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ORGANIZATIONAL USE AND DIFFUSION OF INFORMATION TECHNOLOGY IN CHINA AND AN INTERNATIONAL COMPARATIVE ASSESSMENT

A Dissertation

Presented for the

Doctor of Philosophy

Degree

The University of Memphis

En Mao

August 2001

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To the Graduate Council:

I am submitting herewith a dissertation written by En Mao entitled "Organizational Use and Diffusion of Information Technology in China and an International Comparative Assessment." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy with a major in Business Administration and a concentration in Management Information Systems and Decision Sciences.

Mark Gillenson, Ph.D.
Major Professor

We have read this dissertation and recommend its acceptance:

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For me, a new journey has begun.

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ABSTRACT

Mao, En. Ph.D. The University of Memphis. August, 2001. Organizational Use and Diffusion of Information Technology in China and an International Comparative Assessment. Major Professor: Mark Gillenson, Ph.D.

The research on determinants of technology acceptance is important and provides practical insights into how organizations can manage information technology (IT) diffusion. However, great inconsistencies in the findings of the determinants of IT acceptance and use plague the existing literature in this area. While the established innovation diffusion theory has always stated that different adopters exist in the innovation diffusion process and some recent studies have urged the researcher to distinguish between users and potential adopters, the majority of the studies in the IT area fail to make that distinction. We believe that one major cause of the inconsistencies in the literature is the failure to recognize different adopter groups. The primary purposes of this study are to demonstrate that there are different types of adopters and more importantly, that the variable relationships pertinent to technology acceptance are different across the adopter groups. Two research models and 21 hypotheses are developed based on the review of relevant literature to investigate the differences among three adopter groups: earlier, later, and potential adopters. We test the hypotheses and models with data collected in China, an increasingly important player in the global market and a significant trading partner of the United States. Fourteen hypotheses are supported. The results show that the adopters differ from each other along several dimensions: the behavioral beliefs that shape attitude, the

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effect of attitude and subjective norm on behavioral intention, and the degree of innovativeness. The comparisons of the findings of this study to others suggest that cultural factors, such as individualism are relevant in IT acceptance research. The theoretical and practical implications of the findings are discussed.

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INTRODUCTION

Organizations in the information age no longer question the value of information technology (IT). Companies invest millions of dollars in information technology to ensure industry leadership, maintain competitiveness, or simply comply with industry standards. The question that many IT researchers attempt to answer is how the systems and technologies being implemented contribute to firms' overall performances. While it is difficult to directly measure the IT contribution because of its hidden and intangible benefits, researchers have developed the concept of system success. Information systems success is a complex and multifaceted construct comprised of six related dimensions: system and information quality, user satisfaction, individual and organizational impacts, and system use (DeLone and McLean 1992). The outcome measures range from subjective attitudinal measures (e.g., user satisfaction) to objective behavioral measures (e.g., system use) (Agarwal and Prasad 1997). Among the measures, usage is the most important one (Agarwal and Prasad 1997). It is a prerequisite to realizing any end-user systems' benefit. IT usage can be studied as a phase of IT diffusion, defined as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers 1995, p. 5). IT adoption, preceding IT usage, is another phase of IT diffusion; adoption occurs when an individual decides to use an IT.

Now a more fundamental question is to what extent employees use the technological innovations deemed so beneficial. If a well-developed system with

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high quality is not used, it is ineffective. Naturally, the question anyone can ask is why some employees use technology more than others. From a researcher's point of view, we translate this last question into what variables determine and explain IT adoption and usage.

An understanding of the determinants of IT innovation adoption and usage is important. First, systems development efforts can be focused on issues that affect usage. Second, with such knowledge, IT managers can predict usage of software or systems by evaluating known determinants on a trial basis that would minimize underutilization risks. Third, and most important, management can use such knowledge to promote usage.

In the past three decades, IS usage, diffusion, implementation, and adoption issues have been extensively studied. In contrast to earlier studies, which lack theoretical foundation, more recent studies focus on developing theory-based models which are tested, validated, and compared. Among the models proposed and studied, the technology acceptance model (TAM, Davis 1986, 1989), a model based on the Theory of Reasoned Action, is a widely accepted IT usage model. In the TAM model, "perceived usefulness" and "perceived ease of use" are hypothesized as key determinants of usage through two mediating variables, user attitude and intention. The model's parsimony is well received. The TAM model has been replicated and tested extensively (e.g., Adams et al. 1992; Chau 1996; Chin and Todd 1995; Davis and Venkatesh 1995; Segars and Grover

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1993; Taylor and Todd 1995b) and the main constructs of the model are found to be reliable and valid. In addition, many studies proposed extensions and modifications (e.g., adding constructs and variables) to TAM based on the theory of reasoned action (TRA, Ajzen and Fishbein 1980; Fishbein and Ajzen 1975), the theory of planned action (TPA, Ajzen and Madden 1986), innovation diffusion theory (Rogers 1995), learning theory (Bandura 1977), stage theory (Cooper and Zmud 1990), and empirical results. Such studies have produced a set of equivocal results on some variable relationships. For example, perceived ease of use was found to be insignificant in some studies (e.g., Adams et al. 1992; Bagozzi et al. 1992; Igbaria et al. 1995); the effect of social norm variables on behavioral intention, which are tested in Davis' original study and many recent studies (e.g., Bagozzi 1992; Davis et al. 1989; Venkatesh and Davis 2000), was inconsistent in the literature.

One critical aspect that is often ignored in the IT adoption and acceptance literature is the distinction of the type of adopters. Innovation diffusion theory has long asserted the importance of dividing the adopters into appropriate groups (Rogers 1995). "Innovativeness," which refers to the likeliness that a person "is relatively earlier in adopting" an innovation (Rogers, 1983) has been used in innovation diffusion studies. Adopters, depending on how early they adopt an innovation, differ in characteristics and attitude (Rogers 1995). Yet, few IT studies took adopter types into account (Brancheau and Wetherbe 1990; Karahanna et al. 1999). In studies where adopter types are considered, there is

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strong evidence to show that adopters differ in characteristics (Brancheau and Wetherbe 1990) and determinants of attitude and behavioral intention (Karahanna et al. 1999). Currently, the study of attitudinal variable differences is limited to those between users and potential adopters and we are not aware of studies that distinguish between different types of users.

In addition, most of the existing studies were conducted in North America (the United States and Canada). When TAM is tested in other countries, for example, Switzerland, (Straub et al. 1997), Japan (Straub 1994; Straub et al. 1997), Arabic countries (Rose and Straub 1998), and Hong Kong (Hu et al. 1999), the results vary on TAM's predictive power. Culture is suggested to play an important role in explaining different patterns in IT usage (Straub 1994; Straub et al. 1997). However, existing studies have not established clear relationships between cultural variables and IT adoption and usage determinants.

There is a great motivation to study IT diffusion, usage, and adoption in different countries. In responding to globalization initiatives, companies in the United States are penetrating foreign countries and regions, such as large emerging economies (e.g., China, India, and Brazil). Information technology, considered a standard infrastructure in most American companies is not readily accepted in many countries. Also, in general, there is a lack of understanding concerning the management of information technology. IS research is mainly applied and

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conceptual in Europe and Asia (Evaristo et al. 2000) and the amount of empirical research performed there is very small when compared with the United States.

In this study, we conduct a cross-sectional study of IT Diffusion in China, one of the largest trading partners of the United States. There are advantages of conducting studies in China. First, IT diffusion in China is a recent and rapid event. In 1996, China became the second largest personal computer market in Asia (Arnold 1997) and about two years after that it became the largest emerging PC market in the world (Einhorn 1990). Major development and use of information technology started in 1993 and China is yet to approach IT maturity, unlike the western realm where companies are mature adopters of IT.

Few existing studies make distinctions between IT adoption and usage (Karahanna et al. 1999), which are two different stages along the diffusion process. Thus, by making the critical distinction between users and adopters, a study of IT adoption and usage in China has the potential to contribute to our understanding of IT diffusion in a different culture as well as provide additional knowledge about IT adoption and usage. Further, the distinction between various types of users will give us a better and more accurate understanding of the determinants of adoption attitude and behavioral intention.

Moreover, findings from such study can be valuable not only to Chinese IT managers but also foreign corporations investing in China, a market that has

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attracted investment from large U.S. telecommunications and software corporations such as Sprint, Microsoft, and MCI. Currently, many U.S. and other multinational companies are increasingly hiring local employees who are required to use information technology. As they expand their operations in China, the multinationals are facing the challenge of managing and training local employees to use the IT they developed in their home countries. With skilled labor resources scarce, companies need to be knowledgeable about how to effectively diffuse the technology at the individual level specifically, because some of the known western IT management practices may be ineffective when applied in a distinctively different culture such as China. On the other hand, the Chinese managers can benefit even more from this study. Management practices, in particular IT training and support, are greatly under appreciated by Chinese organizations. This study can potentially provide guidance in reducing the skepticism in the value of IT management by pointing out specific areas that affect IT diffusion. In addition, findings from this study may also benefit IT managers in other countries, such as Brazil, who are in the similar developmental environments.

Overall, this study has several goals. We intend to demonstrate that various types of adopters differ in the determinants of attitude and intention. While the present study may not provide conclusive results of the determinants of attitude and intention, it is a step closer to reaching the understanding of the differences between different types of IT adopters. Next, we plan to develop and test IT

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adoption and use models in a different culture, China. In addition, through comparing the results of this research with existing studies conducted in other cultures, we aim to learn more about the differences of IT adoption and usage across different groups of IT end-users as well as across cultures.

We review relevant theories and significant prior studies. Based on the literature review, three research models are proposed for this research. The first two models are designed to study information technology adoption and usage among individual employees. The purpose of using two models is to distinguish two types of diffusion behaviors: adoption and use. One model is designed to study potential IT adopters and the other one IT users. Current research has reliable instruments to measure IT usage and its determinants; however, stages of diffusion or implementation are not explicitly treated in the majority of the studies. With separate models, we are able to fulfill the objective of advancing and contributing to the learning of how potential information technology adopters and users differ in the IT diffusion process. The third model, an organizational level model, is developed to investigate the factors that affect IT diffusion at a higher level. Following the discussion of the models, research questions and hypotheses are introduced. Then the research methodology is presented. We test the hypotheses and models with data collected from 30 Chinese companies. Finally, the results of the analyses are presented and discussed.

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LITERATURE REVIEW

IT diffusion is a branch of innovation diffusion research. There is a significant amount of work in this area resulting in strong concepts and paradigms such as innovation attributes, individual innovativeness, opinion leadership, and rate of diffusion (Rogers 1995). The body of innovation diffusion research started to emerge in the early 20th century. Every behavioral science discipline is involved in innovation diffusion research in some form or another. Some of the major disciplines are anthropology, early sociology, rural sociology, education, public health and medical sociology, communication, marketing, geography, general sociology, and general economics.

Empirical innovation diffusion research was pioneered by Ryan and Cross (1943) in their study of diffusion of hybrid seed corn in Iowa in the area of rural sociology research. Prior to that, many conceptual studies had been conducted. According to Rogers (1995), there were approximately 4,000 published papers in the field of diffusion research by 1995. However, the study of information technology diffusion is more recent, beginning approximately two decades ago. The early studies in IT diffusion were limited in scope and lacked strong theoretical foundations. In addition, many ignored the foundations established in other diffusion traditions. Fragmented conceptual and empirical research plagued the IT diffusion area.

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However, the recent trend is more encouraging. It is marked by the development of the technology acceptance model (TAM) (Davis 1989). An increasing number of researchers are drawn to this area. Many are moving beyond the initial conceptual and commentary research and searching for valid and reliable measures based on stronger theoretical grounds. In the next several sections, we review some of the key theoretical elements and foundations of IT diffusion research. First, diffusion is defined. Then several theories and research traditions (theory of reasoned action (TRA), technology acceptance model (TAM), theory of planned behavior (TPB), and stage theory) are reviewed and critiqued.

Diffusion

Diffusion is a complex research subject. In order to understand diffusion, we need to understand its elements. An earlier definition of IT diffusion by Sullivan states that it is "the degree to which technology has been disseminated or scattered throughout the company" (1985, p. 6). While this definition is practical, it ignores some key elements of diffusion. A more vigorous and comprehensive definition given by Rogers describes diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (1995, p. 5). Four elements can be identified from this definition of diffusion: innovation, communication channels, time, and the social system. Innovation is defined as "an idea, practice, or object that is *perceived* as *new* by an individual or another unit of adoption" (Rogers 1983,

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p.11). In this study, information technology is treated as an innovation (Karahanna et al. 1999). Therefore, relevant innovation diffusion theories can be extended to IT diffusion. Communication channels, the vehicle of diffusion, play "different roles at various stages in the innovation-decision process" (Rogers 1995, p. XVII). Diffusion research has found that interpersonal word-of-mouth channels have significant impact on an initial adoption decision. Time is a crucial dimension of a diffusion study. When it is plotted against the number of adopters at a given time, an S-shaped curve is constructed. At an aggregate level (e.g., organizational level), a diffusion curve can indicate the diffusion rate, defined as how fast an innovation is diffused. A social system may be defined as "a set of interrelated units that are engaged in joint problem-solving to accomplish a common goal" (Rogers 1995, p. 23). In this study, the social system is the organization, which consists of individual employees that are users or potential adopters of information technology, the innovation.

Innovation Diffusion Theory

In this section, relevant theories and concepts from innovation diffusion literature are reviewed. Two major areas of established concepts and paradigms developed in innovation diffusion research are discussed below: innovativeness and innovation attributes.

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Innovativeness: Adopter Types

Innovation diffusion theory presents a framework used to divide the adopters based on innovativeness which by definition refers to the likelihood that a person "is relatively earlier in adopting" an innovation (Rogers, 1983). The framework, widely applied in innovation diffusion research, is based on the notion that the adopter distributions "follow a bell-shaped curve over time and approach normality" (see Figure 1, Rogers 1983, p. 245). This evidence is supported in numerous disciplines and by a large number of studies since late 1940s (Rogers 1983). The logistic function of diffusion is also evidenced in the IT adoption studies (e.g., Brancheau and Wetherbe 1990). The framework shows that the adopters can be divided into five classifications based on when the users adopt an innovation: innovator, early adopter, early majority, late majority, and laggards. Table 1 shows the corresponding percentage of each adopter category.

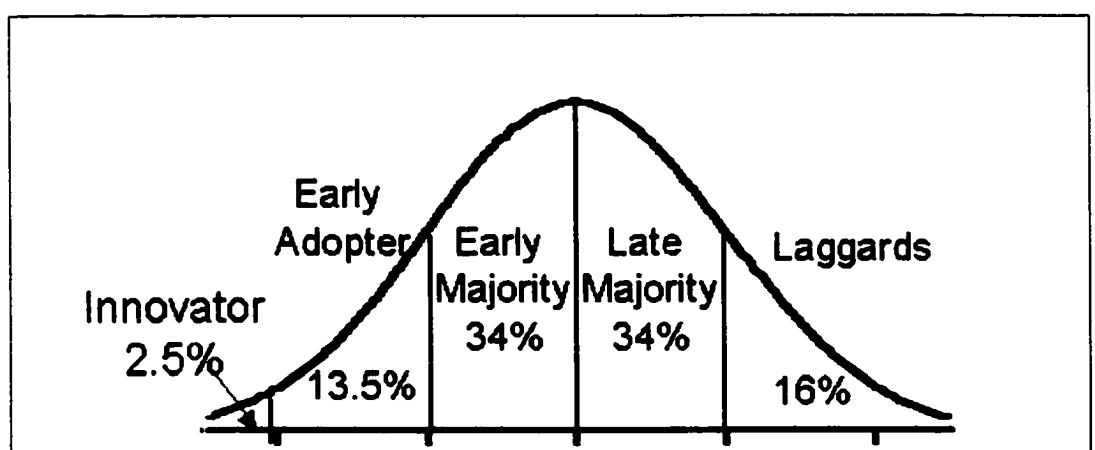

Figure 1. Adopter Categorization (Rogers 1983, p. 247)

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Table 1. Innovation Diffusion Theory Adopter Distrbution	
Type	**%**
Innovator	2.5%
Early Adopter	13.5%
Early Majority *	34.0%
Late Majority *	34.0%
Laggards *	16.0%

* Scope of this study

The innovators are the first group of people (2.5%) who adopt an innovation. They are generally characterized as venturesome and cosmopolitan (Rogers 1983). Early adopters are those who are more connected to the rest of the adopters. They lead the adoption process within an organization. The early majority and late majority are the two largest groups, accounting for nearly 70% of the adopters. The early majority adopt the innovation just before the average member of the organization (Rogers 1983, p. 249) and the late majority adopt just after the average member. The late majority usually adopt when they are pressured by the norms of an organization. The laggards are the last within the organization to adopt the innovation. They are frequently those who are isolated from the majority and disconnected from the organizational network (Rogers 1983). In summary, the innovators and the early adopters are the leaders of the diffusion process, while the early majority, late majority, and the laggards are the followers.

One of the primary purposes of the IT adoption and acceptance studies is to determine relevant variables that affect adoption and acceptance so that IT

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managers can design intervention programs based on such knowledge in managing IT adoption and diffusion. The later three groups, early majority, late majority, and the laggards, compared to the innovators and early adopters who are self-motivators, are much more susceptible to influences of others in making their adoption decision. When there is a lack of influences or the influences are negative, the later groups would delay or resist adoption and therefore hinder the diffusion process. On the other hand, proper management of the influences, such as the intervention programs, may persuade the later groups to adopt sooner and therefore shorten the diffusion process. Because the later groups are the most challenging groups of end users in managing IT diffusion, they are the best candidates of study for that purpose. In our study, we focus on these three groups, which are renamed for practical purpose. The groups are hereafter classified as earlier adopters, later adopters, and potential adopters, respectively (also see Table 2).

Table 2. Adopter Group Classification (Selected for this study)

Type	This study
Early Majority *	Earlier adopter
Late Majority *	Later Adopter
Laggards *	Potential adopter

Innovation Attributes

Among the research concepts and paradigms developed in innovation diffusion research, rate of adoption is one of the research areas identified (Rogers 1995).

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A major finding of this type of research is that innovations possessing certain attributes are adopted more rapidly. Relative advantage, compatibility, complexity, observability, and trialability are five perceived attributes of innovation identified by Rogers (1995), who stated that these attributes are extensively studied and tested in many innovation diffusion studies.

In their meta-analysis of innovation diffusion literature, Tornatzky and Klein (1982) reviewed 75 articles and discovered more than 30 innovation characteristics. They investigated ten major innovation characteristics: compatibility, relative advantage, complexity, cost, communicability, divisibility, profitability, social approval, trialability, and observability. The results show that compatibility, relative advantage, and complexity are the most robust measures of innovation attributes that affect innovation diffusion. The study also revealed that results based on studies of other attributes are inconclusive or nonsignificant. The dependent variable in the majority of the innovation diffusion research examined in Tornatzky and Klein's study is adoption, which is measured dichotomously (i.e., yes/no). User behavior following adoption was reported only in a few studies. We discuss some of the major attributes of innovation and their relationships with adoption next.

Compatibility

Compatibility is the most widely cited innovation attribute according to Tornatzky and Klein's meta analysis (1982). Compatibility is defined as "the degree to

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which an innovation is perceived as being consistent with the existing values, past experiences, and needs of the receivers" (Tornatzky and Klein 1982, p. 33). Many studies distinguish cognitive compatibility from operational compatibility. Cognitive compatibility refers to the compatibility with what people think or feel about an innovation. Operational compatibility refers to the degree of compatibility with tasks people perform (Tornatzky and Klein 1982). Both definitions are used in the studies they analyzed. The relationship between compatibility and adoption is positive and significant when aggregated (p = .046; number of studies with statistics = 20).

Relative Advantage

Relative advantage is defined as "the degree to which an innovation is perceived as being better than the idea it supersedes (Tornatzky and Klein 1982, p. 34)." In general, in innovation diffusion studies, relative advantage of an innovation is a broad term. The measurement of it, therefore, becomes problematic. It could be measured in terms of social benefits, time saved, profitability, or productivity (Tornatzky and Klein 1982). It is found that relative advantage has a significant (p = .031; number of studies with statistics = 11) positive correlation with adoption.

Complexity

Complexity is "the degree to which an innovation is perceived as relatively difficult to understand and use" (Tornatzky and Klein 1982, p. 35). The

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relationship between complexity and adoption is negative and nonsignificant (p = .062; number of studies with statistics = 13). Therefore, it is a weak relationship.

Additional Variables

Other variables investigated in Tornatzky and Klein's study are cost, communicability, divisibility, profitability, and trialability. Cost has been studied by many, but contradictory results are reported and the relationship between cost and adoption is found to be nonsignificant (p = .5). Communicability is "the degree to which aspects of an innovation may be conveyed to others" (Tornatzky and Klein 1982, p. 36). For example, assuming that it is easier to talk about a new digital camera than it is to talk about new computer software, then the communicability of the new digital camera would be higher than that of the computer software. This attribute is generally inferred and rarely tested. Divisibility refers to "the extent to which an innovation can be tried on a small scale prior to adoption" (Tornatzky and Klein 1982, p. 37). Expert judges generally determine the degree of divisibility. Contradictory results were found on this attribute. Its relationship with diffusion is not clear at this point. Profitability refers to "the level of profit to be gained from adoption of the innovation" (Tornatzky and Klein 1982, p. 37). This characteristic does not apply to all innovation studies (e.g., consumer product adoption). Theoretically, profitability should correlate positively with diffusion; however, some studies found a negative relationship between profitability and diffusion, resulting in a nonsignificant relationship. The negative relationship could have been caused by

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ineffective use or under-utilization of the innovation. When an innovation is being diffused, the cost of diffusion (e.g., acquisition cost) increases; however, if the cost is not justified by performance gains through using innovation, profitability will decrease. Trialability refers to the degree to which an innovation may be experimented with on a restricted basis. The directionality of the trialability-diffusion relationship cannot be determined from their study (Tornatzky and Klein 1982).

In addition to innovation attributes, there are other factors that affect the rate of diffusion: individual innovativeness, norms, and role of opinion leaders (Rogers 1995). Individual innovativeness is the most researched diffusion area as discussed earlier (Rogers 1995). Norms include cultural and religious norms. Norms can operate at various levels: a nation, a community, an organization, or a local system like a village (Rogers 1995). Opinion leaders are those who have the most links and communication with other members of a system. The role of opinion leadership often is a major determinant of the success or failure of diffusion programs. The characteristics of the leaders, when compared to the followers, are more formal education, a higher level of literacy, greater innovativeness, higher socioeconomics status, and more mass media exposure (Rogers 1995).

Classical diffusion research also posits that the diffusion process when plotted in a two-dimensional plane (time on the x-axis; number of adopters at a given time

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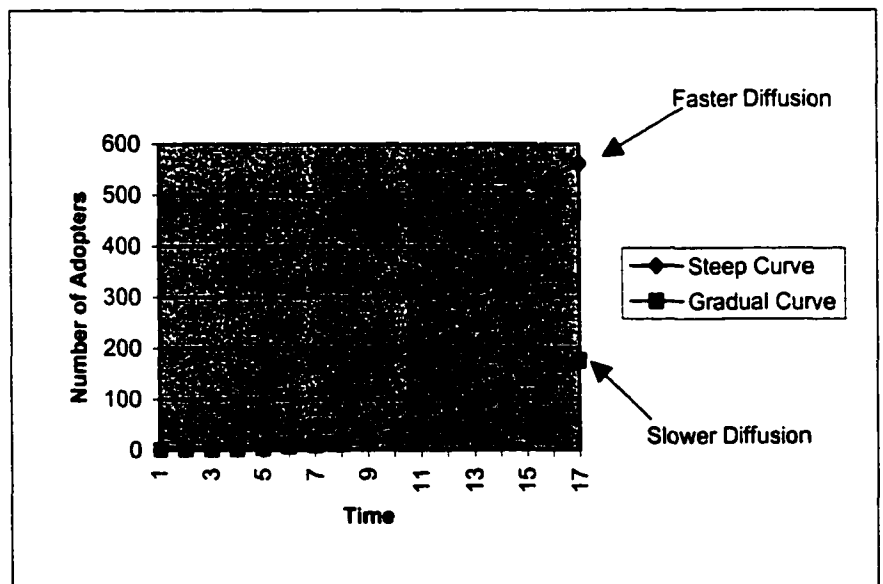
on the y-axis) resembles an S-shaped curve (Rogers 1995). The rate of diffusion is measured by the length of time required for a desirable percentage of the members of a system to adopt an innovation. The variations of the curve provide insight into the rate of diffusion. If the curve is steep, the diffusion rate is fast; if the curve is gradual, the rate is slower. Figure 2 depicts a steep curve which indicates faster diffusion and a gradual curve which indicates slower diffusion. The unit of analysis of the rate of diffusion is an innovation in a system, not individual members of a system (Rogers 1995).



FigFigure 2. Diffusion Curves

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Theory of Reasoned Action (TRA)

We now examine another theoretical foundation, Theory of Reasoned Action. Innovation diffusion research provides strong empirical evidence in many areas, yet it lacks the vigor and theoretical foundation required to explain human behavior. The Theory of Reasoned Action (TRA) model proposed by Fishbein and Ajzen (1975) (also see, Ajzen and Fishbein 1980; Fishbein and Ajzen 1979) has been incorporated into recent social science literature. The theory focuses on predicting behavioral intention and actual behavior based on behavioral beliefs and subjective norms. This theory is depicted in Figure 3. According to TRA, "a behavioral intention measure will predict the performance of any voluntary act, unless the intention measure does not correspond to the behavioral criterion in terms of action, target, context, time-frame and/or specificity" (Sheppard et al. 1988, p. 325). Its strong predictive power of human behavior has drawn attention from multiple disciplines, such as psychology, sociology, marketing, and MIS (Sheppard et al. 1988). In the MIS area, it serves as a theoretical foundation for technology acceptance and usage models and theories. However, TRA and traditional innovation diffusion research differ in two ways. First, TRA relies mainly on subjective measures and innovation diffusion research relies on objective measures. Second, TRA is based on behavioral beliefs toward an innovation unlike innovation diffusion research that examines the perception of the innovation. Each point is discussed below.

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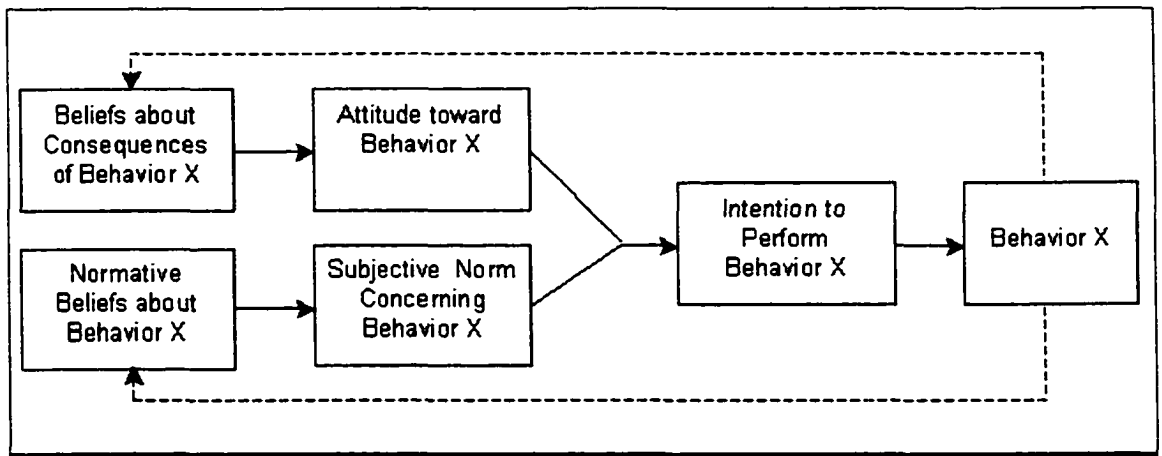

Figure 3. Theory of Reasoned Action

Subjective Measures versus Objective Measures

The adoption decision, similar to other types of decisions, is based on subjective rather than objective measures (Abelson and Levi 1985; Adelbratt and Montgomery 1980; Ajzen and Fishbein 1980; Sutton 1998; Wright 1975 in Davis 1989). In traditional innovation diffusion research, when studying the relationship between innovation attributes and diffusion rate, researchers refer to objective attribute measures, also called primary attributes. Cost, for example, is one such measure. It can be expressed in an objective measure, such as the dollar amount. However, cost can also become subjective. An innovation that seems costly for one organization may be less costly for another simply because of the differences between their available resources or size. Similarly, the perception of relative advantage of an innovation can vary significantly among individual adopters. In addition, innovation attributes are rated by one single expert judge or a small group of them in innovation diffusion research; whereas, innovation

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attributes are measured by individual adopter perceptions in TRA. The advantage of using subjective measures of an individual is that researchers are able to predict an individual's behavior, such as IT usage and adoption. In fact, the validity of comparison may become questionable if objective measures were used (Tornatzky and Klein 1982). This study, consistent with behavioral research, is based on individual perceptions.

Behavioral Beliefs versus Perceptions of Innovation

Perception of an innovation is different from *behavioral beliefs* such as beliefs toward using an innovation (Karahanna et al. 1999). A person may have a favorable perception about an innovation in terms of its usefulness in general; however, he/she may not perceive the innovation being useful at work. In other words, the behavioral context of perceptions is important. To better understand this concept, we introduce some fundamental concepts under TRA: attitude, belief, object, attribute, behavioral intention, and behavior.

Attitude is "a person's favorable or unfavorable evaluations of an object" (Fishbein and Ajzen 1975, p. 11). A person holds certain beliefs or information about the object. An object is associated with some attributes. An object of a belief may be a person, an organization, a behavior, or an event, and the associated attribute may be any object, outcome, characteristics, property, or event. The link between object and attribute is belief; the stronger the link between them, the stronger the belief (Fishbein and Ajzen 1975). For example,

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in the context of IT diffusion, an object may be using E-mail at work (a behavior) and an attribute associated with the object may be improve job performance (an outcome). Belief can then be measured by a person's assessment of the subjective probability of using E-mail at work improves job performance.

In a general sense, the theory of reasoned action postulates that a person's actual behavior can be predicted from behavioral intention, which is a function of two factors: attitude toward the behavior and the person's subjective norm. A person's attitude toward a behavior is related to his/her beliefs that performing the behavior will lead to certain consequences or outcomes. In other words, if a person holds positive beliefs about a behavior, it is likely that he/she holds favorable attitude toward it. The person's subjective norm is formed based on his/her normative beliefs defined as beliefs that certain referents think the person should or should not perform the behavior in question.

TRA is heavily applied and studied in behavioral sciences. In a recent meta-analysis, Sutton (1998) investigated the predictive and explanatory power of TRA. Percent of variance explained is the most commonly used measure of effect size. While prior studies reported that between 63 to 71 percent of variance was explained in behavioral intention, only 18 to 38 percent of variance was explained in behavior by behavioral intention. Sutton demonstrated that the use of percent of variance explained is a pessimistic measure of effect size and might not be sufficient in some studies. He proposed nine reasons that the

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model fails to predict well. One significant mistake is using an unequal number of response categories for intention and behavior. For example, intention often is measured on a 5 or 7-point scale, but behavior is measured in binary categories (e.g., yes or no). In this case, even when the relationship between intention and behavior is substantial, the percent of variance explained in behavior can be very low. Sutton recommended using other effect size measures, for example, the power effect size index (f^2) (Cohen 1992, 1998). Another common mistake is that intentions may be provisional in some studies. This is a problem suggested in some IT usage studies in which student samples were used (Adams et al. 1992; Davis 1989). When subjects sampled are not engaged in making real decisions, the intention-behavior relationship may not be accurately estimated (Hu et al. 1999; Sutton 1998).

Technology Acceptance Model (TAM)

It is every IT manager's dream to deploy a technology that will be used by all intended employees. Determinants of usage of information systems and technology are of great interest to MIS researchers. In the 70's and 80's, numerous scales and measures were developed pertaining to systems and technology use; however, many of them failed to correlate with the usage construct because of a lack of theoretical foundation and poor measurement. In a search for quality measures for key constructs predicting information technology use, Davis (1986, 1989) suggested and validated two key determinants of technology use: perceived usefulness (PU) defined as "the

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degree to which a person believes that using a particular system would enhance his or her job performance" (p. 320), and perceived ease of use (EOU) as "the degree to which a person believes that using a particular system would be free of effort" (p. 320). Simply put, the more useful and easier to use the technology is, the more likely the user will use it. These two constructs, supported by extensive theories (e.g., TRA, innovation diffusion theory, and cost-benefit paradigm, Davis 1989) constitute the major determinants of user attitude, which mediates the relationship between the two beliefs and user intention. The two constructs echo some of the major innovation attributes proposed in innovation diffusion research. In fact, perceived usefulness parallels with relative advantage and perceived ease of use parallels with complexity (Davis et al. 1989; Karahanna et al. 1999). The resulting model was named Technology Acceptance Model (TAM) (Davis 1989) (see Figure 4).

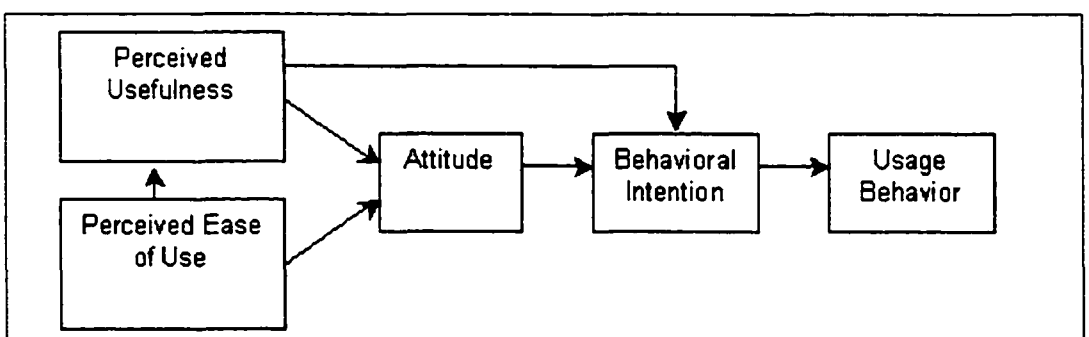

Figure 4. Technology Acceptance Model

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Note that in TAM, by adding a direct link between usefulness and behavioral intention, the model deviates from TRA, which asserts that attitude wholly mediates the relationship between beliefs and intention (Taylor and Todd 1995b). The rationale behind this link is that organizational employees may have a negative overall attitude toward the technology, however, positive beliefs of usefulness can lead to positive intention with the consideration of job consequences (Taylor and Todd 1995b). In addition, perceived ease of use influences attitude indirectly through its effect on perceived usefulness, meaning that the easier the system, the more likely it will be perceived as useful, resulting in a favorable attitude toward using or accepting it.

The TAM model's parsimoniousness has attracted a lot of researchers and it has become a well-known model to study technology acceptance and usage. However, researchers should not overlook the mixed results when TAM is applied in various situations and environments yet it is being extended and modified in some recent technology acceptance and usage studies (Briggs et al. 1999; Chau 1996; Chau and Tam 1997; Jackson et al. 1997; Lucas and Spitler 1999; Szajna 1996).

Two types of TAM related research have proliferated: one defends and the other extends and modifies. The first set of research replicated, tested, retested, and validated TAM and its construct's measurement and validity. In the early 1990's, a series of debates published in *MIS Quarterly* raised the interest in TAM to a

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new level. Adams, Nelson, and Todd's (1992) replication of Davis's study concluded that while the two main constructs of TAM, perceived usefulness and perceived ease of use, possess high convergent and discriminant validity, the TAM model fit is questionable which is demonstrated by the results from structural equation modeling. In a subsequent study, Segars and Grover (1993) reexamined TAM's two original constructs using data from Adams et al. (1992) and found this construct validity to be insufficient. They examined the modification indices and standardized residuals produced from structural equation modeling and claimed that by adding another construct called effectiveness (made up by two items from the usefulness construct) followed by the elimination of two items achieved a better model fit. Clearly, the modifications to the scales were data-driven. Chin and Todd (1995) countered the Segars and Grover study with a note of caution to researchers. They demonstrated that Segars and Grover's suggestion of the third construct is theoretically unfounded. To further examine the validity and reliability of the two constructs, they conducted a new study (N = 259, 40% response rate) and demonstrated that the addition of the third construct is purely speculative. Further, they urged researchers to make modifications to constructs only when substantially justified.

The questions remain. Is TAM valid? Are measures of TAM reliable? Motivated by inconsistent and equivocal results from numerous studies, Doll, Hendrickson, and Deng (1998) examined the measurement aspect of TAM. Using a large

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sample (N = 902), the study confirmed that the items ease of use and usefulness had good construct validity. In addition, they conducted a multigroup invariance analysis using confirmatory factor analysis and concluded that the ease of use instrument is tau-equivalent, used to describe measures with invariant item-factor loadings across different samples (Doll et al. 1998), across different types of applications investigated (word processing, graphics, database, and spreadsheet applications) as well as level of computing experience of the users. The usefulness instrument is tau-equivalent across applications (except word processing software), between gender, and between recent and early adopters. The authors further stated that the instrument, given it works well for both recent adopter and experienced computer users, has the potential to serve as an easy to use instrument for software evaluation. Further, TAM, originally tested for E-Mail and graphics software usage (Davis 1989), has been applied to spreadsheet software (Mathieson 1991), voice mail and word processing software (Adams et al. 1992), DBMS (Szajna 1994), and GSS (Chin 1995). There is a general agreement that perceived usefulness and perceived ease of use correlate with usage significantly (Gefen and Straub 1997).

Some researchers are skeptical of the simplicity of TAM. Compared to innovation diffusion theory in which a larger set of innovation attributes are proposed, TAM only accounts for two behavioral beliefs, PU and EOU. In addition, there is concern about the subjective norm construct. In early TAM studies, subjective norm, the combination of the "beliefs that certain referents

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think the person should or should not perform the behavior in question" (Fishbein and Ajzen 1975, p. 16), was investigated and found to have no impact on behavioral intention. Instead of questioning the results, many studies simply excluded the subjective norm construct.

The skeptics argue that in studies (e.g., Davis et al. 1989; Mathieson 1991) that found subjective norm had no significant influence on intention, the research settings were different from organizational environment. Many of those studies were set in a laboratory environment and participants were students; therefore, there were no real consequences associated with behaviors (Taylor and Todd 1995b). The absence of consequences resulted in insignificant subjective norm effect. This general thought led to studies attempting to augment the TAM model. Inconsistent results from their study prompted Adams et al. (1992) to speculate that user experience or other user characteristics may also play a part in technology acceptance. This idea is not speculative at all. In fact, TRA addresses some of these concerns. There may be other important factors that need to be considered. Subjective norm is found to be a significant determinant of usage in field surveys (e.g., Karahanna et al. 1999; Lucas and Spitler 1999; Robertson 1989). Agarwal and Prasad (1999), in answering whether individual differences are germane to technology acceptance, found that with regard to technology, level of education and prior knowledge have significant impacts on beliefs about usefulness of an IT. Also, training influences beliefs about the ease of use of an IT (Nelson and Cheney 1987). Individual innovativeness in relation

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to IT innovation, defined as "the willingness of an individual to try out any new information technology" (Agarwal and Prasad 1998, p.26) is also found to be a driver of innovation adoption. On the dimension of behavioral belief, some recent studies include a fuller set of perceived beliefs about using an innovation (e.g., Agarwal and Prasad 1997; Karahanna et al. 1999; Moore and Benbasat 1991). The results show the importance of other behavioral beliefs.

Further investigation of the TAM literature reveals that certain inconsistencies exist but they are rarely dealt with and not clearly answered. Table 3 includes findings from some widely-cited studies. In the table, the results suggest that perceived usefulness (PU) is consistently found to be a significant determinant of attitude or usage. On the contrary, the findings on perceived ease of use (EOU) is mixed. Only three studies in Table 3 found EOU to be a significant factor in determining attitude or usage. Regardless of statistical significance, the relationship between PU and attitude/usage is consistently stronger than the relationship between EOU and attitude/usage.

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Table 3. TAM Study Results

Studies	Reported Findings and Other Information							
	IT	**N**	**Subject**	**Field (Y/N)**	**PU→A/ PU→U**	**EOU→A/ EOU→U**	**A→BI**	**BI/U R^2**
(Davis et al. 1989)	E-Mail	109	IBM employees in Canada 6-month experience	Y	.56 S	.32 S		
(Adams et al. 1992)	E-Mail	116	10 firms 21 month experience	Y	.36 S	.05 NS		U .16
	Vmail	68	10 firms	Y	.31 S	.13 NS		U .17
	WP	73	Students	N	.21 S	-.03 NS		U .04
(Bagozzi et al. 1992)	WP	96	MBA students No Experience	N	.25 S	-.02 NS		BI .46
			14 weeks later		.58 S	.74 S		BI .54
(Hendrickson et al. 1993)		51	Students Experience varied	N	S	S		
(Igbaria et al. 1995)	PC	236	PT MBA (Avg. Age = 29)	N	.10 S	.09 NS		
(Jackson et al. 1997)		111	Accounting firms	Y	.23 NS	.159 S	.74 S	.38
(Hu et al. 1999)	Telemedicine	421	Physicians in Hong Kong	Y	.45 S	.08 NS	.25 S	BI 37%

Abbreviations: PU – Perceived Usefulness; EOU – Perceived Ease of Use; A – Attitude; BI – Behavioral Intention; WP – WordPerfect; S – Significant; NS – Not Significant.

In summary, TAM is valuable and many times applicable. More importantly, it is parsimonious. TAM-based research has attracted the recent modifications and extensions of the model by IT diffusion researchers. Such studies have appeared in *MIS Quarterly, Decision Sciences, Management Science*, and *Journal of MIS*. However, TAM's scope is often limited and highly focused. Also, other variables

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are studied in determining IT usage. In a later section, we will discuss some TAM related studies conducted in other cultures.

Theory of Planned Behavior

The Theory of Planned Behavior (TPB) (Ajzen 1985, 1991) (see Figure 5), as an extension of the Theory of Reasoned Action, accounts for social influences, namely subjective norm and perceived behavior control factors. TRA is limited to predicting human behavior when people have complete discretion to perform. When the volitional control is incomplete, TPB claims that behavior intention is the composite effect of behavioral beliefs, subjective norm, and perceived behavioral control.

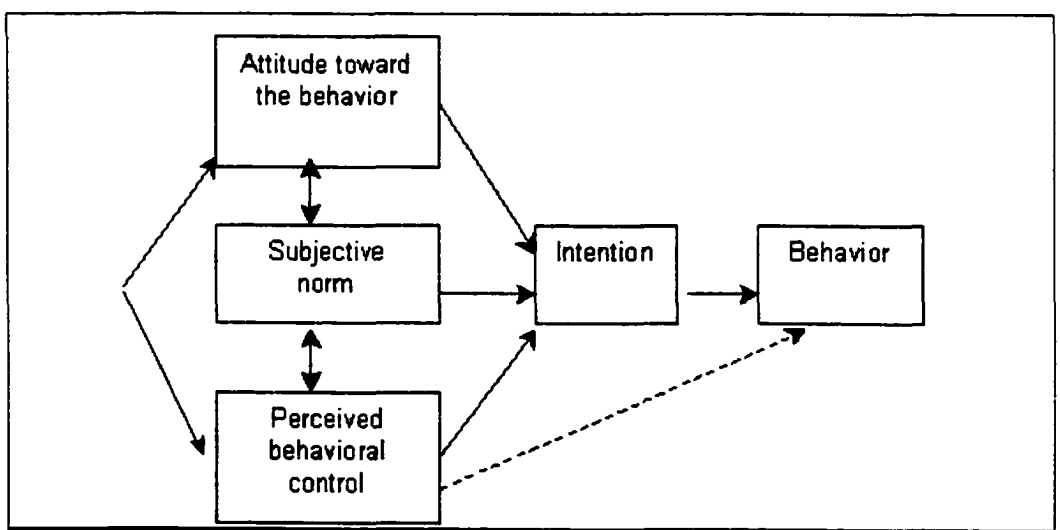

Figure 5. Theory of Planned Behavior (TPB) (Ajzen 1991)

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The additional dimension, perceived behavioral control (PBC) is a reflection of perceived internal and external constraints on behavior. PBC accounts for the effect of self-efficacy raised in some research (e.g., Bandura 1977, 1982; Venkatesh and Davis 1996)). Self-efficacy is "concerned with judgments of how well one can execute courses of action required to deal with prospective situations" (Bandura 1977, p. 122) and is suggested to strongly correlate with future performances (Bandura 1977; Gist 1987). PBC is also determined by availability of resources and opportunities (Dillon and Morris 1996). Another addition to the theory is that behavior is now a function of both behavioral intention and PBC. While the new dimension, PBC, is added with some new proposed structural relationships, the dimensions of behavioral belief and normative belief are eliminated as the precedents of the attitude and subjective norm dimensions, respectively.

TPB seems to predict behavior such as voting, shoplifting, lying, and playing video games very well. The total variance (R^2) explained by both intention and PBC reaches above .50 and even .80 in half of the studies examined in Ajzen's research (1991). Therefore, it is important that we consider using TPB to predict end user behavior if it is applicable to IT. Mathieson (1991) compared TAM with TPB. The results reveal that there is no difference in the variance explained in intention between the two models and TAM explains attitude much better than TPB, even when TPB contains considerably more variables than TAM. While

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TAM is believed to have greater generality, TPB provides some specific guidelines for systems development with more constructs (Mathieson 1991).

In another study of competing IT usage models, Taylor and Todd (1995b) compared three models: TAM, TPB, and a decomposed TPB. The decomposed TPB included a set of antecedents to each of the three independent constructs in TPB. Three behavioral beliefs (PU, EOU, and compatibility) determine attitude. Subjective norm is a composite effect of both peer and supervisor influences. PBC is the function of self-efficacy, resource facilitating conditions, and technology facilitating conditions (see Figure 6). The study found that subjective norm, a component omitted in TAM, was a significant predictor of intention in TPB. Between TPB and the decomposed TPB, the decomposed model demonstrated more accuracy and predictive power. However, when comparing TPB to TAM, the authors are reluctant to recommend either model. The predictive power of the decomposed model only increased 2% over TAM with seven more variables.

In summary, the two studies provide similar results. TAM and TPB are comparable in their predictive strengths; however, TAM is parsimonious and easy to apply while TPB provides more insight into usage and behavioral intention (Mathieson 1991; Taylor and Todd 1995b). One possible reason that TPB does not perform significantly better over TAM could be that some of the effects of PBC have been taken into consideration in the behavioral belief

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construct. For example, the effect of self-efficacy is embedded in perceived ease of use (Davis 1989). Therefore, to keep the research models simple, in this study we do not include the PBC construct.

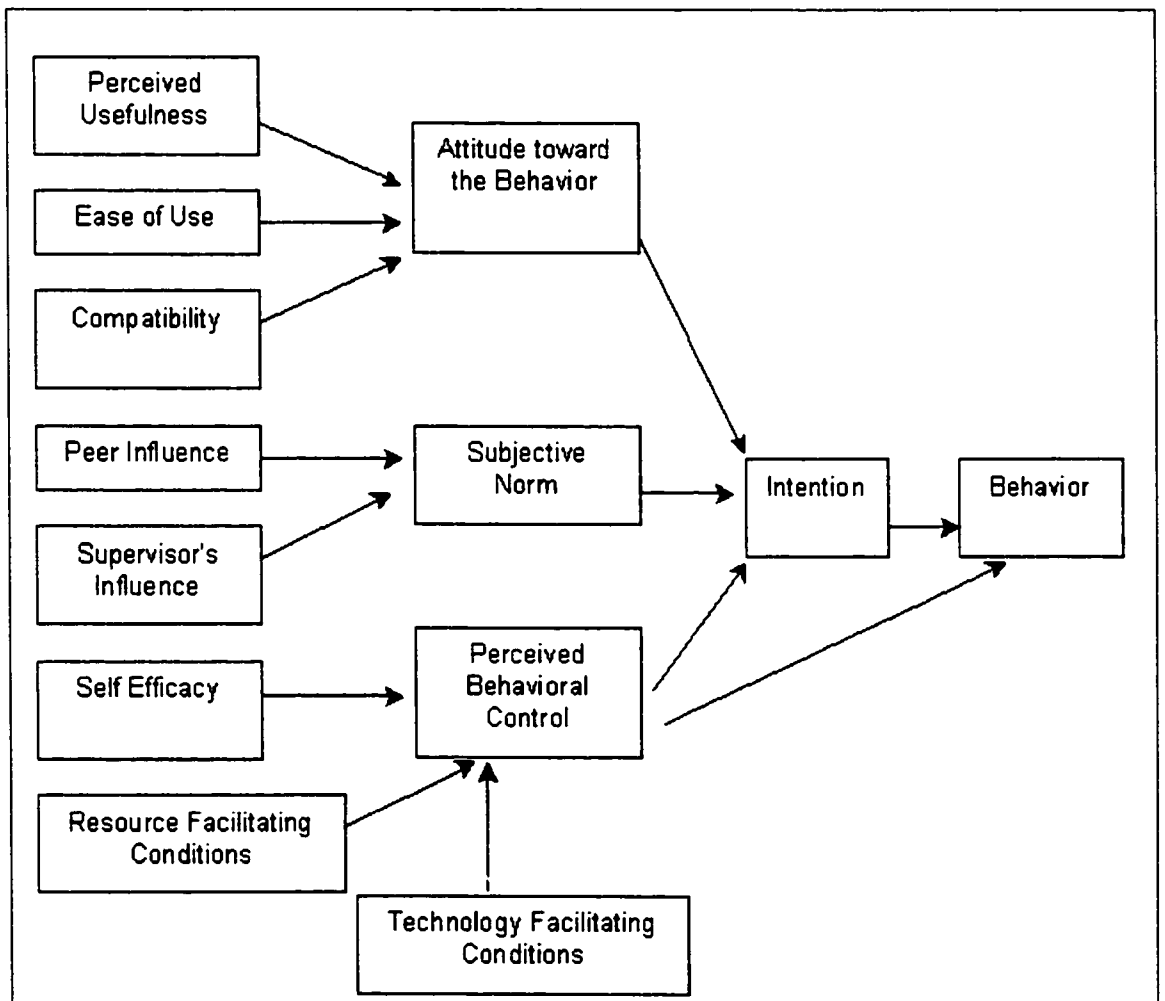

Figure 6. A Decomposed Theory of Planned Behavior Model

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Individual Innovation-Decision Process

Despite being a process of several stages, IT diffusion is often treated as binary, adoption versus non-adoption. Innovation diffusion studies have identified five innovation-decision stages from an adopter's point of view: knowledge, persuasion, decision, implementation, and confirmation (Rogers 1995). Innovation decision starts with the knowledge stage in which a potential adopter is exposed to an innovation and gains some understanding of how it works. The persuasion stage occurs when the potential adopter forms "a favorable or unfavorable attitude toward the innovation" (Rogers 1995, p. 167-168). The decision stage refers to the time when the potential adopter decides to either adopt or reject the innovation. Implementation stage occurs when the potential adopter starts using the innovation. Once this happens, the person can be classified as a user. At the confirmation stage, users seek to "avoid dissonance or to reduce it if it occurs" (Rogers 1995, p. 181). As suggested by TRA, attitude formation occurs while making the adoption decision. Rogers (1995) also notes that different communication channels play different roles in different diffusion stages. For example, interpersonal communication is more important at the adoption decision stage.

The Concept of Stage

Due to the difficulty of examining and segmenting the end users according to the stages, IT adoption researchers often avoid articulating the differences in IT

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acceptance determinants and their impact on user acceptance and behaviors along the diffusion process (Beal and Rogers 1957; Rogers 1995). Nevertheless, the importance of stages or processes of diffusion is distinctively and extensively documented in many diffusion studies (e.g., Cooper and Zmud 1990; Rogers 1995; Tornatzky and Klein 1982). The fact that studies found contradictory results of the relationships between innovation attributes and IT diffusion or usage may have been caused by the lack of distinction between two major diffusion processes: adoption and implementation or usage. The key point is that different factors play different roles and have different or sometimes the opposite impact on diffusion at different stages. For example, all things being equal, an organization is more likely to adopt a less expensive innovation than a more expensive one. However, once it is adopted, the more expensive it is, the more likely it will be used (Tornatzky and Klein 1982) because companies tend to pay more attention to diffusing costly innovations.

One aspect of the diffusion process is to provide information that helps adopters to overcome uncertainties. The importance of subjective norm is outlined in innovation diffusion studies. It is believed that at the earliest stage of an innovation, when innovators adopt, subjective norm may not be available, therefore, the attitude of the innovators depends on the assessment and perceptions of the innovation. As early adopters join the adoption, they have the innovators' established perceptions which would contribute to overcoming the uncertainties of the early adopters. The attitudes of the early adopters may be

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influenced by the their perceptions as well as the norms. As the innovation continuously diffuses through an organization, the effect of norms on attitude will intensify for the early majority, late majority, and laggards, in that order.

In the IS area, Nolan's stage model (1979) is the best known and most widely cited model of computing evolution in organizations (King and Kraemer 1983). It is a prescriptive diagram that uses an S-shaped curve of data processing expenditures as a surrogate for the growth phenomena of organizational use of computers. Based on the change in computer budget, the model identifies six stages of evolution by the following characteristics: initiation, contagion, control, integration, data administration, and maturity (Nolan 1979). The drawback of this framework is that it presents an aggregated view of IT diffusion at the organizational level and does not address end-user computing issues and certainly not determinants of technology acceptance. Further, the model lacks theory and empirical evidence (Benbasat et al. 1984).

Recognizing the importance of addressing the differences between adopters and users, in a recent IT adoption study, Karahanna et al. (1999) explicitly distinguish potential IT adopters from users. They examine the issue of whether the beliefs and intentions of adopters and users differ. There are some major findings: subjective norm dominates prediction of behavioral intention for adopters; attitudinal measures dominate prediction of behavioral intention for users; the relationship between attitude and behavioral intention is nonsignificant for

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adopters; the relationship between subjective norm and behavioral intention is nonsignificant for users; for adopters, perceived usefulness, visibility, result demonstrability, ease of use, and trialability are significant behavioral beliefs determining attitude; for users, perceived usefulness and image are the only two significant behavioral beliefs underlying attitude; normative beliefs are different for both adopters and users. The results of the study suggest that behavioral intention and attitude are determined by different combinations of behavioral beliefs for potential adopters and users and the behavioral beliefs have different strengths in predicting attitude and intention between potential adapters and users.

In another study that claims to be a study of a group of adopters and nonadopters (Taylor and Todd 1995b), it was found that subjective norm is an important determinant of intention. While perceived usefulness significantly influenced attitude, ease of use does not; however, the results should be interpreted carefully. The subjects in the study are a combination of different groups of adopters (based on given information).

The implication of the above discussions is significant: There are different issues that management should focus toward different groups of adopters. However, such studies have not been widely conducted and the results are not confirmed. Therefore, further studies are required to validate the findings.

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In summary, behavioral belief measures, attitude, and subjective norms operate differently across adopters and users. However, studies rarely articulate the distinction between earlier adopters and later adopters, which are found to be different in diffusion studies, specifically in relation to how normative beliefs operate. The Karahanna et al. (1999) study treats the users uniformly. Therefore, in our study, in addition to further investigating the differences between potential adopters and users, we attempt to separate users into earlier adopters and later adopters. The sampling procedures are discussed in the methodology section.

Global IT Diffusion Studies

Diffusion research also has made its way into the international arena. However, the percentage remains small and is mostly in anthropology, rural sociology, and public health. Moreover, the international diffusion studies in the IS area focus on high-level and national issues. Little empirical research focuses on organizational and individual issues. TAM in particular is found less applicable or predictive in other countries than in the U.S. (Phillips et al. 1994; Rose and Straub 1998; Straub 1994; Straub et al. 1997). Table 4 summarizes the model predictive statistics (R^2) reported in selected studies.

In Table 4, TAM is found to be less predictive when applied in Japan. While TAM is supported in the cases of Switzerland and Arab countries, the strength of the model is weaker in other countries than those reported in the United States

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studies based on the R^2 statistic. In Switzerland and Japan, the effect of perceived ease of use is found to be insignificant. These studies find that culture may be a potentially meaningful explanation of the differences. However, no factors in the TAM model are linked to culture factors with well-grounded rationale.

Table 4. TAM-Based Studies Conducted in other Countries

	Studies		
	Straub et al. 1997		Rose and Straub 1998
Country/Region	Switzerland	Japan	Arabic World (Lebanon, Palestine, Saudi Arabia, Sudan)
Fit	Yes	No	Yes
N	152	142	96
R^2	.10	.01	.40

The recent global IT studies proposed and asserted that IT diffusion is affected by many high level factors: technological, political, economic, and cultural factors in international studies (Deans et al. 1991; Dekeleva and Zupancic 1993; Dologite et al. 1997; Palvia and Palvia 1996). In the following section, those factors are briefly discussed with more emphasis on cultural factors.

Technological Status

Information technology is largely dependent on other types of technologies, such as telecommunication infrastructures (Deans et al. 1991). Electronic switching and advanced telecommunications are the backbones of emerging information

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technology. In other words, IT diffusion is strongly dependent on the capacity of IT infrastructure (Antonelli 1997).

Political Factors

Technology transfer, as well as diffusion, requires government leadership. Foreign countries bring modern management techniques along with technology that can contribute to a country's growth. Policy makers can ensure faster diffusion by providing funding, tax preference, campaigning, and other types of assistance to technology investors. On the other hand, from a safeguarding point of view, the policy makers can help screen out improper technology (Ohkawa and Otsuka 1994). However, when strict restrictions are imposed, IT diffusion could be hindered.

Economic Factor

Ohkawa and Otsuka (1994) strongly suggest that technological diffusion is only realized with the residual from economic and social capacity growth because technology requires capital investment. In fact, economic theories found positive correlations between technology advancement and capital accumulation (Ohkawa and Otsuka 1994). In addition, external economies have had a great impact on technology advancement with foreign investment (Ohkawa and Otsuka 1994). Foreign exposure, foreign investment, and international trade can help less-developed countries adopt advanced technologies. There is also the constraint of labor. One main objective of IT is to enhance end-user

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performance; however, technology will not contribute to firm or national growth if there is a severe lack of qualified and skillful people (Ohkawa and Otsuka 1994).

Culture

Several studies assert that culture plays a significant role in IT diffusion (Burn 1995; Ein-Dor et al. 1993; Kedia and Bhagat 1988). Hofstede's (1980, 1991, 1994) studies are well-known but the original data were collected in the 1970s. In a more recent study (Trompenaars 1994) that is receiving increasing attention, 15,000 managers from 28 countries were surveyed. In this 10-year study, Trompenaars proposed five constructs, some of which are similar to those of Hofstede's. While each country has its unique set of culture dimension values, researchers have found some countries to be similar based on certain groupings, producing cultural clusters which are useful in making generalizations (Hofstede 1991; Ronen and Kraut 1977; Ronen and Shenkar 1985).

Culture is a concept that has been deemed important in IT diffusion as well as in global research. Many studies have called for more empirical study of culture in business (e.g., Hodgetts and Luthans 1997). Its importance has been evidenced in various diffusion disciplines, anthropology in particular (Rogers 1995). In failing to account for the value of culture, diffusion programs could be ineffective and even result in adverse consequences. To better understand culture, Hofstede developed a framework recognizing the dimensions of culture which are commonly known as power distance, uncertainty avoidance, individualism

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versus collectivism, and masculinity versus femininity (1994). The major motivation behind this classification framework is that it is able to establish "the degree to which cultural environment systematically influences employees' attitude and behavior" (Paik et al. 1996, p. 20). Even though this framework has been widely cited and acknowledged in the literature, the effects of cultural dimensions are not clearly addressed. In our study we attempt to connect specific dimensions of culture to the determinants of IT adoption.

Power Distance: Power distance refers to the degree of power inequality among people, and more specifically, between supervisors and subordinates (Shore and Venkatachalam 1995). In a culture with great power distance, organizations tend to be more hierarchical in nature because of the high degree of power distance. There is a significant implication on the design of information systems, whose structure is generally believed to parallel that of organizational structure. If a firm were to implement a decentralized system, the firm would have to make major adjustments to its organizational structure to benefit from such a system. The power structure and distance would then be greatly altered. We have to prepare the top management and the end-users for such cultural transitions. More importantly, in cultures with a large power distance, the effect of upper level management on individual employee IT adoption or usage may not be as powerful as in cultures with flatter power structures.

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Uncertainty Avoidance: Uncertainty avoidance refers to the extent to which people feel threatened by uncertain circumstances and avoid such situations by providing job security and establishing rigid rules (Shore and Venkatachalam 1995). In some cultures, employees are guaranteed life-time employment. This is particularly critical when firms are in the process of automating their business activities and processes, which may introduce job insecurity. Firms must proceed with computerization with great caution and avoid creating the perception of job insecurity. IT managers need to be aware of the effect of such uncertainties created during the IT diffusion process.

Individualism: Individualism refers to the degree to which people focus on themselves as individuals rather than act as members of groups. The opposite is collectivism. In collective cultures, individuals usually find groups they can relate to for a long time. Usually, the groups are formed in work settings. Collectivism can work for the implementation of IT when members of the groups exchange positive feedback of the technology, thus encouraging and reinforcing IT usage. The effect of norms on IT adoption and usage is expected to be significant in a collective culture, such as China.

Masculinity: Masculinity and femininity refer to values like assertiveness, performance, success and competition. Opposite of masculinity is femininity. Traditionally, the male is the dominating role. However, this dimension is moving

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to a more neutral status. The effect of this dimension on IT adoption is yet to be determined (Shore and Venkatachalam 1995).

Overall, studies have indicated that culture is important and found differences in IT adoption across cultures, however, the specific effects of culture have not been clearly identified in the literature. Generally, in existing cross-cultural research, cultural dimensions are not directly measured (Straub et al. 1997). Most studies utilize Hofstede's existing values to compare variables across countries. For example, Straub et al. (1997) created a Computer-based Media Support Index (CMSI), which is a mathematical expression of the simultaneous effect of the four Hofstede dimensions of culture (uncertainty avoidance, power distance, individualism, and assertiveness/masculinity). In their study, the United States, Switzerland, and Japan are indexed at 157, 204, and 287, respectively. Based on this index, they proposed and the results supported that the TAM model does fit the Japanese data sample. In addition, they found that the overall technology acceptance models of all three countries are significantly different. The use of such an index is theoretically unfounded and fails to isolate the dimensional effect of culture.

In our study, the inclusion of subjective norm, a function of normative beliefs may be potentially meaningful in explaining the effects of culture on technology acceptance. Specifically, the individualism dimension can help explain the effect of normative beliefs, which refer to what an individual feels and what his salient

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referents expect him to do. The salient referents make up the groundwork of the interpersonal network channels through which information technologies are communicated and diffused. It is expected that in an individualistic culture, the effect of norms may not be as influential as it is in a collectivism culture. For example, the U.S. culture is highly individualist (Cullen 1999); therefore, the effect of norms may not be strong. On the other hand, in our study, which is conducted in China, we expect the effect of norm would be significant for IT adopters because China is a highly collective culture.

CONVERGING THE RESEARCH STREAMS - RESEARCH MODELS

After reviewing relevant theories and studies, some objectives are established: 1) to examine the differences in factors determining adoption and use of IT; 2) to test IT diffusion models in a culture other than the United States; and 3) to learn more about the role of culture in determining IT adoption and usage by comparing the proposed models with existing studies conducted in other cultures. To achieve these objectives, we develop three research models (see Table 5 for a comparison of the models) that are analyzed at different levels. Each model encompasses different research variables. Models 1 and 2 are examined at the individual level and Model 3 at the organization level.

In order to achieve the first objective, we examine the differences of IT adopters and users in the context of the two models (Model 1 and Model 2; in Figure 7 and

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Figure 8, respectively). A potential IT adopter is defined as a person who is not currently using an IT but does have sufficient knowledge of the IT. An IT user is an individual who is using an IT. Models 1 and 2 are structurally similar; an additional outcome variable has been added to Model 2. This variable is IT usage behavior. Adoption intention of IT is the dependent variable in Model 1. To find differences between the two models, we can compare variables and construct relationships across the models.

To achieve the second objective of this study, we introduce Model 3 (Figure 9), which allows examination of IT diffusion at the organizational level. This model investigates how IT diffusion differs among organizations. The final analysis is to test the models in a culture other than the United States and which will satisfy objective three of our study. Results from these analyses provide insight into the diffusion of IT in a different culture.

These models were developed from a review of literature related to innovation diffusion theory, the Theory of Reasoned Action (TRA), and the technology acceptance model (TAM). Innovation diffusion research and IT diffusion studies both contribute to the development of models for this study.

Understanding the stages of IT diffusion is critical and should be taken into consideration when designing diffusion research. This is the reason that potential adopters are distinguished from users of IT. This research approach

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may lead to the reassessment of the theories used in predicting IT usage. It also enables us to answer questions pertaining to the applications of existing theories and models (e.g., TRA, TAM, TPB) to various diffusion stages.

Table 5. Research Models

	Research Models		
	Model 1 (Figure 7)	**Model 2** (Figure 8)	**Model 3** (Figure 9)
Level of analysis (Individual/ Organizational)	Individual	Individual	Organizational
Subject	Potential IT Adopters	IT Users	IT directors, Managers, or CIOs
Methodology	Field Survey	Field Survey	Interviews

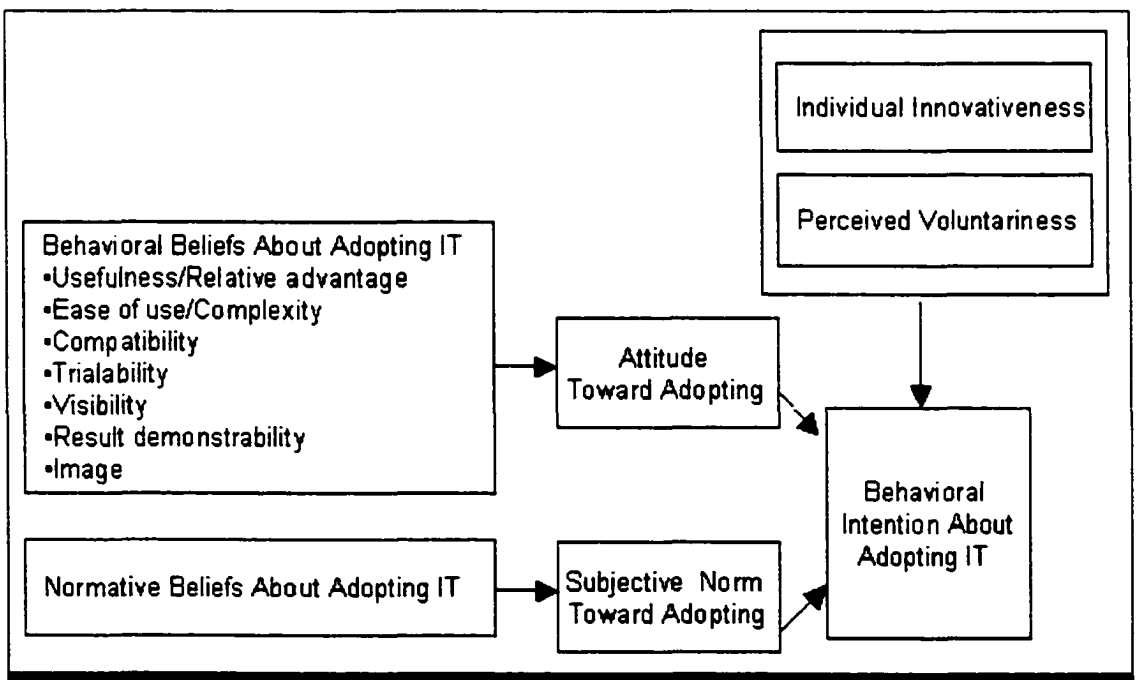

Figure 7. Model 1 - Potential IT Adopter Research Model

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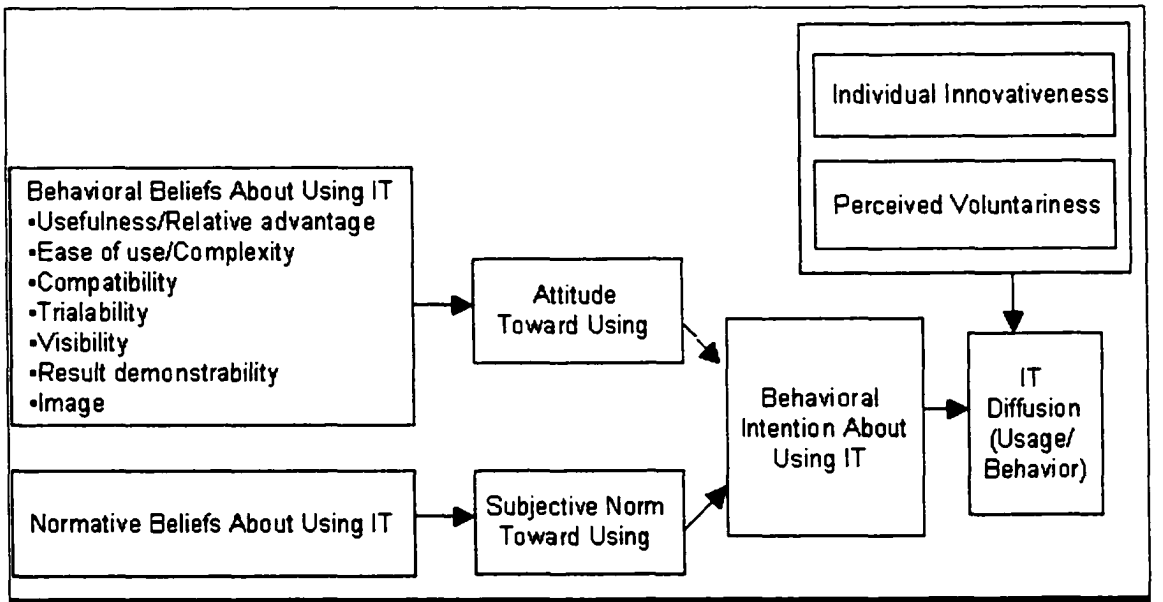

Figure 8. Model 2 - IT User Research Model

Individual-Level Models (Models 1 and 2)

Information technology's benefits range from mere automation to strategic competitiveness. The adoption of information technology by employees in organizations is a critical research area. While the benefits of IT are well known, individual employees may not perceive the technology favorably or adopt it. In this research, we investigate potential adopters of IT as well as users of IT. We compare potential adopters and users on the dimension of time, a critical element studied in diffusion research that parallels the stages of diffusion (Cooper and Zmud 1990). The potential adopters are at the early stages of diffusion, knowledge or persuasion; in contrast, users are at a later stage, implementation.

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As the literature suggests, to truly understand IT diffusion, various stages of diffusion must be taken into consideration. Therefore, two models are derived based on this notion: one is for potential IT adopters (Model 1, shown in Figure 7) and one for IT users (Model 2, shown in Figure 8). The structure and variables in both models are very similar. Each model combines TAM's intention, attitude, and actual usage construct and Karahanna et al. 's (1999) normative belief and subjective norm constructs that are based on the Theory of Reasoned Action. Consistent with innovation diffusion theory, IT diffusion studies suggest that innovation's perceived attributes, the individual's attitude and beliefs, and social communications are the key constructs of the innovation decision process (Karahanna et al. 1999; Rogers 1995). Consequently, those constructs are adopted in Models 1 and 2. In addition, individual innovativeness, deemed important in innovation diffusion theory, is incorporated in the models. In the following sections, the variables and their linkages are discussed.

Behavioral Beliefs

The initial decision making and motives of innovation diffusion are studied from the perspective of behavioral beliefs for adopting/using the IT. Currently, studies and findings in this area are limited due to the difficulty of data collection pertaining to motives, which goes back to the perception of innovation. Note that the behavioral beliefs studied here are subjective measures. The dimensions of behavioral beliefs include usefulness (relative advantage), ease of use

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(complexity), image, compatibility, trialability, visibility, and result demonstrability (e.g., Agarwal and Prasad 1997; Davis 1989; Davis et al. 1989; Karahanna et al. 1999; Rogers 1995). These dimensions, which are separate constructs, have seldom been tested simultaneously in studies. Most of the studies choose a subset of the dimensions. Table 6 contains the definitions and supporting references of the dimensions (adopted from Karahanna et. al. 1999).

Attitude Toward Behavior

Attitude is defined as "a learned, implicit anticipatory response" (Doob 1947, in Fishbein and Ajzen 1975, p. 24). Based on TRA and previous studies, behavioral beliefs about adopting/using the IT lead to attitudes toward IT. For example, a potential adopter with positive behavioral beliefs about adopting an IT would likely favor (attitude) adopting the IT. On the contrary, negative behavioral beliefs would lead to unfavorable attitude.

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Table 6. Perceived Innovation Attributes (Behavioral Beliefs) (Adopted from Karahanna et al. 1999)

Behavioral Beliefs about Adopting/Using an IT	Definition	References
Perceived Usefulness	The subjective probability that using a specific application system will increase his or her job performance within an organizational context.	Davis et al. 1989; Karahanna et. al. 1999; Rogers 1995; Hoffer and Alexander 1992; Moore and Benbasat 1991
Ease of Use	The degree to which using a particular system is free of effort.	Karahanna et al. 1999; Rogers 1995; Hoffer and Alexander 1992; Moore and Benbasat 1991
Compatibility	The degree to which using the IT innovation is compatible with what people do.	Karahanna et al. 1999; Rogers 1995; Hoffer 1992; Moore and Benbasat 1991
Trialability	The degree to which one can experiment with an innovation on a limited basis before making an adoption or rejection decision.	Karahanna et al. 1999; Rogers 1995; Moore and Benbasat 1991
Visibility	The degree to which the innovation is visible in the organization.	Karahanna et al. 1999; Moore and Benbasat 1991
Result Demonstrability	The degree to which the results of adopting/using the IT innovation are observable and communicable to others.	Karahanna et al. 1999; Moore and Benbasat 1991
Image	The degree to which adoption/usage of the innovation is perceived to enhance one's image or status in one's social system.	Karahanna et al. 1999; Moore and Benbasat 1991

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Subjective Norm and Normative Beliefs

Normative beliefs of an individual refer to what he feels and what his/her salient referents expect him to do. There are many sources from which normative beliefs are formed. It can be from a friend, a parent, or a coworker, depending on the type of behavior under examination. A number of normative beliefs shape a person's subjective norm, which is the perception of social pressure to perform the behavior (Mathieson 1991). In the context of IT diffusion, the normative beliefs should be assessed and are pertinent to adoption and usage of IT. MIS literature indicates that normative beliefs are formed from the following sources: top management, friends and peers, IS department, and IS specialists (Karahanna et al. 1999).

Behavioral Intention

TRA theorizes that both attitude and subjective norm determine behavioral intention (Fishbein and Ajzen 1975). The user intention construct has been compared to other competing measures, such as realism of expectations, motivational force, value, user satisfaction and involvement, and user satisfaction in its predictability of user behavior (Venkatesh and Davis 1996). It indicates the amount of effort people are willing to put forth to perform the behavior. In Model 2, behavioral intention serves as an outcome (dependent variable) of attitude and subjective norm.

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Actual Behavior

Behavioral intention subsequently influences one's behavior (Fishbein and Ajzen 1975). It is empirically supported that behavioral intention has good predictability toward both self-reported and actual usage (Agarwal and Prasad 1999; Jackson et al. 1997; Szajna 1996). Therefore, in Model 2, intention serves as an antecedent of behavior (IT usage behavior). Some studies (e.g., Szajna 1996 uses student subjects). In an actual field setting, the actual usage may not be more accurate than self-report. In addition, the use of objective measures, such as actual usage, would prevent us from making meaningful comparisons between the current study and existing studies (Tornatzky and Klein 1982). Therefore, consistent with IT acceptance literature, self-reported measures are used to measure actual behavior in the current study.

Additional Variable: Individual Innovativeness

Innovativeness of an individual is one area that has been heavily studied in the general innovation diffusion area. Individual innovativeness is defined as the degree to which an individual is likely to adopt new ideas compared to others. Education, age, gender, and social status are found to be influential factors of innovativeness in an individual (Agarwal and Prasad 1998; Rogers 1995). In addition, whether a person reads relevant publications (e.g., technical journals and books) and has outside contacts (e.g., colleagues) are good predictors of individual innovativeness (Hoffer and Alexander 1992; Rogers 1995).

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Recently, the importance of individual innovativeness has been studied in the IT area (e.g., Agarwal and Prasad 1998). A domain specific construct of individual innovativeness has been developed and is suggested to be more useful in predicting acceptance of specific innovation. Agarwal and Prasad (1998) define individual innovativeness pertaining to IT adoption as "the willingness of an individual to try out any new information technology" (Agarwal and Prasad 1998, p. 206). It has been found that individual innovativeness and IT diffusion are positively linked. Individual innovativeness is treated as an determinant of behavioral intention (Agarwal and Prasad 1997). The scales developed are shown in the operationalization section.

Additional Variable: Perceived Voluntariness

Another variable influencing behavioral intention (in Model 1; it directly affects behavior in model 2) identified in the literature is voluntariness, which refers to the perceived degree of volitional control (Agarwal and Prasad 1997). Studies of individual characteristics often imply that individuals are to be blamed for delayed adoptions or slow adoptions. However, many times individual decisions cannot be made until a more collective decision is made (Rogers 1995). In innovation diffusion studies, a concept similar to voluntariness, decision type, is pointed out as a variable that affects diffusion rate. Four decision types are identified (Rogers 1995, p. 28-29) as follows:

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1. Optional innovation-decisions: these are decisions completely dependent on the adopters. They are generally faster than collective decision.
2. Collective innovation-decisions: These require the consensus of a collective body.
3. Authority innovation-decisions: These types of decisions are made by top management and are generally faster than other types of decisions. They are common in formal organizations.
4. Contingent decisions: Such decisions are a sequential combination of two or more decisions listed above. For example, a collective decision follows an authority decision.

The first three types of decisions are on a continuum; however, it is difficult to measure a decision type on a continuous scale. Voluntariness may be a better measurement. The degree of voluntariness of adopters in making an adoption decision varies and could lead to varying usage. In fact, TRA is designed to predict voluntary behavior (Sheppard et al. 1988). The addition of voluntariness will improve explained variance in usage and is assessed using self-reported items (Agarwal and Prasad 1997).

Organizational-Level Model (Model 3)

The purpose of an organizational model (Model 3) is to study how IT diffusion differs based on a set of organizational variables. Differing from the individual-level models, the dependent variable in the organizational level model is IT diffusion (see Model 3 in Figure 9), which is measured by the percent of employees who are using the IT at a given time, and is commonly used in diffusion studies (Rogers 1995).

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There are two other groups of variables, an independent variable and control variables. The independent variable is training and support, believed to enhance diffusion and usage of IT. The effects are evidenced in several studies (Nelson and Cheney 1987; Torkzadeh and Dwyer 1994). The control variables are a set of organizational characteristic variables suggested in the literature: location/region, and ownership, size, and industry.

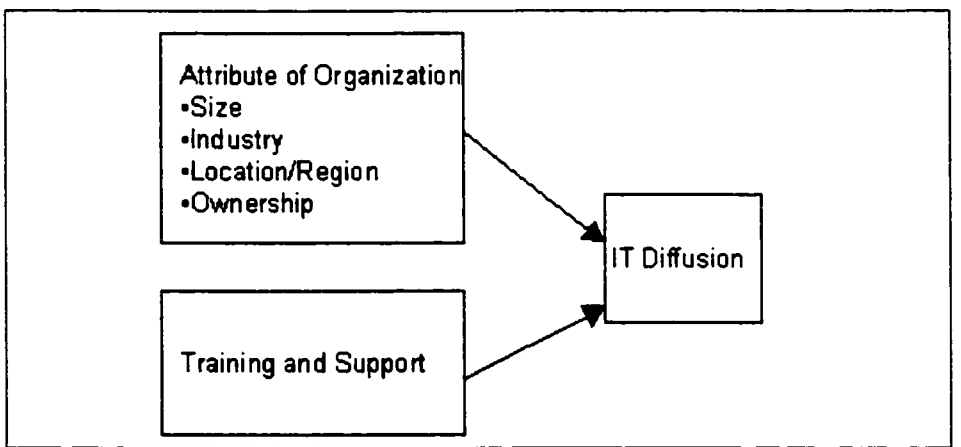

Figure 9. Organizational IT Diffusion Research Model

The control variables, location/region, ownership, size, and industry are discussed in the following sections.

Location/Region

Generally, some regions are more technologically advanced than others. For example, in China, regional dynamics and policies differ significantly (Cui and Liu 2000). Special economic zones are given more privileges in technological development. Regional factors need to be taken into consideration. It is

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expected that more economically advanced regions will tend to be more innovative.

Ownership

Economically and technologically speaking, in some countries a dualistic environment exists. Technologically advanced corporations operate in the same environment as traditional organizations (Detragiache 1998). Publicly-owned companies tend to be more traditional while private companies are more modern and innovative (Bretschneider and Wittmer 1993; Rovere 1996). Ownership was found to have a significant differential effect on adoption of PC technology (Bretschneider and Wittmer 1993). It could be hypothesized that public-owned companies tend to utilize less IT than private ones and their diffusion rate is lower.

Size

Larger firms are believed to have more advantages than smaller firms and tend to lead in innovation diffusion (Utterback and Suzrez 1993). A study of IT in Japan indicates significant differences in IT diffusion among small/medium enterprises (SMEs) and large enterprises (Les). SMEs are found to be much slower in IT diffusion when compared to LEs (Griffy-Brown et al. 1999). The findings in IT literature are consistent with innovation diffusion literature (Rogers 1995).

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The size of an organization can be measured by the number of employees (Chengalur-Smith and Duchessi 1999). However, there is no general operational definition of SMEs or LEs (Thong 1999). Many studies define that a small enterprise is one with less than 100 employees (Igbaria et al. 1997; Yap et al. 1992). The size of an SME ranges between 20 and 250 in studies when reported (e.g., Soh et al. 1992; Yap et al. 1992). In this study we will use 250 as the cutoff for SMEs. It is expected that the larger companies are more innovative.

Industry

It is believed that some industries are more IT-intensive than others; therefore, IT diffusion is more widespread in some industries than others (Kagan et al. 1990; Mockler et al. 1999). For example, retailing was found to use more sophisticated technologies than than manufacturing (Kagan et al. 1990). We expect to see different rates of diffusion across industry sectors.

Research Questions

Based on the literature review and models constructed, three sets of research questions are developed: (1) questions pertaining to the research models, (2) descriptive questions that deal with specific variables, and (3) questions about relationships between variables. These questions focus on filling in the knowledge gaps in IT diffusion, acceptance, and usage research.

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Model Questions

The following questions are related to the research models developed.

1. Do the models fit for potential IT adopters, IT users (both earlier and later adopters), and organizations in China?
2. Compared to existing studies, do the models differ from those applied in other cultures using the same measures?

Technology acceptance and diffusion studies conducted in other countries have produced differing results from the U.S. studies. The differences, when compared with existing studies in other cultures, could be explained by cultural factors. The models are tested using data collected from China; therefore, we can gain more insight into the variables that affect IT diffusion and acceptance in China. We investigate the fitness of the models. If we find a good model fit, we can further investigate the predictive powers of the models and construct relationships within the models. However, one of the objectives of this study is to determine whether certain relationships exist in any of the adopter groups (i.e., earlier adopters, later adopters, and potential adopters); therefore, it is suspected that some constructs in the models are misspecified. Consequently, we anticipate less than satisfactory fits of data to the models. The focus of the model testing is on gaining a broader perspective of the determinants of IT acceptance and usage and how variables operate for different adopters.

Descriptive Questions

Each of the following descriptive questions deals with behavioral belief constructs and innovativeness:

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1. Do behavioral beliefs differ between potential adopters and users of IT?
2. Do behavioral beliefs differ between earlier and later adopters (two user groups) of IT?
3. Does innovativeness differ between potential adopters and users of IT?
4. Does innovativeness differ between earlier adopters and later adopters of IT?

The theme of the above questions is whether potential adopters and users differ along the dimensions of behavioral belief, normative belief, and innovativeness. There are few studies that examine the differences between potential adopters and users of IT. In addition, fewer studies distinguished among different types of IT users/adopters and no studies that we are aware of explore the differences between different types of IT users along the dimensions of behavioral belief, normative belief, and innovativeness (Brancheau and Wetherbe 1990; Karahanna et al. 1999).

However, knowing the behavioral belief differences among different adopter groups could be a key to finding the determinants of usage. Question 1 examines whether behavioral beliefs are different between potential adopters and users of IT. Question 2 investigates whether behavioral beliefs differ between earlier and later adopters of IT.

According to innovation diffusion theory, diffusion occurs in stages. Adoption and continued usage are the target behaviors of different stages in diffusion, pre-adoption stages (e.g., knowledge and persuasion) and post-adoption stages (e.g., use) (Karahanna et al. 1999; Rogers 1995). The target behaviors are

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determined by different behavioral beliefs. Therefore, we propose that the set of behavioral beliefs underlying users attitude will be different from the set of potential adopters (Karahanna et al. 1999). To answer questions 1 and 2, the research models are examined and the significant paths leading from the behavioral beliefs to attitude are assessed (Karahanna et al. 1999).

Questions 3 and 4 bring up the possibility that potential IT adopters may be different from the users and the earlier adopters from later adopters along the innovativeness dimension. Questions 3 and 4 are further developed into hypotheses and discussed in the hypothesis section.

Relationship Questions

The following questions are concerned with variable relationships and how the relationships differ for the potential adopters and users of IT.

1. Does the behavioral beliefs-attitude link differ in strength between potential adopters and users of IT?
2. Does the attitude–intention link differ in strength between potential adopters and users of IT?
3. Is the subjective norm-intention link significant for potential adopters and users of IT?
4. Does the subjective norm-intention link differ in strength between potential adopters and users of IT?
5. Is there any effect of individual innovativeness on intention for potential adopters of IT?
6. Is there any effect of individual innovativeness on behavior for users of IT?
7. Is there any effect of voluntariness on intention for potential adopters of IT?
8. Is there any effect of voluntariness on behavior for users of IT?
9. Does the effect of voluntariness on behavior differ between earlier and later adopters of IT?
10. Do organizations that differ in region/location, ownership, size, and industry have different rate of IT diffusion?

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The literature provides strong evidence that researchers have reached a consensus on the following variable relationships in the IT acceptance and usage area, which are supported by TAM and TRA: intention is determined by attitude, which is formed by a set of behavioral beliefs, and normative beliefs shape subjective norm (e.g., Agarwal and Prasad 1997; Davis 1989; Karahanna et al. 1999; Mathieson 1991). However, these relationships have rarely been compared across potential adopters and different types of users of IT. Questions 1, 2, and 4 are designed to investigate such differences.

The effect of subjective norm on attitude is still inconclusive as revealed in the literature. Prior empirical studies present contradicting results. Subjective norm is found to be a significant factor determining attitude in some studies (e.g., Agarwal and Prasad 1999; Karahanna et al. 1999; Taylor and Todd 1995a) while it is not in others (e.g., Davis 1989; Davis et al. 1989). Question 3 intends to investigate this relationship. We expect to see differences in the effect of subjective norm on different types of adopters. Even though a single study such as ours may not be conclusive, the results of the study may lead the researchers toward a more rigorous approach in studying the IT adopters.

Individual innovativeness and voluntariness are two variables introduced in diffusion research; however, they are not systematically tested in IT diffusion research. A few existing studies deal with these two concepts in the IT area (e.g., innovativeness, Agarwal and Prasad 1998; voluntariness, Agarwal and

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Prasad 1997; Karahanna et al. 1999; Moore and Benbasat 1991). Questions 5, 6, 7, and 8 are designed to investigate the effect of these two variables on potential adopter intention and user behavior. Further, question 9 intends to answer whether the effect of voluntariness on usage is different for earlier and later adopters. It is suggested that voluntariness has significant effect on IT adopters' behavior (Agarwal and Prasad 1997; Moore and Benbasat 1991). Knowing the effect of voluntariness on different types of adopters, IT managers can deploy various levels of IT diffusion policies at different stages of the diffusion process.

Question 10 investigates the relationships between some organizational variables and the rate of diffusion. Studies have found that region/location (Rogers 1983), ownership (Bretschneider and Wittmer 1993; Detragiache 1998; Rovere 1996), size (Griffy-Brown et al. 1999; Igbaria et al. 1997; Rogers 1995; Utterback and Suarez 1993), and industry (Kagan et al. 1990; Mockler et al. 1999) affect the rate of diffusion. The knowledge of the effects of these variables can be potentially beneficial to policy makers at the regional or national levels. This question will be studied using descriptive data and diffusion curves.

Descriptive Questions 3 and 4 and Relationships Questions 1 through 9 are translated into hypotheses, which are discussed next.

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Hypotheses

The research questions formulated lead to the following hypotheses. The hypotheses focus on testing the differences among earlier, later, and potential adopters. The testing method for each hypothesis is presented in Table 7 on page 72.

H1: The effect of attitude (A) on behavioral intention (BI) will be stronger for earlier adopters than for later adopters.

H2: The effect of attitude (A) on behavioral intention (BI) will be stronger for later adopters than for potential adopters.

H3: The effect of attitude (A) on behavioral intention (BI) will be stronger for earlier adopters than for potential adopters.

H4: The effect of subjective norm (SN) on behavioral intention (BI) will be weaker for earlier adopters than for later adopters.

H5: The effect of subjective norm (SN) on behavioral intention (BI) will be weaker for later adopters than for potential adopters.

H6: The effect of subjective norm (SN) on behavioral intention (BI) will be weaker for earlier adopters than for potential adopters.

Hypotheses 1 through 6 investigate the comparatives strength of the determinants of behavioral intention (i.e., attitude and subjective norm) across earlier, later, and potential adopters. Hypotheses 1, 2, and 3 compare the relationship between attitude (A) and behavioral intention (BI) across the three

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adopter groups while Hypothesis 4, 5, and 6 compare the relationship between subjective norm (SN) and behavioral intention (BI) across the groups.

Both earlier and later adopters having direct experience with IT would rely more on attitude rather than subjective norm in determining behavioral intention (Karahanna et al. 1999), compared with potential adopters (H1 and H2). Earlier adopters, those who adopt before the average users, have more concrete knowledge of the innovation than later adopters; therefore, a stronger linkage between attitude and intention is expected in the earlier adopter group (H3).

Subjective norm has been found to be more important for the potential adopters than the users (Hartwick and Barki 1994; Karahanna et al. 1999; Taylor and Todd 1995a); therefore it is reasonable to assume that subjective norm will be more influential in shaping potential adopters' behavioral intention than earlier (H4) or later adopters' (H5). Later adopters, in contrast to earlier adopters, in order to confirm their behavior, will rely heavily on their subjective norm (Rogers 1995). Consequently, hypothesis 6 postulates that the strength of SN→BI will be stronger for later adopters than for earlier adopters.

H7: Perceived usefulness (PU) will be a significantly stronger factor for earlier adopters than for later adopters of IT in determining attitude.

H8: Perceived usefulness (PU) will be a significantly stronger factor for later adopters than for potential adopters of IT in determining attitude.

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H9: Perceived usefulness (PU) will be a significantly stronger factor for earlier adopters than for potential adopters of IT in determining attitude.

The literature reports inconsistent results on the relationships between behavioral belief variables and attitude. While the majority of the studies make no distinctions between earlier and later adopters and potential adopters, we intend to demonstrate that these relationships are different among the three types of adopters. We selected two behavioral beliefs that have been extensively studied, perceived usefulness and perceived ease of use. Hypotheses 7, 8, and 9 investigate the perceived usefulness construct and hypotheses 10, 11, and 12 study the perceived ease of use construct.

Perceived usefulness is reported in some studies to be a significantly stronger factor for users in shaping their attitude than for potential adopters (Davis 1989; Szajna 1996); therefore, we hypothesize that the strength of PU→A path will be significantly stronger for later adopters than for potential adopters (H8) and for the earlier adopters than for potential adopters (H9). For continuous users, their attitude relies on positive information, for example, the usefulness of an innovation (Karahanna et al. 1999). More specifically, as earlier adopters continue using IT, their attitude will become increasingly manipulated by their knowledge of IT (Karahanna et al. 1999). Perceived usefulness is directly related to IT functions; therefore, its effect on attitude is expected to be stronger for earlier adopters than for later adopters (H7).

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H10: Perceived ease of use (EOU) will be a significantly weaker factor for earlier adopters than for later adopters of IT in determining attitude.

H11: Perceived ease of use (EOU) will be a significantly weaker factor for later adopters than for potential adopters of IT in determining attitude.

H12: Perceived ease of use (EOU) will be a significantly weaker factor for earlier adopters than for potential adopters of IT in determining attitude.

On the contrary, perceived ease of use is believed to be more important at early stages of diffusion, consequently, it is more dominant in determining potential adopters' attitude (Adams et al. 1992). Therefore, the strength of EOU→Attitude path is hypothesized to be stronger for potential adopters than for users (H11 and H12). The effect of ease of use on attitude is less apparent as earlier adopters have more experience with IT; hence, we expect to see a weaker effect of perceived ease of use for earlier adopters than for later adopters (H10).

H13: Individual innovativeness (II) will be positively correlated with IT usage for the earlier adopter group.

H14: Individual innovativeness (II) will be positively correlated with IT usage for the later adopter group

H15: Individual innovativeness (II) will be positively correlated with potential adopters' intention to adopt IT.

Hypotheses 13, 14, and 15 examine the relationship between individual innovativeness and behavioral intention. The more innovative a person is, the

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more likely he/she will adopt or use an IT (Agarwal and Prasad 1997; Rogers 1995). We intend to test this relationship in each of the three adopter groups, earlier adopter (H13), later adopter (H14), and potential adopter (H15). The purpose of these hypotheses is to gain further insight into the utility of the individual innovativeness instrument, which could be a substitute for the time of adoption.

H16: Earlier adopters will be more innovative than later adopters.

H17: Later adopters will be more innovative than potential adopters

H18: Earlier adopters will be more innovative than potential adopters.

Hypotheses 16, 17, and 18 are intended to test whether earlier, later, and potential adopters will be different along the individual innovativeness dimension. A person who is more innovative will be more likely to adopt an IT early (Rogers 1995); therefore, the mean of individual innovativeness will be higher for earlier adopters than for later adopters (H16). To test H16, we compare the latent means of individual innovativeness to see whether they are significantly different between later adopters and earlier adopters. Similarly, potential adopters may be less innovative than the users; consequently, we hypothesize that users will be more innovative than potential adopters (H17 and H18). To test these hypotheses, the latent means of individual innovativeness are compared between potential adopters and users. One purpose of these hypotheses is to

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check to see whether we can use the innovativeness instrument to classify the adopters.

H19: Perceived voluntariness will have a significant effect on usage for earlier adopters.

H20: Perceived voluntariness will be negatively correlated with usage (U) for later adopters.

H21: Perceived voluntariness (VOL) will be negatively correlated with behavioral intention (BI) for potential adopters.

The effect of voluntariness is explored in Hypotheses 19, 20, and 21. The knowledge of the effect of voluntariness would be highly practical for the IT managers in designing policies to facilitate IT diffusion. There is evidence that the effect of voluntariness differs among the users (Agarwal and Prasad 1997). Earlier adopters, being more innovative tend to rely mainly on their evaluations of the innovation in determining their behavior; therefore, we hypothesize that there will be a significant effect of voluntariness on earlier adopter usage (H19). Hypothesis 19 is stated in non-null form, thus we intent to reject this hyupothsis. However, later adopters are more reluctant even when they are presented with ample opportunities to adopt the innovation; the effect of voluntariness will be effective on later adopters. Thus, H20 hypothesizes that later adopters' actual behavior, which is IT usage, will be influenced by perceived voluntariness negatively. Similarly, potential adopters tend to be more eager to adopt if the use of an IT is perceived to be mandatory (low voluntariness; Rogers 1995),

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therefore, H21 postulates that for potential adopters, there will be a significant negative relationship between voluntariness and behavioral intention).

Table 7 lists the hypotheses and their corresponding data samples and testing methods. Three types of analyses were used in hypothesis testing: 1) testing of the regression coefficient equivalence using multi-group analysis (H1, H2, H3, H4, H5, H6, H7, H8, H9, H10, H11, and H12), 2) examining the significance and direction of parameter estimates (H13, H14, H15, H19, H20, and H21), and 3) testing of the latent mean invariance using multi-group analysis (H16, H17, and H18).

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Table 7. Hypothesis Testing Methods and Data Sets

Hypothesis	Sample/Group	Test/Analysis
H1: The effect of attitude (A) on behavioral intention (BI) will be stronger for earlier adopters than for later adopters.	Earlier adopters Later adopters	Test the equivalence of the regression of Behavioral Intention on Attitude using multi-group analysis
H2: The effect of attitude (A) on behavioral intention (BI) will be stronger for later adopters than for potential adopters.	Later adopters Potential adopters	Test the equivalence of the regression of Behavioral Intention on Attitude using multi-group analysis
H3: The effect of attitude (A) on behavioral intention (BI) will be stronger for earlier adopters than for potential adopters.	Earlier adopters Potential adopters	Test the equivalence of the regression of Behavioral Intention on Attitude using multi-group analysis
H4: The effect of subjective norm (SN) on behavioral intention (BI) will be weaker for earlier adopters than for later adopters.	Earlier adopters Later adopters	Test the equivalence of the regression of Behavioral Intention on Subjective Norm using multi-group analysis
H5: The effect of subjective norm (SN) on behavioral intention (BI) will be weaker for later adopters than for potential adopters.	Later adopters Potential adopters	Test the equivalence of the regression of Behavioral Intention on Subjective Norm using multi-group analysis
H6: The effect of subjective norm (SN) on behavioral intention (BI) will be weaker for earlier adopters than for potential adopters.	Earlier adopters Potential adopters	Test the equivalence of the regression of Behavioral Intention on Subjective Norm using multi-group analysis
H7: Perceived usefulness (PU) will be a significantly stronger factor for earlier adopters than for later adopters of IT in determining attitude.	Earlier adopters Later adopters	Test the equivalence of the regression of Attitude on Perceived Usefulness using multi-group analysis

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Table 7. Continued

Hypothesis	Sample/Group	Test/Analysis
H8: Perceived usefulness (PU) will be a significantly stronger factor for later adopters than for potential adopters of IT in determining attitude.	Later adopters Potential adopters	Test the equivalence of the regression of Attitude on Perceived Usefulness using multi-group analysis
H9: Perceived usefulness (PU) will be a significantly stronger factor for earlier adopters than for potential adopters of IT in determining attitude.	Earlier adopters Potential adopters	Test the equivalence of the regression of Attitude on Perceived Usefulness using multi-group analysis
H10: Perceived ease of use (EOU) will be a significantly weaker factor for earlier adopters than for later adopters of IT in determining attitude.	Earlier adopters Later adopters	Test the equivalence of the regression of Attitude on Perceived Ease of Use using multi-group analysis
H11: Perceived ease of use (EOU) will be a significantly weaker factor for later adopters than for potential adopters of IT in determining attitude.	Later adopters Potential adopters	Test the equivalence of the regression of Attitude on Perceived Ease of Use using multi-group analysis
H12: Perceived ease of use (EOU) will be a significantly weaker factor for earlier adopters than for potential adopters of IT in determining attitude.	Earlier adopters Potential adopters	Test the equivalence of the regression of Attitude on Perceived Ease of Use using multi-group analysis
H13: Individual innovativeness (II) will be positively correlated with IT usage for the earlier adopter group.	Earlier adopters	Examine the significance and direction of the Individual Innovativeness→Usage path estimate

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Table 7. Continued

Hypothesis	Sample/Group	Test/Analysis
H14: Individual innovativeness (II) will be positively correlated with IT usage for the later adopter group.	Later adopters	Examine the significance and direction of the Individual Innovativeness→Usage path estimate
H15: Individual innovativeness (II) will be positively correlated with potential adopters' intention to adopt IT.	Potential adopters	Examine the significance and direction of the Individual Innovativeness→Behavioral Intention path estimate
H16: Earlier adopters will be more innovative than later adopters.	Earlier adopters Later adopters	Test latent mean (individual innovativeness) difference using multi-group analysis
H17: Later adopters will be more innovative than potential adopters.	Later adopters Potential adopters	Test latent mean (individual innovativeness) difference using multi-group analysis
H18: Earlier adopters will be more innovative than potential adopters.	Earlier adopters Potential adopters	Test latent mean (individual innovativeness) difference using multi-group analysis
H19: Perceived voluntariness will have a significant effect on usage for earlier adopters.	Earlier adopters	Examine the significance and direction of the Voluntariness→Usage path estimate
H20: Perceived voluntariness will be negatively correlated with usage (U) for later adopters.	Later adopters	Examine the significance and direction of the Voluntariness→Usage path estimate
H21: Perceived voluntariness (VOL) will be negatively correlated with behavioral intention (BI) for potential adopters.	Potential adopters	Examine the significance and direction of the voluntariness→Behavioral Intention path estimate

RESEARCH METHODOLOGY

In this section, we discuss how the research is conducted. We choose to examine the diffusion and use of E-Mail and word processing software (WP). The rationale behind selecting these applications is that they have been studied in the United States and other countries (e.g., Agarwal and Prasad 1998; Straub et al. 1997); therefore, comparisons can be drawn across cultures. In addition, we conducted a preliminary examination of field study subjects regarding the type of software used at work. The finding was that E-Mail and WP are the most accessible computer software among the Chinese companies. Microsoft Office products, MS Outlook and MS Word are the dominant applications.

A combination of field survey and interviews were employed to collect data. The prototypical methodology for diffusion research, established in 1941, is one-shot survey interviews with the adopters of an innovation, who are asked to recall their adoption behavior and decisions (Rogers 1995). Because recall data may suffer from poor accuracy (Rogers 1995), we minimize the use of recall data. We only asked the current users to recall when they first adopted the computer software (E-Mail or WP).

The study is field survey-based at the individual level (to test Models 1 and 2). The survey was given to employees in selected Chinese companies. To test the organizational level model, we collected data through interviews with IS directors or managers and analyzed organizational documents and brochures.

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Scale Development

The questionnaire items are based on concepts and scales developed and found in U.S. research; therefore we must be cautious when using the questionnaires in other cultures. Cross-cultural research stresses the importance of equivalence. In this study, the scales were developed to establish, at minimum, structural or construct equivalence. Construct equivalence is achieved when the same construct is measured even though it is operationalized differently across cultures (Vijver and Leung 1997). With construct equivalence, it is feasible to compare the results of this study with existing ones in the relationships of the constructs.

The scale development process was three-fold. First, the scales were operationalized by adopting and adapting items from the existing scales. Second, the scales were translated into Chinese and pretested (the English version of the questionnaire used in the pretest can be found in Appendix A) and pilot tested for reliability. Third, the resulting instrument from the pilot test was applied to the field survey.

Operationalization of the Scales

Table 8 shows the major studies from which the items were adopted. The reliability coefficients of the scales are presented. As shown in Table 8, the

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scales demonstrate good reliability with the exception of selected constructs (shaded in Table 8).

Table 8. Existing Scales and Their Reliability.
(Number of items in each scale is in the parentheses)

Construct	**Cronbach's Alpha**			
	Karahanna et al. 1999		**Moore and Benbasat 1991**	**Agarwal and Prasad 1997**
	Users (N = 161)	**Potential Adopters (N = 107)**	**Users and potential adopters (N = 270)**	**Users (N=73)**
Sample	Organizational employees	Organizational employees	Organizational employees	Part-time MBA Students
Technology	Windows	Windows	Personal Computers	WWW
Perceived Usefulness	.88(4)	.90	.95 (9)	.90
Result Demonstrability	.82(3)	.76	.81(4)	.81
Image	.84(3)	.83	.79(5)	.85
Trialability	.95(3)	.92	**.73(5)**	**.30**
Compatibility	.88(3)	.93	.88(4)	.84
Ease of Use	.87(3)	.90	.81(8)	.80
Visibility	.90(2)	.98	**.72(5)**	**.51**
Attitude	.90(3)	.94		
Intention	.50(2)	.90		.81
Voluntariness	**.71(2)**	**.74**	.82(4)	
Usage				.92

When operationalizing the scales of the instrument, we first established content validity, "the degree to which the score or scale being used represents the concept about which generalizations are to be made" (Davis 1989, p. 91). Simply put, the instrument should contain the items that fit the content domains.

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The primary method undertaken to establish content validity was to develop the survey instrument using prior literature. In previous studies, each scale contains three to four items; sometimes the same scale is operationalized differently in different studies; therefore, similar items from different studies were included for the preliminary instrument. The purpose was to ensure there were enough items for each construct entering the measurement refinement process; we anticipated that some of the items would be aggregated and deleted in translation, pretest, and pilot test.

Operationalization of the Independent Variables

The constructs were operationalized using scales tested in previous studies. The scales selected were used to test adoption of similar technologies. The majority of the items were adopted from Karahanna et al. (1999) and Moore and Benbasat (1991). Fully anchored 7-point Likert scales were used with end points being "strongly disagree" and "strongly agree".

The items shown below are worded for IT (E-Mail or word processing software) users. The items for potential adopters are reworded.

Perceived Usefulness/Relative Advantage (PU)

1. Using E-Mail/word processing software helps me to accomplish tasks more quickly (Karahanna et al. 1999).
2. Using E-Mail/word processing software improves the quality of my work. (Karahanna et al. 1999).

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3. Using E-Mail/word processing software enhances my effectiveness on the job (Karahanna et al. 1999).
4. Using E-Mail/word processing software makes my job easier (Karahanna et al. 1999).
5. Using E-Mail/word processing software improves my job performance (Davis 1989).
6. Using E-Mail/word processing software gives me greater control over my job (Moore and Benbasat 1991).
7. Using E-Mail/word processing software in my job increases my productivity (Davis 1989).
8. I find E-Mail/word processing software useful in my job (Davis 1989).

Ease of Use/Complexity (EOU)

1. Learning to use E-Mail/word processing software was easy for me (Karahanna et al. 1999).
2. E-Mail/word processing software is easy to use (Karahanna et al. 1999).
3. It is easy to get E-Mail/word processing software to do what I want it to do (Moore and Benbasat 1991).
4. My interaction with E-Mail/word processing software is clear and understandable (Davis 1989).
5. I find E-Mail/word processing software to be flexible to interact with (Davis 1989).
6. It is easy for me to become skillful at using E-Mail/word processing software (Davis 1989).

Compatibility (COM)

1. Using E-Mail/word processing software is compatible with most aspects of my work (Karahanna et al. 1999).
2. Using E-Mail/word processing software fits my work style (Karahanna et al. 1999).
3. Using E-Mail/word processing software fits well with the way I like to work (Karahanna et al. 1999).
4. Using E-Mail/word processing software is very compatible with the way I like to work (Moore and Benbasat 1991).

Trialability (TR)

1. Before I started using E-Mail/word processing software, I was able to use it on a trial basis (Karahanna et al. 1999).
2. Before I started using E-Mail/word processing software, I was able to properly try it out (Karahanna et al. 1999).
3. I was permitted to use E-Mail/word processing software long enough to see what it can do (Karahanna et al. 1999).

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4. I was able to experiment with E-Mail/word processing software as necessary (Moore and Benbasat 1991).
5. I had E-Mail/word processing software for a long enough period to try it out (Moore and Benbasat 1991).

Visibility

1. In my organization, one sees E-Mail/word processing software on many computers (Karahanna et al. 1999).
2. In my organization, I have seen many people with E-Mail/word processing software on their computers (Karahanna et al. 1999).
3. I have seen what other people do using E-Mail/word processing software (Moore and Benbasat 1991).
4. It is easy for me to observe others using E-Mail/word processing software in my company (Moore and Benbasat 1991).
5. I have had plenty of opportunity to see E-Mail/word processing software being used (Moore and Benbasat 1991).
6. I have not seen many others using E-Mail/word processing software in my department (Moore and Benbasat 1991).

Result Demonstrability (RD)

1. The results of using E-Mail/word processing software are apparent to me (Moore and Benbasat 1991).
2. I could communicate to others the pros and cons of using E-Mail/word processing software (Karahanna et al. 1999).
3. I have no difficulty telling others about the results of using E-Mail/ word processing software (Karahanna et al. 1999).
4. I would have difficulty explaining why using E-Mail/ word processing software may or may not be beneficial (Moore and Benbasat 1991).

Image

1. People who use E-Mail/word processing software have high status in the organization (Moore and Benbasat 1991).
2. People who use E-Mail/word processing software have more prestige than those who do not (Moore and Benbasat 1991).
3. Using E-Mail/word processing software is a status symbol (Moore and Benbasat 1991).
4. Using E-Mail/word processing software improves my image within the organization (Moore and Benbasat 1991).

(Item 1: Agarwal and Prasad, 1997 used "profile" and Karahanna et al. 1999 substituted it with "status".)

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Normative Beliefs about Using IT (NB)

1. Top management thinks I should use E-Mail/word processing software (Karahanna et al. 1999).
2. My supervisor thinks I should use E-Mail/word processing software (Karahanna et al. 1999).
3. Peers think I should use E-Mail/word processing software (Karahanna et al. 1999).
4. Friends think I should use E-Mail/word processing software (Karahanna et al. 1999).
5. MIS department thinks I should use E-Mail/word processing software (Karahanna et al. 1999).
6. Computer Specialists in the company think I should use E-Mail/word processing software (Karahanna et al. 1999).

Individual Innovativeness (II)

Self reported measures were used to measure individual innovativeness

(Adopted from Agarwal and Prasad 1998): (II)

1. If I hear about a new information technology, I would look for a way to experiment with it.
2. Among my peers, I am usually the first to try out new information technologies.
3. In general, I am hesitant to try out new information technologies. (Reverse scale item)
4. I like to experiment with new technologies.

Voluntariness (Vol)

1. Although it might be helpful, using E-Mail/word processing software is certainly not compulsory in my company (Karahanna et al. 1999).
2. My supervisor does not require me to use E-Mail/word processing software (Karahanna et al. 1999).
3. My use of E-Mail/word processing software is voluntary. (Moore and Benbasat 1991)
4. My supervisor expects me to use E-Mail/word processing software. (Moore and Benbasat 1991) (Reverse scale)

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Operationalization of the Mediating/Dependent Variables

Attitude (A)

The attitudinal items use fully anchored 7-point Likert scales.

Using E-Mail/word processing software on my job is

1. Extremely negative ... Extremely positive (Karahanna et al. 1999).
2. Extremely good ... Extremely bad (Karahanna et al. 1999).
3. Extremely harmful...Extremely beneficial (Karahanna et al. 1999).
4. Unpleasant ...Pleasant (Taylor and Todd 1995b).
5. Useless ..... Useful (Barki and Hartwick 1994).
6. Worthless ....Valuable (Barki and Hartwick 1994).
7. Terrible....Terrific (Barki and Hartwick 1994).
8. I like using E-Mail/word processing software (Agarwal and Prasad 1999).
9. E-Mail/word processing software is fun to use (Agarwal and Prasad 1999).
10. I dislike using E-Mail/word processing software (Agarwal and Prasad 1999).
11. E-Mail/word processing software provides an attractive working environment (Agarwal and Prasad 1999).

Subjective norm (SN)

1. Most people who are important to me think I should use E-Mail/word processing software (Karahanna et al. 1999).
2. Most people who influence my behavior think I should use E-Mail/word processing software (Taylor and Todd 1995b).

Behavioral Intention (BI)

1. I intend to continue using E-Mail/word processing software (Karahanna et al. 1999).
2. I intend to increase my use of E-Mail/word processing software (Karahanna et al. 1999).
3. Assuming I had access to E-Mail/word processing software, I intend to use it (Venkatesh and Davis 1996).
4. Given that I had access to E-Mail/word processing software, I predict that I would use it (Venkatesh and Davis 1996).

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Operationalization of the Dependent Variable

Diffusion is measured by a cumulative frequency, which can be plotted on a two-dimensional plane: time (x) and the cumulative percentage of individual adopting an innovation at a given time (y). Year is used to measure time. Therefore, individuals will be asked to recall when he/she adopted (started using) a particular IT innovation. In China, the major development and business use of information systems and technology started in 1993; therefore, recalling may not be too difficult. Other usage scales were adopted from the TAM model and related studies in which self-reported measures are widely used (Ajzen and Fishbein 1980; Davis 1989). The following scale was used in Davis, Bagozzi, and Warshaw's 1989 study.

___Not at all; ___ less than once a week; ___about once a week; ___2 or 3 times a week; 4 to 6 times a week; ___about once a day; ___more than once a day.

The four questions used to assess usage (U) were adapted from Agarwal and Prasad 1997:

1. I use E-Mail/word processing software a lot to do my work.
2. I use E-Mail/word processing software whenever possible to do my work
3. I use E-Mail/word processing software frequently to do my work
4. I use E-Mail/word processing software whenever appropriate to do my work

Instrument Translation

Two independent translators translated the instrument into Chinese. Both translators are native Chinese speakers and have extensive computing and work

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experiences in China. They also possess a good command of English. First, the translators were instructed to use consistent sentence structures in their translations. When both translations were completed, the translators were brought together along with the author to compare their translations. The translators agreed on approximately 90% (73 out of 82 items) of the translation. Out of 82 items, only eight items were translated with moderate inconsistency between the two translators and one item (I could communicate to others the pros and cons of using E-Mail) was translated incorrectly by one translator who misinterpreted "communicate." The translator later accepted the other translation. The other eight items differed in keyword selection. When discussed, consensus was reached. The remaining items were equivalent in the two translations, with some items differing in minor word selections. All discrepancies were discussed and resolved. The subsequent instrument, approved by both translators and the author was used in the pretest.

Pre-test

The instrument possesses a reasonable level of face validity, which was gained through the translation process. The major purpose of the pretest was to refine the wording of instrument, thereby reinforcing face validity. Face validity is established when the items of a scale ask the questions we think they are or simply "look right" (Churchill 1979). Face validity can also be achieved through the use of experts.

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The translated instrument was pre-tested among a group of Chinese E-Mail users. The survey was posted on the web. The link was sent with a message explaining the intended purposes of the questionnaire to two LISTSERVs: University of Chicago Chinese students and New York University Chinese students. Individual messages were sent to personal contacts. Twenty-one usable responses (N = 21) were received.

The respondents were asked to provide feedback on the length of the questionnaire, the format of the scales, and the wording of the items. They were encouraged to also identify other relevant factors not included in the questionnaire. Because similar items were purposefully included, based on the suggestions from the respondents, the ambiguous items were refined by rewording with the help of four Chinese computer users, both experts and new users, at this stage. A set of items demonstrating face validity was retained for the pilot test.

Pilot Test

Before the field survey was conducted, a pilot test was carried out. The primary purpose of the pilot test is to check the reliability of the instrument. Also, the format of the instrument was evaluated. The pilot test was conducted in a large state-owned enterprise in Shanghai, China. A total of 50 employees were surveyed. All respondents were users of both E-Mail and word processing software.

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There are approximately 769 employees in this company. We coached several individuals to distribute the questionnaires. Also, we visited some offices to distribute and collect questionnaires directly from the respondents. In a week, 50 forms were collected and used for the pilot analysis. Two forms were not usable due to incomplete responses.

Fourteen constructs containing 69 items were tested for reliability. Individual construct reliability was assessed and reported in Table 9. Based on item total correlation, items with low correlation were first considered for deletion. Because we purposefully included as many items as possible for each construct, item deletion is justified (Churchill 1979).

One significant problem discovered in the pilot test was that Chinese employees do not react very well to reverse scale items. A total of five items are reverse scale items. One suggestion was to reword the items. Also, many participants commented that the questionnaire was relatively long. As a result of the pilot, 14 items were suggested for deletion based on reliability assessment. Five suggested items were deleted based on strong evidence. The item deletion process is discussed in a later section. However, eight items were retained because the pilot sample size was relatively small. The suggestion for deletion based on a small sample may be unique to the data set. These items were first examined in the final analysis and their deletion was confirmed. The resulting

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instrument is consistent with the recommended short scales in the existing studies (Moore and Benbasat 1991). In fact, the scales presented in the IT acceptance literature often consist of two or three items. There were 64 items remaining in addition to the demographic items in the final instrument. The reliability of the 14 constructs, with their reliability before and after their suggested deletion, is shown in Table 9.

Table 9. Pilot Test Cronbach's Reliability Coefficients

	Construct Description	Number of Items Before pilot	Number of Items After pilot	Cronbach's α
1.	Perceived Usefulness (PU)	8	6	.90
2.	Perceived Ease of Use (EOU)	6	5	.77
3.	Compatibility (COM)	4	4	.83
4.	Trialability (TR)	5	4	.80
5.	Visibility (VI)	6	6	.86
6.	Result Demonstrability (RD)	4	4	.74
7.	Image (IM)	4	4	.91
8.	Normative Beliefs (NB)	6	6	.94
9.	Individual Innovativeness (II)	4	4	.68
10.	Voluntariness (VOL)	4	4	.71
11.	Attitude (A)	8	8	81
12.	Subjective Norm (SN)	2	2	.92
13.	Behavioral Intention (BI)	4	3	.83
14.	Use (U)	4	4	.81
	Overall	69	64	.91

The reliability coefficients of constructs 6, 9, and 10, are .74, .68, and .71, respectively, which are relatively low. However, studies reported Cronbach's alpha values as low as .30 to .70 (Agarwal and Prasad 1997; Karahanna et al. 1999; Moore and Benbasat 1991). Generally, it should be around .70 (Bagozzi

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et al. 1992; Nunnally 1967). To improve the constructs, we examined the items and discovered that each of these constructs contained a reverse scale item, which may have caused the construct to be relatively unstable. Chinese employees are not familiar with surveys; therefore, reverse scale items may have added confusion. In the final instrument, the items were reworded.

Results

Organized by construct, the items retained are listed below. Please note, crossed-out items were deleted from the instrument. Correlation with corrected item total was assessed. Items with low correlation were first considered for deletion (Nunnally 1967). For the final instrument, please see Appendix B (in Chinese; 12 pages in total). The items used in the E-mail user section of the final instrument are listed in Appendix C (in English). The same questionnaire was given to the word processing software users with the software application reworded.

Perceived Usefulness/Relative advantage (PU)

1. Using E-Mail helps me to accomplish tasks more quickly.
2. Using E-Mail improves the quality of my work.
3. Using E-Mail enhances my effectiveness on the job.
4. Using E-Mail makes my job easier.
5. ~~Using E-Mail improves my job performance.~~
6. ~~Using E-Mail gives me greater control over my job.~~
7. Using E-Mail in my job increases my productivity.
8. I find E-Mail useful in my job.

With all items, $\alpha = .89$
With item 1, 2, 3, 4, 7, & 8, $\alpha = .90$

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For the perceived usefulness construct, item 5 was pointed out at the pretest stage because it has very similar meaning to item 3 in the Chinese language. The computer users commented on the redundancy and suggested using only one of the two. Item 3 seems to be more stable based on the reliability analysis; therefore it was chosen to remain in the instrument. "Greater control, " an advantage from item 6, was thought to have a negative connotation in the Chinese language and it was not perceived as an advantage in some situations. Therefore, items 5 and 6 were eliminated from the perceived usefulness construct.

Ease of Use/Complexity (EOU)

1. Learning to use E-Mail was easy for me.
2. E-Mail is easy to use.
3. It is easy to get E-Mail to do what I want it to do.
4. My interaction with E-Mail is clear and understandable.
5. ~~I find E-Mail to be flexible to interact with.~~
6. It is easy for me to become skillful at using E-Mail.

With all items, $\alpha = .74$
with items 1, 2, 3, 4, & 6, $\alpha = .77$

Item 5 was deleted from the perceived ease of use construct. Aside from the statistical implication, "flexible" does not apply to use of computer software very well in the Chinese language. Item 5 assumed little face validity and the scale improves without it; therefore, item 5 was deleted.

Compatibility (COM)

1. Using E-Mail is compatible with most aspects of my work.
2. Using E-Mail fits my work style.
3. Using E-Mail fits well with the way I like to work.
4. Using E-Mail is very compatible with the way I like to work.

With all items, $\alpha = .83$
All items of compatibility were retained.

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Trialability (TR)

1. Before I started using E-Mail, I was able to use it on a trial basis.
2. Before I started using E-Mail, I was able to properly try it out.
3. I was permitted to use E-Mail long enough to see what it can do.
4. ~~I was able to experiment with E-Mail as necessary.~~
5. I had E-Mail for a long enough period to try it out.

With all items, α = .78
With items 1, 2, 3, & 5, α = .80

For the trialability construct, item 4 was only used in one study (Moore and Benbasat 1991), in which it was only recommended for extended scales. The exclusion of this item improved the scale reliability; therefore, it was deleted.

Visibility (VI)

1. In my organization, one sees E-Mail on many computers.
2. In my organization, I have seen many people with E-Mail on their computers.
3. I have seen what other people do using E-Mail.
4. It is easy for me to observe others using E-Mail in my company.
5. I have had plenty of opportunity to see E-Mail being used.
6. I have not seen many others using E-Mail in my department. (Reverse scale item)

With all items, α = .77
With items 1-5, α = .86

Item 6 was suggested for deletion. Chinese employees do not respond to reverse scale items very well. However, it was retained in the final survey for confirmation because the sample size of the pilot test is relatively small.

Result Demonstrability (RD)

1. The results of using E-Mail are apparent to me.
2. I could communicate to others the pros and cons of using E-Mail.
3. I have no difficulty telling others about the results of using E-Mail.
4. I would have difficulty explaining why using E-Mail may or may not be beneficial. (Reverse scale item)

With all items, α = .53
With items 1-3, α = .74

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Item 4 is a reverse scale item. Similarly, it was retained in the final instrument for further investigation due to the small sample size.

Image (IM)
1. People who use E-Mail have high status in the organization.
2. People who use E-Mail have more prestige than those who do not.
3. Using E-Mail is a status symbol.
4. Using E-Mail improves my image within the organization.

With all items, $\alpha = .91$
All items were retained.

Normative Beliefs About Using the IT (NB)
1. Top management thinks I should use E-Mail.
2. My Supervisor thinks I should use E-Mail.
3. Peers think I should use E-Mail.
4. Friends think I should use E-Mail.
5. MIS department thinks I should use E-Mail.
6. Computer Specialists in the company think I should use E-Mail.

With all items, $\alpha = .94$
All items were retained.

Individual Innovativeness (II)
1. If I hear about a new information technology, I would look for a way to experiment with it.
2. Among my peers, I am usually the first to try out new information technologies.
3. In general, I am hesitant to try out new information technologies. (Reverse scale item)
4. I like to experiment with new technologies.

With all items, $\alpha = .60$
With items 1, 2, & 4, $\alpha = .68$

This construct also contains a reverse scale item (item 3), which was retained for confirmation in the final analysis.

Voluntariness (VOL)
1. Although it might be helpful, using E-Mail is certainly not compulsory in my company.
2. My supervisor does not require me to use E-Mail.
3. My use of E-Mail is voluntary.

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4. My supervisor expects me to use E-Mail. (Reverse scale item)

α = .66
items 1, 2, 4 α = .71

Item 3 was retained for confirmation in the final analysis because the improvement of the scale without it was marginal.

Attitude (A)

Using E-Mail on my job is

1. Extremely good ... extremely bad.
2. Extremely harmful...extremely beneficial.
3. Useless ..... Useful.
4. Worthless ....valuable.

5. I like using E-Mail.
6. E-Mail is fun to use.
7. I dislike using E-Mail. (Reverse scale item)
8. E-Mail provides an attractive working environment.

With all items, α = .81
With items 1-4, α = .88

This shows that the first 4 items together are more reliable than all 8 items of attitude. They were all retained for more investigation in the field survey.

Subjective norm (SN)
1. Most people who are important to me think I should use E-Mail.
2. Most people who influence my behavior think I should use E-Mail.

α = .92

Behavioral Intention (BI)
1. I intend to continue using E-Mail.
2. ~~I intend to increase my use of E-Mail.~~
3. Assuming I had access to E-Mail, I intend to use it.
4. Given that I had access to E-Mail, I predict that I would use it.

α = .61

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with items 1, 3, 4 $\alpha = .83$

Users did not respond to "increase my use" very well and because it had a significant impact on the scale reliability, it was deleted from instrument.

Usage (U)
1. I use E-Mail a lot to do my work.
2. I use E-Mail whenever possible to do my work
3. I use E-Mail frequently to do my work
4. I use E-Mail whenever appropriate to do my work

$\alpha = .80$

Overall, the items were deleted based on statistical implications, face validity, and recommendations by other studies. In addition, a number of reverse scale items were retained and reworded for the final instrument. In summary, 13 items were suggested for deletion, of which five were deleted and eight were retained for confirmation in the final analysis. The total number of indicators that remained is 64.

Field Study

The final survey was distributed in Chinese companies in three regions. A total of 828 (number of surveys returned) employees from 30 companies in three Chinese regions were surveyed during June 2000. These companies were conveniently selected based on personal connections. Most of the companies are well established and have a history of 20 or more years.

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The questionnaires developed were worded for two different technologies and two categories of employees. The information technologies are E-Mail and word processing software, which were selected because they are commonly known and are among the leading technologies diffused. The large number of employees and companies makes random sampling possible in data collection. Three types of survey forms were used in the field study in order to collect data from the two types of employees, potential adopters and users. See Table 10 for the types of questionnaires and the targeted participants. Please note that each questionnaire is divided into two parts, one for each computer application.

Table 10. Field Survey Questionnaires

Questionnaire	Part I	Part II
1	E-mail User	Word processing user
2	Word processing software user	Potential E-Mail adopter
3	Potential E-mail adopter	Potential word processing software adopter

Questionnaire 1 is designed to survey users of both E-mail and word processing applications. Questionnaire 2 is designed to survey current word processing software users and potential adopters of E-mail. Questionnaire 3 is targeted to potential adopters of both E-mail and word processing software.

The purpose of using three different questionnaire forms is, most importantly, to accurately word the questionnaire toward the desired respondent. This will

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enable us to make the distinction between potential adopters and users. For example, the questionnaires were worded for the users to assess their perceptions toward *using* E-mail while for the potential adopters it was to assess their perceptions toward *adopting* E-mail. Knowing it is critical to use the correct form, we provided clear instructions to the participants and to those who helped distribute and collect the surveys. The questionnaires were administered with both oral and written instructions. Therefore, even though the survey distribution method varied from one organization to another, we did not expect any impact on the data collected.

The process followed to hand out the correct form to each participant is depicted in Figure 10. First, each participant is screened and classified as a potential adopter or user of E-mail and/or word processing software. The users are easily identified when the respondents state they currently use the applications. If the respondents state that they do not, they are asked if they have sufficient knowledge of the application. This is assessed in a single oral question. If they do, they are classified as a potential adopter of the software. Otherwise, they do not fill out the part of the questionnaire pertaining to that software. Therefore, in cases where individuals are not familiar with either of the applications, he or she will not be qualified to participate in the survey.

A revelation from the pilot survey was that all the E-mail users in the company we surveyed are also word processing software users. The reverse is not true. We

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also confirmed this situation with other companies. Consequently, the scenario in which an E-Mail user is a potential adopter of word processing software is excluded from our study because of its nonexistence. In the final survey, we follow a series of questions to determine the type of the form to distribute. See Figure 10 for the depiction of the process.

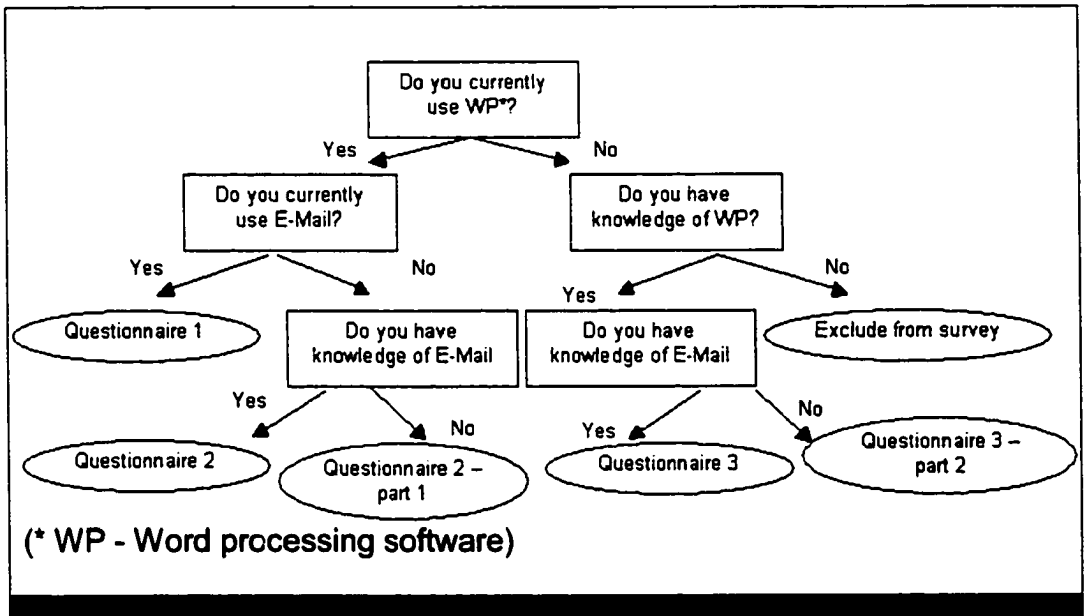

Figure 10. Questions Asked to Determine Type of Questionnaire to Use.

In some companies, we were allowed to interact with and distribute questionnaires to employees directly. In these situations, we started the survey with a brief explanation of the questionnaire followed by an oral instruction to the participants on how to complete the questionnaire. Then we assessed the type of questionnaire to distribute to each employee. The same instructions, also printed at the beginning of the questionnaire, were pointed out to the participants

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to again ensure the employee had received the correct form. In companies where we were not allowed to interact directly with the employees, an employee from the organization was asked to serve as a contact person. The contact, who distributed and collected the survey, was from the company and was usually a manager or executive. In most of the cases, we held a separate interview session with the contact, during which we gathered information about the organization and explained the purpose and nature of the survey. In order to make the process clear and easy for the contact to follow, we provided a one-page instruction on how to distribute the questionnaire forms. We also emphasized the importance of appropriate distribution, authenticity, and completeness. All contacts performed well in general except one who ignored the instructions. After a discussion with the contact, that set of questionnaires were evaluated and discarded.

In the questionnaire, the participants are asked to rate the extent to which they agree with each statement by circling a description from seven answers arranged horizontally, which are "Strongly Disagree," "Disagree," "Slightly Disagree," "Neutral," "Slight Agree", "Agree," and "Strongly Agree."

Upon collection of the survey, we requested the participant to complete unanswered questions if the respondent returned the survey in person. The contacts were also asked to screen the survey for unanswered items immediately. However, because the surveys are anonymous, when incomplete

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surveys were undetected upon collection, it was impossible to ask the participants for further information.

It is worthwhile to mention that the format of the final survey was changed during the early stage. Many respondents expressed unwillingness toward filling out the survey because of the length. Originally, printed on A4-size (Dimension: 8.27"x11.69") paper, questionnaire 1 was five pages. Both questionnaire 2 and 3 were four pages. A suggestion was made to print the questionnaires on larger paper (dimension: approximately 11"x17") two-sided and then fold the questionnaire. The questionnaires were reformatted and fitted into one page. The revised final one-page folded survey was much better received.

Companies Surveyed

The field survey was conducted in three cities located in three distinctive regions of China: Shanghai, located in Eastern China; Jinan, located in Northern China; and Hefei, located in Central China. A total of 30 companies were surveyed. These companies were selected based on personal connections. Most of these companies are well known and established either nationally or locally. In Shanghai, a self-regulated city, 16 companies were surveyed, from which 816 cases, including pilot cases, were collected. In Jinan, the capital of Shangdong Province, three companies were surveyed and 85 cases were collected. In Hefei, the capital of Anhui province, 11 companies were surveyed and 701 cases

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were collected. The break down of the companies by region, ownership, and size is in Table 11.

Table 11. Company Breakdown by Ownership and Number of Employees

	Ownership			Size (Number of Employees)	
Region	**State**	**Private**	**Joint-Venture**	**Small/Medium <250**	**Large >500**
Eastern	8	2	6	12	4
Northern	3	0	0	0	3
Central	11	0	0	6	5
Total	22	2	6	18	12

The majority of the companies surveyed were state-owned; two were private, and six were joint-ventures. In regard to size, 18 companies were small/medium (SME) and 12 were large (LE). The size of an SME ranged between 20 and 250 (e.g., Soh et al. 1992; Yap et al. 1992). The large companies in this study had over 500 employees. In each company, the minimum number of employees surveyed was 20.

Sample Demographics

Profiles of the respondents are provided in Table 12. For each variable, the percentage of missing values is placed under a not reported category. Approximately 40% of the respondents were between 23 and 28, which is representative of the young work force in China. Approximately 60% of the respondents were male and 30% female. The largest group, based on the

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highest degree obtained, was college graduates. The survey covered every level of organization.

Table 12. Sample Demographics

Variables	Sample Composition	Percentage
Age	18-22	40.1 %
	23-28	23.1 %
	29-34	17.3 %
	35-44	8.6 %
	45-55	1.7 %
	55+	7.1 %
	Not reported	2.1%
Gender	Men	60.8 %
	Women	30.5 %
	Not reported	8.7%
Highest Educational Level Attained	Junior high	1.3 %
	High school	10.0 %
	Associate degree	23.2 %
	College degree	43.8 %
	Master's	11.8 %
	Doctorate	8.1%
	Not reported	10.0%
Organizational level represented	Executive	2.2%
	Management	23.9%
	Professional	34.5%
	Technical/clerk	25.6%
	Student	12.8%
	Not reported	1.0%

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DATA ANALYSIS

In this section, we discuss the data analysis process as follows:

(1) data recording and missing values;
(2) outlier detection;
(3) data subsets;
(4) scale reliability assessment;
(5) two-step model testing: measurement model testing followed by structural model (performed for both user and potential adopter models);
(6) hypothesis testing (21 hypotheses); and
(7) organizational level model assessment.

Data Recording and Missing Values

Before data entry, the questionnaires were coded and screened. Each questionnaire collected, regardless of its usability, was given a unique number, which is used as an integrity check. Data collected from the field survey were first entered into several spreadsheet files.

A preliminary data screening was performed manually prior to entering data. Some questionnaires were incomplete when received from the contacts. Because participants were anonymous, incomplete surveys were not returnable to original respondents. Data were entered with missing values, which were treated using listwise deletion in data analysis. Eleven questionnaires that were filled with uniform answers (e.g., 7 for all items on a page) were discarded. It was noted that the uniform answers were evidenced in the second part of the questionnaire. We speculate that it was due to the length of the questionnaire; therefore, the first part of the questionnaires was retained while the other part

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was discarded. In cases where wrong questionnaires were selected, the questionnaires were discarded. However, the number of such cases was small; therefore, the reliability of the survey should have not been affected. For example, if the usage questions in a form were left blank while the other parts were attempted, we were confident that the respondent chose the wrong form; the form was discarded. In addition, a set of approximately 30 questionnaires from one company were discarded because the respondents chose the wrong questionnaires. This case was an exception because the contact person (admittedly) did not follow the procedures outlined.

After the initial screening, several items were coded on the questionnaire to facilitate data entry. The items include measures of attitude, frequency of usage, length of usage, age, and education. Four data entry persons were used. Data from separate spreadsheet files were combined into one SPSS file. The frequency and range of each variable was assessed. Outliers resulting from data entry (e.g., 77 for a perceived usefulness item) were resolved by revisiting the original questionnaires using the unique number assigned to the questionnaire. The total number of data points (cases), including cases with missing values was 1714. The number of data points by type of respondents is presented in Table 13:

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Table 13. Types of Respondent in the Sample			
		Frequency	**Percent**
User	Email User	650	37.9
	WP* User	701	40.9
Potential Adopter	Email Adopter	245	14.3
	WP Adopter	118	6.9
	Total	1714	100.0

(*WP: word processing software)

Cases with missing values were evaluated for elimination. In any particular construct, if there was more than one missing value, the case was deleted. Unanswered demographic information, including age, gender, education, and position, were not considered as missing values. The resulting sample size was 1,635. Data were separated into two subsets: the user group (N = 1,296) and the potential adopter group (N = 339). Next, the approach took to divide the user group into earlier and later adopter subsets is discussed.

Data Subsets

In order to test the hypotheses that investigate the differences between earlier and later adopters, the user sample was divided further into earlier adopters and later adopters based on time of adoption reported by each subject. The innovation diffusion classification framework is used to divide the user sample (see Table 1 and Figure 1, Rogers 1983) (and also Brancheau and Wetherbe 1990). The overall usable sample size for testing hypothesis pertaining to users was 1,097 (N), the number of respondents who reported the time of adoption.

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The following descriptions outline the data sample division approach. According to innovation diffusion theory, users account for 84% of the IT diffusion in general (Rogers 1983). The relative percentage (within the 84% adopters) was used to calculate the sample size for each adopter category. As indicated previously, the two groups, early majority and late majority, which account for almost 70% of all adopters were the focus of this study. These two categories are referred to as earlier and later adopter in the study. The relative percentage for the earlier and late adopters was approximately 40% each. Table 14 shows the approximate sample sizes of the adopter groups based on the overall user sample size 1,097: 444 each for the earlier and later adopters.

Next, the raw data was sorted by the time of adoption. The approximate sample size was used to guide the division of the user sample. The resulting data subsets were earlier adopter (N = 442), later adopter (N = 442), and potential adopter (N = 339). The time of adoption ranged from early 1995 to the end of 1997 for the earlier adopters and from early 1998 to mid 2000 for the later adopters.

Table 14. Adopter Sample Classification

Type	%	Relative %	N	Adoption ranges (mm/yy)
Innovator	2.5%	3.0%	33	4/84-6/90
Early Adopter	13.5%	16.0%	176	7/90-2/95
Early Majority*	34.0%	40.5%	444	3/95-12/97
Late Majority**	34.0%	40.5%	444	1/98-6/00
Total	84.0%	100.0%	1097	

Note: * Referred to as "earlier adopter" in the analysis and discussions
** Referred to as "later adopter" in the analysis and discussions

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Outliers

In this section, the detection of outliers is discussed. Outliers in multivariate analysis can significantly affect the results of structural equation modeling and such extreme case can be deleted (West et al. 1995). Outliers were detected in the overall sample (all adopter sample points combined, N = 1635) first using univariate and then multivariate techniques. The univariate technique refers to selecting cases with standardized variable values exceeding ±3 (Hair et al. 1998). For each of the 56 variables, such cases were detected. The cases with the highest frequencies were first examined. A total of 48 cases that were suggested for four or more times were deleted using univariate technique. Then, the multivariate technique, which is model-dependent, is applied because some outliers are only detectable using the multivariate technique (West et al. 1995). The variables were grouped by the 14 constructs. Each variable was regressed against the other variables within the same construct. The outliers were detected using SPSS. A total of 124 cases that were detected for four or more times were suggested under the multivariate method. Twenty-one cases were suggested by both methods. Therefore, the total number of unique cases deleted was 151.

The resulting data sample sizes were 400, 382, and 317 for the earlier, later, and potential adopter groups, respectively. In order to ensure the validity of the adopter subsets, we compared the demographics (e.g., age, education, and job level) within each adopter category with prior findings. The chi-square test of independence was used to assess the relationship between each demographic

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variable and adopter type, which are ordinal variables. The Spearman's rank correlation coefficient was used to assess the relationships. Adopter type is coded as 1 for earlier adopter, 2 for later adopter, and 3 for potential adopter. All the demographic variables are rank ordered from the lowest to the highest. Age is coded as 1 for 18-22, 2 for 23-28, 3 for 29-34, 4 for 35-44, 5 for 45-55, and 6 for (55+). Education is coded as 1 for Junior High, 2 for High School, 3 for Associate Degree, 4 for College Degree, 5 for Master's degree, and 6 for Doctorate. Job level is coded as 1 for Student, 2 for Technical/Clerk, 3 for Professional, 4 for Management, and 5 for Executive.

Age. In the literature, there are inconsistent findings on the relationship between age and innovativeness (earliness of adoption), which by definition is equivalent to adopter type: among 228 studies examined by Rogers (1983), 50% found no relationship, 19% negative, and 33% positive. Age can be analyzed in two ways: age reported currently and age at the time of adoption (Rogers 1983). In the IS field, research has found that earlier adopters were younger than later adopters and later adopters were younger than potential adopters (e.g., Brancheau and Wetherbe 1990). In our study, both age reported currently as well as age at the time of adoption correlate significantly with adoption type (r_s = .26, p = .00; r_s = .29, p = .00). This result was consistent with prior IS findings.

Education. One generalization that innovation diffusion studies drew is that earlier adopters have more years of education than later adopters (Rogers 1983).

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IS research has found that earlier adopters have more education than later adopters (e.g., Brancheau and Wetherbe 1990). In this study, education was found to correlate significantly with innovativeness (r_s = -.46, p = .00), which means that later adopters tended to have less education. The result was consistent with prior findings.

Job Level. Job level is found to have a positive relationship with innovativeness in 2/3 of the innovation studies (Rogers 1983). In the current study, we found a positive, yet a nonsignificant relationship (r_s = .03, p = .45). The result does not contradict prior findings.

Overall, the adopter types demonstrate consistent characteristics and provide appropriate foundation for further analysis. Next, the reliability of the scales is assessed for the overall sample followed by the assessment of the adopter subsets.

Scale Reliability

Scale reliability was assessed based on available values. It was evaluated using Cronbach's alpha. In Table 15, the overall sample and earlier, later, and potential adopter subset reliability coefficients are presented.

Some items were suggested for deletion by the pilot test results. Those items were kept in the final instrument because we were not confident due to the small sample size in the pilot study. The suggested deletions were confirmed at this

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stage. It should also be noted that the items deleted were not included in the short scales suggested in some studies (e.g., Moore and Benbasat 1991). The refined instrument used in analysis contained 56 indicators. All constructs, except subjective norm had three or more items. Table 15 shows the reliability coefficient α of each construct for the overall, earlier adopter, later adopter, and potential adopter data sample, respectively.

Table 15. Reliability Coefficients: Overall, Earlier, Later, and Potential Adopters

	Cronbach's α			
Construct (# of Items)	**Overall**	**Earlier Adopter**	**Later Adopter**	**Potential Adopter**
Perceived Usefulness (6)	.93	.92	.89	.94
Perceived Ease of Use (5)	.87	.86	.83	.91
Compatibility (4)	.87	.86	.81	.89
Trialability (4)	.86	.88	.83	.89
Visibility (5)	.91	.90	.86	.91
Result Demonstrability (3)	.82	.74	.80	.84
Image (4)	.95	.93	.93	.95
Normative Believes (6)	.94	.95	.92	.92
Innovativeness (3)	.71	.66	.70	.76
Voluntariness (3)	.87	.86	.83	.91
Attitude (4)	.88	.89	.87	.80
Subjective Norm (2)	.94	.94	.93	.91
Behavioral Intention (3)	.82	.86	.83	.70
Usage (4)	.86	.84	.84	-

Overall, the scales were reliable in this study. The reliability coefficients ranged from .66 to .95. Generally, the values should be above .70 (Nunnally 1967). Only one scale was below that value: II (individual innovativeness) for the earlier adopter subset (.66). Further tests were used to refine the construct.

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Table 16 gives a summary table of the means, standard deviations, and correlations for all research variables based on the overall sample.

The construct validity of the measurement was assessed. Construct validity relates "to the question of what the instrument is in fact measuring" (Churchill 1979, p. 70). It is indicated through convergent and discriminant validity, which are associated with multitrait-multimethod approach. The models of this study were tested using data collected with one method; therefore, validity was assessed in a limited scope. "Discriminant validity is determined by demonstrating that a measure does not correlate very highly with another measure from which it should differ" (Peter 1981, p. 136-137). Convergent validity is evidenced when the measures from the same construct correlate highly.

Examination of the correlation matrix indicated that the instrument demonstrated adequate convergent and discriminant validity. The correlation coefficients within the same construct (mean absolute value = .64) were generally higher than the correlations across constructs (mean absolute value = .24). All variables within the same construct correlated highly with Pearson's coefficients above .50 with the exception of EOU3 and II2. The majority of the correlation coefficients between variables across constructs were below .50. Closer examination revealed that RD1 correlated highly with two constructs: perceived usefulness and compatibility.

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Table 16. Descriptive Statistics: Mean, Standard Deviation, and Correlations

	Construct	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
	Perceived Usefulness																													
1	PU1	5.80	1.03	1																										
2	PU2	5.74	.99	.74	1																									
3	PU3	5.72	1.00	.73	.74	1																								
4	PU4	5.67	1.01	.65	.68	.71	1																							
5	PU7	5.74	.96	.64	.62	.67	.68	1																						
6	PU8	5.91	.85	.58	.59	.59	.60	.65	1																					
	Ease of Use (EOU)																													
7	EOU1	5.73	.96	.41	.36	.35	.35	.38	.44	1																				
8	EOU2	5.72	.96	.41	.37	.35	.36	.39	.45	.82	1																			
9	EOU3	5.37	1.11	.37	.40	.41	.48	.45	.39	.46	.48	1																		
10	EOU4	5.62	.93	.40	.39	.39	.43	.42	.44	.66	.67	.54	1																	
11	EOU6	5.73	.96	.35	.34	.33	.36	.36	.42	.63	.62	.48	.64	1																
	Compatibility(COM)																													
12	COM1	5.33	1.16	.43	.45	.46	.50	.49	.46	.32	.33	.48	.39	.39	1															
13	COM2	5.25	1.10	.39	.43	.47	.49	.47	.42	.32	.33	.49	.42	.39	.70	1														
14	COM3	5.64	.88	.44	.44	.47	.44	.48	.48	.42	.42	.36	.44	.42	.51	.60	1													
15	COM4	5.38	1.05	.41	.44	.47	.47	.48	.44	.33	.35	.43	.41	.38	.61	.77	.66	1												
	Trialability (TR)																													
16	TR1	5.03	1.41	.19	.17	.16	.19	.19	.20	.24	.21	.24	.21	.25	.23	.23	.21	.23	1											
17	TR2	4.73	1.49	.11	.13	.15	.14	.15	.11	.17	.16	.25	.21	.23	.24	.27	.17	.24	.67	1										
18	TR3	4.74	1.44	.14	.15	.16	.15	.17	.16	.19	.17	.24	.23	.23	.23	.25	.19	.23	.52	.70	1									
19	TR5	4.40	1.58	.11	.12	.16	.17	.14	.09	.15	.13	.28	.20	.19	.25	.29	.16	.22	.52	.66	.69	1								
	Visibility (VI)																													
20	VI1	5.70	1.19	.32	.31	.32	.31	.30	.38	.32	.32	.27	.31	.33	.31	.25	.30	.24	.18	.15	.15	.10	1							
21	VI2	5.75	1.13	.32	.30	.31	.31	.30	.39	.32	.31	.28	.30	.33	.32	.25	.30	.26	.19	.15	.14	.12	.86	1						
22	VI3	5.87	1.05	.30	.29	.28	.25	.27	.37	.29	.29	.24	.26	.29	.22	.19	.29	.20	.21	.15	.15	.07	.61	.66	1					
23	VI4	5.76	1.12	.32	.34	.30	.35	.31	.39	.32	.34	.30	.30	.34	.33	.27	.31	.28	.21	.15	.14	.11	.66	.70	.70	1				
24	VI5	5.77	1.06	.34	.35	.33	.33	.33	.40	.37	.37	.31	.35	.38	.33	.29	.33	.29	.22	.19	.19	.12	.65	.68	.67	.79	1			
	Result Demonstrability (RD)																													
25	RD1	5.56	1.00	.49	.50	.53	.50	.52	.50	.35	.39	.44	.39	.37	.48	.52	.46	.49	.19	.17	.20	.19	.32	.33	.27	.38	.42	1		
26	RD2	5.34	1.09	.33	.33	.34	.35	.36	.34	.32	.31	.38	.34	.36	.38	.42	.33	.39	.21	.26	.28	.25	.26	.28	.24	.33	.36	.57	1	
27	RD3	5.31	1.13	.31	.30	.32	.36	.33	.34	.36	.34	.37	.36	.40	.37	.39	.34	.40	.18	.22	.23	.21	.29	.30	.23	.33	.37	.54	.76	1

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Table 16 Continued

	Construct	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
	Image (IM)																													
28	IM1	3.15	1.66	-.11	-.08	-.06	-.03	-.04	-.12	-.13	-.13	.06	-.10	-.12	.04	.11	-.06	.07	.13	.18	.17	.26	-.22	-.22	-.23	-.18	-.21	-.03	.05	.01
29	IM2	3.07	1.64	-.13	-.09	-.06	-.02	-.04	-.14	-.15	-.14	.05	-.11	-.12	.03	.10	-.08	.07	.11	.18	.16	.26	-.23	-.22	-.25	-.18	-.21	-.04	.05	.02
30	IM3	3.03	1.67	-.13	-.09	-.05	-.02	-.04	-.14	-.16	-.16	.05	-.10	-.12	.03	.10	-.08	.06	.11	.19	.17	.25	-.22	-.21	-.25	-.18	-.20	-.05	.05	.02
31	IM4	3.48	1.76	-.05	-.02	.02	.01	.00	-.06	-.13	-.13	.04	-.07	-.09	.09	.13	-.04	.10	.14	.20	.19	.27	-.19	-.18	-.20	-.17	-.17	.00	.07	.02
	Normative Beliefs (NB)																													
32	NB1	4.82	1.47	.27	.27	.28	.28	.26	.28	.10	.13	.27	.16	.12	.36	.32	.24	.31	.17	.19	.21	.21	.20	.22	.17	.23	.23	.29	.25	.22
33	NB2	4.92	1.41	.26	.27	.28	.27	.26	.28	.09	.12	.25	.15	.13	.36	.32	.24	.30	.16	.19	.19	.21	.23	.23	.18	.23	.23	.30	.26	.23
34	NB3	5.06	1.33	.27	.26	.29	.29	.27	.26	.13	.15	.24	.19	.16	.32	.32	.25	.29	.14	.17	.16	.20	.20	.20	.17	.24	.23	.31	.28	.25
35	NB4	5.16	1.30	.26	.24	.27	.26	.25	.25	.18	.18	.23	.21	.18	.29	.31	.25	.30	.17	.21	.19	.20	.14	.14	.15	.18	.19	.31	.28	.26
36	NB5	5.13	1.34	.22	.25	.27	.26	.25	.23	.14	.13	.21	.15	.13	.28	.28	.21	.28	.19	.20	.19	.21	.16	.15	.14	.15	.16	.28	.25	.22
37	NB6	5.11	1.34	.25	.25	.29	.28	.26	.24	.15	.16	.23	.18	.16	.30	.31	.23	.29	.17	.19	.18	.20	.15	.15	.13	.16	.15	.28	.25	.22
	Individual Innovativeness (II)																													
38	II1	5.45	1.03	.31	.31	.28	.32	.32	.35	.35	.33	.28	.30	.36	.29	.32	.32	.28	.17	.16	.15	.10	.20	.18	.19	.23	.28	.35	.37	.37
39	II2	4.13	1.45	.07	.12	.12	.18	.15	.09	.16	.12	.17	.15	.18	.20	.30	.12	.24	.20	.29	.23	.28	.04	.03	-.04	.05	.08	.15	.26	.28
40	II4	5.28	1.13	.23	.24	.23	.25	.27	.28	.30	.27	.25	.28	.32	.24	.26	.26	.24	.15	.18	.16	.14	.15	.15	.14	.17	.20	.25	.32	.32
	Voluntariness (VOL)																													
41	VOL1	3.66	1.80	-.18	-.17	-.14	-.13	-.14	-.20	-.10	-.12	-.06	-.11	-.12	-.15	-.06	-.14	-.08	.07	.11	.13	.19	-.37	-.37	-.33	-.33	-.32	-.15	-.04	-.05
42	VOL2	3.78	1.73	-.16	-.16	-.15	-.12	-.12	-.19	-.07	-.08	-.08	-.06	-.07	-.14	-.05	-.12	-.07	.03	.09	.07	.14	-.35	-.36	-.29	-.29	-.28	-.15	-.06	-.03
43	VOL4	3.00	1.32	-.19	-.21	-.23	-.20	-.22	-.20	-.05	-.06	-.19	-.11	-.10	-.27	-.21	-.17	-.20	-.18	-.19	-.18	-.20	-.21	-.21	-.17	-.22	-.22	-.22	-.19	-.19
	Attitude (A)																													
44	A1	5.59	.93	.41	.36	.39	.41	.39	.40	.27	.28	.35	.28	.29	.42	.41	.37	.39	.14	.13	.17	.12	.31	.32	.29	.34	.38	.46	.36	.38
45	A2	5.54	.88	.39	.39	.39	.41	.42	.45	.28	.30	.36	.28	.30	.43	.41	.39	.40	.18	.17	.18	.13	.31	.32	.28	.37	.39	.48	.40	.38
46	A3	5.52	.88	.43	.43	.42	.45	.44	.46	.30	.31	.36	.31	.33	.45	.43	.39	.40	.19	.18	.20	.15	.33	.33	.28	.35	.37	.49	.40	.40
47	A4	5.44	1.13	.34	.33	.35	.33	.33	.37	.27	.28	.28	.28	.26	.34	.30	.32	.33	.08	.06	.08	.01	.29	.31	.27	.32	.36	.40	.32	.33
	Subjective norm (SN)																													
48	SN1	4.90	1.33	.23	.22	.25	.25	.27	.24	.13	.13	.27	.15	.16	.30	.32	.18	.29	.13	.20	.18	.20	.09	.12	.07	.12	.14	.29	.25	.24
49	SN2	4.95	1.31	.24	.23	.25	.26	.28	.25	.13	.13	.26	.16	.15	.29	.32	.21	.29	.14	.22	.18	.18	.07	.09	.08	.12	.13	.29	.24	.23
	Behavioral Intention (BI)																													
50	BI1	5.81	.86	.40	.36	.37	.36	.38	.44	.44	.44	.31	.38	.40	.33	.33	.43	.33	.17	.10	.09	.04	.34	.37	.35	.34	.41	.42	.33	.35
51	BI3	5.84	.83	.35	.33	.31	.32	.34	.40	.34	.34	.25	.31	.30	.27	.30	.38	.28	.13	.08	.08	.05	.26	.25	.30	.26	.30	.34	.24	.24
52	BI4	5.62	1.16	.29	.29	.28	.29	.27	.34	.33	.30	.21	.26	.29	.25	.26	.34	.23	.13	.08	.08	.05	.32	.32	.35	.35	.37	.29	.26	.27
	Usage (U)																													
53	U1	5.23	1.30	.37	.39	.41	.40	.38	.37	.12	.14	.36	.20	.19	.50	.45	.26	.42	.15	.19	.16	.15	.22	.23	.13	.26	.26	.45	.38	.32
54	U2	5.65	.99	.38	.37	.34	.33	.36	.37	.20	.24	.30	.22	.20	.38	.36	.31	.36	.12	.12	.13	.06	.28	.27	.21	.34	.33	.40	.31	.31
55	U3	5.51	1.14	.33	.36	.35	.36	.34	.40	.17	.23	.37	.23	.24	.48	.43	.31	.41	.12	.18	.16	.13	.27	.29	.20	.34	.33	.41	.35	.33
56	U4	5.74	.94	.32	.29	.33	.32	.32	.35	.21	.25	.29	.23	.23	.34	.40	.31	.39	.09	.11	.12	.08	.25	.26	.19	.28	.30	.39	.31	.31

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Table 16 Continued

	Construct	Mean	SD	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
	Image (IM)																															
28	IM1	3.15	1.66	1																												
29	IM2	3.07	1.64	.93	1																											
30	IM3	3.03	1.67	.88	.92	1																										
31	IM4	3.48	1.76	.73	.77	.78	1																									
	Normative Beliefs (NB)																															
32	NB1	4.82	1.47	.22	.24	.24	.34	1																								
33	NB2	4.92	1.41	.18	.20	.19	.28	.89	1																							
34	NB3	5.06	1.33	.15	.16	.16	.24	.74	.82	1																						
35	NB4	5.16	1.30	.14	.13	.13	.22	.67	.73	.85	1																					
36	NB5	5.13	1.34	.17	.18	.17	.25	.68	.73	.76	.78	1																				
37	NB6	5.11	1.34	.17	.18	.16	.25	.67	.71	.75	.77	.91	1																			
	Individual Innovativeness (II)																															
38	II1	5.45	1.03	-.02	-.03	-.05	.00	.16	.16	.20	.20	.20	.22	1																		
39	II2	4.13	1.45	.32	.34	.34	.28	.17	.17	.16	.16	.15	.16	.39	1																	
40	II4	5.28	1.13	.00	.00	-.01	.00	.11	.09	.15	.15	.13	.12	.63	.40	1																
	Voluntariness (VOL)																															
41	VOL1	3.66	1.80	.44	.45	.44	.36	-.12	-.16	-.13	-.08	-.10	-.09	-.01	.27	.07	1															
42	VOL2	3.78	1.73	.40	.39	.39	.31	-.20	-.24	-.19	-.13	-.15	-.15	-.01	.23	.10	.80	1														
43	VOL4	3.00	1.32	-.09	-.08	-.09	-.14	-.48	-.49	-.44	-.39	-.44	-.43	-.11	-.11	-.12	.15	.18	1													
	Attitude (A)																															
44	A1	5.59	.93	-.02	-.02	-.03	.00	.26	.26	.24	.22	.21	.22	.27	.16	.24	-.15	-.14	-.25	1												
45	A2	5.54	.88	-.03	-.03	-.04	.01	.30	.31	.28	.25	.24	.25	.28	.17	.24	-.16	-.17	-.29	.80	1											
46	A3	5.52	.88	-.03	-.04	-.05	.01	.28	.30	.28	.27	.25	.25	.32	.20	.26	-.16	-.16	-.29	.76	.87	1										
47	A4	5.44	1.13	-.19	-.19	-.20	-.13	.17	.18	.19	.19	.15	.15	.26	.04	.21	-.26	-.25	-.17	.53	.57	.56	1									
	Subjective norm (SN)																															
48	SN1	4.90	1.33	.21	.21	.22	.29	.50	.50	.54	.56	.51	.52	.20	.21	.13	.04	-.01	-.34	.26	.30	.31	.18	1								
49	SN2	4.95	1.31	.19	.20	.21	.27	.50	.50	.54	.56	.50	.52	.19	.23	.14	.04	.02	-.34	.26	.32	.32	.16	.91	1							
	Behavioral Intention (BI)																															
50	BI1	5.81	.86	-.20	-.21	-.20	-.13	.22	.22	.26	.32	.22	.24	.36	.09	.30	-.19	-.18	-.18	.40	.43	.45	.42	.30	.31	1						
51	BI3	5.84	.83	-.12	-.14	-.13	-.06	.21	.20	.26	.31	.22	.23	.32	.06	.26	-.12	-.10	-.16	.32	.32	.34	.31	.27	.29	.62	1					
52	BI4	5.62	1.16	-.13	-.13	-.12	-.13	.21	.22	.24	.25	.20	.20	.30	.14	.25	-.18	-.19	-.20	.33	.37	.39	.34	.19	.21	.55	.60	1				
	Usage (U)																															
53	U1	5.23	1.30	.06	.05	.02	.07	.26	.27	.24	.22	.20	.20	.26	.21	.21	-.12	-.13	-.19	.41	.46	.46	.40	.26	.26	.27	.18	.17	1			
54	U2	5.65	.99	-.10	-.10	-.11	-.04	.22	.24	.23	.24	.20	.21	.31	.11	.26	-.18	-.16	-.18	.39	.45	.44	.42	.21	.22	.38	.31	.28	.64	1		
55	U3	5.51	1.14	.00	.00	-.02	.01	.25	.27	.24	.21	.19	.19	.28	.19	.25	-.19	-.17	-.21	.44	.48	.46	.43	.24	.24	.33	.23	.21	.74	.66	1	
56	U4	5.74	.94	-.08	-.08	-.08	-.01	.22	.23	.23	.25	.20	.21	.30	.13	.27	-.15	-.14	-.15	.40	.44	.43	.41	.23	.24	.40	.32	.31	.53	.70	.63	1

In order to improve the unidimensionality of the construct, the three items detected in the convergent and discriminant validity analysis were reviewed for deletion. EOU3 and RD1 were not included or recommended in several studies (e.g., Karahanna et al. 1999; Segars and Grover 1993; Subramanian 1994), and therefore deleted. II2 of the innovativeness construct was adopted from Agarwal and Prasad (1998), which is the only study known to the present author that operationalizes innovativeness in the context of IT. Due to the exploratory nature of this scale, we decide to shorten the innovativeness construct.

In addition, the risk of multicollinearity was assessed. Each indicator was regressed against all other indicators within the same construct. All variance inflation factors (VIF) were less than 10 except the one for IM2 (Image Item 2; approximate VIF = 13, varied slightly in different runs). Item IM2 (People who use E-Mail have more prestige than those who do not) was examined. It was determined that it was similar to IM1 (people who use E-Mail have high status in the organization), and therefore deleted. Once IM2 was omitted from the regression, all the VIFs were below 10 indicating that multicollinearity was not significant (Black 1997).

Once the validity and reliability of the scales were established, the measurement models were assessed first in modeling testing.

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Model Testing

As the area under study is supported by strong theoretical foundations, it is only appropriate to evaluate the associations of the constructs with structural equation modeling (SEM), a technique for discovering potential latent structures (Jöreskog and Sörbom 1993). Research models were tested using structural equation modeling techniques performed using LISREL 8.30. The syntax was written in SIMPLIS command language. PRELIS 2.30 was used to produce data subsets and matrices.

The estimation procedure used was maximum likelihood (ML). Even though ML estimator performs relatively well under various conditions (Hoyle and Panter 1995), it assumes normality of the data. Univariate normality for each variable was tested. The kurtosis and skewness of the variable distribution were assessed. The examination of the histograms indicated that most of the indicators were slightly negatively skewed. The mean skewness and kurtosis values were -0.71 and 0.59 respectively. These values indicated that the variables in this study approximate a normal distribution and were acceptable for LISREL analysis (Bollen 1989; Byrne 1998; West et al. 1995). Several Monte Carlo studies have shown the ML estimator to be robust under nonnormal conditions (for examples, see Bollen 1989; Byrne 1998).

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Fit Criteria

Since no uniform recommended measures of model fit are available, multiple measures were used. The use of multiple fit indices was suggested by Hu and Bentler (1999). In assessing the model fit, the following statistics were reported: χ^2 (*df*), comparative fit index (CFI), and root mean square error of approximation (RMSEA). The cutoff values for these fit indices are inconsistent in the literature. Many researchers have adopted the .90 as the critical value for the normed fit indexes (Hoyle and Panter 1995). Recently, Hu and Bentler (1999) compared the effectiveness of the fit indices extensively using a variety of sample sizes and models and recommended the cutoff values of .95 for CFI and .06 for RMSEA to be used for model fit assessment. The fit statistics are discussed below.

For each research model, we examined the χ^2 goodness-of-fit statistic, which assesses the degree of departure of the sample covariance matrix from the fitted covariance matrix (Hu and Bentler 1999). A nonsignificant and small chi-square is desirable. However, when sample size is large and models contain a large number of indicators, the chi-square statistic easily can become significant because it is a direct product of sample size (Byrne 1998). This problem with the χ^2 statistic has long been recognized (Chou and Bentler 1995), therefore, we also reported the fit indices, which indicate the degree of model fit along a continuum (Hu and Bentler 1999). CFI is an incremental fit index that "measures the proportionate improvement in fit by comparing a target model with a more restricted, nested baseline model" (Hu and Bentler 1999, p. 2). CFI is selected

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because it is less sensitive to sample size. In addition, it is suggested as the best approximation of the population value for a single model (Medsker et al. 1994). The Root Mean Square Error of Approximation (RMSEA) is a type of absolute fit indexes, which assess "how well an a priori model reproduces the sample data" (Hu and Bentler 1999, p. 2). This index is recommended along with the CFI index in evaluating model fit. The multiple measures used and their recommended values are presented in Table 17 (Hu and Bentler 1999).

Table 17. Model Fit Statistics

Fit statistics	Recommended Values
χ^2 (Chi-Square)	p-value ≥ .05
Root Mean Square Error of Approximation	about .06
Comparative Fit Index	≥ .95

In the next sections, the tests of the research models are presented. The models were evaluated following the two-step approach (Anderson and Gerbing 1988): first, the measurement models were evaluated and refined based on modification indices and standard errors to reach a satisfactory fit; then, the structural aspect of the models was examined.

Measurement Model Testing

Because it is common to have specification errors in measurement models (Anderson and Gerbing 1982), it was respecified to achieve satisfactory fit. However, excessive modifications would reduce the generalizability and validity

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of the findings (MacCallum 1986). Therefore, the specification search was minimized and limited to item elimination.

In addition, it is difficult to fit data to large and complex models and it is more likely to capitalize on chances when researchers make modifications to such models (MacCallum 1986), therefore, the overall measurement model was divided into two sub-models, each containing a subset of constructs. The behavioral belief and attitude constructs were grouped into one submodel (noted as SUB1 in the following analyses) and the rest were grouped into another submodel (noted as SUB2). SUB1 contained the following constructs and their measurement items: PU, EOU, COM, TR, VI, RD, IM, and A. SUB2 contained the following constructs and their measurement items: A, NB, SN, BI, and U.

First, SUB1 was fitted to the overall data sample (N = 1484). The initial fit statistics were χ^2 (376 *df*, N = 1484) = 2175.71, $p < .001$, RMSEA = .052, and CFI = .95. Even though the fit statistics suggested adequate fit, the examination of residuals and modification indices revealed some misspecifications. Item VI2 (visibility 2: In my organization, I have seen many people with E-Mail on their computers) was suggested to be deleted. Because this item is similar to VI1 (In my organization, one sees E-Mail on many computers), we decided to delete VI2 from the scale. An additional two items were evaluated and deleted in the subsequent model fitting process. These items were COM3, and TR1. Item COM3 (compatibility 3: using E-Mail fits well with the way I like to work) was

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deleted because it is similar to COM4 (using E-Mail is very compatible with the way I like to work). Item TR1 (trialability 1: before I started using E-Mail, I was able to use it on a trial basis) was deleted because it is similar to TR2 (before I started using E-Mail, I was able to properly try it out). The final model fit statistics indicated good fit of the model to data: χ^2 (295 df, N = 1484) = 1025.03, $p < .001$, RMSEA = .041, and CFI = .98. Individual item loadings were all above .70.

Then, SUB2 was fitted to the overall data. The initial fit statistics were χ^2 (92 df, N = 1484) = 442.61, $p < .001$, RMSEA = .051, and CFI = .98. Even though the fit statistics suggested adequate fit, the examination of residuals and modification indices revealed some misspecifications. A4 (Attitude 4: Using E-Mail on my job is worthless....valuable) was suggested for evaluation. This item was compared to A3 (Using E-Mail on my job is useless....useful). The meanings of "useless" and "worthless" are almost redundant in Chinese. Also, in some studies, one of the two was used. Therefore, A4 was deleted. The final model fit statistics indicated good fit of the model to data: χ^2 (78 df, N = 1484) = 353.34, $p < .001$, RMSEA = .049, and CFI = .99. Individual item loadings were all above .70.

Next, the fitted measurement models were assessed for each of the data subsets: the earlier, later, and potential adopters. Table 18 (page 120) gives a summary of the measurement model fit statistics at the end of the measurement model assessment.

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Earlier Adopter

All four item deletions were incorporated in the measurement models fitted for the earlier adopter data set. The fit statistics for SUB1 were χ^2 (295 df, N = 400) = 628.47, p < .001, RMSEA = .053, and CFI = .97. The fit statistics for SUB2 were χ^2 (78 df, N = 400) = 191.54, p < .001, RMSEA = .060, and CFI = .98. All statistics demonstrated good fit of the models to the earlier adopter data.

Later Adopter

All item deletions were incorporated in the measurement models fitted for the later adopter data set. The fit statistics for SUB1 were χ^2 (295 df, N = 382) = 486.19, p < .001, RMSEA =, and CFI = .97. The fit statistics for SUB2 were χ^2 (78 df, N = 382) = 207.51, p < .001, RMSEA = .066, and CFI = .97. All statistics demonstrated good fit of the models to the later adopter data.

Potential Adopter

All item deletions were incorporated in the measurement models fitted for the potential adopter data set. The fit statistics for SUB1 were χ^2 (295 df, N = 317) = 586.49, p < .001, RMSEA = .056, and CFI = .95. The fit statistics for SUB2 were χ^2 (78 df, N = 317) = 175.67, p < .001, RMSEA = .063, and CFI = .97. All statistics demonstrated good fit of the models to the potential adopter data.

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Table 18. Summary of Measurement Model Fit Statistics				
Data Set	χ^2	**N**	**RMSEA**	**CFI**
	SUB1 (*df* = 295)			
Overall Data	1025.03	1484	.041	.98
Earlier Adopter	628.47	400	.053	.97
Later Adopter	486.19	382	.041	.97
Potential Adopter	586.49	317	.056	.95
	SUB2 (df = 78)			
Overall Data	353.34	1484	.049	.99
Earlier Adopter	191.54	400	.060	.98
Later Adopter	207.51	382	.066	.97
Potential Adopter	175.67	317	.063	.97

Equivalency Assessment

Even though the measurement models demonstrated similar model fit, stacked models were used to assess their statistical equivalency. The purpose of assessing the equivalency of the measurement models across the groups was to enable group comparisons of structural equations in hypothesis testing. As Table 18 shows, the measurement models across adopter groups demonstrate similar fit statistics. The root mean square error of approximation statistics for all three groups of adopter samples are within acceptable range. The comparative fit indices are similar and above the accepted .95 cutoff. Across adopter groups, there are discrepancies among the composite reliability coefficients of the constructs presented in Table 15. Some measures appear to behave similarly across adopter groups, while others do not. The largest difference in the coefficients for each construct ranges between 0 and .10. Further, we examine across adopter groups the phi matrices (see Appendix E) and factor loadings (see Appendix F). There are also notable differences across groups.

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The stacked model statistics revealed that the overall measurement model equivalency at the factor loading and error variance level could not be established. However, it has been found that even when invariance tests fail, tests for the invariance of specific parameters hold (Byrne 1998). Muthén (1988 in Byrne 1998) states that specific hypotheses pertaining to invariance can be tested even when the omnibus test fails. In the hypothesis testing, we focused on testing the equivalency of model forms and specific regression coefficients. The details of the tests are given in the hypothesis testing section starting on page 127.

Structural Model Testing

Given a satisfactory measurement model fit, the structural model was assessed for each of the adopter groups. Thirteen structural paths were added to each structural equation model (12 for the potential adopter group). No modification was applied to the structural model. The fit indices indicate good fit of all three adopter models. Overall, six out of thirteen structural paths were significant in all three groups: perceived usefulness→attitude, attitude→behavioral intention, normative belief→subjective norm, subjective norm→behavioral intention, behavioral intention→usage (only in the earlier and later adopter group), and individual innovativeness→usage/behavioral intention. Table 19 gives a summary of the structual model fit statistics at the end of the structural model assesment on page 126. Table 20 gives a summary of the standardized path coefficients estimated in the structural model on page 127.

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Earlier Adopter

The structural model was assessed for the earlier adopters. The model fit statistics were χ^2 (928 *df*, N = 400) = 2065.66, p < .001, RMSEA = .055, and CFI = .92. Overall, the statistics demonstrated a marginal fit of the model to the earlier adopter data.

Figure 11 shows the estimated standardized path coefficients and their *t*-values in the structural model for the earlier adopters and the variance explained for each of the constructs. The model explained approximately 32% of the variance in behavioral intention and 29% of the variance in usage. Significant paths (p < .05) are indicated in Figure 11. Four out of seven behavioral belief→attitude paths were significant. They are perceived usefulness→attitude, compatibility→attitude, visibility→attitude, and result demonstrability→attitude. Overall, nine out of 13 paths were significant. All scales had reliabilities above .70.

Later Adopter

The structural model was assessed for the later adopters. The model fit statistics were χ^2 (928 *df*, N = 382) = 1901.80, p < .001, RMSEA = .053, and CFI = .92. Overall, the statistics demonstrated a marginal fit of the model to the later adopter data.

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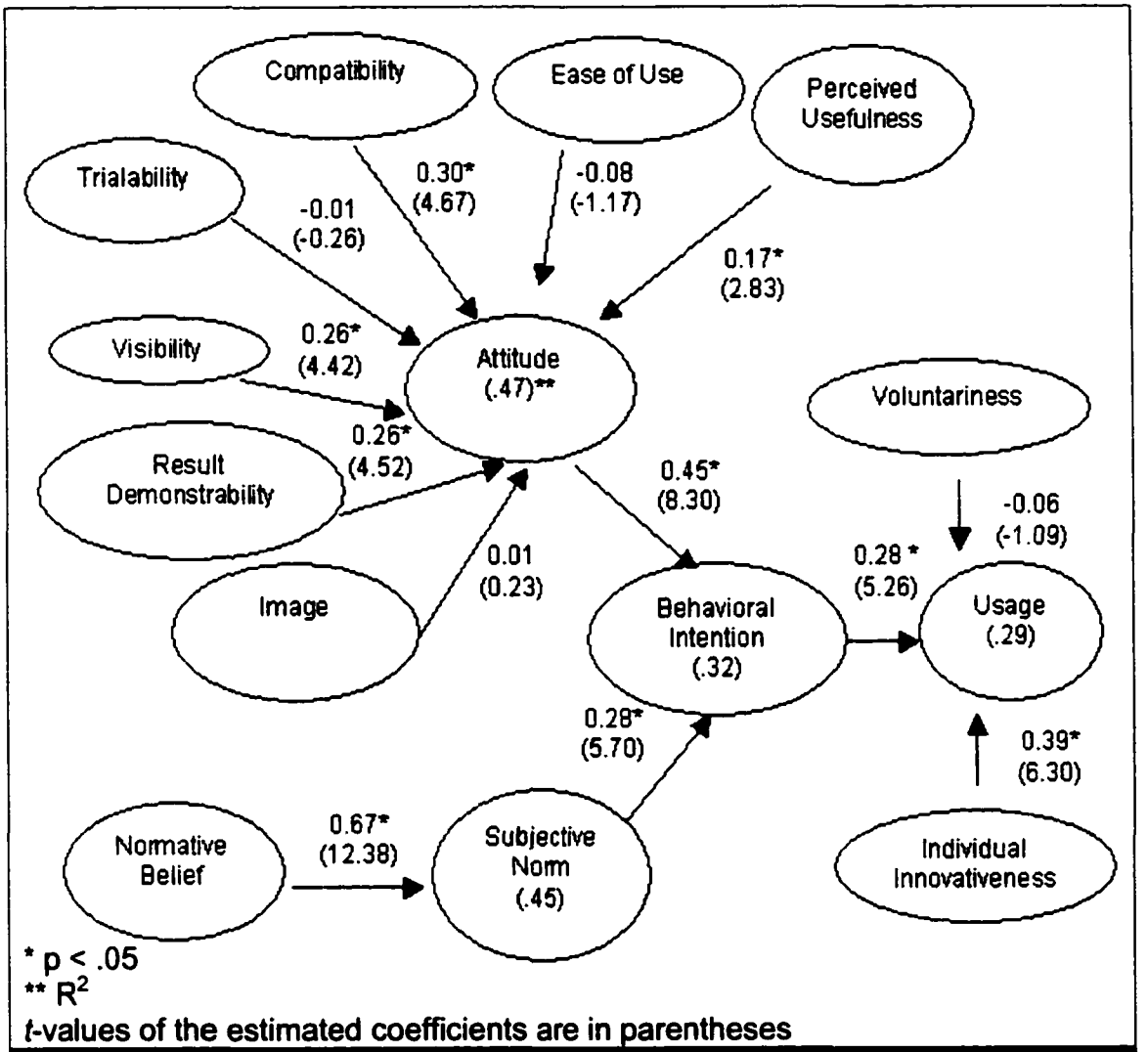

Figure 11. Standardized Path Coefficients for the Earlier Adopters

Figure 12 shows the estimated standardized path coefficients and their *t*-values in the structural model for the later adopters and the variance explained for each of the constructs. The model explained approximately 13% of the variance in behavioral intention and 39% of the variance in usage. Significant paths ($p < .05$) are indicated in Figure 12. Two out of seven behavioral belief→attitude paths were significant. They are perceived usefulness→attitude and result

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demonstrability→attitude. Overall, eight out of 13 paths were significant. All scales had reliabilities above .70.

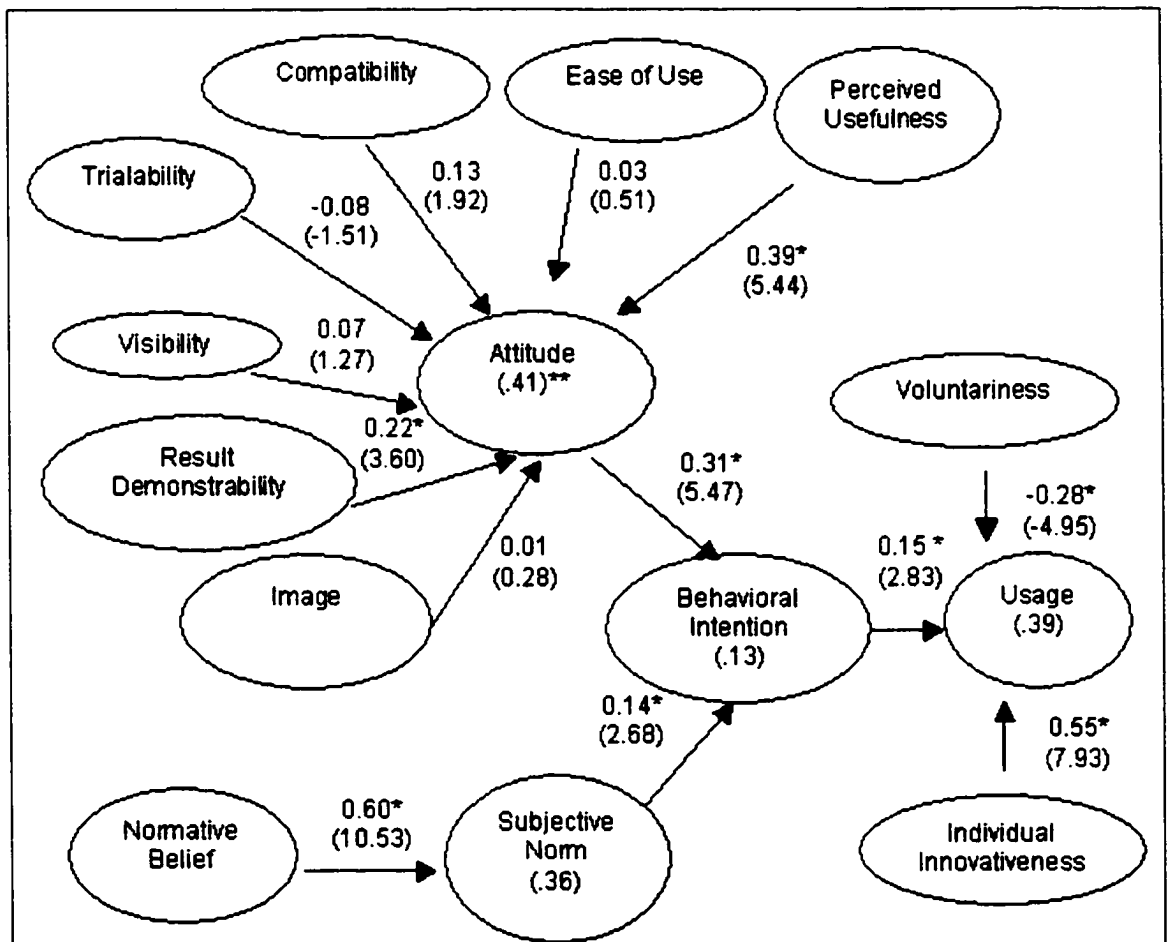

Figure 12. Standardized Path Coefficients for the Later Adopters

Potential Adopter

The structural model was assessed for the potential adopters. The model fit statistics were χ^2 (759 *df*, N = 382) = 1619.66, p < .001, RMSEA = .060, and CFI

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= .92. Overall, the statistics demonstrated a marginal fit of the model to the potential adopter data.

Figure 13 shows the estimated standardized path coefficients and their *t*-values in the structural model for the potential adopters and the variance explained for each of the constructs. The model explained approximately 52% of the variance in behavioral intention. Significant paths ($p < .05$) are indicated in Figure 13. Three out of seven behavioral belief→attitude paths were significant. They are perceived usefulness→attitude, trialability→attitude, and visibility→attitude. Overall, seven out of 12 paths were significant. All scales had reliabilities above .70.

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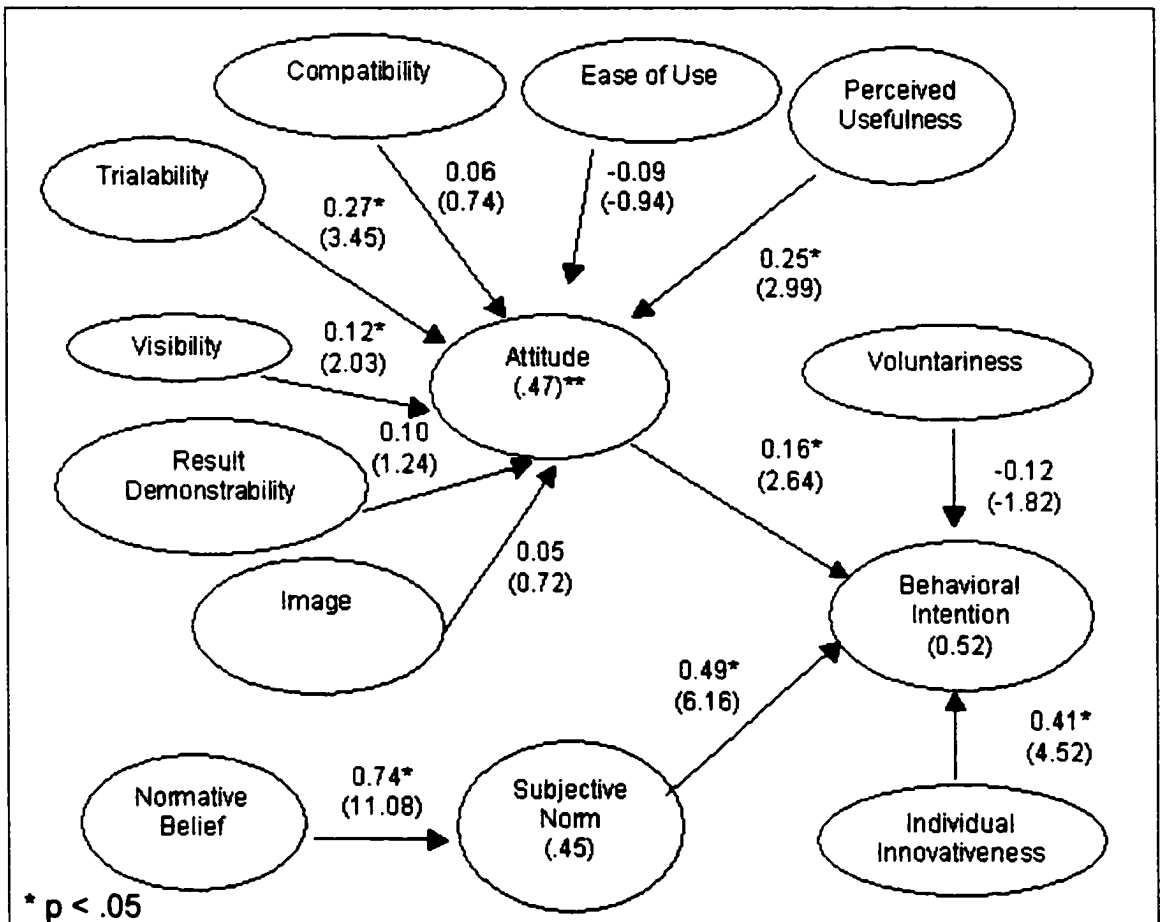

Figure 13. Standardized Path Coefficients for the Potential Adopters

Table 19. Summary of Structural Model Fit Statistics

Data Set	χ^2	*df*	RMSEA	CFI
Earlier Adopter	2065.66	928	.055	.92
Later Adopter	1901.80	928	.053	.92
Potential Adopter	1619.66	769	.060	.92

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Table 20. Summary of Path Coefficients

Structural Path	Earlier Adopter	Later Adopter	Potential Adopter
Perceived Usefulness→Attitude	.17*	.39*	.25*
Ease of Use→Attitude	-.08	.03	-.09
Compatibility→Attitude	.30*	.13	.06
Trialability→Attitude	-.01	-.08	.27*
Visibility→Attitude	.26*	.07	.12*
Result Demonstrability→Attitude	.26*	.22*	.10
Image→Attitude	.01	.01	.05
Normative Belief→Subjective Norm	.67*	.60*	.74*
Attitude→Behavioral Intention	.45*	.31*	.16*
Subjective Norm→Behavioral Intention	.28*	.14*	.49*
Innovativeness→Behavioral Intention/Usage	.39*	.55*	.41*
Voluntariness→Behavioral Intention/Usage	-.06	-.28*	-.12
Behavioral Intention→Usage	.28*	.15*	-

Note: * $p < .05$

Hypotheses Testing

In the following sections, the testing procedures of the 21 hypotheses and the analyses of these hypotheses are presented. The relevant path coefficients presented in Figure 11, Figure 12, and Figure 13 are discussed. Three types of analyses were used: 1) testing of the regression coefficient equality using multi-group analysis (H1, H2, H3, H4, H5, H6, H7, H8, H9, H10, H11, and H12) (Jöreskog and Sörbom 1993), 2) examining the significance and direction of parameter estimates (H13, H14, H15, H19, H20, and H21) using t-values (Jöreskog and Sörbom 1989), and 3) testing of the latent mean invariance using multi-group analysis (H16, H17, and H18). The summary of the tests used is shown in Table 7. All analyses were done using LISREL 8.30. The syntax of the

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programs was written in SIMPLIS. The covariance matrices used in the analyses were produced using PRELIS 2.0 programs. Limited by the number of variables allowed in the version of the LISREL software, we tested the hypotheses using a smaller set of variables.

In the first group of analyses (H1, H2, H3, H4, H5, H6, H7, H8, H9, H10, H11, and H12), we test the equality of regression coefficients (γs) in regression models with latent variables using multi-group analysis (Jöreskog and Sörbom 1993). Model form and similarity in parameter values are the two types of comparability in models (Bollen 1989). Even though in most research equal form is assumed (Bollen 1989), we assess whether the form of two models was the same for each hypothesis test. To begin a multi-group analysis, the researcher first establishes a baseline model, which is used to compare with subsequent models for chi-square differences (Jöreskog and Sörbom 1993). There is no standard in selecting the baseline model; some suggest using a fully constrained model, in which all nonfixed parameters are restricted to have the same value across groups (e.g., Jöreskog and Sörbom 1993) whereas others suggest a fully free model (e.g., Bollen 1989).

The parameters differences can be tested in a hierarchy and depend on the interests of the researcher, who needs to decide which tests and the order of the tests based on the research elements in interest (Bollen 1989). The χ^2 difference

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test is used to compare the models. Nonsignificant *p*-values indicate the hypothesis of equal parameter is not rejected (Byrne 1998).

In this study, the key interest of the first group of hypotheses is the equality of the regression coefficients across groups, therefore, the analyses were designed to investigate the χ^2 difference by comparing the baseline model to the model in which all parameters are reestimated except the regression coefficients (Jöreskog and Sörbom 1993).

The default multi-group analysis programs written in SIMPLIS syntax using LISREL assume identical models over groups unless the parameters are specified in the second group (Jöreskog and Sörbom 1993). Based on Bollen's (1989) recommendation, we specified the baseline model as the least restrictive model: all nonfixed parameters were allowed to be estimated in both groups. The baseline model, which is specified as Model 1 in the following analyses also serves as a check for the form equality across groups (Bollen 1989). The parameters reestimated in group 2 include the regression coefficients, intercepts, error variances of the indicators and dependent variable, and variances of the independent variables (Jöreskog and Sörbom 1993). The second model (Model 2) restricts the regression coefficients in interest to be the same across groups while still allowing the remaining coefficient to be reestimated in the second group; therefore, the χ^2 difference between the models can be attributed to the difference between the coefficients (Bollen 1989). The significance of the χ^2

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difference between Model 1 and Model 2 is then assessed. Because the hypotheses (H1, H2, H3, H4, H5, H6, H7, H8, H9, H10, H11, and H12) were stated in nonnull form, a significant χ^2 difference (α = .05) indicates the hypothesis is supported.

In the second group of analyses (H13, H14, H15, H19, H20, and H21), the significance and directions of the parameter estimates (βs and γs) were observed from the structural models previously presented. The *t*-values of the parameters estimated were assessed (Jöreskog and Sörbom 1989). In the third group of analyses (H16, H17, and H18), we applied the latent mean invariance tests using multi-group analysis. In addition to the covariance matrices, the means of the variables were used to estimate the mean difference in the latent variables between groups (Jöreskog and Sörbom 1993). The *t*-values of the mean difference were assessed.

Following the procedures described above, we analyzed the hypotheses:

H1: The effect of attitude (A) on behavioral intention (BI) will be stronger for earlier adopters than for later adopters.

Hypothesis 1 proposed that the relationship between attitude and behavioral intention would be stronger in the earlier adopter group than in the later adopter. The standardized parameter estimated for this linkage in the earlier adopter structural model was .45 (t = 8.30, p < .001) (see Figure 11) and later adopter .31

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(t = 5.47, p < .001) (see Figure 12). Both estimates were significant. The statistical difference of the parameters was assessed using a multi-group analysis, the earlier adopter versus later adopter groups. In this test, the latent variables attitude, behavioral intention, and subjective norm and their indicators were entered in a regression model to assess the regression of behavioral intention on attitude and subjective norm. In Model 1, the non-restrictive model, all parameters were reestimated in group 2. The χ^2 for Model 1 was 117.2 with 58 degrees of freedom. The CFI of the model was .98. The good fit statistics indicate an equal model form between the earlier adopter and later adopter groups. In Model 2, only the regression coefficient of Attitude ($\gamma_{BI,A}$) was restricted to be the same across both groups. The χ^2 for Model 2 was 123.6 (59 *df*). The CFI of the model was .98.

The difference in χ^2 between Model 1 and Model 2 was 6.4 with one *df* (p = .0114), therefore, the hypothesis was supported. Table 21 shows the multi-group analysis for hypothesis 1.

Table 21. Multi-Group Analysis for Hypothesis 1

Model Number	Model Description	χ^2	*df*	$\Delta\chi^2$ from Model 1	*p*-value	CFI
1	Non-restrictive	117.2	58	0	-	.98
2	$\gamma_{BI,A}$ restricted	123.6	59	6.4	.0114	.98

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H2: The effect of attitude (A) on behavioral intention (BI) will be stronger for later adopters than for potential adopters.

Hypothesis 2 proposed that the relationship between attitude and behavioral intention would be stronger in the later adopter group than in the potential adopter. The standardized parameter estimated for this linkage in the later adopter structural model was .31 (t = 5.47, p < .001) (see Figure 12) and potential adopter .16 (t = 2.64, p < .05) (see Figure 13), thus providing directional support for the hypothesis. Both estimates were significant. The statistical difference of the parameters was assessed using a multi-group analysis, the later adopter versus potential adopter groups. In this test, the latent variables attitude, behavioral intention, and subjective norm and their indicators were entered in a regression model to assess the regression of behavioral intention on attitude and subjective norm. In Model 1, the non-restrictive model, all parameters were reestimated in group 2. The χ^2 for Model 1 was 114.94 with 58 degrees of freedom. The CFI of the model was .99. The fit statistics indicate good model fit and thus an equal model form between the later adopter and potential adopter groups. In Model 2, only the regression coefficient of Attitude ($\gamma_{BI,A}$) was restricted to be the same across both groups. The χ^2 for Model 2 was 115.03 (59 *df*). The CFI of the model was .99.

The difference in χ^2 between Model 1 and Model 2 was .09 with one *df* (p = .7642), therefore, the hypothesis was not supported. Table 22 shows the multi-group analysis for hypothesis 2.

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Table 22. Multi-Group Analysis for Hypothesis 2

Model Number	Model Description	χ^2	*df*	$\Delta\chi^2$ from Model 1	*p*-value	CFI
1	Non-restrictive	114.94	58	0	0	.99
2	$\gamma_{BI,A}$ restricted	115.03	59	.09	.7642	.99

H3: The effect of attitude (A) on behavioral intention (BI) will be stronger for earlier adopters than for potential adopters.

Hypothesis 3 posited that the relationship between attitude and behavioral intention would be stronger in the earlier adopter group than in the potential adopter. The standardized parameter estimated for this linkage in the earlier adopter structural model was .45 (t = 8.30, p < .001) (see Figure 11) and potential adopter .16 (t = 2.64, p < .05) (see Figure 13). Both estimates were significant. The statistical difference of the parameters was assessed using a multi-group analysis, the earlier adopter versus potential adopter groups. In this test, the latent variables attitude, behavioral intention, and subjective norm and their indicators were entered in a regression model to assess the regression of behavioral intention on attitude and subjective norm. In Model 1, the non-restrictive model, all parameters were reestimated in group 2. The χ^2 for Model 1 was 167.09 with 58 degrees of freedom. The CFI of the model was .97. The good fit statistics indicate an equal model form between the earlier adopter and potential adopter groups. In Model 2, only the regression coefficient of Attitude ($\gamma_{BI,A}$) was restricted to be the same across both groups. The χ^2 for Model 2 was 174.29 (59 *df*). The CFI of the model was .97.

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The difference in χ^2 between Model 1 and Model 2 was 7.2 with one *df* (p = .0073), therefore, the hypothesis was supported. Table 23 shows the multi-group analysis for hypothesis 3.

Table 23. Multi-Group Analysis for Hypothesis 3

Model Number	Model Description	χ^2	*df*	$\Delta\chi^2$ from Model 1	*p*-value	CFI
1	Non-restrictive	167.09	58	0	-	.97
2	$\gamma_{BI,A}$ restricted	174.29	59	7.2	.0073	.97

H4: The effect of subjective norm (SN) on behavioral intention (BI) will be weaker for earlier adopters than for later adopters.

Hypothesis 4 stated that the relationship between subjective norm and behavioral intention would be weaker in the earlier adopter group than in the later adopter. The standardized parameter estimated for this linkage in the earlier adopter structural model was .28 (t = 5.70, p < .001) (see Figure 11) and later adopter .14 (t = 2.68, p < .05) (see Figure 12). The coefficient estimated for the earlier adopter was greater than the later adopter group, thus contradicting the hypothesis. Regardless, the statistical difference of the parameters was assessed using a multi-group analysis, the earlier adopter versus later adopter groups. In this test, the latent variables subjective norm, behavioral intention, and attitude and their indicators were entered in a regression model to assess the regression of behavioral intention on attitude and subjective norm. In Model 1, the non-restrictive model, all parameters were reestimated in group 2. The χ^2

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for Model 1 was 117.2 with 58 degrees of freedom. The CFI of the model was .98. The good fit statistics indicate an equal model form between the earlier adopter and later adopter groups. In Model 2, only the regression coefficient of subjective norm ($\gamma_{BI,SN}$) was restricted to be the same across both groups. The χ^2 for Model 2 was 118.05 (59 *df*). The CFI of the model was .98.

The difference in χ^2 between Model 1 and Model 2 was .85 with one *df* (p = .3566), therefore, the hypothesis was not supported. Table 24 shows the multi-group analysis for hypothesis 4.

Table 24. Multi-Group Analysis for Hypothesis 4

Model Number	Model Description	χ^2	*df*	$\Delta\chi^2$ from Model 1	*p*-value	CFI
1	Non-restrictive	117.2	58	0	-	.98
2	$\gamma_{BI,SN}$ restricted	118.05	59	.85	.3566	.98

H5: The effect of subjective norm (SN) on behavioral intention (BI) will be weaker for later adopters than for potential adopters.

Hypothesis 5 stated that the relationship between subjective norm and behavioral intention would be weaker in the later adopter group than in the potential adopter. The standardized parameter estimated for this linkage in the later adopter structural model was .14 (t = 2.68, p < .05) (see Figure 12) and potential adopter .49 (t = 6.16, p < .001) (see Figure 13), thus providing evidence of directional support for the hypothesis. The statistical difference of the parameters was

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assessed using a multi-group analysis, the later adopter versus potential adopter groups. In this test, the latent variables subjective norm, behavioral intention, and attitude and their indicators were entered in a regression model to assess the regression of behavioral intention on attitude and subjective norm. In Model 1, the non-restrictive model, all parameters were reestimated in group 2. The χ^2 for Model 1 was 114.94 with 58 degrees of freedom. The CFI of the model was .99. The good fit statistics indicate an equal model form between the earlier adopter and later adopter groups. In Model 2, only the regression coefficient of subjective norm ($\gamma_{BI,SN}$) was restricted to be the same across both groups. The χ^2 for Model 2 was 165.22 (59 *df*). The CFI of the model was .97.

The difference in χ^2 between Model 1 and Model 2 was 50.28 with one *df* (p = .0000), therefore, the hypothesis was supported. Table 25 shows the multi-group analysis for hypothesis 5.

Table 25. Multi-Group Analysis for Hypothesis 5

Model Number	Model Description	χ^2	*df*	$\Delta\chi^2$ from Model 1	*p*-value	CFI
1	Non-restrictive	114.94	58	0	-	.99
2	$\gamma_{BI,SN}$ restricted	165.22	59	50.28	.0000	.97

H6: The effect of subjective norm (SN) on behavioral intention (BI) will be weaker for earlier adopters than for potential adopters.

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Hypothesis 6 stated that the relationship between subjective norm and behavioral intention would be weaker in the earlier adopter group than in the potential adopter. The standardized parameter estimated for this linkage in the earlier adopter structural model was .28 (t = 5.70, p < .001) (see Figure 11) and potential adopter .49 (t = 6.16, p < .001) (see Figure 13), thus providing directional support for the hypothesis. The statistical difference of the parameters was assessed using a multi-group analysis, the earlier adopter versus potential adopter groups. In this test, the latent variables subjective norm, behavioral intention, and attitude and their indicators were entered in a regression model to assess the regression of behavioral intention on attitude and subjective norm. In Model 1, the non-restrictive model, all parameters were reestimated in group 2. The χ^2 for Model 1 was 167.09 with 58 degrees of freedom. The CFI of the model was .97. The good fit statistics indicate an equal model form between the earlier adopter and potential adopter groups. In Model 2, only the regression coefficient of subjective norm ($\gamma_{BI,SN}$) was restricted to be the same across both groups. The χ^2 for Model 2 was 206.78 (59 *df*). The CFI of the model was .96.

The difference in χ^2 between Model 1 and Model 2 was 39.69 with one *df* (p = .0000), therefore, the hypothesis was supported. Table 26 shows the multi-group analysis for hypothesis 6.

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Table 26. Multi-Group Analysis for Hypothesis 6						
Model Number	**Model Description**	χ^2	*df*	$\Delta\chi^2$ from Model 1	*p*-value	CFI
1	Non-restrictive	167.09	58	0	-	.97
2	$\gamma_{BI,SN}$ restricted	206.78	59	39.69	.0000	.96

H7: Perceived usefulness (PU) will be a significantly stronger factor for earlier adopters than for later adopters of IT in determining attitude.

Hypothesis 7 stated that the relationship between perceived usefulness and attitude would be stronger in the earlier adopter group than in the later adopter. The standardized parameter estimated for this linkage in the earlier adopter structural model was .17 (t = 2.83, p < .05) (see Figure 11) and later adopter .39 (t = 5.44, p < .001) (see Figure 12). The parameters contradicted the hypothesized direction of group difference. Regardless, the statistical difference of the parameters was assessed using a multi-group analysis, the earlier adopter versus later adopter groups. In this test, the latent variables perceived usefulness, ease of use, compatibility, trialability, result demonstrability, and attitude and their indicators were entered in a regression model to assess the regression of attitude on perceived usefulness, ease of use, compatibility, trialability, and result demonstrability. In Model 1, the non-restrictive model, all parameters were reestimated in group 2. The χ^2 for Model 1 was 1061.31 with 354 degrees of freedom. The CFI of the model was .95. The good fit statistics indicate an equal model form between the earlier adopter and later adopter groups. In Model 2, only the regression coefficient of perceived usefulness

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($\gamma_{A,PU}$) was restricted to be the same across both groups. The χ^2 for Model 2 was 1073.25 (355 *df*). The CFI of the model was .94.

The difference in χ^2 between Model 1 and Model 2 was 11.94 with one *df* (p = .0005), therefore, the group difference was supported. However, the direction of the difference was not as posited, therefore, the hypothesis was not supported. Table 27 shows the multi-group analysis for hypothesis 7.

Table 27. Multi-Group Analysis for Hypothesis 7

Model Number	Model Description	χ^2	*df*	$\Delta\chi^2$ from Model 1	*p*-value	CFI
1	Non-restrictive	1061.31	354	0	-	.95
2	$\gamma_{A,PU}$ restricted	1073.25	355	11.94	.0005	.94

H8: Perceived usefulness (PU) will be a significantly stronger factor for later adopters than for potential adopters of IT in determining attitude.

Hypothesis 8 stated that the relationship between perceived usefulness and attitude would be stronger in the later adopter group than in the potential adopter. The standardized parameter estimated for this linkage in the later adopter structural model was .39 (t = 5.44, p < .001) (see Figure 12) and potential adopter .25 (t = 2.99, p < .05) (see Figure 13), thus the direction of the hypothesis was supported. The statistical difference of the parameters was assessed using a multi-group analysis, the later adopter versus potential adopter groups. In this test, the latent variables perceived usefulness, ease of use,

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compatibility, trialability, result demonstrability, and attitude and their indicators were entered in a regression model to assess the regression of attitude on perceived usefulness, ease of use, compatibility, trialability, and result demonstrability. In Model 1, the non-restrictive model, all parameters were reestimated in group 2. The χ^2 for Model 1 was 1232.68 with 354 degrees of freedom. The CFI of the model was .93. The marginal fit statistics indicate an equal model form between the later adopter and potential adopter groups. In Model 2, only the regression coefficient of perceived usefulness ($\gamma_{A,PU}$) was restricted to be the same across both groups. The χ^2 for Model 2 was 1754.36 (355 *df*). The CFI of the model was .83. The dramatic decrease in CFI provided evidence of the difference between the groups.

The difference in χ^2 between Model 1 and Model 2 was 521.68 with one *df* (p = .0000), therefore, the hypothesis was supported. Table 28 shows the multi-group analysis for hypothesis 8.

Table 28. Multi-Group Analysis for Hypothesis 8

Model Number	Model Description	χ^2	*df*	$\Delta\chi^2$ from Model 1	*p*-value	CFI
1	Non-restrictive	1232.68	354	0	-	.93
2	$\gamma_{A,PU}$ restricted	1754.36	355	521.68	.0000	.83

H9: Perceived usefulness (PU) will be a significantly stronger factor for earlier adopters than for potential adopters of IT in determining attitude.

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Hypothesis 9 stated that the relationship between perceived usefulness and attitude would be stronger in the earlier adopter group than in the potential adopter. The standardized parameter estimated for this linkage in the earlier adopter structural model was .17 (t = 2.83, p < .05) (see Figure 11) and potential adopter .25 (t = 2.99, p < .05) (see Figure 13), thus the direction of the hypothesis was not supported. Regardless, the statistical difference of the parameters was assessed using a multi-group analysis, the earlier adopter versus potential adopter groups. In this test, the latent variables perceived usefulness, ease of use, compatibility, trialability, result demonstrability, and attitude and their indicators were entered in a regression model to assess the regression of attitude on perceived usefulness, ease of use, compatibility, trialability, and result demonstrability. In Model 1, the non-restrictive model, all parameters were reestimated in group 2. The χ^2 for Model 1 was 529.38 with 122 degrees of freedom. The CFI of the model was .94. The marginal fit statistics indicate an equal model form between the earlier adopter and potential adopter groups. In Model 2, only the regression coefficient of perceived usefulness ($\gamma_{A,PU}$) was restricted to be the same across both groups. The χ^2 for Model 2 was 531.64 (123 *df*). The CFI of the model was .94.

The difference in χ^2 between Model 1 and Model 2 was 2.26 with one *df* (p = .1328), therefore, the hypothesis was not supported. Table 29 shows the multi-group analysis for hypothesis 9.

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Table 29. Multi-Group Analysis for Hypothesis 9						
Model Number	**Model Description**	χ^2	***df***	$\Delta\chi^2$ **from Model 1**	***p*-value**	**CFI**
1	Non-restrictive	529.38	122	0	-	.94
2	$\gamma_{A,PU}$ restricted	531.64	123	2.26	.1328	.94

H10: Perceived ease of use (EOU) will be a significantly weaker factor for earlier adopters than for later adopters of IT in determining attitude.

Hypothesis 10 stated that the relationship between ease of use and attitude would be weaker in the earlier adopter group than in the later adopter. The standardized parameter estimated for this linkage in the earlier adopter structural model was -.08 (t = -1.17, p = .2423) (see Figure 11) and later adopter .03 (t = .51, p = .6102) (see Figure 12), thus the direction of the hypothesis was not supported. In addition, the parameters were not significant for either group. Regardless, the statistical difference of the parameters was assessed using a multi-group analysis, the earlier adopter versus later adopter groups. In this test, the latent variables perceived usefulness, ease of use, compatibility, trialability, result demonstrability, and attitude and their indicators were entered in a regression model to assess the regression of attitude on perceived usefulness, ease of use, compatibility, trialability, and result demonstrability. In Model 1, the non-restrictive model, all parameters were reestimated in group 2. The χ^2 for Model 1 was 859.09 with 354 degrees of freedom. The CFI of the model was .95. The good fit statistics indicate an equal model form between the earlier adopter and later adopter groups. In Model 2, only the regression coefficient of

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ease of use ($\gamma_{A,EOU}$) was restricted to be the same across both groups. The χ^2 for Model 2 was 861.41 (355 *df*). The CFI of the model was .94. The decrease in CFI provided evidence of the difference between the groups.

The difference in χ^2 between Model 1 and Model 2 was 2.32 with one *df* (p = .1277), therefore, the hypothesis was not supported. Table 30 shows the multi-group analysis for hypothesis 10.

Table 30. Multi-Group Analysis for Hypothesis 10

Model Number	Model Description	χ^2	*df*	$\Delta\chi^2$ from Model 1	*p*-value	CFI
1	Non-restrictive	859.09	354	0	-	.95
2	$\gamma_{A,EOU}$ restricted	861.41	355	2.32	.1277	.94

H11: Perceived ease of use (EOU) will be a significantly weaker factor for later adopters than for potential adopters of IT in determining attitude.

Hypothesis 11 posited that the relationship between ease of use and attitude would be weaker in the later adopter group than in the potential adopter. The standardized parameter estimated for this linkage in the later adopter structural model was .03 (t = .51, p = .6102) (see Figure 12) and potential adopter -.09 (t = -.94, p = .3475) (see Figure 13), thus the direction of the hypothesis was supported. However, the parameters were not significant for either group. Regardless, the statistical difference of the parameters was assessed using a multi-group analysis, the later adopter versus potential adopter groups. In this

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test, the latent variables perceived usefulness, ease of use, compatibility, trialability, result demonstrability, and attitude and their indicators were entered in a regression model to assess the regression of attitude on perceived usefulness, ease of use, compatibility, trialability, and result demonstrability. In Model 1, the non-restrictive model, all parameters were reestimated in group 2. The χ^2 for Model 1 was 1232.68 with 354 degrees of freedom. The CFI of the model was .93. The good fit statistics indicate an equal model form between the later adopter and potential adopter groups. In Model 2, only the regression coefficient of ease of use ($\gamma_{A,EOU}$) was restricted to be the same across both groups. The χ^2 for Model 2 was 1875.78 (355 *df*). The CFI of the model was .82. The dramatic decrease in CFI provided evidence of the difference between the groups.

The difference in χ^2 between Model 1 and Model 2 was 643.1 with one *df* (p = .0000), therefore, the hypothesis was supported. Table 31 shows the multi-group analysis for hypothesis 11.

Table 31. Multi-Group Analysis for Hypothesis 11

Model Number	Model Description	χ^2	*df*	$\Delta\chi^2$ from Model 1	*p*-value	CFI
1	Non-restrictive	1232.68	354	0	-	.93
2	$\gamma_{A,EOU}$ restricted	1875.78	355	643.1	.0000	.82

H12: Perceived ease of use (EOU) will be a significantly weaker factor for earlier adopters than for potential adopters of IT in determining attitude.

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Hypothesis 12 stated that the relationship between ease of use and attitude would be stronger in the earlier adopter group than in the potential adopter. The standardized parameter estimated for this linkage in the earlier adopter structural model was -.08 (t = -1.17, p = .2423) (see Figure 11) and potential adopter -.09 (t = -.94, p = .3475) (see Figure 13), thus the direction of the hypothesis was supported. In addition, the parameters were not significant for either group. Regardless, the statistical difference of the parameters was assessed using a multi-group analysis, the earlier adopter versus potential adopter groups. In this test, the latent variables perceived usefulness, ease of use, compatibility, trialability, result demonstrability, and attitude and their indicators were entered in a regression model to assess the regression of attitude on perceived usefulness, ease of use, compatibility, trialability, and result demonstrability. In Model 1, the non-restrictive model, all parameters were reestimated in group 2. The χ^2 for Model 1 was 529.38 with 122 degrees of freedom. The CFI of the model was .94. The good fit statistics indicate an equal model form between the earlier adopter and potential adopter groups. In Model 2, only the regression coefficient of ease of use ($\gamma_{A,EOU}$) was restricted to be the same across both groups. The χ^2 for Model 2 was 532.18 (123 *df*). The CFI of the model was .93.

The difference in χ^2 between Model 1 and Model 2 was 2.8 with one *df* (p = .0943), therefore, the hypothesis was not supported at the .05 level. Table 32 shows the multi-group analysis for hypothesis 12.

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Table 32. Multi-Group Analysis for Hypothesis 12						
Model Number	**Model Description**	χ^2	*df*	$\Delta\chi^2$ from Model 1	*p*-value	CFI
1	Non-restrictive	529.38	122	0	-	.94
2	$\gamma_{A,EOU}$ restricted	532.18	123	2.8	.0943	.93

H13: Individual innovativeness (II) will be positively correlated with IT usage for the earlier adopter group.

Hypothesis 13 stated that the relationship between individual innovativeness and usage would be positive in the earlier adopter group. The standardized parameter estimated for this linkage in the earlier adopter structural model was positive and significant at .39 (t = 6.30, p = .0000) (see Figure 11), thus the hypothesis was supported.

H14: Individual innovativeness (II) will be positively correlated with IT usage for the later adopter group

Hypothesis 14 stated that the relationship between individual innovativeness and usage would be positive in the later adopter group. The standardized parameter estimated for this linkage in the later adopter structural model was positive and significant at .55 (t = 7.93, p = .0000) (see Figure 12), thus the hypothesis was supported.

H15: Individual innovativeness (II) will be positively correlated with potential adopters' intention to adopt IT.

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Hypothesis 15 stated that the relationship between individual innovativeness and behavioral intention would be positive in the potential adopter group. The standardized parameter estimated for this linkage in the potential adopter structural model was positive and significant at .41 (t = 4.52, p = .0000) (see Figure 13), thus the hypothesis was supported.

H16: Earlier adopters will be more innovative than later adopters.

This analysis was designed to estimate the mean difference of innovativeness as a latent variable by its indicators. In addition to the covariance matrices, the means were used as the input of this multi-group analysis. The addition of means is critical in mean structure analysis because the means of the variables are assumed to be equal in a covariance structure analysis (Jöreskog and Sörbom 1993). The mean difference is produced in the Kappa matrix. A positive value would indicate the mean of the latent variable in group 2 is greater than in group 1; a negative value would indicate the mean of the latent variable in group 2 is lower (Jöreskog and Sörbom 1993). The t-value associated with the mean difference is used to assess statistical significance of the difference. The same type of analysis was conducted in H17 and H18.

The earlier and later adopter data covariance matrices and means were used in the analysis. The earlier adopter group was specified in the model as group 1 following by the later adopter group, group 2. In the LISREL output, the kappa parameter that represents the mean difference between the two groups was

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examined. The kappa estimate was -.21 (t = -3.29, p < .05). The negative value indicates that the mean of innovativeness was higher in the earlier adopter group than in the later adopter group, thus the hypothesis was supported.

H17: Later adopters will be more innovative than potential adopters

This analysis was designed to estimate the mean difference of innovativeness as a latent variable by its indicators. In addition to the covariance matrices, the means were used as the input of this multi-group analysis. The later and potential adopter data covariance matrices and means were used in the analysis. The later adopter group was specified in the model as group 1 following by the potential adopter group, group 2. In the LISREL output, the kappa parameter that represents the mean difference between the two groups was examined. The kappa estimate was -.29 (t = -3.67, p < .05). The negative value indicates that the mean of innovativeness was higher in the later adopter group than in the potential adopter group, thus the hypothesis was supported.

H18: Earlier adopters will be more innovative than potential adopters.

This analysis was designed to estimate the mean difference of innovativeness as a latent variable by its indicators. In addition to the covariance matrices, the means were used as the input of this multi-group analysis. The earlier and potential adopter data covariance matrices and means were used in the analysis. The earlier adopter group was specified in the model as group 1 following by the

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potential adopter group, group 2. In the LISREL output, the kappa parameter that represents the mean difference between the two groups was examined. The kappa estimate was -.52 (t = -7.21, p < .05). The negative value indicates that the mean of innovativeness was higher in the earlier adopter group than in the potential adopter group, thus the hypothesis was supported.

H19: Perceived voluntariness will have a significant effect on usage for earlier adopters.

Hypothesis 19 postulated that the relationship between voluntariness and usage would not be significant in the earlier adopter group. The standardized parameter estimated for this linkage in the earlier adopter structural model was not significant at -.06 (t = -1.09, p = .2760) (see Figure 11), thus the hypothesis was rejected. Consequently, the hypothesized relationship was supported.

H20: Perceived voluntariness will be negatively correlated with usage (U) for later adopters.

Hypothesis 20 postulated that voluntariness and usage would be negatively correlated in the later adopter group. The standardized parameter estimated for this linkage in the later adopter structural model was significant at -.28 (t = -4.95, p = .0000) (see Figure 12), thus the hypothesis was supported.

H21: Perceived voluntariness (VOL) will be negatively correlated with behavioral intention (BI) for potential adopters.

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Hypothesis 21 postulated that voluntariness and usage would be negatively correlated in the potential adopter group. The standardized parameter estimated for this linkage in the potential adopter structural model was not significant at -.12 (t = -1.82, p = .0691) (see Figure 13), thus the hypothesis was not supported at the .05 significance level.

Descriptive Questions 1 and 2

The descriptive questions 1 and 2 (on page 60) raised the question whether the behavioral beliefs that shape attitude differ among different types of adopters. The standardized path coefficients are shown in Figure 11 (page 123), Figure 12, (page 124), and Figure 13 (page 126) for the earlier, later, and potential adopters, respectively and summarized in Table 20 (page 127). The significant behavioral belief→attitude paths were examined. Seven behavioral beliefs were included in this study and they are perceived usefulness, ease of use, compatibility, trialability, visibility, result demonstrability, and image.

For the earlier adopters, four of the seven paths were significant: perceived usefulness→attitude (.17), compatibility→attitude (.30), visibility→attitude (.26), and result demonstrability→attitude (.26). Three paths were not significant: ease of use→attitude (-.08), trialability→attitude (-.01), and image→attitude (.01).

For the later adopters, two of the seven paths were significant: perceived usefulness→attitude (.39) and result demonstrability→attitude (.22). Five paths

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were not significant: ease of use→attitude (.03), compatibility→attitude (.13), trialability→attitude (-.80), visibility→attitude (.07), and image→attitude (.22). The compatibility→attitude was significant at .01 level.

For the potential adopters, three of the seven paths were significant: perceived usefulness→attitude (.25), trialability→attitude (.27), and visibility→attitude (.12). Four paths were not significant: ease of use→attitude (-.09), compatibility→attitude (.06), result demonstrability→attitude (.10), and image→attitude (.05).

Overall, there are some observations:

- Perceived usefulness→attitude was the only paths significant in all three groups.
- Only in the two user groups, result demonstrability→attitude was significant.
- Compatibility→attitude was significant only in the earlier adopter group.
- Trialability→attitude was significant only in the potential adopter group.
- Ease of use→attitude and image→attitude were not significant in any of the groups.

The implications of these observations are discussed later.

Organizational-Level Model Assessment

The relationship question 10 raised previously (page 62) aimed to answer whether organizational factors such as region/location, ownership, size, and industry affect IT diffusion. A total of 30 companies were investigated in this study. Due to a small sample size, statistical tests of the variables presented in

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the organizational model may not be meaningful. The analyses performed on the organizational model were descriptive and posited to explore the relationships between organizational variables and IT diffusion rate, which is the percentage of employees who are using the software at a given time in an organization (Rogers 1995).

Overall Diffusion

The overall diffusion curve, based on all the users who reported the approximate month and year when they started using the software, is depicted in Figure 14 where the cumulative percentage of employees who adopted the software was plotted against year 1984, which was the earliest reported computer usage in this study, to year 2000.

We examine the steepness of the curve; flat curves indicate slow diffusion and steep curves reflect rapid diffusion (Brancheau and Wetherbe 1990). For the first nine years (1984-1992), the diffusion curve remained relatively flat, reflecting slow diffusion during this period. In contrast, the curve became steep in the later seven years (1993-2000); the increasing steepness indicated a much faster rate of diffusion compared to the earlier period. The transitional point depicted in the diagram, 1993, is concomitant with the period indicated as the starting point of major information systems development in China.

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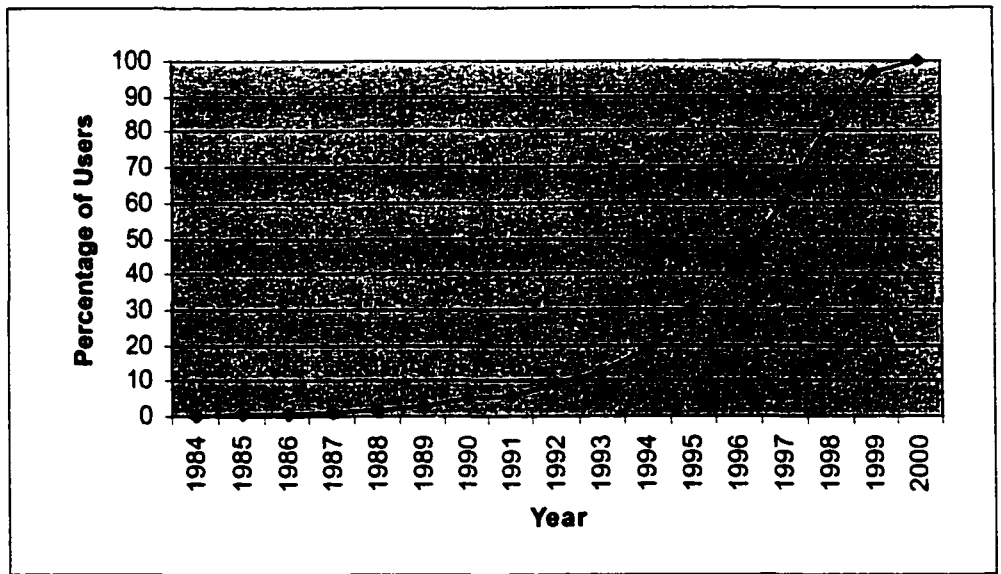

Figure 14. Diffusion Curve - All Users

Analysis by Variables

Region/Location

Companies from three cities in China were investigated in this study. The three cities were Shanghai, Jinan, and Hefei, located in eastern, northern, and central China, respectively. Shanghai is one of the most economically and technologically advanced cities in China. Therefore, it was expected that the companies in Shanghai would have the highest rate of diffusion among the three cities. Jinan is the capital city of a major industrial province in northern China and leads the country in many innovations, while Hefei is the capital city of a central province in central China and lags behind central and eastern China economically and technologically (Cui and Liu 2000). It is reasonable to assume that Hefei has the lowest rate of IT diffusion among the three. The field survey confirmed the assumption. We compared the diffusion rates, which were

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calculated by dividing the number of users by the total number of respondents (users and potential adopter), across the three cities. The companies surveyed in Shanghai, Jinan, and Hefei had an IT diffusion rate of 90.7%, 89.4%, and 82.7%, respectively.

With regard to the speed of diffusion by city, the diffusion curves are presented in Figure 15. As shown in Figure 15, the steepness of the diffusion curves are similar for all three. Shanghai, however, seemed to have diffused IT faster from 1993 to 1999. Shangdong, taken over by Shanghai in 1993, led in IT diffusion from 1984 to 1993. Hefei is shown to have the slowest diffusion rate among the three, but in 1998 it increased its momentum for IT diffusion.

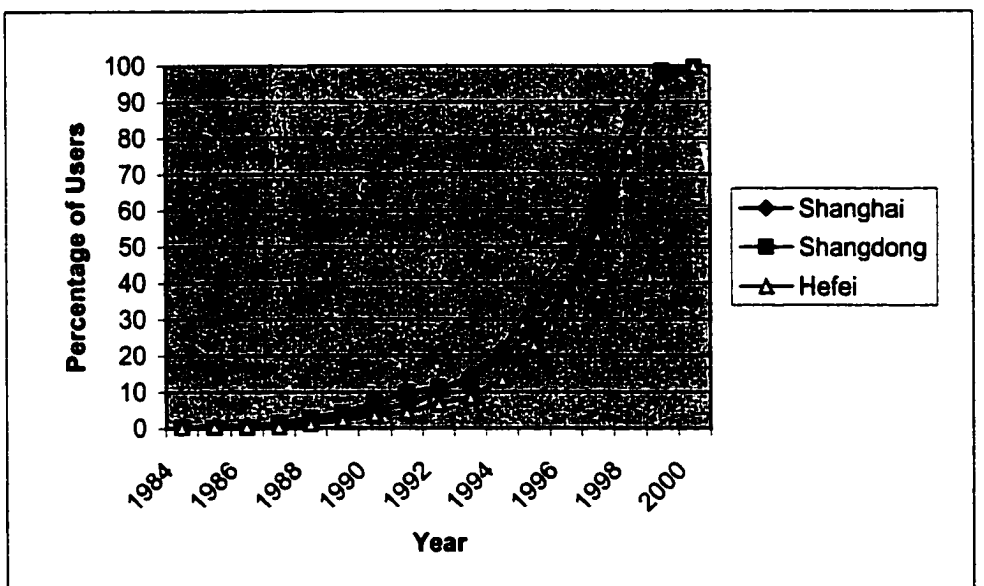

Figure 15. Diffusion Curves by Region

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Ownership

We separated the companies into three categories: public, private, and joint-venture. The public companies are controlled and solely or partly owned by the Chinese government. The private companies operate with only private investment. The joint-ventures are partly owned and controlled by foreign entities.

Table 33. Number of Companies Surveyed and the Rate of Diffusion

	Count	Diffusion
Public Company	22	76.6%
Private Company	2	89.1%
Joint-venture	6	85.7%

The diffusion rates were 76.6%, 89.1%, and 85.7% for the public companies, the private companies, and the joint-ventures, respectively. The diffusion rate among all the companies owned by the Chinese, aggregating both the public and the private companies, was 77.1%. The public companies, traditionally wholly owned by the government, are now increasingly diversifying. Many are considering private investment. Among the 22 public companies surveyed, five companies had private funding and many others were considering it. The diffusion rate in the public companies having private shareholders was 81.7% in contrast to 76.0% in solely-owned public companies. Some state companies had no IT penetration while others are fully computerized.

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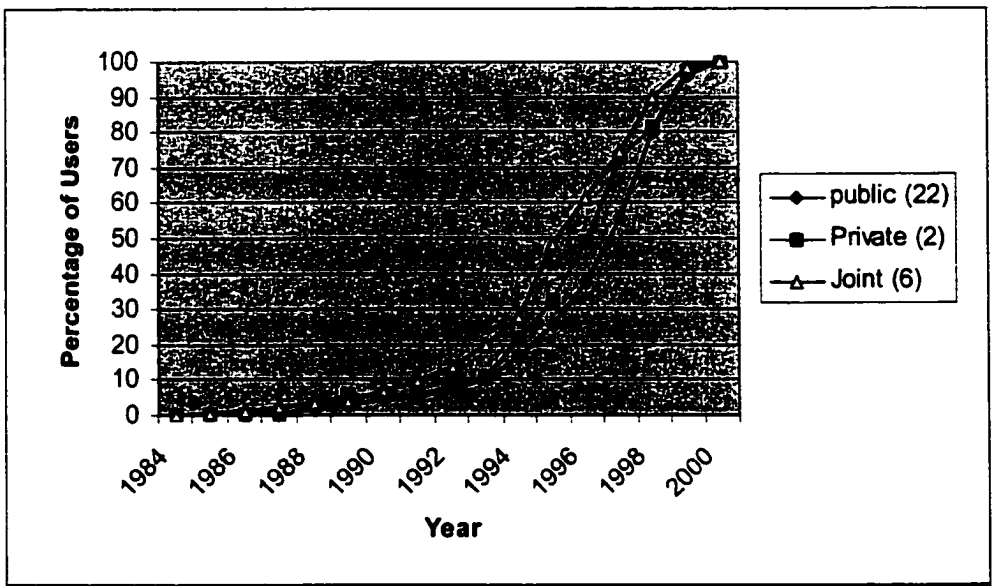

Figure 16. Diffusion Curves by Ownership

Figure 16 shows that the joint-ventures were the leaders in IT diffusion. There was no reported usage for the joint-ventures prior to 1984 and for the private companies prior to 1988. These indicated that penetrations from joint-ventures and private companies were recent. The public companies lagged behind the others and had become more diffused since 1998.

We investigated the public companies further. They are increasingly diversifying and using private funding. We examined whether public companies that were more diversified were more technologically diffused than their solely-owned counterparts. In Figure 17, the diffusion curves show that the diffusion rate was faster in diversified public companies than in the solely-owned public companies between the years of 1993 and mid-1997.

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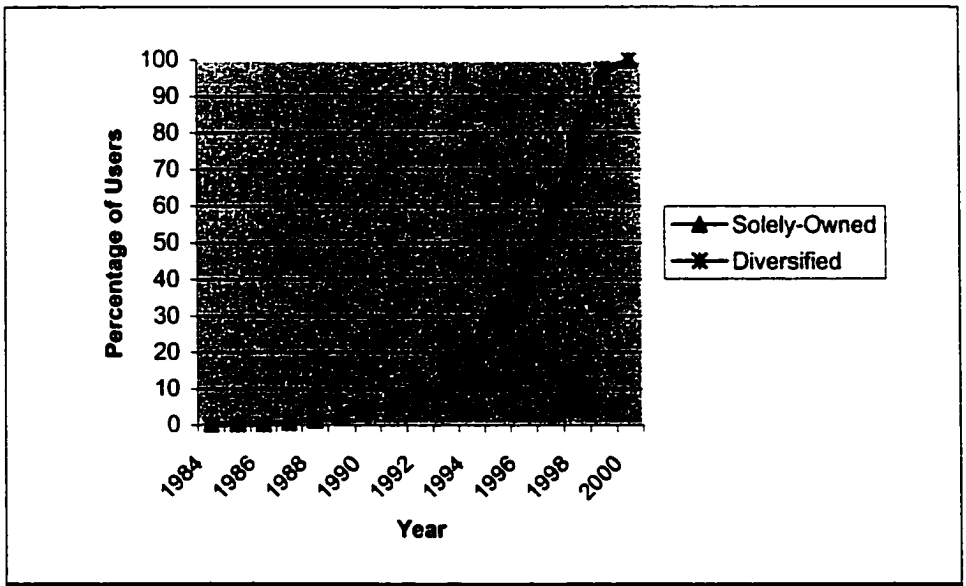

Figure 17. Diffusion Curves: Solely-Owned vs. Diversified Public Companies

Size

In our study, the companies having 100-250 employees were categorized into small/medium companies (SME). The companies having 500 employees or more were classified as large (LE). The diffusion rates for the small/medium (N = 18) and large companies (N = 12) were 89.0% and 74.7%, respectively. The lowest rate of diffusion within an organization was 50% and 0% in the small/medium and large companies investigated, respectively, while, within each category, there were companies that have achieved 100% IT diffusion.

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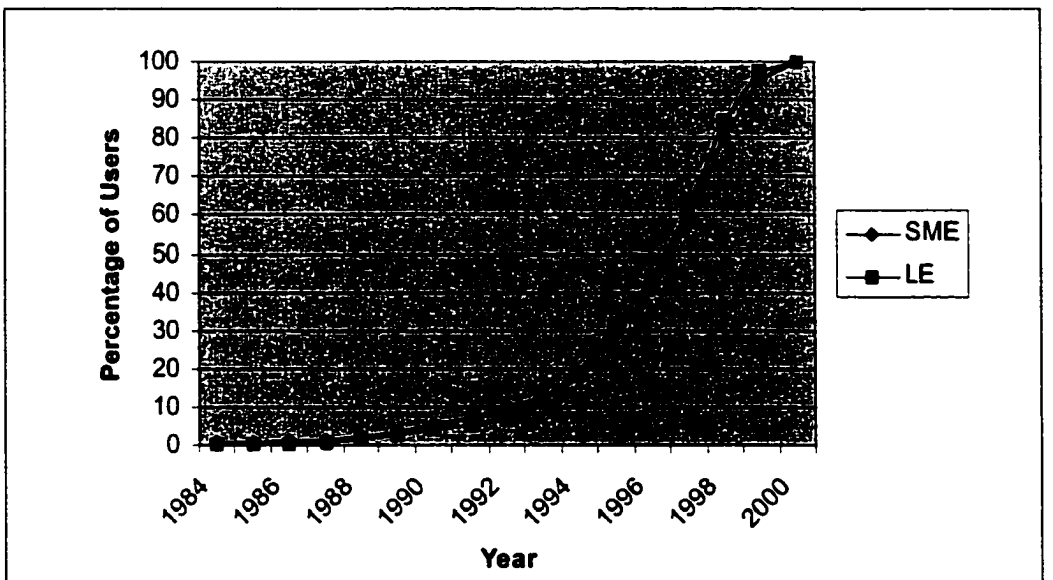

Figure 18. Diffusion Curves: Small/Medium (SME) and Large Enterprises (LE)

The diffusion curves however showed very little difference based on the size of the company. The curves were almost identical. The small company curve showed slight slower diffusion from 1995 to 1999 as compared with the large company curve.

Industry

In this study, we categorize industry into manufacturing (N = 7), services (N = 10), research and development (N = 10), and IT and telecommunications (N = 2). The industries, ranking from the highest to the lowest rate of diffusion, are IT and telecommunications, research and development, services, and manufacturing, at 94.50%, 93.37%, 84.02%, and 61.28%, in that order.

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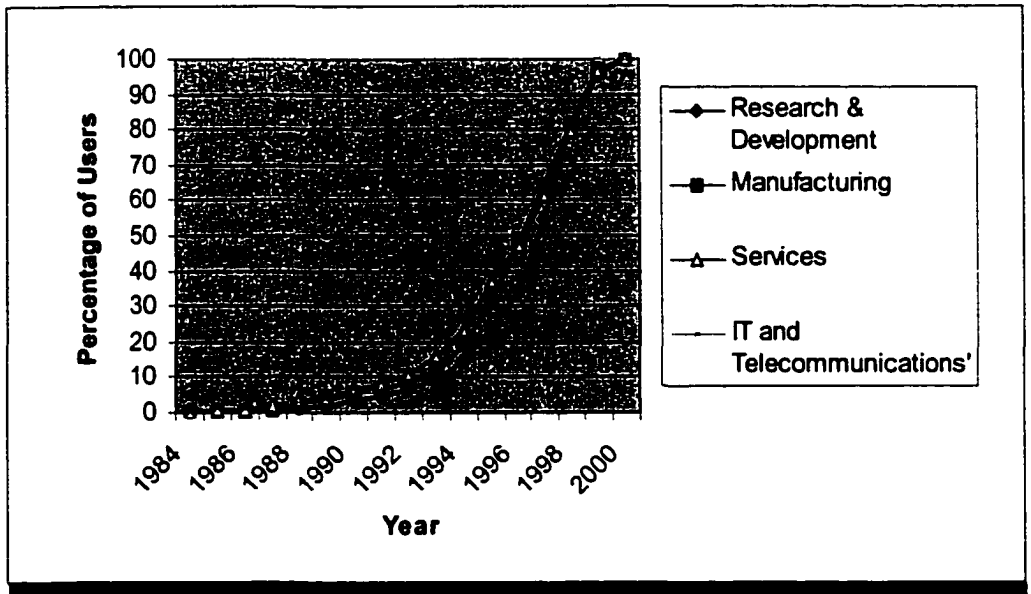

Figure 19. Diffusion Curves by Industry

The diffusion curves in Figure 19 show that the companies in IT and telecommunications led in IT diffusion. The companies in manufacturing and services have similar rates of diffusion. The companies in research and development had the slowest diffusion until 1998.

Training/Support

The interviews revealed that most of the organizations in China lacked IT training and support. While some organizations offered training before implementing the technology, training was voluntary. Formal policies in training were absent in general. The common model in the companies investigated was that when new technologies were introduced, each functional area would send its computer person, unofficially appointed, to attend the training if provided. Vendor-offered training dominated the type of trainings available. Following the training, the

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computer person would train the rest of the members in the functional area. However, the responsibility was never mandatory nor compensated.

In the survey, respondents were asked to indicate whether they received training before and after adopting the technology. A small percentage of the respondents (13.6%) received training before adoption and 6.4% received training after adoption. Within a single organization, the highest percentage of employees that received training was 44.4%. Six organizations provided no training.

The main form of IT support in the organizations investigated was self-provided. The employees attempted to troubleshoot and resolve the problems by themselves first. Only when they failed, would they ask for help from the computer person. Only in situations such as hardware failures, would employees contact the IT supporting staff. The average IT staff in our sample was small. For example, in a research institution that had over 600 employees, there was only one IT specialist. Many firms also reported the use of vendor support.

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DATA ANALYSIS RESULTS

Three sets of results are summarized in this section: model testing, hypothesis testing, and organizational model testing results. The results of the LISREL analyses of the measurement models for earlier, later, and potential adopters are summarized in Table 18 (page 120). The measurement model was divided into two portions. Each part was tested using the overall sample. A total of four measurement items were deleted based on residual and modification index assessments. The refined measurement model was then tested against the three adopter samples. The fit statistics indicated good fit of the measurement models to all.

The structural model was assessed following the measurement model. Table 19 (page 126) gives the summary of the fit statistics, which indicated the structural equation models fit marginally to the adopter data subsets. The structural path coefficients estimated are presented in Figure 11 (page 123), Figure 12 (page 124), and Figure 13 (page 126), for the earlier adopter, later adopter, and potential adopter groups, respectively. Nine of the 13 structural linkages were significant for the earlier adopters, eight for the later adopters, and seven for the potential adopters. Table 20 (page 127) summarizes the results of the path estimates. The model had good predictive power: R^2_A = .47, R^2_{SN} = .45, R^2_{BI} = .32, and R^2_U = .29 for the earlier adopters, R^2_A = .41, R^2_{SN} = .36, R^2_{BI} = .13, and R^2_U = .39 for the later adopters, and R^2_A = .33, R^2_{SN} = .55, and R^2_{BI} = .63 for the potential adopters.

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Of the 21 hypotheses tested, 14 were supported statistically (H1, H3, H5, H6, H8, H11, H13, H14, H15, H16, H17, H18, H19, H20) and seven were not supported (H2, H4, H7, H9, H10, H12, H21) at the .05 significance level. H2 was directionally supported. H7 found a statistical difference; however, the direction of the hypothesis was contradicted. H12 and H21 were supported at the .10 significance level.

Table 34 gives a summary of the hypothesis testing results. The effect of attitude on behavioral intention was found to be stronger for the earlier adopter than for the later and potential adopters. The difference of the effect was not statistically supported when the later adopters were compared to the potential adopters. The effect of subjective norm on behavioral intention was not different between earlier and later adopters, whereas it was between the potential adopters and earlier and later adopters. The effect of perceived usefulness on attitude was significantly different across all groups; however, it was found that the effect was stronger in the later adopters than the earlier, contradicting the expectation. The effect of perceived ease of use on attitude was only significantly different between the later and potential adopters. We found the earlier adopters to be the most innovative followed by the later and potential adopters. Individual innovativeness significantly correlated with usage for both the earlier and later adopters. It also correlated highly with behavioral intention for the potential adopters. No effect of voluntariness on behavioral intention was found for the

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earlier adopters. There was a significant negative correlation between voluntariness and behavioral intention for the later adopters. Contradicting the hypothesis, the negative effect of voluntariness on behavioral intention was not statistically significant.

Overall, two of the five hypotheses pertaining to the differences between the earlier and later adopters were supported (H1 and H16), four of five between the later and potential adopters (H5, H8, H11, and H17), and three of five between the earlier and potential adopters (H3, H6, and H18).

Table 34. Summary of Hypothesis Testing Results

Hypothesis	Support
H1: The effect of attitude (A) on behavioral intention (BI) will be stronger for earlier adopters than for later adopters.	Yes
H2: The effect of attitude (A) on behavioral intention (BI) will be stronger for later adopters than for potential adopters.	No
H3: The effect of attitude (A) on behavioral intention (BI) will be stronger for earlier adopters than for potential adopters.	Yes
H4: The effect of subjective norm (SN) on behavioral intention (BI) will be weaker for earlier adopters than for later adopters.	No
H5: The effect of subjective norm (SN) on behavioral intention (BI) will be weaker for later adopters than for potential adopters.	Yes
H6: The effect of subjective norm (SN) on behavioral intention (BI) will be weaker for earlier adopters than for potential adopters.	Yes
H7: Perceived usefulness (PU) will be a significantly stronger factor for earlier adopters than for later adopters of IT in determining attitude.	No

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Table 34. Continued

Hypothesis	Support
H8: Perceived usefulness (PU) will be a significantly stronger factor for later adopters than for potential adopters of IT in determining attitude.	Yes
H9: Perceived usefulness (PU) will be a significantly stronger factor for earlier adopters than for potential adopters of IT in determining attitude.	No
H10: Perceived ease of use (EOU) will be a significantly weaker factor for earlier adopters than for later adopters of IT in determining attitude.	No
H11: Perceived ease of use (EOU) will be a significantly weaker factor for later adopters than for potential adopters of IT in determining attitude.	Yes
H12: Perceived ease of use (EOU) will be a significantly weaker factor for earlier adopters than for potential adopters of IT in determining attitude.	No
H13: Individual innovativeness (II) will be positively correlated with IT usage for the earlier adopter group.	Yes
H14: Individual innovativeness (II) will be positively correlated with IT usage for the later adopter group	Yes
H15: Individual innovativeness (II) will be positively correlated with potential adopters' intention to adopt IT.	Yes
H16: Earlier adopters will be more innovative than later adopters.	Yes
H17: Later adopters will be more innovative than potential adopters	Yes
H18: Earlier adopters will be more innovative than potential adopters.	Yes
H19: Perceived voluntariness will have a significant effect on usage for earlier adopters.	Yes
H20: Perceived voluntariness will be negatively correlated with usage (U) for later adopters.	Yes
H21: Perceived voluntariness (VOL) will be negatively correlated with behavioral intention (BI) for potential adopters.	No

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For the organizational model proposed, the variables were not tested statistically. The descriptive power of the variables was explored. In summary, the data, when segmented by region, ownership, and industry, showed variability, which was as expected. Size, however, was found to be inconsistent with the expectation. Implications of the results are discussed next.

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DISCUSSIONS

Overall, the results of this study confirm many of the results of prior studies while providing promising evidence of differences across adopter groups. We discuss the results of the study in the sequence as follows:

1) The results of the research models for each adopter group.
2) The results of the hypotheses testing are discussed and prior studies are linked.
3) The results of the organizational model analysis.
4) The results of this study are compared to some existing cross-cultural studies.

The focus of the study is to uncover differences across adopter groups. In testing the hypotheses, we were able to establish the form equivalency and isolate the structural differences. Nevertheless, such differences should be discussed with caution because the measurement models were different across the adopter groups.

Research Models

One research question raised in this study was whether the proposed research models fit well for earlier, later, and potential adopters. Overall, the results of the model testing show that the models demonstrated good predictive power and explained potential adopter and user behaviors well for the data collected. The CFI index was above .95 and the RMSEA was around .06 (except for the SUB1 fit for the later adopter group data) for the measurement model for each data set. The measurement model fit statistics are seldom reported in the existing

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technology acceptance model studies, therefore, we only focus on the comparisons of structural model fit between this study and existing studies.

The structural models were assessed with all hypothesized paths included. The RMSEA indices were approximately .06 and indicative of good fit for the structural model to all three adopter samples. The CFI indices were indicative of marginal fit at .92 for all adopter samples. The structural model fit indices in other studies of technology acceptance models range from .79 to .96 for CFI and from .097 to .053 for RMSEA (e.g., Agarwal and Prasad 1998; Bagozzi et al. 1992; Doll et al. 1998; Igbaria et al. 1997; Taylor and Todd 1995a, 1995b). Overall, the fit indices in this study were adequate based on fit indices as well as when compared to those reported in prior studies. Other types of fit indices reported include Goodness of Fit (GFI), Adjusted Goodness of Fit (AGFI), Root Mean Square Residual (RMR), and Relative Noncentrality Index (RNI) and the recommended values are .90, .90, .08, and, .95, respectively (Hu and Bentler 1995; Hu and Bentler 1999). Many models fit poorly to data in some studies; for example, GFI as low as .75, AGFI as low as .65, and RNI as low as .86 have been reported (e.g., Adams et al. 1992; Bagozzi 1992; Doll et al. 1998; Taylor and Todd 1995a, 1995b).

The significant structural paths were examined. With the exception of the behavioral belief to attitude and voluntariness to behavioral intention/usage paths, all paths are significant as proposed in adopter groups. The differences in

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the significant paths are discussed in the hypotheses testing section. More importantly, we examine the percentage of variance extracted accounted for by the structural model.

With regard to its predictive power, the model explained 29% of the variance in behavior, 32% in behavioral intention, 47% in attitude, and 45% in subjective norm for earlier adopters. For later adopters, the model explained 39% of the variance in behavior, 13% in behavioral intention, 41% in attitude, and 36% in subjective norm. For the potential adopters, the model explained 52% in behavioral intention, 47% in attitude, and 45% in subjective norm. Table 35 summarizes the predictive power of the model in terms of the variance explained in the key variables for all three adopter groups.

Table 35. Predictive Power (R^2)

Variable	Earlier Adopter	Later Adopter	Potential Adopter
Usage	29%	39%	-
Behavioral Intention	32%	13%	52%
Attitude	47%	41%	47%
Subjective Norm	45%	36%	45%

When compared to existing studies, the variation in usage behavior explained in this study is consistent with prior reported values. The typical value has been around 30% (e.g., 34%, Davis et al. 1989; 30%, Taylor and Todd 1995). Similarly, the results of a meta analysis (Sheppard et al. 1988) of 87 TRA studies

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also found that 30% of the variance in behavior could be explained by behavioral intention. However, there are other studies that report exceptionally low (e.g., 4%, Adams et al. 1992) or high values (e.g., 74%, Davis 1989).

The model explained 32%, 13% and 52% of the variance in behavioral intention for the earlier, later, and potential adopters, respectively. In other studies, results vary notably from 23.6% to more than 60%, for example, Karahanna et al. (1999), 23.6%, Mathieson (1991), 62.1%, Sheppard et al. (1988), 60%, and Taylor and Todd (1995a), 43%.

The percent of the variance in attitude explained by behavioral beliefs is 47%, 41% and 47% for earlier, later, and potential adopters. Some reported values in prior studies are 41.2% in Mathieson (1991) and 76% Taylor and Todd (1995b).

Normative beliefs explained 45%, 36%, and 45% of the variance in subjective norm for earlier, later, and potential adopters, respectively. The percentages are less than the reported values in Mathieson (1991), 47.7% and Taylor and Todd (1995), 50 to 57%.

It is clearly demonstrated thus far that there are great inconsistencies in the variance explained in the key constructs across the existing studies. As proposed earlier in the study, we believe that one explanation to such inconsistencies is the lack of distinction between adopter types. The variations of

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the results across the adopter groups in this study are indicative of this proposition, which implies that the predictive power of the model varies for different adopter groups. In this study, the model had better predictive power for the potential adopters than the users. There were similar findings in the Karahanna et al. (1999) study where behavioral intention was studied in users and potential adopters. Only 23.6% of variance in behavioral intention was explained for users, while 38.4% was explained for potential adopters. In addition, in our study, we differentiated the users and found the earlier and later adopter models to have different predictive powers.

To further demonstrate that the adopter types play an important role in explaining IT acceptance, we reexamined the types of adopters in the Taylor and Todd (1995a) study where the adopters were differentiated based on experience. The survey study was conducted based on the usage of a student computing resource center (CRC) in a business school with 1000 students, of which 786 participated in the survey study. The study divided the participants into nonusers (N=356) and current users (N=430). Following the survey, the participants' usage of the CRC was tracked for a 12-week period. The total number of participants who used the CRC was 451, of which 119 were among the 356 nonusers and 332 were among the 430 users with prior experience. The study classified the 119 nonusers as inexperienced users and the 332 users as experienced users. The differences between the two groups were examined. However, when we applied the adopter classification framework to the sample

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(assuming the sample of 786 is representative of the population), we concluded that the 119 nonusers were the late majority (later adopters in this study), and the 332 users were a combination of the innovators, early adopters, and early majority (earlier adopters in this study). In their study, they found the model to have different predictive power for the later and earlier adopters.

In this study, with regard to predictive power, the models behave differently for different groups of adopters as discussed above. The model predicted the later adopter usage behavior better than that of the earlier adopter. The model predicted the potential adopter behavioral intention the best, following by the earlier adopter and then later adopter. The model predicted the potential and earlier adopter attitude and subjective norm equally well and better than the later adopter. The model results provide us with some preliminary insight into the differences between earlier, later, and potential adopters. Additional determinants may need to be discovered for each group of adopters. In the next section, the results of hypothesis testing are discussed with a focus on the findings of the differences across adopter groups.

Hypotheses

The focus of the discussions of the hypotheses is the findings of the differences across the adopter groups. Five groups of such findings are discussed:

1. Differences in the determinants of behavioral intention (H1-H6).
2. Differences in the effects of perceived usefulness and ease of use (H7-H12).

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3. Differences in innovativeness (H13-H18).
4. Differences in the effect of perceived voluntariness (H19-H21).
5. Differences in the determinants of attitude (Descriptive Questions 1 and 2).

Differences in the Determinants of Behavioral Intention

For all adopter groups, both attitude and subjective norm are significant determinants of behavioral intention. The comparative strengths of the attitude on behavioral intention and subjective norm on behavior intention differ across the adopter groups. More intriguingly, the differences reflect that earlier adopters are similar to later adopters along some dimensions while later adopters and potential adopters are similar along other dimensions. The effect of attitude on behavioral intention differs between earlier and later adopters and earlier and potential adopters but not between later and potential adopters. These results indicate that the effect of attitude on intention is the strongest for earlier adopters while it is similar for the later and potential adopters.

The prior literature provides support to such findings. It is found that users form attitude based on direct experience, thus a closer relationship between attitude and behavioral intention is expected (Fazio and Zanna 1982). This is also evidenced in other studies where a closer relationship is found in users than in potential adopters (e.g., Karahanna et al. 1999). We extended the knowledge of this relationship to earlier and later adopters. Apparently, later adopters are similar to potential adopters because both lack direct experience.

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With regard to the effect of subjective norm on behavioral intention, earlier and later adopters do not differ. This effect is the strongest for the potential adopters. This firmly suggests that subjective norm plays a more critical role in shaping potential adopters' intention than users'. Having direct experience, users are less influenced by normative pressures. This is also found in other studies (e.g., Karahanna et al. 1999).

Innovation diffusion studies also provide support for this finding. Earlier adopters rely on their own experience with the technology to form their perceptions. The knowledge of the earlier adopters, diffused through personal communication networks and made available to later adopters and potential adopters, plays a part in shaping the perceptions of the subsequent adopters (Rogers 1995). In other words, the attitudes of later and potential adopters tend to be formed by indirect experience, which can be attributed to subjective norm.

The important message from the findings is that IT managers can focus on applying different approaches to encourage adoption and use of IT to different types of end-users. For early adopters, to sustain usage, more emphasis should be placed on the technical aspects of the technology. Therefore, training should be designed to provide users with exposures to the functionalities of the technology. For later adopters, the diffusion process can be facilitated using the norms exist in the environment. For potential adopters, when promoting an IT the managers can focus on how the technology has been diffused in the

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organization, specifically addressing the parties of the interpersonal networks. Anecdotes and examples pertaining to end-users' personal networks can be extremely influential.

Differences in the Effects of Perceived Usefulness and Ease of Use

The effect of perceived usefulness is significant on attitude for all adopter groups while ease of use is not. When the strength of the effect of perceived usefulness on attitude is compared across groups, it differs significantly between earlier and later adopters and later and potential adopters. However, contrary to the hypothesized direction, the effect of perceived usefulness on attitude is stronger for later adopters than for earlier adopters. No difference is found between earlier and potential adopters. The difference of the effect of perceived usefulness between later and potential adopters is supported by prior studies (Davis 1989; Szajna 1996).

The effect of perceived ease of use on attitude is the weakest for later adopters and significantly different only between later and potential adopters. The effect is similar for earlier and potential adopters. In Davis et al. (1989), a significant effect of perceived ease of use was found immediately after a brief one-hour training; however, after a 14-week period, no significant effect of perceived ease of use was found. In addition, numerous studies that found that perceived ease of use was a nonsignificant factor in technology acceptance are indicative that the effect of perceived ease of use is only short-term (e.g., Adams et al. 1992;

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Davis 1989; Hu et al. 1999; Igbaria et al. 1995). It is also reasonable to assume that most IT end-users, once having made the adoption decision do not associate "easy to use" with information technology usage, which requires in-depth knowledge sometimes.

The literature suggests that attitude changes with experience (Fazio 1989). As users gain experience with IT, they become more knowledgeable about the technology. To sustain long-term use, they demand more functions of the technology. If the technology becomes less adequate as users demand more functions, they will adopt other innovations as replacements. Some studies also demonstrated through longitudinal studies that the effect of perceived usefulness become stronger in a short period, however, usually less than three months (e.g., Davis 1989; Szajna 1996). The changes of behavioral beliefs in the long-term are unclear in the literature. In addition, the antecedents of change are yet to be determined (Szajna 1996).

It is reasonable to argue that perceived usefulness significantly influences attitude of all adopters at different stages of the individual adoption process. For the potential adopters studied here, they are likely to be in the knowledge, persuasion, or decision stage. For the later adopters, they are in the confirmation stage or beyond. The earlier adopters have most likely moved beyond the confirmation stage. The findings suggest that perceived usefulness is the most influential for later adopters in the confirmation stage. On the other

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hand, the findings of perceived ease of use was not a significant factor in determining attitude, however the effect does differ across different types of adopters found in this study should invite further studies to determine at what stage(s) of the adoption process would the effect of ease of use to be significant for what type(s) of adopters.

Differences in Innovativeness

Early adopters are more innovative than later adopters and potential adopters. Overall, we see an evolution of the degree of innovativeness from potential, to later, to earlier adopters. The findings of the differences in innovativeness across adopter types validate the classification of the adopters. Also, it is found that the more innovative the potential adopters are, the more likely they will adopt the IT. Similarly, the more innovative the users are, the more they use the technology. The findings can be interpreted as that potential, later, and earlier adopters are different end-users who differ in the nature of innovativeness (Rogers 1995). On the other hand, it is also rational to assume that end-users become more innovative through the use of technology over time. In fact, individual innovativeness can be improved; therefore, IT managers can invest in methods that enhance innovativeness, such as providing trade journals and IT seminars, which may not be directly related to the use of IT (Rogers 1995). Such methods, which are relatively inexpensive compared to IT training, can effectively improve individual innovativeness, and therefore, ultimately promote a positive environment for IT innovation diffusion.

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Differences in the Effect of Perceived Voluntariness

The findings of the effect of perceived voluntariness on earlier and later adopters are supported by prior studies. For earlier adopters who are in continued usage stage, the effect of voluntariness on usage is not significant (Agarwal and Prasad 1997). For later adopters, the effect of perceived voluntariness is significant. Because they adopt after the average members, even when there are plenty of information available to them, their behaviors are more motivated by external pressures, such as mandatory usage policies (Agarwal and Prasad 1997).

The effect perceived voluntariness on potential adopter behavioral intention was supported directionally. Similarly to later adopters, potential adopters react to external pressures; however, the impact may not be as effective. This may imply that mandatory usage policies fail to promote usage at the later stage of the diffusion process. The rationalization maybe that the potential adopters have the greatest resistance to change and they would only adopt when all others have; therefore, mandatory usage policies have little effect on them.

The implication is that a mandatory usage policy should be deployed after the average members adopt IT because it is the most effective for later adopters. Such policy should be lifted in the last stage of the IT diffusion process because it is ineffective for laggards.

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Differences in the Determinants of Attitude

In examining the behavioral belief to attitude paths, different behavioral beliefs were found significant for different groups of adopters. There are four, two, and three significant behavioral beliefs in determining attitude for earlier, later, and potential adopters (see Table 36). Table 36 summarizes the results of significant behavioral beliefs in this study and some prior studies, which contain a similar list of behavioral beliefs.

Table 36. Significant Behavioral Beliefs

Adopter	PU	EOU	COM	TR	VI	RD	IM
Current Study							
Earlier Adopter	S	NS	S	NS	S	S	NS
Later Adopter	S	NS	NS	NS	NS	S	NS
Potential Adopter	S	NS	NS	S	S	NS	NS
Prior Studies							
User (Moore and Benbasat 1991)	S	S	S	NS	NS	NS	NS
User (Agarwal and Prasad 1997)	NS	NS	S	S	S	NS	NS
User (Karahanna et al. 1999)	S	NS	NS	NS	NS	NS	S
Potential Adopter (Karahanna et al. 1999)	S	NS	NS	S	S	S	NS

S – Significant ($p < .05$); NS – Not significant.
PU – Perceived Usefulness, EOU – Ease of Use; COM – Compatibility; TR – Trialability; VI – Visibility; RD – Result Demonstrability; IM – Image.

In this study, only perceived usefulness is significant for all adopters. In fact, perceived usefulness has been a significant factor in the majority of the technology acceptance literature with rare exceptions (e.g., Agarwal and Prasad

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1997). In studies where only perceived usefulness and ease of use are studied, the significance of perceived usefulness has been persistent. The current study confirms the importance of usefulness for all adopters.

Perceived ease of use and image are two factors that are not significant for any adopters. In many of the studies, perceived ease of use was not significant (e.g., Adams et al. 1992; Agarwal and Prasad 1997; Hu et al. 1999; Igbaria et al. 1995; Jackson et al. 1997). As discussed earlier, the effect of perceived ease of use may be only short-term and before adoption. Few studies in the IS examined the effect of image. It was found significant in few studies for users (e.g., Karahanna et al. 1999).

Two beliefs that are unique to an adopter group are compatibility and trialability. Compatibility is significant for only earlier adopters. This is also found to be significant for users in prior studies (e.g, Agarwal and Prasad 1997). The earlier adopters, having directly experienced the technology, would be in a better position than the later or potential adopters to assess the compatibility factor. It is reasonable to assume that a continuous user who has grown to be dependent on the technology (i.e., earlier adopter) would be more likely to rate the technology as compatible.

Trialability is significant for only potential adopters in this study. This factor is also significant for the potential adopters studied in the Karahanna et al. (1999)

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study. In fact, all three significant behavioral belief factors were found to be significant in the Karahanna et al. (1999) study, in which an additional factor, result demonstrability, was found to be significant. The consensus is that perceived usefulness, trialability, and visibilities are significant behavioral beliefs for potential adopters. Not only is the usefulness factor important for potential adopters, but also it is important for them to try the technology and to see others using the technology before adoption. The ability to try out a technology is only salient to potential adopters because the experimentation with the technology helps them to overcome uncertainties and makes the change process less demanding (Karahanna et al. 1999). In addition, seeing others using the technology would also contribute to a more favorable attitude toward adoption.

Result demonstrability is a significant factor for both the earlier and later adopters. This result is not supported by other studies of users, which usually consist of a combination of innovators, earlier and later adopters, are treated as homogeneous end-users. The discrepancies in those studies are indicative of the importance of separating the adopters. As demonstrated in our study, different sets of beliefs drive the attitude of different adopters.

Overall, there are some common findings in this study and prior studies with respect to significant user behavioral beliefs. However, the comparison is limited because there are very few studies to date that simultaneously examined an elaborate set of behavioral beliefs as performed in this study (e.g., Agarwal and

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Prasad 1997; Moore and Benbasat 1996; Karahanna et al. 1999). It is noteworthy that the results of this study are based on simultaneous testing of the behavioral beliefs. Therefore, their comparative strengths are shown clearly. In studies where only a small set of beliefs is tested, it is possible that the beliefs that are significant can be overshadowed by more influential factors when introduced. Therefore, the studies selected for comparison include similar variables.

Consistent with prior research, perceived usefulness is significant in this study. In fact, perceived usefulness is the only factor that is significant in all studies (with the exception of Agarwal and Prasad 1997), including the TAM studies. Compatibility was significant in both Agarwal and Prasad and Moore and Benbasat (1991) studies. Visibility was significant in the Agarwal and Prasad and Karahanna et al studies while not in Moore and Benbasat. Result demonstrability was not significant for users in other studies while it is in the current study. The factors that were not significant for users in this study are perceived ease of use, trialability, and image. Prior studies have shown inconsistent findings of perceived ease of use. Particularly in field studies, perceived ease of use is often not significant (see Table 3 for the findings on perceived ease of use).

To compare the results of the potential adopter sample, the study we selected is Karahanna et al. (1999), which is the only available study of potential adopters

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we are aware of with the variables of interest. The significance of perceived usefulness, trialability, and visibility are consistent in the two studies. Table 36 shows the results.

Organizational Model Discussions

The results of the descriptive analyses performed on the variables introduced in the organizational model provide some indications to how technology is diffusing in China. Regional effect is evidenced: more advanced regions have higher IT diffusion rate; joint-ventures lead IT diffusion in China; public companies with private funding are more diffused technologically than sole-owned public companies; companies in IT and telecommunications industry lead IT diffusion; and organizational size has no significant relationship with IT diffusion rate.

Government policies play a part in economic development in China. Therefore, government intervention could lead to a more rapid IT diffusion. Policies that encourage foreign and private penetrations also help accelerate the diffusion rate. In regard to industry, policies can be designed to spur IT diffusion in laggards.

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External Validity

The empirical results and analysis of this study are based on data collected in China. Therefore, they must be interpreted and applied with caution. Even though our study was intended to explore theoretical relationships rather than to make generalizations, we still need to examine the issue of external validity, which deals with "to what populations, settings, treatment variables, and measurement variables can an effect be generalized" (Campbell and Stanley 1963). The main focus of the study was to demonstrate that variable relationships and their impact are different for different types of adopters.

Regardless, the results of this study, when compared with other studies, exhibited the majority of expected relationships and degrees of predictive power; therefore, there is some degree of external validly for the results found here (Winer 1999).

Comparisons of Results to Existing Cross-Cultural IT Diffusion Studies

The importance of culture in IT research has been addressed in some recent studies (Kedia and Bhagat 1988; Straub 1994; Straub et al. 1997). Current literature calls for more studies of the role of culture in technology diffusion (Prescott and Conger 1995). Similar studies conducted pertaining to IT acceptance and diffusion in non-U.S. regions are limited in number and scope.

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They are based on the TAM model. In this section, with the intent of exploring the role of culture in explaining IT acceptance, we first compare the results of our study to those TAM studies. In addition, we compare the results of our study to some U.S. studies with similar scope from a cultural perspective. One potential contribution of this study is that we may be able to explain the differences in the determinants of IT acceptance based on cultural differences.

Cross-culture studies in the IT diffusion area are mainly TAM-based studies that are limited to testing the relationships among perceived usefulness, perceived ease of use, attitude, and behavioral intention. In this section, we compare the results of our study with the existing studies. The purpose of the comparisons is to explore the effect of cultural factors on information technology acceptance. Although such comparisons may not generate definitive conclusions, we intend to draw more attention to the importance of studies of the role of culture and cultural factors in information technology acceptance. We selected the following studies conducted outside the United States and Canada:

Straub et al. (1997): Japan, Switzerland, and the United States
Hu et al. (1999): Hong Kong
Rose and Straub (1998): Arab

First, we inspect the values of cultural dimensions of those countries. In Table 37, the culture dimension values of seven countries and regions are presented. We list four dimensions of culture. Also, the cultural cluster to which each country/region belongs is included. Studies have developed the concept of cultural clusters that can be used to group similar cultures (Ronen and Shenkar

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1985). Canada and the United States are in the same cluster, Anglo. China and Hong Kong are in the Far Eastern cluster. The Japanese culture is unique and is classified as independent. Switzerland is in the Germanic cluster. Arab countries form the Arab cluster. Next, the cultures of these countries are discussed.

Table 37. Culture Dimensions and Their Values of Selected Countries

Country	Cultural Cluster	Power Distance	Uncertainty Avoidance	Individualism	Masculinity
United States	Anglo	30	21	100	74
Canada	Anglo	28	24	93	57
China	Far Eastern	89	44	39	54
Hong Kong	Far Eastern	73	8	32	67
Japan	Independent	32	89	55	100
Switzerland	Germanic	17	40	75	93
Arab	Arab	89	51	52	58

Adapted from (Cullen 1999, p. 62). (100 = highest; 50 = middle)

The majority of the existing studies of technology acceptance and diffusion studies were conducted in the United States and Canada. These two cultures are similar according to the values of the cultural dimensions. They have a low degree of power distance. They have the lowest degree and uncertainty avoidance and highest degree of individualism among the seven countries. The degree of masculinity is relatively high for Anglo cultures. Overall, the United States and Canada cultures are individualistic and have a low degree of power distance and uncertainty avoidance.

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China and Hong Kong are classified under the Far Eastern cluster. They have a higher degree of power distance, lower degree of individualism, and similar degree of masculinity as the United States and Canada. Among all seven countries, China and Hong Kong have the highest values of power distance and the lowest values of individualism. The degree of uncertainty avoidance is quite different between the two cultures. China has a much higher degree of uncertainty avoidance than Hong Kong, whose value is the lowest among the seven countries. Overall, the Far Eastern culture is group oriented and has a high degree of uncertainty avoidance.

Japan has a low degree of power distance, the highest degree of uncertainty avoidance among the seven countries, relatively neutral level of individualism, and the highest degree of masculinity. Compared to the Anglo culture, Japan has a similar degree of power distance, a much higher degree of uncertainty avoidance and masculinity, and much less degree of individualism. Compared to the Far Eastern culture, Japan has a much lower degree of power distance, much higher degree uncertainty avoidance and masculinity, and a higher degree of individualism. Overall, the Japanese culture is characterized as high uncertainty avoidance and masculine.

Switzerland belongs to the Germanic culture cluster. Among the seven countries, it has the lowest level of power distance. It has a similar level of uncertainty avoidance to China. It has relatively high degree of individualism and

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very high degree of masculinity. The degree of individualism is just below the Anglo culture and its degree of masculinity is just below the Japanese culture. Overall, it is a low power distance, highly individualistic, and masculine culture. Arab countries make up a distinctive culture cluster. This culture has the highest degree of power distance as China, high degree of uncertainty avoidance, relatively neutral degree of individualism, and relatively low level of masculinity. The culture values of the Arab culture are similar to China in ranking. The two cultures have the highest level of power distance. The Arab culture has to some extent higher degree of uncertainty avoidance, individualism, and masculinity than China. Overall, the Arab culture demonstrates high power distance and uncertainty avoidance.

Table 38 compares the significance of perceived usefulness and ease of use and subjective norm and the variance extracted for behavioral intention found in the existing studies. It is important to point out that all the studies selected here are field studies. The IT acceptance literature review indicated that field studies tend to have different results from lab experiments. Perceived ease of use often is concluded as a nonsignificant factor in field studies. In addition, when the TAM model is applied, the total percent of variance explained in behavior is much smaller in field studies than in lab experiments. For example, in Davis (1989), two studies were conducted. Study 1 was a field study in which no significant effect of perceived ease of use was found on usage behavior. On average 38% of the variance in usage was explained. In Study 2, a lab experiment, ease of

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use was significant overall; the average variance explained in usage was 74%. The comparison raises the question of whether there are more variables that account for the variations in usage in field settings. Several studies have suggested that norms may be one such variable (Lucas and Spitler 1999). However, the norm variables have been consistently omitted in the majority of the existing IT acceptance studies.

In Straub et al. (1997), the study selected a company that uses E-Mail from each of the counties. As indicated in the study, Japan was in an early stage of E-Mail use. The United States and Switzerland were mature users of E-Mail. In Rose and Straub (1998), computer use among 274 knowledge workers in five Arab countries was investigated. In Hu et al. (1999), the use of telemedicine by 408 physicians at public educational hospitals in Hong Kong was investigated. However, in these studies, no effort was made to separate the users into appropriate groups. In Karahanna et al. (1999), based on given information, the users described in the study were a mixture of innovators, early adopters, and early majority; the potential adopters were a mixture of late majority and laggards. As the current study has demonstrated, the omission of types of adopters may ultimately prohibit studies from producing meaningful and accurate results; therefore, we need to be cautious in comparing the findings. Such comparison is fairly limited and the conclusions drawn require further empirical evidence.

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Table 38. Summary of Results in Cross-Cultural IT Adoption Studies - Coefficients and Variance Extracted

Study	Country	PU	EOU	BI (R^2)	U (R^2)	SN
Current Study – earlier adopter	China	S	NS	.32	.29	S
Current Study – later adopter	China	S	NS	.13	.39	S
Current Study – potential adopter	China	S	NS	.52		S
(Straub et al. 1997)	Japan	NS	NS		.01	
	Switzerland	S	NS		.10	
	United States	S	NS		.10	
(Rose and Straub 1998)	Arab	S	S	.40		
(Hu et al. 1999)	Hong Kong	S	NS	.44		
(Karahanna et al. 1999) –users	United States	S	NS	.24		NS
(Karahanna et al. 1999) – potential adopters	United States	S	NS	.38		S

S – Significant; NS – Not Significant. ($p < .05$)
PU—Perceived Usefulness; EOU—Perceived Ease of Use; BI—Behavioral Intention; U—Usage; SN—Subjective Norm.

In Table 38, perceive usefulness (PU) is significant in all studies except the one conducted in Japan. Perceived usefulness seems to be a universal determinant of attitude of the users; such findings are also common in other U.S. based studies. Therefore, IT management must focus on perceived usefulness. Perceive ease of use (EOU) is not significant in any of the studies except the one conducted in the Arab countries. The results pertaining to this variable are inconsistent in U.S.-based studies (see Table 3). In general, EOU is not significant in field studies, the methodology used in all cross-culture studies as well as the current study. It has been criticized that TAM-based model studies often use student samples, which are appropriate in cases where the student

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sample is representative of the population. In addition, sometimes, the sampling techniques are poor, resulting in inconsistent empirical results (Hu et al. 1999). The variance explained in behavioral intention and usage varied across studies.

In Japan's case, no significant determinant was found. The TAM model explained only one percent of variance explained in usage. The uniqueness of the Japanese culture should be noted. It is a high uncertainty avoidance and masculine culture. It is fairly different from other cultures, particularly along the uncertainty avoidance and masculinity dimensions. It is possible that TAM does not apply to the Japanese culture. Other variables must be identified to explain the IT acceptance and adoption behavior. In masculinity cultures, job recognition is important to workers (Cullen 1999); therefore, it is possible that job motivational variables are relevant to IT acceptance.

China and the United States differ significantly along the individualism dimension. The United States is highly individualistic while China is highly collective. The effect of subjective norm has been found to be inconsistent. Many U.S. studies did not find norms to be important in explaining behavior. In the Karahanna et al. (1999) study, subjective norm was found to be a significant indicator of attitude for potential adopters while it is not for users. The innovation diffusion theory notes that potential adopters tend to follow others, and thus are more group oriented (Rogers 1995). In the current study, subjective norm is a significant

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indicator of attitude for every adopter group, even earlier adopters. This is reflective of the collective culture in China.

Even though limited by the number of studies and the type of analyses done in the existing studies, we are able to find some similarities and difference across cultures. The importance of perceived usefulness in determining attitude is found across cultures, while perceived ease of use is often an insignificant factor. The effect of culture, specifically the individualism dimension, was useful in explaining differences found in subjective norm, which is particularly important in a collective culture than in an individualistic culture.

CONCLUSION

The study produced meaningful results that can be of help to organizations in managing IT adoption and usage. First, we established the distinctions between potential adopters and users and further, between earlier adopters and later adopters based on innovation diffusion framework. Through hypotheses testing we are able to demonstrate that earlier, later, and potential adopters are significantly different along some key dimensions; for example, the determinants of attitude, the effect of attitude and subjective norm on behavioral intention, individual innovativeness, and the effect of voluntariness. Also, the study simultaneously tested behavioral belief, normative belief, attitudinal, behavioral intention, and usage factors (for user group); therefore, the relative strengths of the variables are assessed. It contributes to a more in-depth understanding of

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how certain factors operate. The results of the study are consistent in many ways with prior studies. In addition, by conducting our study in a non-US culture, we add to our understanding of the role culture plays in IT acceptance. We found evidence that subjective norm operates differently in a collective culture from an individualistic culture.

In the following sections, we first present some of the key findings followed by the implications of the study.

Key Findings

First, our results provide support for the following theoretical relationships in China: perceived behavioral beliefs and attitude, norms and attitude, attitude and behavioral intention, intention and behavior, voluntariness and behavioral intention/usage, individual innovativeness and behavioral intention/usage. The research models proposed fit the data collected in China adequately. The power of the research model in predicting behavioral intention is the best for the potential adopters, followed by earlier adopters and later adopters, in that order.

Because it is difficult to test a large set of behavioral beliefs, the majority of the prior research only examined very few behavioral belief variables. However, without studying the behavioral beliefs simultaneously in one study based on the same respondents, it is difficult to assess the relative predictive power of different

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behavioral beliefs (Tornatzky and Klein 1982). To date, few IS studies has attempted that. We fill in such knowledge gap by studying seven relevant behavioral beliefs that shape end-user attitude. Further, we find that different behavioral beliefs are salient to different adopter groups.

Consistent with prior findings, our study finds that perceived usefulness is a salient belief across all adopter groups. No other consistent findings are found pertaining to user behavioral belief in the existing studies and the current study. Consistent with previous findings, perceive usefulness, trialability, and result demonstrability are significant behavioral beliefs for potential adopters. Further studies are required to determine the effect of other variables.

Through hypotheses testing, the study provides strong evidence of differences across adopter groups. The key determinants of behavioral intention are attitude and subjective norm. The effect of attitude on behavioral intention is significantly stronger for earlier adopters than for later and potential adopters; no difference was found between later and potential adopters. On the other hand, the effect of subjective norm is significant stronger for potential adopters than for earlier and later adopters; no difference was found between earlier and later adopters. These findings echo prior research that stated that attitude are formed by direct experience; earlier and later adopters have direct experience. Early in the adoption process, earlier adopters are under little influence from others. There is almost no prior knowledge of adopter behavioral beliefs when they adopt. In a

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way, their attitude is mainly determined by their behavioral beliefs that may be solely based on their experience. On the other hand, earlier adopters' behavioral beliefs are available to later adopters and have potential to influence later adopters' perception of behavior.

The effect of perceived usefulness on attitude operates differently across groups. Contradictory to the hypothesis, the effect is significantly stronger for later adopters and earlier adopters. Consistent with prior findings, the effect is stronger for later adopters than for potential adopters. The effect of ease of use on attitude is not significant for any adopter group however the effect is different between later and potential adopters.

The adopters differ in individual innovativeness. The earlier adopters are the most innovative, followed by the later and potential adopter, in that order. It is also found that the more innovative a person is, the more likely he adopts a technology early, confirming innovation diffusion theory. The effect of voluntariness is not significant for earlier or potential adopters. Voluntariness only affects later adopters.

We contributed towards the understanding of determining the set of salient behavioral beliefs that shape IT adopter behavior. There are considerable differences across adopter groups as demonstrated in this study. However, limited by the scope of the study, we only investigated three types of adopters

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using a one-shot survey. The attitude and perceptions we captured are current. The antecedents of the differences found are unclear and need further research. It is unknown how attitudes toward IT adoption and usage change over time. The types of data collected and analyses conducted do not predict changes in perceptions and behavior. The differences we discovered could be the inherent differences between the characteristics of various groups of adopters; or they are the result of using technology. We can speculate the answer in either way or both; however, only longitudinal studies can answer such questions. In addition, some of the effects of adopter type may confound other effects, such as age and experience. Further, readers need to be aware that the measurement models are different across adopter groups. Nevertheless, this study shows that it is critical to distinguish adopter types in studying IT acceptance.

Implications for Theory

The topics of IT adoption and usage have gained increasing attentions from IT researchers recently. A literature review in the IT acceptance and diffusion area reveals that there are great inconsistencies and little consensus on the determinants of IT adoption and diffusion. A few empirical studies have called for the importance of distinguishing adopter types (e.g., Karahanna et al. 1999). The focus of most of this research has been on demonstrating the differences across adopter groups. This critical aspect of technology acceptance research is identified and confirmed. The study demonstrates that earlier, later, and potential adopters differ in several ways.

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We find certain variables are significant for some adopters but not for others. The differences across adopters confirm the importance of accounting for adopter type in the technology acceptance research. In future studies that intend to extend and develop relevant IT adoption and acceptance theory, researchers must provide adequate considerations of the types of adopters at stake. Accounting for adopter type may be a required step toward consistent empirical findings.

This study contributed to our understanding of the adopter groups. While it is clear that the adopters do differ, the validity of the actual differences across adopters and the findings pertain to each adopter group require replications. The determinants of attitude and behavioral intention vary across the adopter groups. These echo the findings of previous studies, which have great inconsistent results because the lack of distinctions between adopters. We have shown that the researchers have made misleading claims on the subjects of the studies. Future replication studies should attempt to classify the adopters.

Consequently, different models should be designed to study the determinants of IT adoption and usage. One phenomenon is that the majority of the recent IT acceptance studies make modifications and extensions to the technology acceptance model, resulting in scattered knowledge in this area. More concise

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models can be designed to capture large amount of variance in IT adoption and usage.

Better models can lead to research of the antecedents of the determinants. The effectiveness of existing training programs has been minimum in corporate America (Georgenson 1982). With better understanding of the determinants and the antecedents of the determinants, more effectual programs can be designed.

Also, the key findings suggest that the time element needs to be examined carefully. This constitutes another critical element of IT adoption study. The current study is based on one-shot data, which provides a limited scope of the relative importance of factors over time. There do exist longitudinal studies that have demonstrated the importance of time related variables, such as experience (e.g., Szajna 1996; Venkatesh 2000).

The adopter classification framework is a good step towards understanding IT end-users. As to the difficulty and tediousness of classifying the users based on the IT adoption date, the study presents evidence of an innovativeness construct being a potentially meaningful alternative determinant of IT adopter type. The items of this construct need to further developed and validated.

The current study has contributed to our understanding of the effect of culture. Specifically, The role of subjective norm in IT adoption and usage has been

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debatable in the literature; while some studies have found subjective norm to be a significant factor in IT adoption while other have not (e.g., Hu et al. 1999). We have demonstrated that the inclusion of culture could help explain the discrepancies.

Implications for Practice

The implications of adopters differ are potentially beneficial to all IT managers. Even though, the actual differences found in this study may not be generalized, the fact that the adopters differ can be extremely important. Specifically, the implications for end-user training is intriguing: designing courses tailored to different types of end-users, namely, earlier, later, and potential adopters can improve the effectiveness of training of the end-users. As we know, the diffusion process involves reducing uncertainties; the study helps IT managers to begin to understand of the importance of identifying specific aspects of behavior that they can target their effort towards for different types of adopters; such targeted efforts can effectively manipulate the diffusion process.

To encourage adoption, IT mangers need to focus on providing proper facilities and ample opportunities to potential adopters, showcasing existing user experiences and cases, and the functionality of the technology. Seminars, newsletters, and trainings should focus on such important factors. The effectiveness of intervention is evidenced in many studies, for example, Taylor and Todd (1995a). The exposure of the nonadopters (the later majority and

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laggards) to the innovation, in the form of a tour, encouraged about 33% of them to adopt in a 12-week period. In addition, subjective norm is critical for potential adopters. Communication channels can be utilized to reinforce the effect of norms.

For users, to sustain their usage, it is critical to provide ongoing training on the functionalities of technology. The findings of earlier and later adopters in this study will require confirmation from future studies. Nevertheless, the findings can be beneficial to IT managers in China as well as mangers in multinational corporations. We showed that culture could be a meaningful factor in explaining IT acceptance. Particularly, the effect of norms is stronger in a collective culture than in an individualistic culture.

The findings on innovativeness mean that IT managers can be proactive. Programs can be developed to enhance individual innovativeness. For example, IT department can provide periodical workshops and seminar on technology in general and subscriptions to journals and magazines to the end-users. Improved innovativeness would shorten the decision process of the later adopters, therefore, achieving a faster overall organizational diffusion.

Future Research

In this study, we are not trying to predict users being earlier or later adopters for the next IT innovation, neither are we insisting the particular relationships tested

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to be generalizable to all settings. Rather, we are trying to shed light on the inconsistent results that have plagued the IT acceptance research. The results of this study can help IT managers in China and potentially other cultures to understand the end-users in the IT diffusion process.

Future studies are necessary to confirm the findings in this study and resolve the inconsistencies that exist in the literature, particularly the inconsistencies in the effect of behavioral beliefs and subjective norm on attitude.

In this study, we distinguish adopters based on the length of technology use which is supported by the innovation diffusion theory framework. However, such data may be difficult to obtain. More studies on the operationalization of individual innovativeness in the IT domain can lead to simpler and better instrument for practical purpose.

As this study lays a good foundation of the differences between adopter groups, future studies of antecedents of behavioral beliefs would become meaningful. For example, the relationships between experience, age, gender, and other individual factors with the technology adoption and usage can be better studied. A few studies have attempted to investigate such variables (Agarwal and Karahanna 2000; Agarwal and Prasad 1999; Morris and Venkatesh 2000; Venkatesh 2000).

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The cultural treatment of this study revealed some interesting results; however, the differences found in the relationships between behavioral beliefs and attitude cannot be scientifically attributed to culture. Further studies of the antecedents of behavioral beliefs may help link the differences to cultural effects.

Future studies in this area should be more vigorous in defining the type of end-users under investigation. To provide meaningful results, the sample should be representative of the population. By establishing both, researchers can further study the variables that have been found to have inconsistent effects on others. We can then come to a better understanding of how attitudes, norms, behavioral intentions, and behaviors differ and relate across different types of end-users.

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Appendix A E-Mail User Questionnaire Items

1. Using E-Mail helps me to accomplish tasks more quickly.
2. Using E-Mail improves the quality of my work.
3. Using E-Mail enhances my effectiveness on the job.
4. Using E-Mail makes my job easier.
5. Using E-Mail would improve my job performance.
6. Using E-Mail gives me greater control over my job.
7. Using E-Mail in my job would increase my productivity.
8. I find E-Mail useful in my job.
9. Learning to use E-Mail was easy for me.
10. E-Mail is easy to use.
11. It is easy to get E-Mail to do what I want it to do.
12. My interaction with E-Mail is clear and understandable.
13. I find E-Mail to be flexible to interact with.
14. It is easy for me to become skillful at using E-Mail.
15. Using E-Mail is compatible with most aspects of my work.
16. Using E-Mail fits my work style.
17. Using E-Mail fits well with the way I like to work.
18. Using E-Mail is very compatible with the way I like to work.
19. Before I started using E-Mail, I was able to use it on a trial basis.
20. Before I started using E-Mail, I was able to properly try it out.
21. I was permitted to use E-Mail long enough to see what it could do.
22. I was able to experiment with E-Mail as necessary.
23. Before I started using E-Mail, I had E-Mail for a long enough period to try it out.
24. In my organization, one sees E-Mail on many computers.
25. In my organization, I have seen many people with E-Mail on their computers.
26. I have seen what other people do using E-Mail.
27. It is easy for me to observe others using E-Mail in my company.
28. I have had plenty of opportunity to see E-Mail being used.
29. I have not seen many others using E-Mail in my department.
30. The results of using E-Mail are apparent to me.
31. I could communicate to others the pros and cons of using E-Mail.
32. I have no difficulty telling others about the results of using E-Mail.
33. I would have difficulty explaining why using E-Mail may or may not be beneficial.
34. People who use E-Mail have high status in the organization.
35. People who use E-Mail have more prestige than those who do not.
36. Using E-Mail is a status symbol.
37. Using E-Mail improves my image within the organization.
38. Top management thinks I should use E-Mail.
39. Supervisor thinks I should use E-Mail.
40. Peers think I should use E-Mail.

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41. Friends think I should use E-Mail.
42. MIS department thinks I should use E-Mail.
43. Computer Specialists in the company think I should use E-Mail.
44. If I heard about a new information technology, I would look for way to experiment with it.
45. Among my peers, I am usually the first to try out new information technologies.
46. In general, I am hesitant to try out new Information technologies.
47. I like to experiment with new technologies.
48. Although it might be helpful, using E-Mail is certainly not compulsory in my company.
49. My supervisor does not require me to use E-Mail.
50. My use of E-Mail is voluntary.
51. My supervisor expects me to use E-Mail.

Using E-Mail on my job is

52. Extremely good ... extremely bad
53. Extremely harmful...extremely beneficial
54. Useless ..... Useful
55. Worthless ....valuable
56. I like using E-Mail .
57. E-Mail is fun to use .
58. I dislike using E-Mail .
59. E-Mail provides an attractive working environment .
60. Most people who are important to me think I should use E-Mail.
61. Most people who influence my behavior think I should use E-Mail .
62. I intend to continue using E-Mail.
63. I intend to increase my use of E-Mail.
64. Assuming I had access to E-Mail, I intend to use it .
65. Given that I had access to E-Mail, I predict that I would use it .
66. I started using E-Mail _____(Month/year)
67. I use email

___Not at all; ___ less than once a week; ___about once a week; ___2 or 3 times a week; 4 to 6 times a week; ___about once a day; ___more than once a day.

68. How much time do you spend using email per day.

Almost never ____less than an hour ___about an hour___about two hours____about three hours ____more than three hours

69. On average, I receive about _____(number of) email messages per day.
70. On average, I send about _____(number of) email messages per day.
71. I use E-Mail a lot to do my work.
72. I use E-Mail whenever possible to do my work
73. I use E-Mail frequently to do my work
74. I use E-Mail whenever appropriate to do my work
75. Age

___ 18-22, ___23-28, ___29-35, ___35-40, ____45-55, ____55+

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76. Gender
    ___Female, ___Male.
77. Education
    ___Junior high, ___High school, ___College.
78. Position in Organization _____
79. Before using Email, did you receive any training?
    Yes No
80. After started using E-Mail, did you receive any training?
    Yes No
81. When did you receive the training?
    _____ (estimate)

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Appendix B Final Instrument in Chinese

电子邮件/文字处理软件 使用调查表 (1)

注: 非常感谢您的帮助! 这个调查表是为了了解您在贵公司里使用电子邮件和文字处理软件的看法和情况. 请您不要遗漏每一个问题. 这个问卷中大部分的问题采用所谓的”七点量表”. 这是一种在市场调研中经常使用的量表. 每个问题一般有七个答案, 请您圈写您认为最合适的一个答案. 这七个答案最左边起是“非常不同意”到最右边是“非常同意”. 在这份调查表里没有所谓的”正确答案”, 请您根据您的个人观点填写问卷.

您是电子邮件使用者 是 不是

您是文字处理软件使用者 是 不是

第一部分: 使用电子邮件的看法和情况:

1.	使用电子邮件可以帮助我更快的完成工作.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
2.	使用电子邮件能够改善提高我的工作质量.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
3.	使用电子邮件能够增强我的工作成效.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
4.	使用电子邮件可以使我的工作变得更加容易.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
5.	使用电子邮件提高了我的工作效率.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
6.	我觉得电子邮件在工作上很有用处	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
7.	电子邮件很容易学.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
8.	电子邮件很容易使用.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
9.	我觉得很容易用电子邮件完成我想做的工作.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
10.	使用电子邮件的过程明白易懂.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
11.	对我来说, 完全掌握使用电子邮件并不难.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
12.	我的工作中的很多方面都适合使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
13.	使用电子邮件很符合我的工作风格.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
14.	使用电子邮件与我的习惯工作方式并不冲突.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
15.	使用电子邮件比较符合我的习惯工作方式.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
16.	在正式使用之前, 我曾经试用过电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
17.	在正式使用之前, 我有过充分的机会去试用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
18.	在正式使用之前, 我有过足够的时间来了解电子邮件的用途.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
19.	在正式使用电子邮件之前, 我有过足够长的试用期.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
20.	在我的工作单位里, 您可以看到很多计算机上都安装了电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
21.	在我的工作单位里, 我见到许多人安装了电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
22.	在我的工作单位里, 我已经见到过有人使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
23.	在我的单位里, 我很容易见到别人使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
24.	我有很多机会见到电子邮件被使用.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
25.	我没有见过我单位里很多人使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
26.	对我来说, 使用电子邮件的效果很明显.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
27.	我可以很容易告诉其他人使用电子邮件的优缺点.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
28.	我没有困难给别人介绍使用电子邮件的效果.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
29.	我觉得很难解释使用电子邮件是好或者是坏的原因.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
30.	使用电子邮件的人职位比较高.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
31.	使用电子邮件的人声望比较高.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
32.	使用电子邮件是身份的象征.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
33.	使用电子邮件提高我在公司里的形象.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
34.	我的最高级主管觉得我应该使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意

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35. 我的直接主管老板觉得我应该使用电子邮件. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
36. 我的同事觉得我应该使用电子邮件. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
37. 我的朋友们觉得我应该使用电子邮件. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
38. 信息管理部门觉得我应该使用电子邮件. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
39. 公司里的计算机专家/管理员觉得我应该使用电子邮件. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意

40. 当我听说新的信息技术时, 我会找机会试用. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
41. 在我的同事中, 我总是第一个使用新信息技术的人. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
42. 一般来说, 我在尝试使用新的信息技术时总有些犹豫. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
43. 我喜欢尝试使用新的信息技术. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意

44. 虽然电子邮件在工作上可能有用处, 但在我们公司里并不要求使用它. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
45. 我的上级主管并不要求我使用电子邮件. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
46. 我使用电子邮件是自愿的. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
47. 我的上级主管希望我使用电子邮件. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意

48. 在我的工作中使用电子邮件: 非常不好 不好 有点不好 一般 还可以 很好 非常好
49. 在我的工作中使用电子邮件: 非常有害 有害 有点害处 一般 有益 很有益 非常有益
50. 在我的工作中使用电子邮件: 非常无助 无助 有时无助 一般 有帮助 很有帮助 非常有帮助
51. 在我的工作中使用电子邮件: 非常没有价值 没有价值 不是很没价值 一般 稍有价值 比较有价值 非常有价值
52. 我喜欢使用电子邮件. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
53. 我觉得使用电子邮件很有趣. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
54. 我不喜欢使用电子邮件. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
55. 我觉得电子邮件能够帮助提供一个吸引人的工作环境. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意

56. 对我很重要的人认为我应该使用电子邮件. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
57. 对我有影响的人认为我应该使用电子邮件. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
58. 我会继续使用电子邮件. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
59. 如果我有条件, 我会使用电子邮件. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
60. 如果我有条件的话, 我想我会使用电子邮件. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
61. 我从 (年, 月) 开始使用电子邮件 _____(年, 月)
62. 我使用电子邮件情况: 从来不用 少于一周一次 一周一次 一周 2 或 3 次 一周 4 或 6 次 一天一次 一天数次
63. 通常您一天花 多少时间收发电子邮件? 几乎不用 少于一个小时 大约一个小时 大约两个小时 大约三个小时 超过三个小时
64. 通常我一天收 (多少个) 电子邮件. _____(估计大约多少个)
65. 通常我一天发 (多少个) 电子邮件. _____(估计大约多少个)
66. 我用电子邮件 和 (多少人) 保持联系. _____(估计大约多少人)
67. 我使用电子邮件做很多的工作. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
68. 在工作上只要能用到电子邮件, 我就尽量使用. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
69. 我在工作中经常使用电子邮件. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
70. 在工作上只要合适, 我会尽量使用电子邮件. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
71. 年龄: 18-22 23-28 29-34 35-44 45-55 55+
72. 性别: 女 男
73. 教育程度: 初中 高中 大专 大学 硕士 博士
74. 职位: _____
75. 您在工作上使用电子邮件的目的 _____

第二部分: 使用文字处理软件的看法和情况:

1. 使用文字处理软件可以帮助我更快的完成工作. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
2. 使用文字处理软件能够改善提高我的工作质量. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
3. 使用文字处理软件能够增强我的工作成效. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
4. 使用文字处理软件可以使我的工作变得更加容易. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
5. 使用文字处理软件提高了我的工作效率. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意

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6.	我觉得文字处理软件在工作上很有用处	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
7.	文字处理软件很容易学.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
8.	文字处理软件很容易使用.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
9.	我觉得很容易用文字处理软件完成我想做的工作.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
10.	使用文字处理软件的过程明白易懂.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
11.	对我来说,完全掌握使用文字处理软件并不难.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
12.	我的工作中的很多方面都适合使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
13.	使用文字处理软件很符合我的工作风格.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
14.	使用文字处理软件与我的习惯工作方式并不冲突.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
15.	使用文字处理软件比较符合我的习惯工作方式.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
16.	在正式使用之前,我曾经试用过文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
17.	在正式使用之前,我有过充分的机会去试用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
18.	在正式使用之前,我有过足够的时间来了解文字处理软件的用途.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
19.	在正式使用文字处理软件之前,我有过足够长的试用期.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
20.	在我的工作单位里,您可以看到很多计算机上都安装了文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
21.	在我的工作单位里,我见到许多人安装了文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
22.	在我的工作单位里,我已经见到过有人使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
23.	在我的单位里,我很容易见到别人使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
24.	我有很多机会见到文字处理软件被使用.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
25.	我没有见过我单位里很多人使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
26.	对我来说,使用文字处理软件的效果很明显.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
27.	我可以很容易告诉其他人使用文字处理软件的优缺点.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
28.	我没有困难给别人介绍使用文字处理软件的效果.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
29.	我觉得很难解释使用文字处理软件是好或者是坏的原因.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
30.	使用文字处理软件的人职位比较高.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
31.	使用文字处理软件的人声望比较高.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
32.	使用文字处理软件是身份的象征.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
33.	使用文字处理软件提高我在公司里的形象.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
34.	我的最高级主管觉得我应该使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
35.	我的直接主管老板觉得我应该使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
36.	我的同事觉得我应该使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
37.	我的朋友们觉得我应该使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
38.	信息管理部门觉得我应该使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
39.	公司里的计算机专家/管理员觉得我应该使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
40.	当我听说新的信息技术时,我会找机会试用.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
41.	在我的同事中,我总是第一个使用新信息技术的人.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
42.	一般来说,我在尝试使用新的信息技术时总有些犹豫.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
43.	我喜欢尝试使用新的信息技术.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意

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44.	虽然文字处理软件在工作上可能有用处，但在我们公司里并不要求使用它.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
45.	我的上级主管并不要求我使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
46.	我使用文字处理软件是自愿的.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
47.	我的上级主管希望我使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
48.	在我的工作中使用文字处理软件: 非常不好	不好 有点不好 一般 还可以 很好 非常好
49.	在我的工作中使用文字处理软件: 非常有害	有害 有点害处 一般 有益 很有益 非常有益
50.	在我的工作中使用文字处理软件: 非常无助	无助 有时无助 一般 有帮助 很有帮助 非常有帮助
51.	在我的工作中使用文字处理软件:	非常没有价值 没有价值 不是很没价值 一般稍有价值 比较有价值 非常有价值
52.	我喜欢使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
53.	我觉得使用文字处理软件很有趣.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
54.	我不喜欢使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
55.	我觉得文字处理软件能够帮助提供一个吸引人的工作环境.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
56.	对我很重要的人认为我应该使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
57.	对我有影响的人认为我应该使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
58.	我会继续使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
59.	如果我有条件，我会使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
60.	如果我有条件的话，我想我会使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
61.	我从 (年，月) 开始使用文字处理软件	_____(年，月)
62.	我使用文字处理软件情况:	从来不用 少于一周一次 一周一次 一周 2 或 3 次 一周 4 或 6 次 一天一次 一天数次
63.	通常您一天花 多少时间使用文字处理软件?	几乎不用 少于一个小时 大约一个小时 大约两个小时 大约三个小时 超过三个小时
72.	我使用文字处理软件做很多的工作.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
73.	在工作上只要能用到文字处理软件，我就尽量使用.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
74.	我在工作中经常使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
75.	在工作上只要合适，我会尽量使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
80.	您在工作上使用文字处理软件的目的	_____

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电子邮件/文字处理软件 使用调查表 (2)

注: 非常感谢您的帮助! 这个调查表是为了了解您在贵公司里使用电子邮件和文字处理软件的看法和情况. 请您不要遗漏每一个问题. 这个问卷中大部分的问题采用所谓的”七点量表”. 这是一种在市场调研中经常使用的量表. 每个问题一般有七个答案, 请您圈写您认为最合适的一个答案. 这七个答案最左边起是“非常不同意”到最右边是“非常同意”. 在这份调查表里没有所谓的”正确答案”, 请您根据您的个人观点填写问卷. 您的信息及回答是一定不会被泄漏给其他人的.

您是文字处理软件使用者 是 不是

您是电子邮件使用者 是 不是

第一部分: 使用文字处理软件的看法和使用情况:

1.	使用文字处理软件可以帮助我更快的完成工作.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
2.	使用文字处理软件能够改善提高我的工作质量.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
3.	使用文字处理软件能够增强我的工作成效.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
4.	使用文字处理软件可以使我的工作变得更加容易.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
5.	使用文字处理软件提高了我的工作效率.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
6.	我觉得文字处理软件在工作上很有用处	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
7.	文字处理软件很容易学.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
8.	文字处理软件很容易使用.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
9.	我觉得很容易用文字处理软件完成我想做的工作.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
10.	使用文字处理软件的过程明白易懂.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
11.	对我来说, 完全掌握使用文字处理软件并不难.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
12.	我的工作中的很多方面都适合使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
13.	使用文字处理软件很符合我的工作风格.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
14.	使用文字处理软件与我的习惯工作方式并不冲突.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
15.	使用文字处理软件比较符合我的习惯工作方式.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
16.	在正式使用之前, 我曾经试用过文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
17.	在正式使用之前, 我有过充分的机会去试用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
18.	在正式使用之前, 我有过足够的时间来了解文字处理软件的用途.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
19.	在正式使用文字处理软件之前, 我有过足够长的试用期.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
20.	在我的工作单位里, 您可以看到很多计算机上都安装了文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
21.	在我的工作单位里, 我见到许多人安装了文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
22.	在我的工作单位里, 我已经见到过有人使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
23.	在我的单位里, 我很容易见到别人使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
24.	我有很多机会见到文字处理软件被使用.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
25.	我没有见过我单位里很多人使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
26.	对我来说, 使用文字处理软件的效果很明显.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
27.	我可以很容易告诉其他人使用文字处理软件的优缺点.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
28.	我没有困难给别人介绍使用文字处理软件的效果.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
29.	我觉得很难解释使用文字处理软件是好或者是坏的原因.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意

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30.	使用文字处理软件的人职位比较高.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
31.	使用文字处理软件的人声望比较高.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
32.	使用文字处理软件是身份的象征.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
33.	使用文字处理软件提高我在公司里的形象.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
34.	我的最高级主管觉得我应该使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
35.	我的直接主管老板觉得我应该使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
36.	我的同事觉得我应该使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
37.	我的朋友们觉得我应该使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
38.	信息管理部门觉得我应该使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
39.	公司里的计算机专家/管理员觉得我应该使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
40.	当我听说新的信息技术时, 我会找机会试用.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
41.	在我的同事中, 我总是第一个使用新信息技术的人.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
42.	一般来说, 我在尝试使用新的信息技术时总有些犹豫.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
43.	我喜欢尝试使用新的信息技术.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
44.	虽然文字处理软件在工作上可能有用处, 但在我们公司里并不要求使用它.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
45.	我的上级主管并不要求我使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
46.	我使用文字处理软件是自愿的.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
47.	我的上级主管希望我使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
48.	在我的工作中使用文字处理软件: 非常不好	不好 有点不好 一般 还可以 很好 非常好
49.	在我的工作中使用文字处理软件: 非常有害	有害 有点害处 一般 有益 很有益 非常有益
50.	在我的工作中使用文字处理软件: 非常无助	无助 有时无助 一般 有帮助 很有帮助 非常有帮助
51.	在我的工作中使用文字处理软件:	非常没有价值 没有价值 不是很没价值 一般 稍有价值 比较有价值 非常有价值
52.	我喜欢使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
53.	我觉得使用文字处理软件很有趣.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
54.	我不喜欢使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
55.	我觉得文字处理软件能够帮助提供一个吸引人的工作环境.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
56.	对我很重要的人认为我应该使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
57.	对我有影响的人认为我应该使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
58.	我会继续使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
59.	如果我有条件, 我会使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
60.	如果我有条件的话, 我想我会使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
61.	我从 (年, 月) 开始使用文字处理软件	_____(年, 月)
62.	我使用文字处理软件情况: 从来不用	少于一周一次 一周一次 一周 2 或 3 次 一周 4 或 6 次 一天一次 一天数次
63.	通常您一天花 多少时间使用文字处理软件?	几乎不用 少于一个小时 大约一个小时 大约两个小时 大约三个小时 超过三个小时
72.	我使用文字处理软件做很多的工作.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
73.	在工作上只要能用到文字处理软件, 我就尽量使用.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
74.	我在工作中经常使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
75.	在工作上只要合适, 我会尽量使用文字处理软件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
76.	年龄:	18-22 23-28 29-34 35-44 45-55 55+
77.	性别:	女 男
78.	教育程度:	初中 高中 大专 大学 硕士 博士
79.	职位:	_____
80.	您在工作上使用文字处理软件的目的	_____

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第二部分: 使用电子邮件的看法:

1.	使用电子邮件可能会帮助我更快的完成工作.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
2.	使用电子邮件会能够改善提高我的工作质量.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
3.	使用电子邮件会能够增强我的工作成效.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
4.	使用电子邮件会使我的工作变得更加容易.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
5.	使用电子邮件可能提高我的工作效率.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
6.	我觉得电子邮件在工作上很有用处	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
7.	电子邮件应该容易学.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
8.	电子邮件应该很容易使用.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
9.	我觉得用电子邮件应该很容易完成我想做的工作.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
10.	使用电子邮件的过程应该明白易懂.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
11.	对我来说, 完全掌握使用电子邮件应该并不难.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
12.	我觉得我的工作中的很多方面都应该适合使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
13.	使用电子邮件很可能符合我的工作风格.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
14.	使用电子邮件应该与我的习惯工作方式并不冲突.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
15.	使用电子邮件应该会符合我的习惯工作方式.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
16.	在正式使用之前, 我可能会有机会试用过电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
17.	在正式使用之前, 我应该会有充分的机会去试用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
18.	在正式使用之前, 我将会有足够的时间来了解电子邮件的用途.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
19.	在正式使用电子邮件之前, 我会有足够长的试用期.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
20.	在我的工作单位里, 您可以看到很多计算机上都安装了电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
21.	在我的工作单位里, 我见到许多人安装了电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
22.	在我的工作单位里, 我已经见到过有人使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
23.	在我的单位里, 我很容易见到别人使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
24.	我有很多机会见到电子邮件被使用.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
25.	我没有见过我单位里很多人使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
26.	对我来说, 我觉得使用电子邮件的效果应该会很明显.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
27.	我想我可以很容易告诉其他人使用电子邮件的优缺点.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
28.	我没有困难给别人介绍使用电子邮件的效果.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
29.	我觉得很难解释使用电子邮件是好或者是坏的原因.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
30.	使用电子邮件的人职位比较高.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
31.	使用电子邮件的人声望比较高.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
32.	使用电子邮件是身份的象征.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
33.	使用电子邮件应该会提高我在公司里的形象.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
34.	我的最高级主管觉得我应该使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
35.	我的直接主管老板觉得我应该使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
36.	我的同事觉得我应该使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
37.	我的朋友们觉得我应该使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
38.	信息管理部门觉得我应该使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
39.	公司里的计算机专家/管理员觉得我应该使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意

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40.	当我听说新的信息技术时，我会找机会试用.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
41.	在我的同事中，我总是第一个使用新信息技术的人.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
42.	一般来说，我在尝试使用新的信息技术时总有些犹豫.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
43.	我喜欢尝试使用新的信息技术.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
44.	虽然电子邮件在工作上可能有用处，但在我们公司里并不要求使用它.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
45.	我的上级主管并不要求我使用电子邮件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
46.	我使用电子邮件是自愿的.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
47.	我的上级主管希望我使用电子邮件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
48.	在我的工作中应用电子邮件可能会: 非常不好	不好 有点不好 一般 还可以 很好 非常好
49.	在我的工作中应用电子邮件可能会: 非常有害	有害 有点害处 一般 有益 很有益 非常有益
50.	在我的工作中应用电子邮件可能会: 非常无助	无助 有时无助 一般 有帮助 很有帮助 非常有帮助
51.	在我的工作中使用电子邮件可能会:	非常没有价值 没有价值 不是很没价值 一般 稍有价值 比较有价值 非常有价值
52.	我可能会喜欢使用电子邮件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
53.	我觉得使用电子邮件应该很有趣.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
54.	我觉得我不会喜欢使用电子邮件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
55.	我觉得电子邮件应该能够帮助提供一个吸引人的工作环境.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
56.	对我很重要的人认为我应该去使用电子邮件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
57.	对我有影响的人认为我应该去使用电子邮件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
65.	我想在六个月内开始使用电子邮件	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
66.	我六个月内会开始使用电子邮件	非常不可能 不可能 不是很可能 不确定 有些可能 可能 非常可能
58.	我会尝试使用电子邮件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
67.	如果我有条件的话，我想我会使用电子邮件.	非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意
80.	迄今为止，您是否接受过培训?	有 没有

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电子邮件/文字处理软件 使用调查表 (3)

注: 非常感谢您的帮助! 这个调查表是为了了解您在贵公司里使用电子邮件和文字处理软件的看法和情况. 请您不要遗漏每一个问题. 这个问卷中大部分的问题采用所谓的"七点量表". 这是一种在市场调研中经常使用的量表. 每个问题一般有七个答案, 请您圈写您认为最合适的一个答案. 这七个答案最左边起是"非常不同意"到最右边是"非常同意". 在这份调查表里没有所谓的"正确答案", 请您根据您的个人观点填写问卷. 您的信息及回答是一定不会被泄漏给其他人的.

您是文字处理软件使用者 是 不是

您是电子邮件使用者 是 不是

第一部分: 对使用电子邮件的看法:

1.	使用电子邮件可能会帮助我更快的完成工作.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
2.	使用电子邮件会能够改善提高我的工作质量.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
3.	使用电子邮件会能够增强我的工作成效.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
4.	使用电子邮件会使我的工作变得更加容易.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
5.	使用电子邮件可能提高我的工作效率.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
6.	我觉得电子邮件在工作上很有用处	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
7.	电子邮件应该容易学.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
8.	电子邮件应该很容易使用.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
9.	我觉得用电子邮件应该很容易完成我想做的工作.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
10.	使用电子邮件的过程应该明白易懂.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
11.	对我来说, 完全掌握使用电子邮件应该并不难.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
12.	我觉得我的工作中的很多方面都应该适合使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
13.	使用电子邮件很可能符合我的工作风格.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
14.	使用电子邮件应该与我的习惯工作方式并不冲突.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
15.	使用电子邮件应该会符合我的习惯工作方式.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
16.	在正式使用之前, 我可能会有机会试用过电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
17.	在正式使用之前, 我应该会有充分的机会去试用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
18.	在正式使用之前, 我将会有足够的时间来了解电子邮件的用途.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
19.	只要我需要, 我应该可以随时使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
20.	在正式使用电子邮件之前, 我会有足够长的试用期.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
21.	在我的工作单位里, 您可以看到很多计算机上都安装了电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
22.	在我的工作单位里, 我见到许多人安装了电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
23.	在我的工作单位里, 我已经见到过有人使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
24.	在我的单位里, 我很容易见到别人使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
25.	我有很多机会见到电子邮件被使用.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
26.	我没有见过我单位里很多人使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
27.	对我来说, 我觉得使用电子邮件的效果应该会很明显.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
28.	我想我可以很容易告诉其他人使用电子邮件的优缺点.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
29.	我没有困难给别人介绍使用电子邮件的效果.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
30.	我觉得很难解释使用电子邮件是好或者是坏的原因.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
31.	使用电子邮件的人职位比较高.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
32.	使用电子邮件的人声望比较高.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
33.	使用电子邮件是身份的象征.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意

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34.	使用电子邮件应该会提高我在公司里的形象.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
35.	我的最高级主管觉得我应该使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
36.	我的直接主管老板觉得我应该使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
37.	我的同事觉得我应该使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
38.	我的朋友们觉得我应该使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
39.	信息管理部门觉得我应该使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
40.	公司里的计算机专家/管理员觉得我应该使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
41.	当我听说新的信息技术时, 我会找机会试用.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
42.	在我的同事中, 我总是第一个使用新信息技术的人.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
43.	一般来说, 我在尝试使用新的信息技术时总有些犹豫.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
44.	我喜欢尝试使用新的信息技术.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
45.	虽然电子邮件在工作上可能有用处, 但在我们公司里并不要求使用它.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
46.	我的上级主管并不要求我使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
47.	我使用电子邮件是自愿的.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
48.	我的上级主管希望我使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
49.	在我的工作中应用电子邮件可能会: 非常不好	不好	有点不好	一般	还可以	很好	非常好	
50.	在我的工作中应用电子邮件可能会: 非常有害	有害	有点害处	一般	有益	很有益	非常有益	
51.	在我的工作中应用电子邮件可能会: 非常无助	无助	有时无助	一般	有帮助	很有帮助	非常有帮助	
52.	在我的工作中使用电子邮件可能会:	非常没有价值	没有价值	不是很没价值	一般	稍有价值	比较有价值	非常有价值
53.	我可能会喜欢使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
54.	我觉得使用电子邮件应该很有趣.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
55.	我觉得我不会喜欢使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
56.	我觉得电子邮件应该能够帮助提供一个吸引人的工作环境.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
57.	对我很重要的人认为我应该去使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
58.	对我有影响的人认为我应该去使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
59.	我会尝试使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
60.	我想在六个月内开始使用电子邮件	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
61.	我六个月内会开始使用电子邮件	非常不可能	不可能	不是很可能	不确定	有些可能	可能	非常可能
62.	如果我有条件的话, 我想我会使用电子邮件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
63.	年龄:	18-22	23-28	29-34	35-44	45-55	55+	
64.	性别:	女	男					
65.	教育程度:	初中	高中	大专	大学	硕士	博士	
66.	职位: _____							
67.	迄今为止, 您是否接受过培训?	有	没有					

第二部分: 使用文字处理软件的看法:

1.	使用文字处理软件可能会帮助我更快的完成工作.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
2.	使用文字处理软件会能够改善提高我的工作质量.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
3.	使用文字处理软件会能够增强我的工作成效.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
4.	使用文字处理软件会使我的工作变得更加容易.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
5.	使用文字处理软件可能提高我的工作效率.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
6.	我觉得文字处理软件在工作上很有用处	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
7.	文字处理软件应该容易学.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
8.	文字处理软件应该很容易使用.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
9.	我觉得用文字处理软件应该很容易完成我想做的工作.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
10.	使用文字处理软件的过程应该明白易懂.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
11.	对我来说, 完全掌握使用文字处理软件应该并不难.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意

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12. 我觉得我的工作中的很多方面都应该适合使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
13. 使用文字处理软件很可能符合我的工作风格.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
14. 使用文字处理软件应该与我的习惯工作方式并不冲突.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
15. 使用文字处理软件应该会符合我的习惯工作方式.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
16. 在正式使用之前，我可能会有机会试用过文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
17. 在正式使用之前，我应该会有充分的机会去试用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
18. 在正式使用之前，我将会有足够的时间来了解文字处理软件的用途.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
19. 只要我需要，我应该可以随时使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
20. 在正式使用文字处理软件之前，我会有足够长的试用期.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
21. 在我的工作单位里，您可以看到很多计算机上都安装了文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
22. 在我的工作单位里，我见到许多人安装了文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
23. 在我的工作单位里，我已经见到过有人使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
24. 在我的单位里，我很容易见到别人使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
25. 我有很多机会见到文字处理软件被使用.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
26. 我没有见过我单位里很多人使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
27. 对我来说，我觉得使用文字处理软件的效果应该会很明显.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
28. 我想我可以很容易告诉其他人使用文字处理软件的优缺点.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
29. 我没有困难给别人介绍使用文字处理软件的效果.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
30. 我觉得很难解释使用文字处理软件是好或者是坏的原因.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
31. 使用文字处理软件的人职位比较高.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
32. 使用文字处理软件的人声望比较高.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
33. 使用文字处理软件是身份的象征.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
34. 使用文字处理软件应该会提高我在公司里的形象.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
35. 我的最高级主管觉得我应该使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
36. 我的直接主管老板觉得我应该使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
37. 我的同事觉得我应该使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
38. 我的朋友们觉得我应该使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
39. 信息管理部门觉得我应该使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
40. 公司里的计算机专家/管理员觉得我应该使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
41. 当我听说新的信息技术时，我会找机会试用.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
42. 在我的同事中，我总是第一个使用新信息技术的人.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
43. 一般来说，我在尝试使用新的信息技术时总有些犹豫.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
44. 我喜欢尝试使用新的信息技术.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
45. 虽然文字处理软件在工作上可能有用处，但在我们公司里并不要求使用它.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
46. 我的上级主管并不要求我使用文字处理软件.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意
47. 我使用文字处理软件是自愿的.	非常不同意	不同意	不是很同意	不确定	有些同意	同意	非常同意

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48. 我的上级主管希望我使用文字处理软件. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意

49. 在我的工作中应用文字处理软件可能会: 非常不好 不好 有点不好 一般 还可以 很好 非常好

50. 在我的工作中应用文字处理软件可能会: 非常有害 有害 有点害处 一般 有益 很有益 非常有益

51. 在我的工作中应用文字处理软件可能会: 非常无助 无助 有时无助 一般 有帮助 很有帮助 非常有帮助

52. 在我的工作中使用文字处理软件可能会: 非常没有价值 没有价值 不是很没价值 一般 稍有价值 比较有价值 非常有价值

53. 我可能会喜欢使用文字处理软件. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意

54. 我觉得使用文字处理软件应该很有趣. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意

55. 我觉得我不会喜欢使用文字处理软件. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意

56. 我觉得文字处理软件应该能够帮助提供一个吸引人的工作环境. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意

57. 对我很重要的人认为我应该去使用文字处理软件. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意

58. 对我有影响的人认为我应该去使用文字处理软件. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意

59. 我想在六个月内开始使用电子邮件 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意

60. 我六个月内会开始使用电子邮件 非常不可能 不可能 不是很可能 不确定 有些可能 可能 非常可能

61. 我会尝试使用文字处理软件. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意

62. 如果我有条件的话, 我想我会使用文字处理软件. 非常不同意 不同意 不是很同意 不确定 有些同意 同意 非常同意

63. 迄今为止, 您是否接受过培训? 有 没有

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Appendix C List of Items in the Final Instrument - E-Mail User Section

1. Using E-Mail helps me to accomplish tasks more quickly.
2. Using E-Mail improves the quality of my work.
3. Using E-Mail enhances my effectiveness on the job.
4. Using E-Mail makes my job easier.
5. Using E-Mail in my job would increase my productivity.
6. I find E-Mail useful in my job.
7. Learning to use E-Mail was easy for me.
8. E-Mail is easy to use.
9. It is easy to get E-Mail to do what I want it to do.
10. My interaction with E-Mail is clear and understandable.
11. It is easy for me to become skillful at using E-Mail.
12. Using E-Mail is compatible with most aspects of my work.
13. Using E-Mail fits my work style.
14. Using E-Mail fits well with the way I like to work.
15. Using E-Mail is very compatible with the way I like to work.
16. Before I started using E-Mail, I was able to use it on a trial basis.
17. Before I started using E-Mail, I was able to properly try it out.
18. I was permitted to use E-Mail long enough to see what it can do.
19. I had E-Mail for a long enough period to try it out.
20. In my organization, one sees E-Mail on many computers.
21. In my organization, I have seen many people with E-Mail on their computers.
22. I have seen what other people do using E-Mail.
23. It is easy for me to observe others using E-Mail in my company.
24. I have had plenty of opportunity to see E-Mail being used.
25. I have not seen many others using E-Mail in my department.
26. The results of using E-Mail are apparent to me.
27. I could communicate to others the pros and cons of using E-Mail.
28. I have no difficulty telling others about the results of using E-Mail.
29. I would have difficulty explaining why using E-Mail may or may not be beneficial.
30. People who use E-Mail have high status in the organization.
31. People who use E-Mail have more prestige than those who do not.
32. Using E-Mail is a status symbol.
33. Using E-Mail improves my image within the organization.
34. Top management thinks I should use E-Mail.
35. My supervisor thinks I should use E-Mail.
36. Peers think I should use E-Mail.
37. Friends think I should use E-Mail.
38. MIS department thinks I should use E-Mail.

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39. Computer Specialists in the company think I should use E-Mail.
40. If I hear about a new information technology, I would look for a way to experiment with it.
41. Among my peers, I am usually the first to try out new information technologies.
42. In general, I am hesitant to try out new Information technologies.
43. I like to experiment with new technologies.
44. Although it might be helpful, using E-Mail is certainly not compulsory in my company.
45. My supervisor does not require me to use E-Mail.
46. My use of E-Mail is voluntary.
47. My supervisor expects me to use E-Mail.
48. Using E-Mail on my job is extremely good ... extremely bad.
49. Using E-Mail on my job is extremely harmful...extremely beneficial.
50. Using E-Mail on my job is useless ..... Useful.
51. Using E-Mail on my job is worthless ....valuable.
52. I like using E-Mail.
53. E-Mail is fun to use.
54. I dislike using E-Mail.
55. E-Mail provides an attractive working environment.
56. Most people who are important to me think I should use E-Mail.
57. Most people who influence my behavior think I should use E-Mail.
58. I intend to continue using E-Mail.
59. Assuming I had access to E-Mail, I intend to use it.
60. Given that I had access to E-Mail, I predict that I would use it.
61. When (month/year) did you start using E-Mail?
62. Frequency of E-Mail use: Not at all; less than once a week; about once a week; 2 or 3 times a week; 4 to 6 times a week; about once a day; more than once a day.
63. Time spent using E-Mail per day: Almost never; Less than an hour; Almost an hour; About two hours; About three hours; More than three hours
64. Number of E-Mails received per day ___
65. Number of E-Mails sent per day ___
66. Number of people you keep in contact using E-Mail ___
67. I use E-Mail a lot to do my work.
68. I use E-Mail whenever possible to do my work
69. I use E-Mail frequently to do my work
70. I use E-Mail whenever appropriate to do my work
71. Age: 18-22; 23-28; 29-34; 35-44; 45-55; 55+
72. Gender: Female
73. Education: Junior High; High School; Associated Degree; Bachelor's; Master's; Doctorate
74. Position: _____
75. Purposes of using E-Mail at work: _____

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Appendix D List of Items and Abbreviations used in the Final Analysis

	Item	Description
	Perceived Usefulness	
1	PU1	Using E-Mail helps me to accomplish tasks more quickly.
2	PU2	Using E-Mail improves the quality of my work.
3	PU3	Using E-Mail enhances my effectiveness on the job.
4	PU4	Using E-Mail makes my job easier.
5	PU7	Using E-Mail in my job increases my productivity.
6	PU8	I find E-Mail useful in my job.
	Ease of Use (EOU)	
7	EOU1	Learning to use E-Mail was easy for me.
8	EOU2	E-Mail is easy to use.
9	EOU3	It is easy to get E-Mail to do what I want it to do.
10	EOU4	My interaction with E-Mail is clear and understandable.
11	EOU6	It is easy for me to become skillful at using E-Mail.
	Compatibility (COM)	
12	COM1	Using E-Mail is compatible with most aspects of my work.
13	COM2	Using E-Mail fits my work style.
14	COM3	Using E-Mail fits well with the way I like to work.
15	COM4	Using E-Mail is very compatible with the way I like to work.
	Trialability (TR)	
16	TR1	Before I started using E-Mail, I was able to use it on a trial basis.
17	TR2	Before I started using E-Mail, I was able to properly try it out.
18	TR3	I was permitted to use E-Mail long enough to see what it can do.
19	TR5	I had E-Mail for a long enough period to try it out.
	Visibility (VI)	
20	VI1	In my organization, one sees E-Mail on many computers.
21	VI2	In my organization, I have seen many people with E-Mail on their computers.
22	VI3	I have seen what other people do using E-Mail.
23	VI4	It is easy for me to observe others using E-Mail in my company.
24	VI5	I have had plenty of opportunity to see E-Mail being used.
	Result Demonstrability (RD)	
25	RD1	The results of using E-Mail are apparent to me.
26	RD2	I could communicate to others the pros and cons of using E-Mail.
27	RD3	I have no difficulty telling others about the results of using E-Mail.

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	Item	Description
	Image (IM)	
28	IM1	People who use E-Mail have high status in the organization.
29	IM2	People who use E-Mail have more prestige than those who do not.
30	IM3	Using E-Mail is a status symbol.
31	IM4	Using E-Mail improves my image within the organization.
	Normative Beliefs (NB)	
32	NB1	Top management thinks I should use E-Mail.
33	NB2	My supervisor thinks I should use E-Mail.
34	NB3	Peers think I should use E-Mail.
35	NB4	Friends think I should use E-Mail.
36	NB5	MIS department thinks I should use E-Mail.
37	NB6	Computer Specialists in the company think I should use E-Mail.
	Individual Innovativeness (II)	
38	II1	If I hear about a new information technology, I would look for a way to experiment with it.
39	II2	Among my peers, I am usually the first to try out new information technologies.
40	II4	I like to experiment with new technologies.
	Voluntariness (VOL)	
41	VOL1	Although it might be helpful, using E-Mail is certainly not compulsory in my company.
42	VOL2	My supervisor does not require me to use E-Mail.
43	VOL4	My supervisor expects me to use E-Mail. (Reverse scale item)
	Attitude (A)	
44	A1	Using E-Mail on my job is extremely good ... extremely bad.
45	A2	Using E-Mail on my job is extremely harmful...extremely beneficial.
46	A3	Using E-Mail on my job is useless ..... Useful.
47	A4	Using E-Mail on my job is worthless ....valuable.
	Subjective norm (SN)	
48	SN1	Most people who are important to me think I should use E-Mail.
49	SN2	Most people who influence my behavior think I should use E-Mail.
	Behavioral Intention (BI)	
50	BI1	I intend to continue using E-Mail.
51	BI3	Assuming I had access to E-Mail, I intend to use it.
52	BI4	Given that I had access to E-Mail, I predict that I would use it.
	Usage (U)	
53	U1	I use E-Mail a lot to do my work.
54	U2	I use E-Mail whenever possible to do my work
55	U3	I use E-Mail frequently to do my work
56	U4	I use E-Mail whenever appropriate to do my work

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Appendix E Phi Matrices

Measurement Model SUB1

Earlier Adopter

	PU	EOU	COM	TR	VI	RD	IM	A
PU	1.00							
EOU	0.52	1.00						
COM	0.60	0.48	1.00					
TR	0.22	0.25	0.27	1.00				
VI	0.38	0.54	0.26	0.17	1.00			
RD	0.41	0.41	0.44	0.29	0.41	1.00		
IM	-0.03	-0.19	0.05	0.22	-0.25	-0.03	1.00	
A	0.50	0.39	0.54	0.20	0.45	0.52	-0.04	1.00

Later Adopter

	PU	EOU	COM	TR	VI	RD	IM	A
PU	1.00							
EOU	0.42	1.00						
COM	0.61	0.43	1.00					
TR	0.11	0.27	0.31	1.00				
VI	0.40	0.42	0.30	0.19	1.00			
RD	0.32	0.45	0.38	0.32	0.38	1.00		
IM	-0.07	-0.13	0.15	0.20	-0.20	0.08	1.00	
A	0.57	0.35	0.46	0.10	0.34	0.40	0.00	1.00

Potential Adopter

	PU	EOU	COM	TR	VI	RD	IM	A
PU	1.00							
EOU	0.67	1.00						
COM	0.64	0.61	1.00					
TR	0.40	0.51	0.51	1.00				
VI	0.32	0.24	0.29	0.40	1.00			
RD	0.48	0.56	0.59	0.43	0.22	1.00		
IM	0.19	0.09	0.38	0.36	0.08	0.39	1.00	
A	0.43	0.34	0.42	0.47	0.33	0.36	0.26	1.00

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Measurement Model SUB2

Earlier Adopter

	NB	II	VOL	A	SN	BI	U
NB	1.00						
II	0.31	1.00					
VOL	-0.24	-0.09	1.00				
A	0.28	0.36	-0.14	1.00			
SN	0.67	0.24	-0.02	0.31	1.00		
BI	0.33	0.47	-0.25	0.59	0.35	1.00	
U	0.31	0.47	-0.12	0.55	0.26	0.51	1.00

Later Adopter

	NB	II	VOL	A	SN	BI	U
NB	1.00						
II	0.07	1.00					
VOL	-0.28	0.13	1.00				
A	0.24	0.34	-0.11	1.00			
SN	0.59	0.16	-0.04	0.30	1.00		
BI	0.27	0.44	-0.08	0.44	0.28	1.00	
U	0.21	0.50	-0.15	0.50	0.26	0.47	1.00

Potential Adopter

	NB	II	VOL	A	SN	BI
NB	1.00					
II	0.51	1.00				
VOL	0.11	0.46	1.00			
A	0.42	0.41	0.03	1.00		
SN	0.74	0.51	0.19	0.43	1.00	
BI	0.58	0.61	0.17	0.50	0.72	1.00

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Appendix F Factor Loadings by Adopter Group

	Factor Loading		
	Earlier Adopter	Later Adopter	Potential Adopter
Item	Perceived Usefulness (PU)		
PU1	.72	.66	1.08
PU2	.65	.77	.95
PU3	.79	.76	.99
PU4	.76	.79	.91
PU7	.70	.69	.93
PU8	.47	.60	.75
	Ease of Use (EOU)		
EOU2	.68	.71	.86
EOU4	.69	.73	.91
EOU6	.66	.75	.87
	Compatibility (COM)		
COM1	.75	.82	.86
COM2	.95	1.05	.95
COM4	.79	.88	.91
	Trialability (TR)		
TR2	1.27	1.36	.99
TR3	1.35	1.25	.94
TR5	1.41	1.24	.98
	Visibility (VI)		
VI1	.77	.76	.99
VI3	.65	.66	.96
VI4	.82	.99	1.03
VI5	.80	.91	.98
	Result Demonstrability (RD)		
RD2	.89	.89	1.05
RD3	.87	1.00	1.06
	Image (IM)		
IM1	1.41	1.28	1.38
IM3	1.46	1.37	1.46
IM4	1.30	1.33	1.17
	Normative Beliefs (NB)		
NB1	1.24	1.14	.83
NB2	1.31	1.22	.80

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	Factor Loading		
	Earlier Adopter	Later Adopter	Potential Adopter
Item	Perceived Usefulness (PU)		
NB3	1.38	1.22	.92
NB4	1.33	1.05	.91
NB5	1.26	1.01	.89
NB6	1.27	.98	.95
	Individual Innovativeness (II)		
II1	.82	.83	.83
II4	.86	.80	.90
	Voluntariness (VOL)		
VOL1	1.56	1.56	1.52
VOL2	1.47	1.36	1.24
	Attitude (A)		
A1	.74	.75	.75
A2	.82	.79	.72
A3	.80	.75	.70
	Subjective norm (SN)		
SN1	1.39	1.24	1.10
SN2	1.34	1.30	.94
	Behavioral Intention (BI)		
BI1	.55	.47	.75
BI3	.75	.71	.57
BI4	.82	.74	.64
	Usage (U)		
U1	.98	1.05	-
U2	.85	.94	-
U3	.88	1.06	-
U4	.78	.83	-

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