected from Lee (1991), Klein and Myers (1999), and Trauth and Jessup (2000) to validate this interpretive case study.

Lee's (1991) criteria are meant to judge the validity of ethnographic studies. One of his criteria states: "The behavior of the native does not, or no longer, strikes the ethnographer as absurd, peculiar, pointless, irrational, surprising, or confusing" (p. 350). This criterion is adopted in this study because it is critical for the researcher to understand the rationale behind the subjects' behaviors. Before the researcher could understand the rationale behind the subjects' behaviors, they appear to be irrational and confusing. The researcher cannot simply dismiss the "confusing behaviors" by claiming that the subjects

are behaving irrationally. Instead, the researcher needs to seek to read the meanings behind these behaviors. When achieving an interpretive understanding which can explain the rationale behind the behaviors, they should no longer strike the researcher as absurd, confusing, and irrational. The interpretive understanding can be said to have passed the test of validity.

The second criterion adopted in this study is called "breakdown resolution" in Trauth and Jessup (2000). "Breakdown resolution" means that the interpretation should be consistent with the data. When the interpretation is not logically consistent with the data, an anomaly (also called a breakdown) occurs. When that happens, the researcher should employ an iterative process to resolve the anomaly. In doing so, the researcher can uncover and resolve as many anomalies as possible and can increase the validity of the interpretations and conclusions of case studies.

Klein and Myers' (1999) developed seven general principles to guide interpretive field work and post hoc evaluation. They suggest that their proposed set of principles should not be applied mechanistically: "it is incumbent upon interpretive scholars to appropriate them and use their own judgment as to their specific application" (p. 88). Among these seven principles, I believe that the principle of dialogical reasoning is the most important one (Lee, personal conversation, 2007). Dialogical reasoning means that the researchers need to be willing to change their preconceptions (prejudices) which guide the original research design. When the research findings cannot support these preconceptions, they "may have to be modified or abandoned altogether" (Klein and Myers, 1999, p. 76). The interpretation held by the researchers will then be consistent with

the actual data that emerge in the research process. Since it is extremely important for researchers to have a considerable degree of openness to the data and a willingness to modify their initial assumptions, I adopted this criterion in evaluating this case study.

In the following part, I will discuss how I employ these three criteria to validate this interpretive case study.

Lee (1991)'s criterion: The behaviors of the doctors in using the EMR system are no longer irrational, but rational and natural when we take their multiple social roles into consideration. When we use the traditional TA models to look at the behaviors of the doctors, which is based on the assumption that the doctors were "rational decision makers", many of their behaviors related with the use of EMR system are irrational and absurd. For instance, they voluntarily invested money to acquire and implement the EMR system; however, they did not use it as they themselves and the software company had expected. The doctors worked around the EMR system by using paper chart or pieces of papers. However, when we developed a new interpretive understanding of "balancing roles", the doctors' behaviors in using the EMR system became rational, understandable, and natural. We can understand the doctors' behaviors as the result of their balancing the different social roles as medical professionals, business owners, and family members.

Trauth and Jessup's (2000) Criterion of "Breakdown Resolution": This study uncovered many understanding breakdowns in the process of the interpretive investigation. These breakdowns are the anomalies discussed in Chapter 4. Iterative processes were employed to make sense of the subjects' behaviors in order to achieve a better understanding of the "bigger picture", in which the behaviors of the subjects appeared

rational to us. For instance, I tested the relationship between "intention to use" and "actual use". If the doctors did not have the intention to use the system, they could have discontinued the use of the system from their medical practice. However, they still kept the system and used it. This is an "understanding breakdown". To resolve this breakdown, this study looked beyond what the extant TA models suggested. The theme of the interaction between the software company and the clinic then emerged from the data. I found that the dynamic of power shift between these two could help us better understand how the doctors were "rational" in keeping the systems in the clinic. They were business owners who were bound by the legal contract with the software company. The doctors had the role of "legal party" to play, in addition to their role as individual medical professionals. By forming a new interpretive understanding, I succeeded in resolving this "understanding breakdown".

Klein and Myers' (1999) principle of dialogical reasoning: In my interpretive investigation process, I let the data "speak" to me. The interpretive understanding was developed inductively and the subjects' understanding guided the development of my interpretive understanding. For instance, I found that I had uncritically taken a technological imperative view to look at the anomaly that "perceived ease of use (PEOU) does not lead to behavior intention (BI)". The technological imperative view suggests that technology drives the behaviors of individuals (Markus and Robey, 1988). When this view is used as the basis for an interpretation of human behaviors, people in an organization need to adapt themselves to the requirements of technology. There is no need to adapt technology to the requirements of people or organizations. Therefore, when the technology is perceived to be easy to use, users will use it. After I realized that the technological

imperative view was responsible for the anomaly, I rejected it for my use in interpreting the human subjects' behaviors. I tried other perspectives to understand the subjects' behaviors and infer their "theory-in-use". I found that the economic value held by the doctors could better explain their behaviors. However, the economic value alone was not sufficient to explain all the behaviors of the doctors because I realized that other behaviors, which previously appeared normal or unproblematic, no longer appeared so. I gave up using the economic value as the only basis for interpreting the subjects' behaviors. I then considered other values such as altruistic and legal values, until I achieved the more comprehensive "balancing roles" interpretive understanding. In this way, I followed Klein and Myers' (1999) principle of dialogical reasoning in conducting this interpretive case study.

5.5 Summary

In this chapter, I provided a synthesis of the findings of the interpretive investigation. Base on the interpretative investigation of the case study in Chapter 4, I provided a revised interpretive understanding. Then based on this new interpretive understanding, I revised the positivist understanding. Lastly, I discussed how to evaluate the validity of this interpretive case study.

CHAPTER 6 Conclusion

This chapter discusses the theoretical and practical implications of this research. Issues regarding the generalizability of this case study are also discussed.

The purpose of this study is to examine how individuals actually form their perceptions about using an information technology in an organization and find out why the extant TA models fail to predict as they purport to. In particular, it focuses on the adoption and use of an Electronic Medical Records System in a healthcare setting.

6.1 Theoretical Implications

This case study contributes to the literature by providing a disconfirmation of the extant technology acceptance models and, more importantly, a validated explanation for the TA models' failure. The "rational decision maker" assumption in the extant TA models was proven incorrect. Instead of seeking the subjective meanings actually held by the human subjects in the field, the traditional technology acceptance researchers had mistakenly used the subjective meanings that the information technology field had for them. For these researchers, the human subjects are just "users" who expect to use the information technology to improve their work efficiency and job performances. As individualistic theories, the existing TA models focus only on individuals' behaviors and treat the individuals as unrelated persons, ignoring the underlying rules which govern their

behaviors. For the traditional TA models researchers, no matter what social roles the users assume, all of them are just "rational users". These TA models therefore cannot explain the underlying mechanisms for use and non-use behaviors. This conclusion is also supported by Lamb & Kling (2003) who suggest:

> *IS researchers have tried to augment individualistic approaches like the technology acceptance model (TAM) with contextual elements to increase predictability (Karahanna and Straub, 1999; Venkatesh and Davis, 2000). Clearly, they recognize that more richly contextualized models can provide better understandings of ICT use and adoption. However, their theoretical bases (the theory of reasoned action and the theory of planned behavior) don't easily allow for augmentation of this sort (p. 222).*

Using an interpretive case study, I provided a new interpretive understanding on the adoption and use of an information technology. This interpretive investigation is based on a reading of the actual subjective understanding held by the human subjects. As a result, this study is able to acquire a more accurate account of the subjective understanding, the everyday meaning that the human subjects use to make sense of their world. The traditional technology acceptance researchers treat "user" as a monolithic concept. Improving work efficiency or performance is therefore the only rationality for the "users". Through this interpretive investigation, we can see that "user" is not a monolithic concept. Instead, these "users" have different social roles in the real world. For different social roles, there are different rationalities, or rationales for their behaviors. In addition, an organization is not a simple aggregation of individuals. The invisible social structure of the organization plays an important role in shaping people's behaviors. The results of this research suggest that social theories that study the social structure and the social relations

among the human beings in the society can do a better job of explaining the adoption and use of an information technology. Therefore, developing more social theories should be the future direction for the technology acceptance and usage research.

The extant technology acceptance models work with an implicit assumption that individuals' adoption of information technology will ultimately lead to organizational IS success. This assumption is obvious when Davis et al. (1989) expressed their concern with users not using computer systems: "Computer systems cannot improve organizational performance if they aren't used. Unfortunately, resistance to end-user systems by managers and professionals is a widespread problem. To better predict, explain, and increase user acceptance, we need to better understand why people accept or reject computers" (p. 982). However, many technology acceptance researchers have realized that "little to no research has addressed the link between user acceptance and individual or organizational usage outcomes" (Venkatash, et al. 2003, p. 470). The results of this research illustrate that the doctors' use of the EMR system did not necessarily bring benefits to the doctors. Using the EMR system to enter detailed medical notes even had a negative impact on the doctors' economic benefits. Therefore, using an information technology in this case might not be a desirable goal of the organization. Simply using "actual usage" or "intention to use" as the dependent variable would not help us much in understanding the complex phenomenon of information technology usage. Future technology acceptance research should focus more on the interaction between an information technology and organizations beyond the initial adoption of the information technology.

This study also contributes to the literature by suggesting a new technology acceptance model. This model includes reverse relationships. Adding these reverse relationships would make it more difficult for researchers to handle statistically; however, it does not mean that those relationships do not exist. One problem with the extant TA models is that these models are static ones and they fail to include any feedback arrows in their models. This study contributes to the technology acceptance literature by illustrating how the adoption and use of an information technology is not a single act of an individual's rational decision making. Instead, it takes place over time through the interaction between social agents and the technology. For instance, people might think highly of an information technology before adoption. After adoption and actual use however, they might form totally different perceptions. Therefore, future TA models need to take into consideration the dynamic nature of technology usage. The findings of this study confirm the results of some previous studies. For instance, by using the notions of hospitality and hostility as the sensitizing device, Jensen and Aanestad (2007) suggest that "the state of a user's attitudes in an adoption process is not single or static, but multi-faceted and dynamic; there are many aspects of the technology towards which the attitudes are different; positive and negative attitudes may co-exist; and the attitudes may change over time" (p. 678-679). In a study to develop user resistance models, Lapointe & Rivard's (2005) also suggest that "time plays an important role in explaining the nature of resistance behaviors…" (p. 462).

This study also contributes to the technology acceptance literature by examining the actual professionals in the real life. These professionals were all real stakeholders in the

process of adopting and using the information technology. They all assumed different social roles in a real social structure in the organization. This is another major difference between this research and many other technology acceptance studies. Therefore, this research has more relevance to the field than those studies which only examine undergraduate or MBA students in the universities. These student subjects do not necessarily play actual social roles in the similar context as described in this case study. These studies then can hardly undercover the mechanism that determine the behaviors of the real professionals in the field. The important implication of this study is that future research on technology acceptance should focus more on examining the real stakeholders in organizational settings.

This research is also informed by the research stream focusing on the adoption of information technology in small and medium enterprises (SMEs). This stream of research emphasizes the influence of organizational factors upon the adoption and use of IS in SMEs, such as external pressure and organizational readiness. For instance, Mehrtens et al. (2001) identify three factors that significantly affect SMEs' adoption of the Internet: "perceived benefits", "organizational readiness", and "external pressure" (p. 171). Grandon and Pearson (2004) identify five factors that influence electronic commerce adoption in SMEs: "organizational readiness", "external pressure", "perceived ease of use", "perceived usefulness" and "compatibility" (p. 206). This study examines the adoption and use of EMR in a small healthcare business with less than 50 employees. Through an in-depth case study, I was able to uncover the dynamic process of EMR adoption as influenced by the specific organizational factors. More specifically, I have found that the social roles

people assume in the organization shape their perceptions of using the EMR and their subsequent behaviors. In small and medium enterprises, people are more likely to play multiple roles at the same time than in big organizations. Therefore, future research on the technology adoption in SMEs should focus more on the interaction between the technology and different social roles in the organizations.

This study illustrated how the interpretive approach can not only provide valuable insights which quantitative or positivist studies cannot attain easily (Trauth and Jessup, 2000; Walsham, 1995), but also can produce scholarly knowledge that will be useful to support and strengthen positivist research. Although "an interpretive understanding does not offer knowledge in competition with, in opposition to, or as a possible replacement for the knowledge that a positivist understanding offers…" (Lee, 1994, p. 147-148), the interpretive approach can provide the basis for the development of a revised positivist theory (Lee, 1991). In other words, the interpretive approach can serve the positivist research by suggesting to the researchers what to add or delete in the positivist theory. When the positivist approach is still dominating the technology acceptance research, a different perspective such as the interpretive approach opens new opportunities for us to understand technology acceptance and use in a different way. This point is consistent with what Orlikowski and Baroudi (1991) suggest: "A single research perspective for studying information systems phenomena is unnecessarily restrictive" (p. 1). This research used an interpretive approach to help strengthen the technology acceptance models, arguably the most mature models in the IS field, and illustrated the usefulness of Lee's (1991)

integrated framework in helping better conduct social sciences studies. This is a contribution to the IS research in general.

6.2 Practical Implications

The case of using EMR system at Alpha Clinic illustrated that the information system is an emergent result of the interaction between the technical system and social system (Lee, 2004). In other words, an information system consists of a technical system and a social system. Therefore, technological characteristics alone cannot ensure a successful adoption and use. When users complain about a technical problem, it is tempting to believe that it is a mere technical problem such as a software quality issue. The technical solutions based on this assumption are likely to fail because they ignore the social system dimension. The improved feature of a technology alone cannot ensure the success of the system. More importantly, the tendency toward technical solutions is likely to prevent managers or researchers from looking for more fundamental reasons to the non-use behaviors.

Some readers of this research may attribute the non-use behaviors to the fact that the information technology is problematic. However, this attribution is misplaced because of two reasons. The first reason is: whether or not an information technology is "good" does not bear on our understanding of the adoption issue. What matters is how the human subjects themselves understand the use of the information technology. Since these human subjects assume different and simultaneous social roles, their perceptions of using the information technology are multifaceted. Although using the EMR system could be "useful" and "good", there were many problematic areas in using the EMR system.

Therefore, the EMR system presented in this case is neither a good nor a bad example of information technology. It is just an instance of the information technology. As the researcher of this study, I do not simply provide my own evaluation of this technology, but leave it to the judgments of the human subjects in the study and the readers of this research. The second reason is that this study also illustrated that the longitudinal nature of the adoption and usage process is an important factor in shaping people's perceptions of using an information technology. Before the adoption of an information technology, it might be perceived by the human subjects as "good". However, after the adoption and actual usage, they might form a totally different perception of using the same technology.

The best practical implication about using the EMR system this study can provide is that there are many uncertainties involved in adopting and using this system. The complicated interaction between the information technology and the different social roles determines that the adoption and use of an information technology is a complex social phenomenon and therefore there are many unexpected consequences involved in the whole process. This study once again proved that the information technology is not a "silver bullet" that can solve organizational problems by itself.

6. 3 Generalizability Issue

Case studies are always challenged on the issue of generalizability by some researchers. These researchers tend to mistakenly use the statistical, sampling-based form of generalizability as the only form of generalizability to judge case studies. However, according to Lee and Baskerville's (2003), this is only one form of generalizability (called type EE generalizability: generalizing from data to description). There are three other

different forms of generalizability: ET (generalizing from description to theory), TE (generalizing from theory to description), and TT (generalizing from concepts to theory).

Table 5. A Generalizability Framework (Adapted from Lee and Baskerville, 2003)

	Generalizing to Empirical Statements	**Generalizing to Theoretical Statements**
Generalizing from Empirical Statements	EE Generalizing from data to description: this involves generalizing data to a measurement, observation, or other description.	ET Generalizing from description to theory: this involves generalizing measurement, observation or other description to a theory.
Generalizing from Theoretical Statements	TE Generalizing from theory to description: this involves generalizing a theory, confirmed in one setting, to descriptions of other settings.	TT Generalizing from concepts to theory: this involves generalizing a variable, construct, or other concept to a theory.

Next, I will discuss how I used other types of generalizability in this case study. First, I used Type EE generalizability (generalizing from data to description). The data include what the interviewees said in the interviews and what I have observed in the field. I used myself as a sense-making instrument to make continuous assessment of these data. Only those data receiving my favorable assessment would be generalizable to a valid descriptive statement. Based on these descriptive statements, I developed a description of the case. However, the generalizability of the descriptive statements cannot be established to new settings to account for the behaviors of other doctors, medical assistants, and administrators whom I have not observed. That is because "[no] descriptive statement

(whether quantitative or qualitative) is generalizable beyond the domain that the researcher has actually observed" (Lee and Baskerville, 2003, p. 235).

Second, I used type ET generalizability, i.e., generalizing from description to theory. Based on my interpretive understanding of the case, I developed a theory to account for the behaviors in the case study. This important form of generalizaability corresponds to what Yin (1994) calls "analytical generalization," or "Level-2 inference". Although Yin's case study method is from a positivist perspective, his concept of analytical generalization is useful in guiding us to generalize empirical descriptions in a case study to a valid theory. Walsham (1995) also suggests that interpretive IS researchers can generalize from empirical statements to concepts, a theory, specific implications, or rich insights.

Hume's truism prohibits the suggestion that increase in sample size could lead to an increase in the generalizability of a sample estimate to its population (See Lee and Baskerville, 2003, p. 226-227, for a detailed discussion of Hume's problem of induction). Therefore, suggesting that by increasing the sample size or the number of sites would increase the generalizability not only violates Hume's truism, but also conflates Type TE generalizability (generalizing from theory to description) and Type EE generalizability (generalizing from data to description) (Lee and Baskerville, 2003).

This research is not attempting to generalize the findings in this study to other settings because "the only way in which a researcher (or practitioner) may properly claim that the theory is indeed generalizable to the new setting would be for the theory to be actually tested and confirmed in the new setting" (Lee and Baskerville, 2003, p. 237).

Obviously, additional studies on the adoption and use of an EMR system in other settings can be helpful in advancing our understanding of this seemingly simple but complicated phenomenon.

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APPENDIX

Interview Guide:

1. Do you think using the Electronic Medical Records system in your job would enable you to accomplish tasks more quickly (or improve your job performance, or achieve your personal goals like increase the chance of getting a raise)? (This question is based on the instrument in Davis, 1989). Why or why not?
2. If you think that the Electronic Medical Records system is useful for your work, do you like working with the system or not? Why or why not?
3. Do you find using the Electronic Medical Records system is easy for you (or the system to be flexible to interact with, or learning to operate the system is easy for you)? (This question is based on the instrument in Davis, 1989) Why or why not?
4. If you think that the Electronic Medical Records system is easy to use, would you think the system is useful for your work? Why or why not?
5. If you think that the Electronic Medical Records system is easy to use, would you like working with the system? (This question is based on the instrument in Venkatesh et.al.2003) Have you used the system? If not, would you plan to use it in the next few months? Why or why not?
6. If you like working with the Electronic Medical Records system, would you want to use it or continue to use it? Why or why not?
7. Is using the Electronic Medical Records system mandatory in your organization? Do you think in general, the organization has supported the use of the system? Do you think people who are important to you believe that you should use the Electronic Medical Records system or not? (This question is based on the instrument in Venkatesh et.al.2003) Why or why not? If they do, do you think you will be influenced by their expectations? Do you expect your colleagues (or others) to use the system in their work? Why or why not?
8. Do you think people in your organization who use the Electronic Medical Records system have more prestige than those who do not? (This question is based on the instrument in Venkatesh et.al.2003) Why or why not?
9. Do you think you have the resources (or knowledge, training) necessary to use the Electronic Medical Records system? Why or why not? Do you have a specific person (or group) available for assistance with system difficulties? (This question is based on the instrument in Venkatesh et.al.2003)
   If there is support from the organization, do you think the support changes your attitude about using the system or changes your behavior toward using the system?

10. Do you think you can complete a job or task using the Electronic Medical system if there was no one around to tell you what to do as you go? (This question is based on the instrument in Venkatesh et.al.2003) Why or why not?
11. Would you hesitate to use the system for fear of making mistakes you cannot correct? Why or why not?
12. If you have used the Electronic Medical system, do you think it improves the quality of your work or helps you identify innovative ways of doing your job? Do you think the system improves customer satisfaction and service quality? Do you think the system improves management control on the work process? (These questions are based on the instrument in Torkzadeh and Doll, 1999) Why or why not?
13. How long have you used the Electronic Medical Records system? Can you describe how you depend on it in your work?

VITA

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