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Leverage Points for Addressing Digital Inequality: An Extended Theory of Planned Behavior Perspective

JJ Po-An Hsieh

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The author of this dissertation is:

JJ Po-An Hsieh
Department of Management and Marketing
Hong Kong Polytechnic University
Kowloon, Hong Kong

The directors of this dissertation are:

Dr. Mark Keil
Dr. Arun Rai
Computer Information Systems Department
Robinson College of Business
Georgia State University
Atlanta, GA 30303-3083

LEVERAGE POINTS FOR ADDRESSING DIGITAL INEQUALITY:

AN EXTENDED THEORY OF PLANNED BEHAVIOR PERSPECTIVE

BY

JJ PO-AN HSIEH

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ACCEPTANCE

This dissertation was prepared under the direction of the JJ Po-An Hsieh Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctoral of Philosophy in Business Administration in the Robinson College of Business of Georgia State University.

Dr. Fenwick Huss

DISSERTATION COMMITTEE

Dr. Mark Keil (Co-Chair)
Dr. Arun Rai (Co-Chair)
Dr. Edward Rigdon
Dr. Lynette Kvasny

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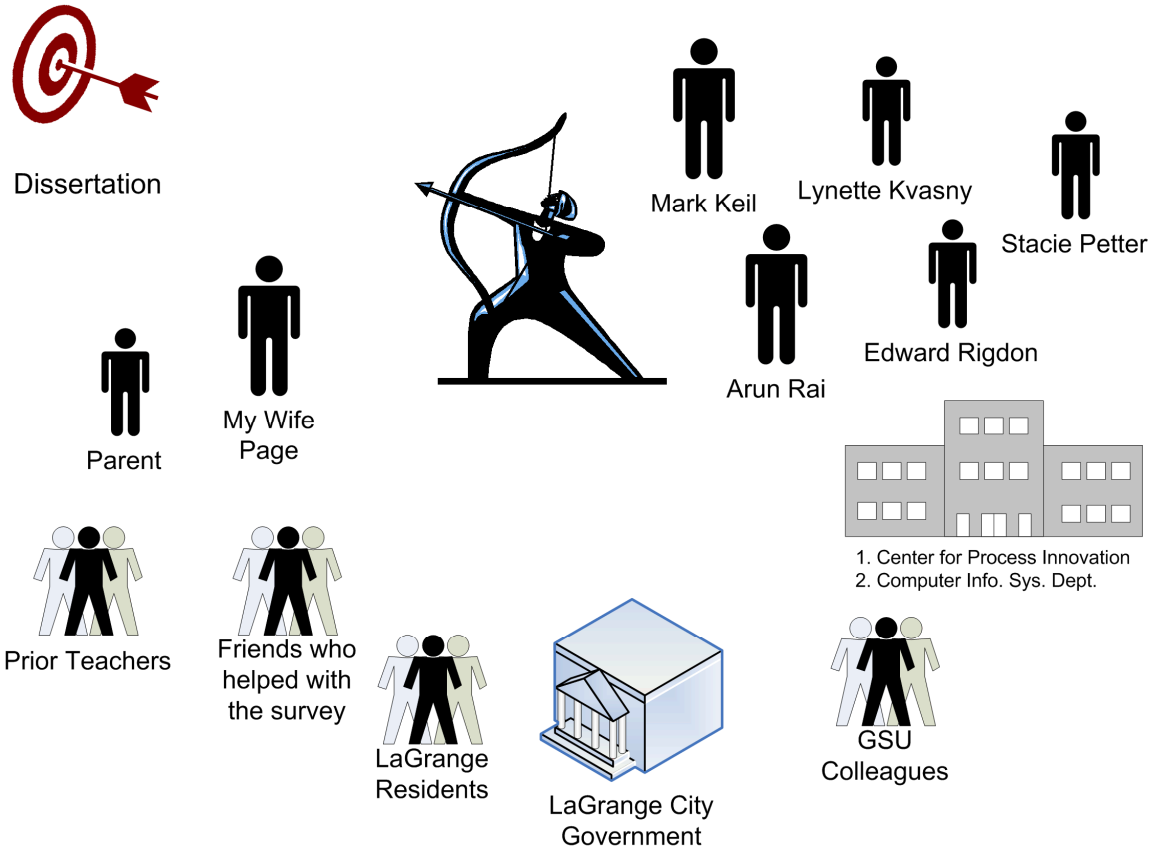

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ABSTRACT

LEVERAGE POINTS FOR ADDRESSING DIGITAL INEQUALITY:

AN EXTENDED THEORY OF PLANNED BEHAVIOR PERSPECTIVE

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JJ Po-An Hsieh

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Committee Chairs: Dr. Mark Keil & Dr. Arun Rai

Major Academic Unit: Computer Information Systems Department

Digital inequality, or the disparity in the access and use of information and communication technologies (ICT), is one of the most critical issues in the knowledge economy. This inequality prevents under-privileged people from exploring digital opportunities to enhance their life quality. Governments, business, and the public have devoted tremendous resources to address this issue, but the results are inconclusive. Theoretical understanding, complemented with theory-based empirical assessment of the phenomenon, is essential to inform effective policy-making and interventions.

This dissertation explored the key factors that lead to the inequality in the access and use of ICT, particularly the high-speed Internet, between the privileged and under-privileged. I applied a belief-based perspective to understand how distinctive beliefs concerning ICT acceptance differentially influence under-privileged and privileged people's innovation decision and behavior at different stages of the implementation process. A theoretical model that drew upon the Theory of Planned Behavior, Motivation Theory, Social Learning Theory, Diffusion of Innovation, and Trust was developed to

explain how cognitive, social, behavioral, and institutional factors inform digital inequality as a whole.

The conceptual model and forwarded hypotheses in the dissertation were empirically tested using data collected from a large-scale field survey. The survey investigated the adoption and usage behavior of residents in the city of LaGrange, Georgia where the city government, aiming to address digital inequality, provided high-speed Internet connection and devices to residents at no cost. A complementary case study was subsequently conducted to examine a multi-stage process model in which various barriers and facilitators may prevent or promote the progress of individuals' ICT innovation. The results of this research reveal valuable insights into the differential patterns of ICT access and usage, and the key factors that cause them, for under-privileged and privileged people. The findings, in turn, suggest a segmentation and stepwise technology implementation strategy for people with different backgrounds and at different stages of their innovation processes.

This dissertation makes several notable contributions for both researchers and practitioners. First, the dissertation contributes a holistic and theoretically grounded perspective that extends beyond the technology-centered view in most digital inequality studies. It also highlights the multifaceted nature of the phenomenon. As such, this research meets the challenge set forward by notable researchers to develop theoretical models capable of revealing the complexity embedded in this issue. Second, the dissertation presents a unifying theory reflected upon adoption and diffusion of innovation. Testing theories in the context of digital inequality extends and complements our existing knowledge about these related fields. Most importantly, the empirical

findings derived from the rich data set identity powerful leverage points for stimulating the adoption and use of ICT among the under-privileged. With such insights, practitioners, particularly policy-makers and service providers, can formulate effective interventions to address the problem of digital inequality.

Chapter 1: Introduction

1.1 Digital Inequality. Why do we need to study it?

The Internet, or the information superhighway, has been recognized as a strategic building block for the development of the U.S. economy. The Internet has the potential for tremendous economic benefits for individuals, organizations, and nations, in terms of productivity and capability to compete in the global market (United States Advisory Council on the National Information Infrastructure [USACNII]1996). In addition to economic growth, the Internet also promises opportunities to increase human resource value, invigorate social and economic structures, reconfirm the sense of community (USACNII 1996), enhance citizen involvement, and improve governmental administration efficiency (Critical Issue Team Minnesota Planning 2001). The value of the Internet is strategic for any nation, and the adoption and use of the Internet is important.

Yet, despite tens of billions of dollars in investment, telecommunication deregulation, and various efforts from the government and private organizations, critical issues are still challenging the U.S. Within the U.S., many nationwide surveys have found significant digital inequality, or the inequality in the access and use of information and communication technologies (ICT) across various socio-economic, racial, and geographic factors (NTIA 1998, 1999, 2000, 2002). Internationally, the adoption level of broadband in the U.S. is far behind many other countries, such as Korea, Hong Kong, and Canada (Dreazen 2003). These data signal a problem that may threaten U.S.

economic development, governmental efficiency, social structure, and eventually the ability to compete in the global market.

Recently, President Bush stated a goal of offering every American access to high-speed Internet at home by 2007 without giving specifics as to how this was going to occur (Dow Jones Newswires 2004). To reach this goal, it is necessary to study and gain an understanding of the factors that drive the household acceptance of information and communication technologies (ICT), so that policy makers, governments, and the public can address digital inequality more effectively and efficiently.

At the G7 summit in 1995, Gore announced that the Clinton Administration was committed to the goal of connecting everyone to the information superhighway, or the Internet (Tarjanne 1995). At the International Telecommunication Union (ITU) conference, Gore called for all nations of the world to cooperate in building the Global Information Infrastructure founded on the principles of universal access, the right to communicate, and diversity of expression. Other politicians and government groups have seconded his call.

Nevertheless, in the following years, results from many large-scale nationwide surveys in the U.S. indicated that this idea to connect everyone to the Internet has not been fulfilled, and the inequality was even increasing (NTIA 1995, 1998, 1999, 2000). Survey studies indicated that digital inequality exists across a variety of demographic, ethnical, and geographic factors (Browning 1997, Katz and Aspden 1997, NTIA 1998, 1999, 2000, 2002). The under-privileged people are usually those who have lower education, earn less income, are older, live in rural or inner-urban neighborhoods, or are African or Latin Americans. These are the ones who generally have less control in the

important resources in their lives. As the world has evolved from the “industrial age” to the so-called “information age” where information is power, the inability to access and use ICT effectively may block opportunities to improve the life quality of the under-privileged, and further their distance from the privileged (Compaine 2001, DiMaggio et al. 2004). Potentially, as argued by some researchers, this inequality will lead to a vicious cycle in which the wealthy become wealthier and the poor become poorer (Jung et al. 2001, Kvasny 2002).

Politicians, scholars, industry, and the press have recognized the seriousness of this challenge and many have argued for policy and interventions to deal with the issue. Tremendous resources will be required to solve the problem (Compaine 2001, Lindsay and Poindexter 2003). Former President Clinton announced his aggressive goal to connect every classroom and library by the year 2000, followed by every home by the year 2007, to ensure "every 12-year-old can log onto the Internet" (Clinton 1997b). Digital inequality also took center stage in Congress. In the State of the Union address by Clinton in 2000, his proposal involved $2 billion in tax incentives over ten years to encourage the private sector to donate computer equipment, support technology centers for poor neighborhoods, and train those who cannot connect to the Internet (Lacey 2001). He proposed setting aside $150 million to help train new teachers to better use technology, $100 million for the creation of 1,000 community technology centers in low-income neighborhoods, $50 million for a pilot project to help poor families get computers and Internet access, and $10 million for a special program to help American Indians prepare for careers in information technology. On March 9, 2000, Senator Barbara A. Mikulski and Senator Paul S. Sarbanes introduced “The National Digital Empowerment

Act" to double technology funding in schools, libraries, technology centers, and students' homes (Attewell 2001, Harris et al. 2000). Shortly after the act was proposed, Rep. William Jefferson, on March 22nd, 2000, presented "The Digital Divide Elimination Act of 2000" to increase the charitable tax deductions for corporations that donate computer equipment and software until 2004, and to expand eligible recipients of these donation to include schools, libraries, community groups, low-income households, and other nonprofit organizations (Harris et al. 2000). Sen. Max Cleland also introduced "The Community Technology Assistance Act" aimed at increasing the tax benefit until 2005 (Harris et al. 2000). At the state level, the governor of Maine proposed a project to provide laptops to every eighth-grade student (Attewell 2001). In addition to the effort from the federal and local government, industry, minority, and civil organizations also took initiatives to address this issue (Kvasny 2002).

In 2002, another national survey (NTIA 2002) shed some optimistic light that the disparities were closing and the entire nation was getting online. At the same time, the Bush administration cut two related programs worth $100 million. The cuts included the Technology Opportunities Program, which had provided $45 million in grants to local nonprofit groups, and the Community Technology Centers program of the Department of Education (Oder 2002). However, a recent study by the International Telecommunication Union showed that the level of broadband adoption of the U.S. is way behind many other countries. The U.S., at 6.9 subscribers per 100 inhabitants, ranked a distant 11th, behind: 1. Korea (21.3), 2. Hong Kong (14.6), 3. Canada (11.5), 4. Taiwan (9.4), 5. Iceland (8.6), 6. Denmark (8.6), 7. Belgium (8.4), 8. Sweden (7.7), 9. Austria (6.6), 10. Netherlands (6.5) (International Telecommunication Union 2002).

With the emphasis on technological or material access to the Internet and initiatives to tackle the issue, some have argued that the inequality seems to be slowly diminishing (NITA 2002). Such arguments, however, do not acknowledge the connection difference between low vs. high speed Internet (i.e. dial-up vs. DSL/cable modem). Some researchers claimed the disappearance of the discrepancy and even challenged the validity of the concept of digital inequality (Compaine 2001, Powell 2001). Others, nevertheless, disagreed and pointed out the problem of focusing on technological access as the key variable for digital inequality research (Joseph 2001, Jung et al. 2001, Loges and Jung 2001, Payton 2003, Van Dijk and Hacker 2003). Joseph (2001) shared his observations from multiple studies that digital inequality would not be understood if people viewed it as purely a technological phenomenon. As access to computers and the Internet becomes more pervasive, some factors, such as skills and opportunity for usage, may become the focus of inequality (Gurstein 2003, Hargittai 2002, Kvasny 2002, Van Dijk and Hacker 2003). When extending the scope from "access" to "use", the disparities among various demographic and ethnic groups are even more salient (Bonfadelli 2002, DiMaggio et al. 2004, Hargittai 2002).

The outcomes of most initiatives taken so far have not been as effective as originally expected. Some have argued that policy makers have not been able to allocate the needed resources to where the real needs are at the right time (Jung et al. 2001, Lindsay and Poindexter 2003). An especially important reason given for the ineffectiveness of these interventions is the lack of a theoretical explanation of the phenomenon (DiMaggio et al. 2001, Kvasny 2002, Kvasny and Keil 2004). It is thus critical to study the phenomenon using a strong theoretical foundation, so that policy

makers, government, and the private sector can effectively steer appropriate resources to where they are needed most.

While many people tenaciously believe that digital inequality can be answered by addressing technology access, research has recently revealed that elements other than technology access can also affect people's ICT innovation behavior (De Haan 2004, Joseph 2001, Jung et al. 2001, Kvasny and Keil 2002, Payton 2003, Van Dijk and Hacker 2003). Although some under-privileged may have benefited from technology-focused interventions that center on providing free technological access, many others are still unable to adopt and start to use ICT (Lenhart 2002). Unfortunately, even for those under-privileged who adopted and started using ICT, factors other than technology access (e.g. knowledge) exist and cause further inequality in ICT usage (DiMaggio et al. 2004).[1] This suggests that the factors affecting pre-adoption behavior may differ from those affecting post-adoption behavior. Such differences, if they exist, suggest that interventions for reducing digital inequality may be more effective if formulated differently for people at distinct stages (i.e. adopters and non-adopters).

In fact, studies of adoption and diffusion of ICT have suggested that factors influencing individuals' innovation behavior are indeed different at distinct diffusion phases. Therefore, practitioners should employ more focused and stepwise approaches for ICT implementation (Cale and Eriksen 1994, Cooper and Zmud 1990, Karahanna et al. 1999, Kwon and Zmud 1987, Prescott and Conger 1995). Most of these research efforts focused on workplace settings, except the work by Venkatesh and Brown (2001), which looked into the determinants of personal computer (PC) acceptance in household. However, little is known about the factors that drive people's pre- and post-adoption

[1] Bonfadelli (2002) refered to this phenomenon as a "double digital divide".

innovation behavior in the context of digital inequality, when resources are allocated to remove economic barriers to ICT use. To address digital inequality, we must learn more about the factors that influence pre and post adoption behavior among the under-privileged.

Meanwhile, as most efforts have focused on providing technology access, these efforts have been criticized as generic and treating every individual as the same (Hoffman et al. 2001, Jung et al. 2001). Implicit in this criticism is the notion that the under-privileged differ in their response to technology, as compared to more privileged members of society, and that there are barriers other than technology access which impede ICT acceptance (Van Dijk and Hacker 2003, Warschauer 2003). Thus, researchers have begun recommending customized programs and targeted resources to meet specific needs of different groups (Hoffman et al. 2001, Kubicek 2004). It thus would be useful to investigate differences in behavioral patterns in the access and use of ICT between privileged and under-privileged groups and the factors that cause them.

To recapitulate, digital inequality is a critical and urgent issue in the knowledge economy and has great impact on a nation's social and economic development. To effectively approach this issue, high priority should be focused on developing a *theoretical* understanding about the phenomenon. Special attention should be placed upon theoretically investigating: (1) the differences in ICT innovation behavior between the privileged and under-privileged groups and (2) the factors that influence pre and post adoption behavior among the under-privileged. This theoretical understanding will enable policy-makers to formulate effective interventions that efficiently allocate resources to attain planned outcomes.

1.2 From Adoption and Diffusion of Information and Communication Technology to Digital Inequality

Adoption of innovation (AOI) has been a well-studied stream in the field of information and communication technology. AOI studies the factors that determine individuals' adoption and use of innovation. Theoretically grounded and empirically tested theories and models have been developed and applied over time in AOI research. The major AOI theories include Fishbein and Azjen's Theory of Reasoned Action (TRA) (1980), Azjen's Theory of Planned Behavior (TPB) (1985), and Davis' Technology Acceptance Model (TAM) (1986). It is obvious that digital inequality is strongly associated with the adoption and use of the Internet. As a result, this research intends to assess whether the theoretical lens of AOI can help to explain digital inequality. The aim is to explore whether differences exist between the under-privileged and privileged people's behavioral models, and, if so, how the differences between models lead to digital inequality.

Beyond the three AOI theories with strong psychological foundation, researchers have suggested other important factors that can help explain innovation behavior, such as institutional influence (Fligstein 1985, Haunschild and Miner 1997, Palmer et al. 1993, Teo et al. 2003) and trust (Gefen 2000, Gefen 2002, Gefen et al. 2003, McKnight et al. 2002, Pavlou 2001, Pavlou and Gefen 2002). In the field of the diffusion of innovation (DOI), DiMaggio and Powell (1983) theorized the institutional mechanisms that may affect innovation adoption. Although prior studies have assessed institutional influence on organizations' decisions on the adoption of innovation (Fligstein 1985, Haunschild and Miner 1997, Palmer et al. 1993, Teo et al. 2003), few studies have investigated this

influence on adoption decisions at the individual level. Given that most digital inequality initiatives are efforts by public institutions, especially the government (Keil et al. 2003, Kvasny and Keil 2002, PeTje et al. 2002, USACNII 1996, Venkataraju et al. 2003, Wilhelm 2001), it is very important to investigate the effect of institutional influence in the context of digital inequality (DiMaggio et al. 2004). Meanwhile, trust has recently been recognized as an important construct that provides significant explanatory power for ICT adoption and use (Gefen et al. 2003). Evidence in digital inequality studies also suggested that trust may be an important factor affecting ICT adoption and use, particularly for the disadvantaged (Jackson et al. 2001, Kvasny 2002). In short, to reach a holistic understanding about the phenomenon, this research examines digital inequality through extending AOI theories by incorporating institutional influence and trust.

1.3 LaGrange Free Internet TV Initiative

LaGrange, with a population of 27,000, is located 60 miles southwest of Atlanta, Georgia. The LaGrange city government, unlike most municipal governments in the U.S., finances their operation by collecting sales tax and generating revenue by providing services, without charging property tax (Keil et al. 2003, Meader et al. 2001). The services offered include electricity, natural gas, sanitary, and telecommunications to both commercial and residential customers. With the policy of no local tax, full utility services, and a modern telecommunication infrastructure, LaGrange attracts considerable business investment and serves as an economic center for the area stretching from east Alabama to west Georgia (*City of LaGrange Business History* n.d.).

To keep existing businesses and attract further investment, in the 1990s, the city government purchased the old cable system and upgraded it to a two-way 750 MHz

hybrid co-axial and fiber-based system with 18 fiber optic nodes around the city. Each node further connects to 500 – 900 households via coaxial cable. In addition to cable TV and broadband services offered via this infrastructure, in April 2000, the city officials devised a three-way contract with the cable company (Charter Communications) and Internet service provider (WorldGate Communications) to use the excess bandwidth to provide an Internet TV service to every household at no cost. Therefore, residents do not have to pay extra beyond the $8.70 basic cable TV service per month, while such Internet service is usually charged for an additional fee from $4.95 to $16.95 per month. With this free Internet TV initiative, the city government expected to address digital inequality, prepare the labor force for the knowledge economy by developing their knowledge and Internet skills, and eventually attract further business investment.

The Internet TV is a television-based Internet access device. Subscribers receive a free wireless keyboard and digital set-top-box, which connects the cable and TV. Users can use the wireless keyboard to browse the Internet via their TV. At the rate of 158 Kbits per second, the connection speed is nearly three times higher than the typical dial-up service (56 Kbits/sec). Subscribers also enjoy unlimited access, a free email service, 5 MB of web space, and a technical support hotline that is available seven days a week (Keil et al. 2003). Training is available in the community center, over cable TV, as well as through the technical support hotline. The Internet TV is user-friendly in that users do not have to install or maintain an operating system or application programs. However, the Internet TV does not allow printing, storing files, and browsing websites that require software plug-ins (e.g. Adobe Acrobat and Apple QuickTime). Users also cannot use the Internet TV and watch TV simultaneously.

The LaGrange Internet TV (LITV) initiative is the first project in the world in which a city government offered devices that provide free Internet access to every household. Compared to a typical Internet PC, the Internet TV is easier to use, yet more limited in its capability. Still, the Internet TV represents a chance to connect those who might not otherwise explore high-speed household Internet access and all that it has to offer. The LITV initiative provides a unique opportunity and serves as a fertile ground to study the ICT innovation behavior of the privileged and under-privileged groups in response to a government initiative designed to eliminate economic barriers and provide universal access. The results of this study hold important implications for researchers and offer useful managerial guidelines for policy-makers concerning digital inequality interventions.

1.4 Summary

This dissertation investigates the behavioral models that characterize under-privileged and privileged people's acceptance of ICT in response to a government's free Internet initiative intended to eliminate economic and technical barriers associated with digital inequality. The phenomenon of interest in this research lies at the intersection of three research areas: adoption and diffusion of innovation, information and communication technology, and digital inequality. Figure 1-1 shows the relationships between the phenomenon of interest and the three fields.

Information and communication technologies have long been a focus in studies of adoption of innovation. Adoption and diffusion of ICT has been described as one of the most mature research streams in the field of information systems (Hu et al. 1999). The rich body of knowledge accumulated in adoption and diffusion of ICT provides a good

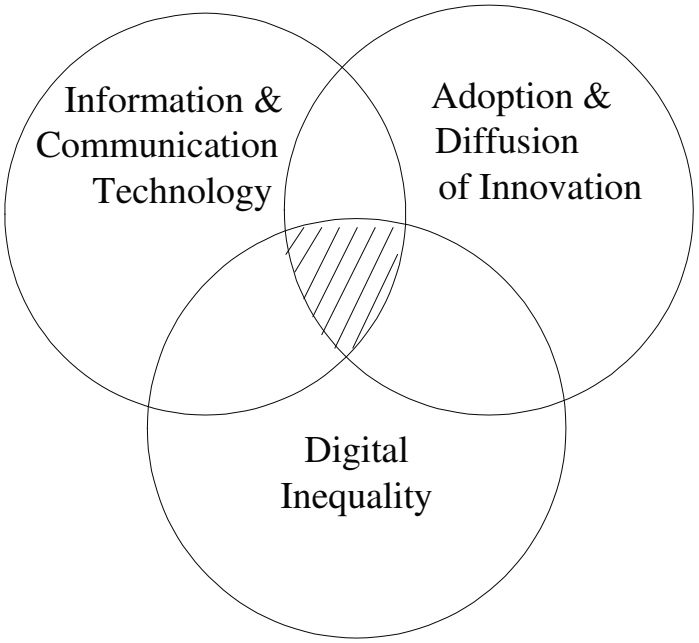


Figure 1-1: Fields of Study and Phenomenon of Interest

understanding about the ICT innovation behavior at various units of analysis, including individual, group, organization, and inter-organization. Researchers in ICT adoption and diffusion are looking forward to extending their understanding and theoretical development (Legris et al. 2003). In contrast, limited knowledge exists regarding the critical issue of digital inequality and that which does exist is, unfortunately, largely descriptive and atheoretical (Kvasny 2002). Strong theoretical development is needed to achieve better explanation and in-depth understanding. Since digital inequality concerns the discrepancy in ICT acceptance among the privileged and under-privileged, adoption and diffusion of innovation theories can provide a theoretical frame for deepening our understanding of the phenomenon. Applying adoption and diffusion theory in the context of digital inequality will, in turn, expand our knowledge about adoption and diffusion of innovation.

In short, this research aims to achieve three main objectives: (1) develop an in-depth theoretical understanding of the digital inequality phenomenon; (2) extend our existing knowledge about adoption and diffusion of ICT by testing theories in the context of digital inequality; and (3) generate managerial information to assist policy-makers to formulate more targeted interventions that can effectively help the under-privileged people at different innovation stages to explore digital opportunities.

The subsequent chapters proceed as follows. Chapter 2 offers a review of relevant literature in the fields of digital inequality, adoption of innovation, diffusion of innovation, and trust. The research questions are stated in the last section of chapter 2. Chapter 3 illustrates the research model and discusses the research hypotheses. As this research consists of a large-scale survey and a case study, Chapter 4 first describes instrument development, data collection, data analysis, and then discusses the result of the survey analysis. Chapter 5 similarly describes the development of interview questions, data collection, data analysis, and then discusses the findings of the case study. Finally, conclusions, limitations, contributions, and future research directions will be presented in Chapter 6.

Chapter 2: Literature Review

This chapter provides the contextual and theoretical background for the key research questions and includes a review of literature in the fields of the digital inequality, adoption of innovation, diffusion of innovation, and trust. The digital inequality literature section discusses the issue of theoretical development and identifies knowledge gaps in the field. The adoption of innovation literature section contains the key theories explaining the adoption and use of information and communication technologies. A decomposed Theory of Planned Behavior (TPB) is selected as the reference model to develop theoretical explanations for the digital inequality phenomenon. To further capture the rich social and institutional aspects of digital inequality and enhance the theoretical explanation power, this chapter reviews the literature in diffusion of innovation (DOI) and trust and suggests additional and relevant constructs to be incorporated in the decomposed TPB model for this study. Research questions are stated in the last section.

2.1 Digital Inequality

2.1.1 The Infrastructural Predecessor: the Telephone Divide

127 years after its introduction, the telephone does not reach every household of the U.S. The survey, *Falling Through the Net: Defining the Digital Divide* (NTIA 1998), revealed that the penetration rate of the telephone in the U.S. was about 94% and had remained at this level for a long time. Furthermore, this penetration level demonstrated apparent and significant disparities over several demographic and ethnic factors,

including income, race, education, household composition, age, region, and state. Only 78.7% of the households earning less than $5,000 per year had telephones. 95.0% of all White households have phones (regardless of location), while Hispanics (84.6%), Blacks (85.4%), and rural-dwelling American Indians/Eskimos/Aleuts (76.4%) had much lower levels. 97.0% of college graduates have telephones; however, people in central city areas with some high-school level education were in the lowest group, 85.0%. Households headed by people under 25 are least connected (87.6%), especially with low rates in rural (84.2%) and central urban (87.7%) areas. Similarly, a study of the "telephoneless" in Camden, NJ, found a telephone penetration level (80%) which fell significantly below the national average (94%) (Mueller and Schement 2001).

Schement and Forbes (1998), in their in-depth studies, also found persistent discrepancy (from 1984 to 1994) in telephone penetration levels along such demographic factors as income, gender, age, unemployment, household structure, and ethnicity. Unlike information goods, such as radio and television, information services like the telephone and the Internet diffuse at a lower speed. The price to access information goods is only the one-time-charge for the goods, while the price to subscribe to information services includes the one-time-charge, plus the usage-related cost (e.g. the monthly bill and long distance charges). It is this usage-related cost that drives away the under-privileged (Mueller 2001).

The telephone divide/inequality obviously does exist and some refer to this as the infrastructure prerequisite of Internet digital inequality, because dial-up, DSL, and

satellite technologies all depend on the existence of telephone services[2] (Schement 1995). Therefore, households without telephone lines are less likely to have Internet access. Given the telephone divide/inequality, the emergence of an inequality in the Internet was inevitable. Potentially, the telephone inequality will leave those previously not connected or underserved, even farther behind, with the result being the reproduction of social inequality (Kvasny 2002).

2.1.2 Digital Inequality Defined

Digital inequality, in general, refers to the inequality in the access and use of ICT (DiMaggio et al. 2004). As digital inequality is a new and evolving concept, its definition changes over time and across different studies (Venkataraju et al. 2003). Such inconsistency in definitions sometimes leads to disagreement in findings. To better define this inequality, it is necessary to look at the evolution of key issues in this field.

Until recently, most digital inequality research focused on investigating the gap between the ICT "haves" and "have-nots", or the so-called "digital divide" (Mason and Kacker 2003, Robinson et al. 2003). The term digital divide makes a binary distinction of whether or not people have the technological means to connect to the Internet (Lenhart et al. 2003). Seen through the lens of telecommunication policy in which universal telephone access is viewed as a virtue, this binary perspective was intuitive and understandable at the onset of the diffusion of the Internet (DiMaggio et al. 2004). Every citizen is entitled to have access to the Internet. Nevertheless, such a binary view seems to overlook potential differences in Internet connection quality and the ensuing

[2] Dial-up, DSL, Cable Modem, and Satellite are the four major conduit technologies for household Internet access. While cable modems use the coaxial cable, the other three technologies all use the telephone lines to transfer digital data. Satellite mode uses telephone lines for upload and satellite dishes for download.

consequences (Davison and Cotton 2003, DiMaggio et al. 2004, Horrigan and Rainey 2002). People with obsolete or inadequate technologies may be left unconnected, encounter more limitations, and are less likely to have satisfying experiences. For example, Horrigan and Rainey (2002) reported that people with high-speed Internet use the Internet more widely and intensively, as compared to those with lower speed connections. Davison and Cotton (2003) also found that broadband users tend to spend more time on the Internet and are more likely to purchase products and services online. Instead of a haves and have-nots binary partition, Cisler (2000) and Kubicek (2004) suggested that we view this discrepancy as a continuous gradation of degrees of access to the technology.

Another drawback of the access-centered view is the belief that providing technology would be the answer for the inequality, thus steering significant amounts of resources towards addressing this issue (Attewell 2001, Clinton 1997a). For example, most of the governmental plans concentrated on providing technologies, such as Internet access in schools, libraries, community centers, and households (Attewell 2001, Clinton 1997b). This view also led a majority of the digital inequality studies to focus on technology access and ownership (DiMaggio et al. 2004, Mason and Kacker 2003), while overlooked other important issues, such as inequality in the use of technologies.

As the Internet spread out to a wider population, some researchers also noticed the inequality in people's use behavior (Bonfadelli 2002, Gurstein 2003, Hargittai 2002, 2003, Jackson et al. 2003, Robinson et al. 2003). Some termed this inequality as the "second digital divide" (Attewell 2001, Hargittai 2002). People may use the Internet for various purposes (e.g. information, communication, service, and entertainment) and may

spend their time quite differently on different activities (Bonfadelli 2002, Jackson et al. 2003, Jackson et al. 2004, Robinson et al. 2003). Hargittai (2002) found considerable differences in the ways people search for information online and the time for people to accomplish online tasks. When investigating use, DiMaggio et al. (2004) recommended looking into the equipment, autonomy, skills, purposes, and the social support associated with ICT use. Viewing the Internet as a productive tool, Gurstein (2003) suggested that, in addition to receiving and consuming digital information, effective ICT use should also consist of producing and disseminating digital information. Presumably, people with lower levels of knowledge and digital skills are less likely to be able to produce digital information. The inequality in the use behavior, however, is more complicated than just a binary distinction of whether or not an individual uses the Internet.

The "divide" concept offers a restrictive bipolar view of the phenomenon. On the other hand, *digital inequality* (DiMaggio et al. 2004), or the inequality in the access and the use of the new information and communication technologies, offers a more nuanced perspective. It goes beyond the simple binary lens and can more faithfully account for the range of differences in the access, as well as the use, of ICT. This definition of digital inequality, or the inequality in the access to and use of ICT, is adopted for the purpose of this dissertation.

2.1.3 The Theoretical Development of Digital Inequality

Digital inequality studies have been criticized by many researchers as atheoretical (Kvasny 2002, Mason and Kacker 2003). Most works concerning digital inequality take the form of policy documents, project reports, or web-based working papers (Kvasny 2002) which typically provide a descriptive profile of the phenomenon and usually report

the pattern and change in adoption levels (De Haan 2004, DiMaggio et al. 2001, Kvasny 2002). These studies also describe the demographic and geographical factors that correlate strongly with the inequality. Although examining the outlook and status of the disparity is important, it is more crucial to develop a theoretical understanding about the conceptualization, determinants, processes, and consequences of the phenomenon (DiMaggio et al. 2001).

Recently, some researchers have worked toward this direction and offered different perspectives to reveal the complexity of digital inequality. Some have also developed or applied different frameworks and theories to try to explain the phenomenon. The following section reviews some important findings and knowledge.

Joseph (2001), from his observation of current studies, concluded that digital inequality would not be understood as a purely technological phenomenon. In an empirical study focusing on under-privileged African-American students, Payton (2003) found that merely providing Internet access to students is not enough. To effectively address the inequality, a social network is needed where career mentors and role models can provide advice and testimonials on the effect that technology will have on the students' careers. In the case of the community technology center initiative in Atlanta, Georgia, Kvasny (2002) argued the design of the program was ineffective because it did not take economic, social, cultural, and institutional factors into consideration. By going beyond just access and looking into both the scope and intensity of Internet use, Lodes and Jung (2001) and Jung et al. (2001) showed that digital inequality was larger and more serious than it had looked when only access was being assessed.

To offer a more comprehensive perspective, Van Dijk and Hacker (2003) conceptualized "access" as a multi-dimensional concept, which includes mental access, material access, digital skills, and usage (see Table 2-1). These four types of access assume a hierarchical relationship. For example, Van Dijk (1999) suggested that when the mental and material barriers are overcome, other access issues related to digital skills and usage would surface and bring with them inequalities. These inequalities are actually the reflection of other existing inequalities, such as the inequality in material, cognitive, and social resources (Van Dijk and Hacker 2003). Van Dijk and Hacker expressed their concern that if no effective interventions take place, the inequalities in these types of access may become structural, or lasting and hard to change.

Table 2-1: Van Dijk and Hacker's View of Access (2003)

Type of Access	Definition
Mental	Lack of elementary digital experience caused by lack of interest, computer anxiety, and unattractiveness of the new technology
Material	Lack of possession of computers and network connections
Skills	Lack of digital skills caused by insufficient user-friendliness and inadequate education or social support
Usage	Lack of significant usage opportunities

To analyze access and usability of ICT, Clement and Shade (2000) suggested considering the following seven aspects: carriage facilities, devices, software tools, content services, service access provision, literacy social facilitation, and governance (Table 2-2). They referred to these seven layers of access as the Access Rainbow. Similar to Van Dijk and Hacker's framework, the rainbow also assume a hierarchy entailing a structural relationship. Gurstein (2003) adapted this framework and proposed a similar rainbow particular for effective use.

Table 2-2: Clement and Shade's Access Rainbow (2000)

Layer of Access	Definition
Carriage	The facilities that store, serve, or carry information.
Devices	The actual physical devices that people operate.
Software Tools	The programs that operate the devices and make connections to services.
Content Services	The actual information and communications services people find useful.
Services/Access Provision	The organizations that provide network services and access to users.
Literacy/Social Facilitation	The skills people need to take full advantages of ICT together with learning facilitation and resources to acquire these skills.
Governance	How decisions are made concerning the development and operation of the infrastructure.

Warschauer, alternatively, suggested treating digital inequality as a form of literacy inequality (Warschauer 2003). He viewed literacy, instead of writing and reading skills, as the ability to perform the processes to code important information in a cultural context. ICT access, just like literacy, is a prerequisite for full social engagement, closely relates to communication and knowledge creation, needs physical artifacts (e.g. books or computers), and involves both consuming and producing information. Thus, to address digital inequality, acquiring literacy should be the focus and this requires a variety of resources, including digital, social, physical, and human resources. However, the under-privileged people are likely to have less control over resources.

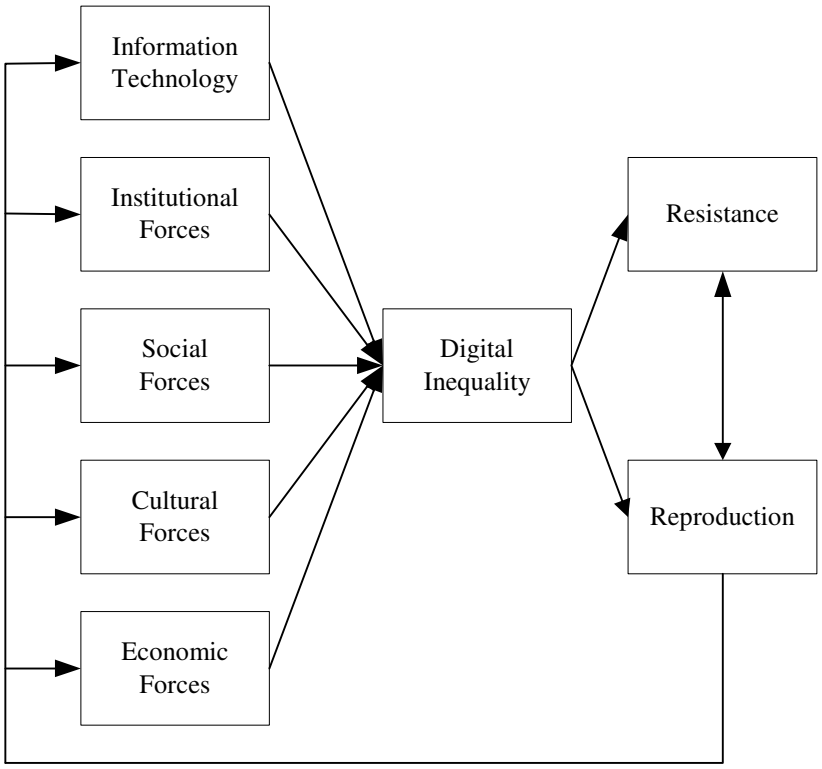
Some researchers argue that, in addition to existing resource inequality, digital inequality may further the under-privileged's distance from the privileged and exacerbate the hardships of their lives (Wilhelm 2001). De Haan (2004) borrowed the notions of the Matthew Effect and accumulation of advantage (AOA) hypothesis to explain such a phenomenon. The Matthew Effect generally refers to the syndrome that the rich get richer and the poor get poorer (Merton 1968). Based on the concept of the Matthew

Effect, Merton (1973) introduced the AOA hypothesis to explain the discrepancies in scientists' performance. The AOA hypothesis can be described as follows:

> Advantage in science, as in other occupational spheres, accumulates when certain individuals or groups repeatedly receive resources and rewards that enrich the recipients at an accelerating rate and conversely impoverish (relatively) the nonrecipients. Whatever the criteria for allocating resources and rewards, whether ascribed or meritocratic, the process contributes to elite formation and ultimately produces sharply graded systems of stratification. (Zuckerman 1977, pp. 59 -60)

Applying this logic, De Haan (2004) argued that earlier advantages (e.g. higher education) may facilitate the acquisition and development of advantages at later stages (e.g. digital skills). Thus, the privileged may become more advantaged as compared to the under-privileged, contributing to growing social inequalities.

Figure 2-1: The Reproduction Function of IT (Kvasny 2002)



Kvasny (2002) offered a similar view by theorizing how prior inequality in the cultural, social, economic, technological, and institutional dimensions informs digital inequality and, in turn, how digital inequality reproduces and/or reinforces inequality in these dimensions (Figure 2-1). In a survey of the Internet activities in Los Angeles, evidence suggested that those who are already privileged (e.g. high income, high education, male, or younger) tend to use the Internet in ways to retain and advance their existing advantages (Jung et al. 2001).

This Matthew Effect in digital inequality may also be explained by Diffusion of Innovation Theory, the Knowledge Gap Hypothesis, and Adaptive Structuration Theories

(Mason and Kacker 2003). In the Diffusion of Innovation Theory (Rogers 2003)[3], the distribution of adopters in a social system follows an S-curve, where early adopters accept the innovation first, then the general population, and followed by late adopters. Because digital skills are cumulative, instead of a single s-curve, there should be consecutive s-curves (Van Dijk 1999). As early adopters have the advantage in developing new skills faster and earlier than late adopters, the rapid technology evolution will widen the skill differences between the early and later adopters. Further, according to Adaptive Structuration Theory (DeSanctis and Poole 1994), when interacting with technologies, members of a social system will appropriate existing rules and resources in the system, and then use technologies according to these rules and resources. The results then reproduce the roles, rules, and resources existing before the interaction. Although technologies may be designed for equal opportunities, the consequences may just reinforce the prior inequality.

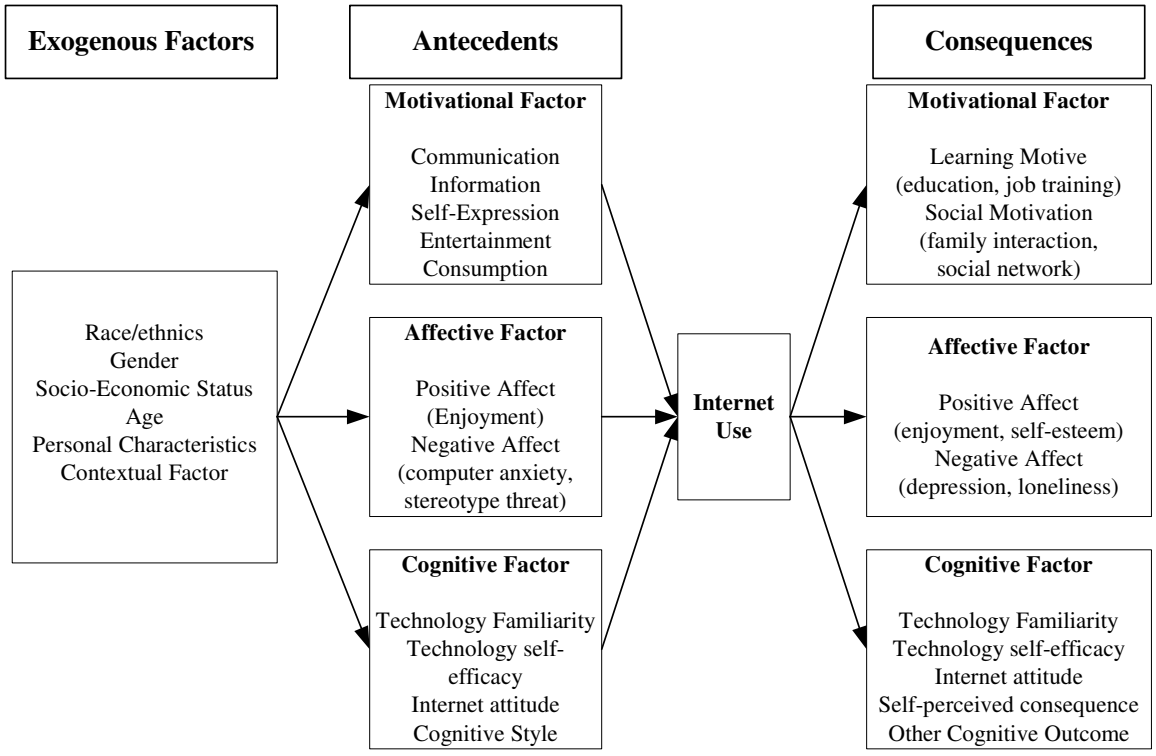
On the other hand, the Knowledge Gap Hypothesis suggests (Tichenor et al. 1970) that when new information is introduced into a society, the higher socioeconomic class will acquire the information earlier than the lower one; therefore the inequality in knowledge between these groups will increase. Many empirical studies have supported this view and found that knowledge inequalities tend to be enduring (Gaziano and Gaziano 1996). Examining the knowledge gap hypothesis in the context of digital inequality, Bonfadelli (2002) found lasting inequalities in both the access to and use of the Internet in Switzerland between the higher- and lower-educated populations. From the perspectives of these theories, it is clear that digital inequality may have a significant

[3] Diffusion of Innovation Theory will be further discussed in section 2.3.

and long-lasting impact on society, and urgently needs to be addressed. However, these theories need further empirical validation in the context of digital inequality.

To model the antecedents and consequences of digital inequality, two other models also deserve our attention. Focusing on Internet use, Jackson et al. (2001) pointed out the importance of incorporating motivational, affective, and cognitive factors in understanding ICT usage behavior in general, and digital inequality in particular. They proposed a conceptual model for Internet use (Figure 2-2), in which the exogenous factors, such as demographic, personal, and contextual, will determine the individual motivational, affective, and cognitive factors, and then indirectly influence individual's Internet Use. An individual's Internet use will ultimately contribute to change the motivational, affective, and cognitive factors.

Figure 2-2: Proposed Model of Internet Use (Jackson et al. 2001)



DiMaggio et al. (2004) proposed another model to explain how digital inequality impact people's life chances (Figure 2-3). They conceived that, at the individual level, personal demographic and situational variables will influence the technical means, skills, and social support. These, in turn, will influence effectiveness of individual technology use. The effectiveness of the technology usage eventually affects individual social and human capital. Similar to the three theories discussed earlier, these two models conceived by Jackson et al. (2001) and DiMaggio et al. (2004) have not been tested empirically in the context of digital inequality.

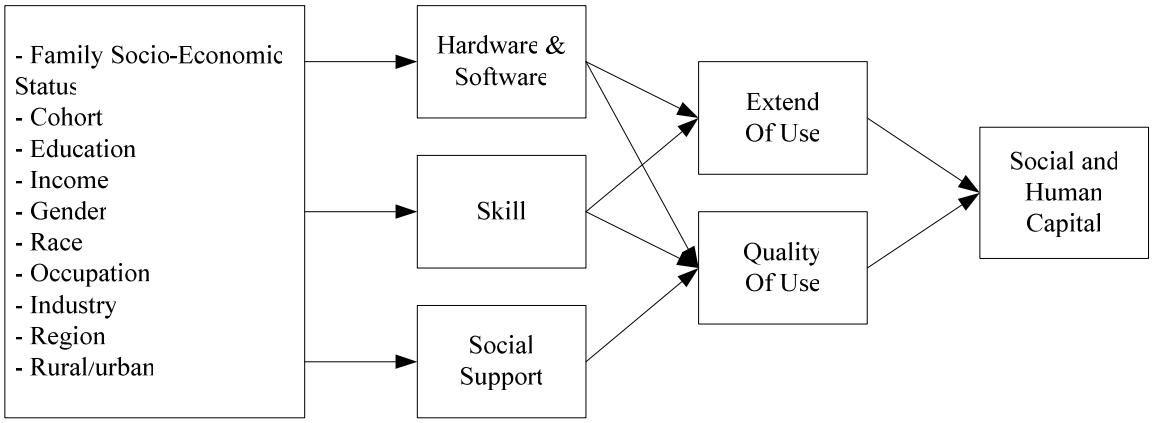


Figure 2-3: Impact of Internet Access on Life Chances (DiMaggio et al. 2004)

To address digital inequality, De Haan (2004) recently introduced a Resource Theory to identify important resources to deal with the inequality. From a consumer's perspective, Coleman (1990) suggested that people are mainly constrained by their possession of material, cognitive, and social resources. De Haan adapted this view and proposed that material resources include money and time; cognitive resources consist of literacy, numeracy, and informacy; social resources include access to people who have new technologies, digital skills, and are in a position to provide knowledge about

technologies. Note that literacy here refers to the classical reading and writing skills, and numeracy stands for the ability to process quantitative data. Informacy, on the other hand, means the ability to process the information available via digital technologies. Warchauer (2003) too provided a similar but slightly different resource-based perspective. He suggested that physical, digital, human, and social resources are critical in addressing digital inequality. Physical resources include materials access to computers and telecom connections; digital resources refer to the information available online; human resources encompass literacy and education; lastly, social resources consist of available support from communities, institutions, and societal structures. These resource-based perspectives, to a certain extent, correspond to the frameworks proposed by Van Dijk and Hacker (2003), Clement and Shade (2000), and Kvasny (2002). As digital inequality reflects and concerns discrepancies in multiple dimensions, the necessary resources to respond to such inequality should be diversified as well. The disadvantage of the under-privileged's ICT access and usage can most likely be explained by their relative lower control over these resources.

Even though the discussed resources may help the under-privileged to overcome barriers of ICT innovation, a very important implication from Clement and Shade's work is the idea to encourage the development of programs that can meet the distinct needs of people with different constraints (Shneiderman 2000). Hoffman et al. (2001) opined that if a universal service policy treats everyone as the same, it is bound to be a poor one and that this kind of policy would only subsidize services that people don't want, or that don't make sense given their particular circumstances. Jung et al. (2001) also proposed targeted and customized resources, instead of generic programs, to meet the needs of different

demographic groups. Thus, policy makers should adopt a segmentation strategy to approach the issue (Kubicek 2004), as it would not be effective to paternalistically impose a predefined set of choices on all individuals. However, little knowledge is known about the specific needs of different groups and more studies should look into this direction.

Although the above efforts have advanced our understanding of the digital inequality phenomenon, many questions and issues remain resolved. DiMaggio et al. (2001) stressed the necessity of studying how institutional forces, government programs, pricing policies, and other contextual factors affect inequality. They also called for a greater level of usage of multivariate methods, instead of binary measurement, when investigating the determinants of inequality. They wrote:

> … choices are being made –systems developed, money invested, laws passed, regulations promulgated –that will shape the systems' technical and normative structure for decades to come. Many of the choices are based on behavioral assumptions about how people and the Internet interact. We believe such assumptions should represent more than guesswork. (DiMaggio et al. 2001, p.308)

To clarify and validate these implicit assumptions, human behavioral models of Internet adoption and use should be subject to careful assessment. In 2004, DiMaggio et al. further pointed out several directions for future research. Their agenda includes (1) developing reliable measure for digital inequality, (2) exploring differences between the predictors for access at distinct locations, such as work, home, and school, as well as between the determinants for access to different types of technologies (e.g. cell phones

and personal digital assistants), (3) studying social mechanisms that influence the adoption and diffusion of ICT, (4) examining the impact of institutional affiliation (e.g. with school) on ICT acceptance, (5) learning more about Internet-dropouts, and (6) investigating the impact of public policies on digital inequality. While not aiming at every aspect suggested, this dissertation looks into several of these directions.

Digital inequality is closely related to the adoption and use of ICT. Despite the aforementioned theoretical development, the phenomenon has not been studied from the perspective of adoption of innovation (AOI). The rich body of knowledge accumulated in AOI can shed more light into the theoretical understanding of digital inequality. Theories in AOI, which are discussed in the next section, serve as the foundation to guide the theoretical development in this research.

To recapitulate, digital inequality is a complex multifaceted problem. Different frameworks have been proposed to describe the multifaceted nature of the phenomenon. While a few researchers have proposed some theories and models to explain the phenomenon, few have been empirically validated in the context of digital inequality. An array of resources may be the answer for this issue, but more knowledge is needed in order to devise programs to allocate the right resources to meet the distinctive needs of people with different constraints. Finally, in responding to the research directions suggested by others, this dissertation focuses on human behavioral models with special attention on the cognitive beliefs, contextual factors, social mechanisms, institutional influence, and policy factors that could help most to explain the phenomenon. To begin with, the next section introduces key theories in the field of AOI.

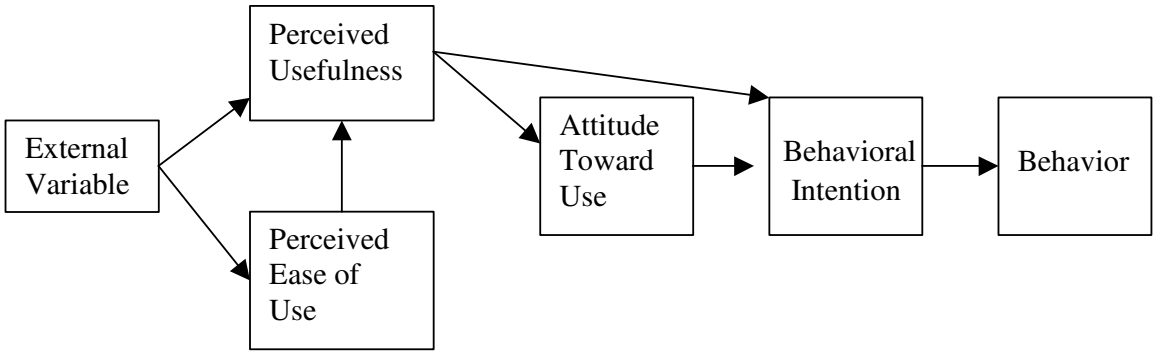
2.2 Adoption of Innovation

Adoption of Innovation (AOI) has been studied in depth and a sophisticated level of knowledge about the phenomenon has been accumulated. Based on a meta-analysis in AOI by Legris et al. (2003), the Technology Acceptance Model (TAM), Theory of Reasoned Action (TRA), and Theory of Planned Behavior (TPB) are the three major theories applied to explain the adoption of information technology. In the following section, these three models are discussed and evaluated for their strength and appropriateness in studying digital inequality.

2.2.1 Technology Acceptance Model

Davis (1989) proposed TAM to explain IT usage behavior across a broad class of information technologies and user populations. Figure 2-4 displays the model. Perceived ease of use (PEOU) means the degree to which the user expects that using the system will be free of effort (Davis et al. 1989); Perceived Usefulness (PU) is the user's perception that the use of the system will enhance his/her performance in an organization (Davis et al. 1989). PEOU influences PU, and both PEOU and PU determine the attitude toward use (A), where A means the user's evaluation of the desirability of using the system. PU and A predict the user's behavioral intention (BI) to use the system. BI determines the actual behavior, or use. Davis et al. (1989) suggested that the internal psychological factors, or the beliefs, including PU and PEOU, are critical to TAM and fully mediate the effects of all other external factors (Agarwal and Prasad 1999).

Figure 2-4: Technology Acceptance Model (Davis 1989)

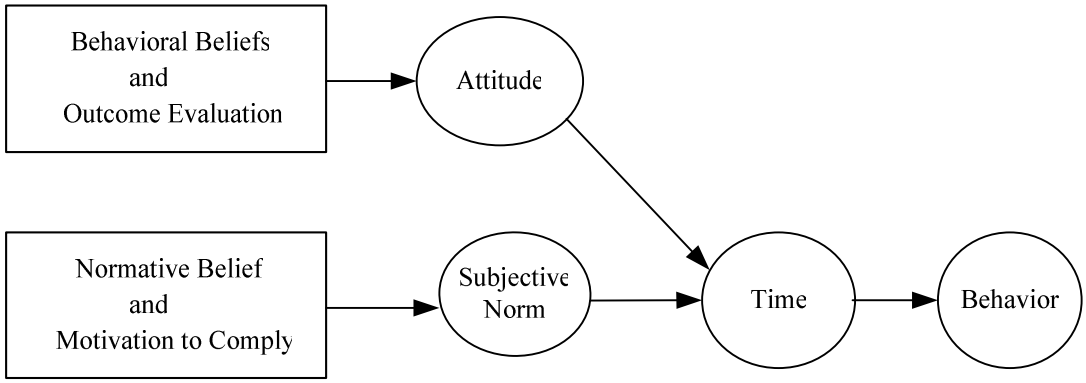


Though empirical data showed that TAM is robust when applied in a non-organizational environment (Agarwal and Karahanna 2000, Gefen et al. 2003, Mathieson 1991, Szajna 1994), a large portion of the research was conducted in a work-related environment for a single task (Gefen et al. 2003, Legris et al. 2003). TAM, which focuses on system design characteristics, can help to improve design technologies, but is limited in capturing the normative and control factors that could influence adoption behavior (Mathieson 1991, Taylor and Todd 1995b). The analysis of TAM studies by Legris et al. (2003) pointed out that TAM should incorporate other components in order to boost its explanatory power beyond just 40% of the variance in the actual behavior.

2.2.2 Theory of Reasoned Action

Ajzen and Fishbein's Theory of Reasoned Action (TRA) (Ajzen and Fishbein 1980) is a psychological model intended to study consciously intended behavior (Davis et al. 1989). The Theory of Reasoned Action is presented in figure 2-5.

Figure 2-5: Theory of Reasoned Action (Ajzen and Fishbein 1980)



In TRA, an individual's Behavior (B) is predicted by his/her Behavioral Intention (BI), while BI is determined jointly by both his/her Attitude (A) and Subjective Norm (SN). Since TAM was derived from TRA, TAM and TRA shared the same definition for U, BI, and A. The Subjective Norm refers to an individual's perceived expectation from people who are important to the individual in regards to whether he/she should use or not use the system (Davis et al. 1989).

According to TRA, Attitude is a function of the product of outcome evaluation and behavioral belief (Ajzen and Fishbein 1980). Behavioral Belief means the user's perceived probability that the behavior will lead to a specific outcome. Outcome Evaluation refers to the rating of the desirability of that outcome. Equation 2.1 shows this function.

$$A = \sum_{i=1}^{nb} \text{Behavioral Believe}(i) * \text{Outcome Evaluation}(i) \qquad \text{-Equation 2.1}$$

nb = number of salient outcomes

Ajzen and Fishbein (1980) recommended certain procedures to elicit the salient outcomes from the subjects in the context of interest. They suggested eliciting five to nine outcomes through a free response interview with representative subjects of the population of interest. The most frequently identified outcomes could qualify as the salient outcomes. Due to the fact that Behavioral Belief and Outcome Evaluation get multiplied in the model, their contribution is magnified when their value is large.

Subjective Norm (SN), on the other hand, refers to the perceived expectation from "referent others" for the individual to perform a behavior (Mathieson 1991). SN is a function of the product of Normative Belief and Motivation to Comply. Motivation to Comply refers to the individuals' willingness to comply with the expectation from the referent others. The referent others usually means other persons or groups who are important or influential to the users (Ajzen and Fishbein 1980, Mathieson 1991). Equation 2.2 shows the function:

$$SN = \sum_{i=1}^{no} \text{Normative Belief (i)} * \text{Motivation to Comply (i)} \qquad \text{-Equation 2.2}$$

no = number of salient others

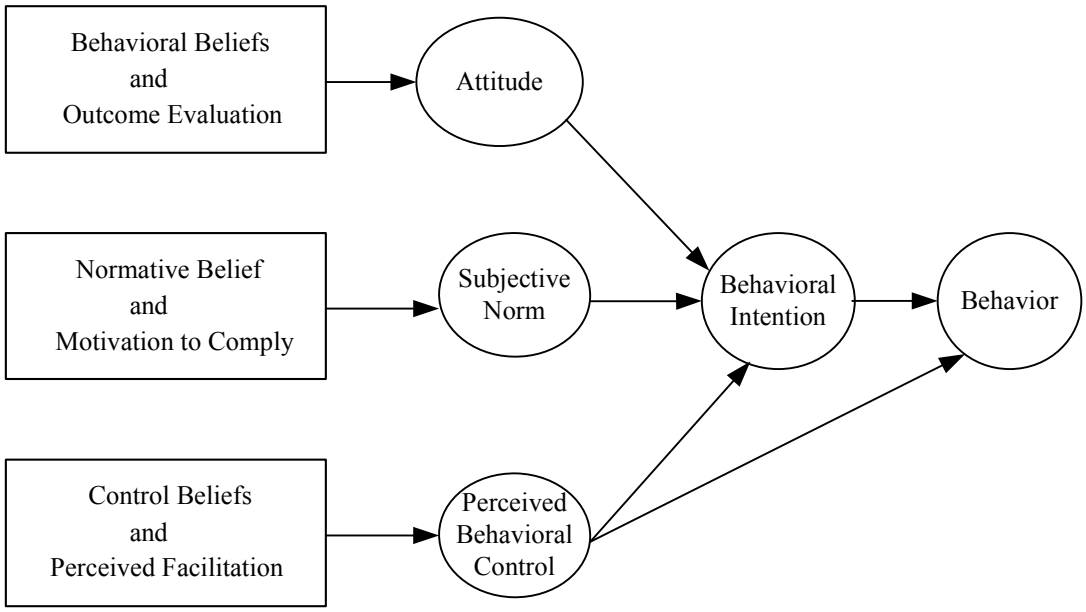
Ajzen and Fishbein (1980) suggested a similar procedure for eliciting salient referent others.

In contrast to TRA, TAM does not explicitly include any social variables. Including social variables is important if the social variables capture variance that is not already explained by other variables in the model (Mathieson 1991).

2.2.3 Theory of Planned Behavior

The limitation of TRA is that it assumes that A and SN can fully determine BI, and BI is the only antecedent of B. However, TRA will not be sufficient when the control over the behavioral goal is not complete (Ajzen and Madden 1986). Ajzen (1985) extended TRA to develop the Theory of Planned Behavior (TPB) by adding a key factor, Perceived Behavioral Control (PBC). Figure 2-6 demonstrates TPB.

Figure 2-6: Theory of Planned Behavior (Ajzen 1985)



PBC refers to individuals' perception of the existence or nonexistence of required resources and opportunities needed to perform the behavior of interest (Ajzen 1985, Ajzen and Madden 1986, Mathieson 1991). Ajzen (1991) has also referred to PBC as people's "perception of the ease or difficulty of performing the behavior of interest," which bleeds into the concept of PEOU proposed by Davis (1989). To make precise predictions of behavior when individuals may not have complete behavioral control, the extent to which individuals have control over the behavior should be assessed (Ajzen and Madden 1986). This aspect is particularly important in studying digital inequality, since

the under-privileged tend to have low control of resources and opportunities in life, thus interfering with their ability to adopt and use ICT.

PBC is a function of the product of Control Belief and Perceived Facilitation (Ajzen 1985, Ajzen and Madden 1986). Control Belief is individuals' perception of the availability of knowledge, skills, resources, and opportunities, while Perceived Facilitation is individuals' estimation of the importance of the knowledge, skills, resources, and opportunities to the accomplishment of the outcome (Ajzen 1985, Ajzen and Madden 1986, Mathieson 1991). Equation 2.3 shows the function.

$$PBC = \sum_{i=1}^{nc} \text{Control Belief (i)} * \text{Perceived Facilitation (i)} \qquad \text{-Equation 2.3}$$

nc = number of salient skills, resources, or opportunities.

Empirical data suggested that PBC, like A and SN, has a significant impact on individuals' Behavioral Intention (Ajzen 1985, Ajzen and Madden 1986, Mathieson 1991, Taylor and Todd 1995a, Taylor and Todd 1995b)**.** Note that the path from PBC to Behavior was also significant in many empirical studies (Ajzen 1985, Ajzen and Madden 1986, Mathieson 1991, Taylor and Todd 1995a, Taylor and Todd 1995b). This shows the direct effect of PBC on Behavior above Behavioral Intention. Ajzen and Madden (1986) suggested that PBC, here, is used as a surrogate for actual behavioral control. Under this situation, PBC represents the actual control and allows the model to provide better prediction.

TRA is really just a special case of TPB in which users are assumed to have volitional control over the necessary knowledge, skill, resource, and opportunities (Ajzen 1985). TPB, on the other hand, can cover these situations in which individuals may not have volitional control over the necessary resources, and thus has a wider range of application.

2.2.4 Decomposed Theory of Planned Behavior

Traditionally, in intention models, such as TRA and TPB, the belief constructs (A, SN, and PBC) are operationalized as the summation of the product of all salient behavioral beliefs and corresponding outcome evaluation (e.g. equation 2.1, 2.2, and 2.3) (Ajzen and Madden 1986, Davis et al. 1989, Mathieson 1991, Taylor and Todd 1995b). Prior research assessed the feasibility of the intention models, TRA and TPB, to assume the unidimensionality of the belief constructs and suggested that these monolithic belief constructs would be better explained as multidimensional (Bagozzi 1981, 1982, Ryan and Bonfield 1980, Shimp and Kavas 1984, Taylor and Todd 1995a, Taylor and Todd 1995b, Warshaw 1980). For example, Bagozzi (1981,1982) argued that, for the Attitude belief, different Behavioral Beliefs are qualitatively dissimilar, vary in significance, and should not be collapsed into one construct which would be assumed to be uni-dimensional (Mathieson 1991, Shimp and Kavas 1984). Similarly, Ryan and Bonfield (1980) and Warshaw (1980) also pointed out the multidimensional nature of the social norm construct. Following this line of reasoning, Taylor and Todd (1995b) decomposed the belief constructs Attitude, Subjective Norm, and Perceived Behavioral Control to represent this multi-dimensionality. Consequently, the relationships in the decomposed model can be rendered more clearly and are easier to understand (Taylor and Todd

1995b).

Ajzen and Fishbein (1980) and Ajzen and Madden (1986) suggested that the salient Behavioral Beliefs, important referents, and Behavioral Controls should be elicited from subjects within the population of study. These elicited salient Behavioral Beliefs, referents, and Behavioral Controls should not be applied across a variety of settings, since the elicited items may not apply in a different context. This limitation of TPB and TRA reduced the generalizability of the models. In contrast, decomposed models provide sets of belief, referents, and behavioral controls which are more stable across different settings and overcome the idiosyncratic problems in traditional intention models (Taylor and Todd 1995b). Venkatesh and Brown (2001) also supported Taylor and Todd's idea on the basis that plenty of extant research on technology adoption existed and therefore significantly reduced the necessity to elicit salient belief information about every newly introduced technology. Lastly, by decomposing the belief constructs into specific dimensions, the results can be understood more easily and provide managerial information about which factors really influence adoption behavior (Taylor and Todd 1995b). Thus managerial manipulation and intervention can be formulated more precisely and effectively. Therefore, it is reasonable and preferable to use the decomposing strategy for TPB.

2.2.5 A Reference Model for the Digital Inequality

One of the major strengths of TPB over TRA is its ability to analyze a situation where an individual does not have volitional behavioral control. Because people, especially those under-privileged, may not have volitional control over the necessary resources, skills, knowledge, and opportunities for a variety of reasons (Jackson et al.

2001, Jung et al. 2001, Kvasny 2002, Loges and Jung 2001), TPB shows its relative strength over TRA. Therefore, either TAM or TPB will be the ideal foundation for the base for model development.

TAM and TPB both have specific strengths for different purposes. TAM is parsimonious and has a reasonable prediction capability (Davis et al. 1989, Mathieson 1991, Taylor and Todd 1995b). Its focus on PU and PEOU is ideal for studying the design factors of a specific technology, assuming that PU and PEOU will be the central determinants for adoption behavior. TPB, on the other hand, tends to capture more information about the context, such as social and behavioral control aspects, rather than just the design factors. Social and behavioral control factors are not captured by TAM (Mathieson 1991, Taylor and Todd 1995b), since TAM focuses more on the characteristics of information technologies. However, these factors may be crucial in explaining the digital inequality phenomenon in which social and behavioral control factors are believed to be important.

In the context of digital inequality, social and behavioral control aspects are recommended as critical dimensions which influence individuals' behavior. For example, Payton (2003) pointed out the necessity to provide access to social networks for African-American students to be able to develop technology-based careers and address digital inequality. Kvasny (2002) illustrated how the social networks that one relies on also contribute to digital inequality. In addition, behavioral control factors, such as economic resources and digital skills are also believed to play important roles in the context of digital inequality. For instance, the limited economic resources controlled by the underprivileged is one of the major impediments that prevent these groups from acquiring

the necessary technologies. Dijk and Hacker (2000) and Kvasny (2002) have indicated how the lack of digital skills and knowledge can contribute to the inequality. As researchers call for alternative views to the pure technical perspective (DiMaggio et al. 2001, Jung et al. 2001, Kvasny 2002, Kvasny and Keil 2002), the social and behavioral control factors captured in TPB can provide further insight about adoption and use behavior in digital inequality.

Given the strength of TPB to capture more and better information about the social and behavioral control aspects of behavior, and the superiority of the decomposed approach over the traditional TPB, the decomposed TPB was chosen as the theory base for the development of the research model.

2.3 Diffusion of Innovation

In addition to AOI, diffusion of innovation (DOI) may also prove helpful in understanding digital inequality. Diffusion of innovation (DOI) has been a widely studied and accepted field, which tries to describe and explain the pattern and mechanism of the adoption of innovation. Instead of an individual, group, or organization, DOI looks at the adoption behavior of a collection of individuals, groups, or organizations. The stream of literature in DOI has provided useful guidelines for the theoretical development of AOI, especially in regards to information technology (Davis 1989, Davis et al. 1989, Moore and Benbasat 1991).

Given the similar results between DOI and digital inequality studies, the researcher's intention to use an AOI based theory (TPB), and the close relationship between DOI and AOI, the knowledge and insights in the DOI stream will benefit this project and assist in developing a theoretical explanation for digital inequality. In the

following section, I review some important and relevant works in the field of DOI, including Roger's theory of diffusion of innovation, Granovette's (1978) threshold model of diffusion, Valente's (1995) Exposure to Innovation, and DiMaggio and Powell's (1983) mimetic isomorphism.

2.3.1 Theory of Diffusion of Innovation

The most well known work in DOI is probably Rogers' (2003) psychological theory of diffusion of innovation. Rogers (2003) defined diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (p.5). He used diffusion to include both the planned and spontaneous spread of new ideas. The following sections review some important aspects of DOI.

2.3.1.1 The Innovation Decision Process

Rogers (2003) asserted that an individual's innovation decision, rather than being immediate, consists of successive stages of actions and decisions. The process unfolds as follows (Figure 2-7): an individual is first exposed to and obtains some knowledge about an innovation (knowledge stage); forms an attitude toward the innovation according to the obtained knowledge (persuasion stage); decides whether or not s/he will accept the innovation (decision stage); starts using/implementing the innovation (implementation stage); and finally, based on the experiences derived from initial engagement, decides whether to continue or discontinue the innovation (confirmation stage).

Knowing about an innovation is the first step of the process. People who tend to know about innovations earlier generally have a higher education level, higher socio-

economic status, more exposure to mass media, more change agent contact[4], more social participation, and are more cosmopolitan. Three types of knowledge are, in general, relevant to an innovation: awareness-knowledge, how-to knowledge, and principle knowledge[5]. People would ask questions like "What is the innovation?" "How do you use it?" and "Why does it work?" to get the answers for the three types of knowledge. At the Knowledge stage, awareness knowledge is the key for people to move to the next stage. However, lack of adequate how-to knowledge before adoption is likely to result in rejection or discontinuance at later stages.

Next, people's attitude toward an innovation is generally formed at the persuasion stage. Since innovations involve risk and uncertainty, people tend to search for innovation-evaluation information to reduce the uncertainty. Subjective opinions from close acquaintances, at this stage, play a significant role in shaping one's evaluation about the innovation. However, not everyone with a positive attitude actually adopts the innovation of interest. This discrepancy between attitude and action might happen when (1) the evaluation of the innovation becomes less positive or negative after taking harmful consequences into consideration, (2) people lack behavioral control because the innovation is not available or too expensive, and (3) individuals are socially isolated and have no social exchange of information about the innovation (Rogers 2003). These three reasons, to some extent, correspond to the affective, social, and behavior control aspects in TPB.

[4] A change agent is an individual who influences clients' innovation decision in a direction deemed desirable by a change agency (Roger 2003, p.27).
[5] Principle knowledge refers to the information about the functioning principles underlying how the innovation works (Rogers 2003)

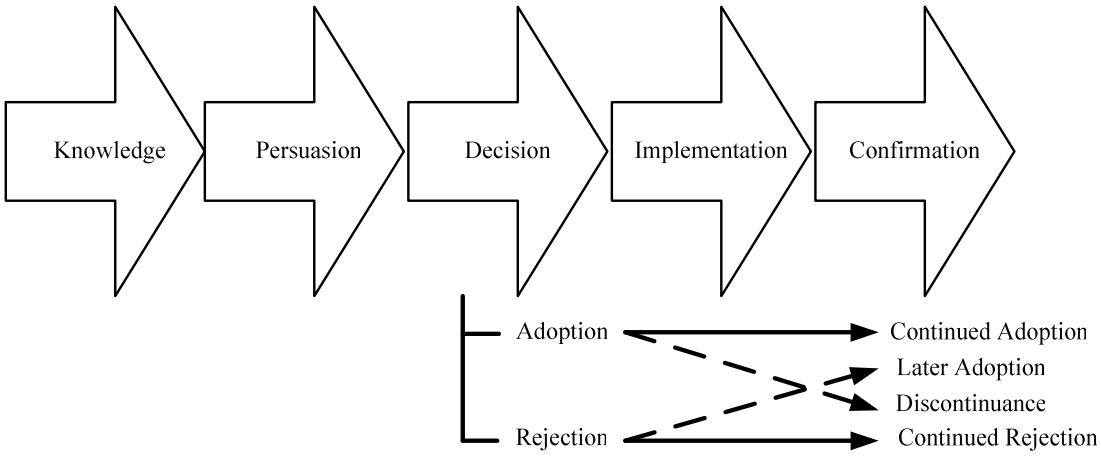


Figure 2-7: Rogers' Model of Stages in the Innovation-Decision Process (2003)

The choice of adoption or rejection occurs at the decision stage. Adoption, according to Rogers (2003), is "a decision to make full use of an innovation as the best course of action available" (p. 171). It is the behavioral intention about whether or not an individual will use the innovation. Next, implementation may take place right after the adoption decision, unless deferred by some logistical issues, such as the innovation not being available (Rogers 2003). At this stage, however, problems about the how-to knowledge become salient. Since people start personally engaging with the innovation, questions like "How do I use it?" "How does it work?" and "What operational problems am I likely to encounter, and how can I solve them?" (p. 173) emerge. Technical support from change agents, at this stage, is usually helpful to carry the new adopters over these challenges.

At the confirmation stage, individuals look for things that reinforce the pre-adoption decision or reverse the direction if exposed to contradictory messages of the innovation (Roger 2003). According to cognitive dissonance theory (Festinger1957), when a person feels a state of internal disequilibrium, s/he will modify his/her knowledge,

attitude, or action to reduce the dissonance. After an adopter obtains more experience in the actual use of an innovation, if s/he feels uncomfortable and regrets the earlier decision to adopt, s/he may discontinue using the innovation. (see Figure 2-7). If the individual initially decided not to adopt the innovation, s/he might obtain more pro-innovation information, causing dissonance that can be reduced by adopting the innovation. The discontinuance can either be: (1) a replacement discontinuance or (2) a disenchantment discontinuance. A replacement discontinuance involves the adoption a superior innovation by rejecting the pervious one. A disenchantment discontinuance, however, refers to rejection of the innovation due to dissatisfaction.

The relationship among the five stages is, in general, both successive and hierarchical (Rogers 2003). For example, the adoption decision must precede implementation activities. The factors important for individuals may be different across these stages because of the unique mechanisms in each stage. For example, Rogers claimed that mass media channels are more influential at the knowledge stage, while interpersonal channels are more important at the persuasion stage (Rogers 2003). He also suggested that inappropriate deployment of communication channels to a specific stage may prolong the diffusion process. Results in AOI studies also supported this view and found notable differences in factors affecting innovative behavior at different stages (Davis et al. 1989, Karahanna et al. 1999, Taylor and Todd 1995a, Thompson et al. 1994, Venkatesh and Brown 2001, Venkatesh and Davis 2000, Venkatesh and Morris 2000). However, no studies have investigated such differences beyond workplace settings and in the context of digital inequality.

2.3.1.2 The Characteristics of Innovation

After reviewing a series of diffusion studies, Rogers (2003) identified five characteristics showing consistent influence on adoption, including Relative Advantage, Compatibility, Complexity, Triability, Observability. The definitions of these characteristics are shown in Table 2-3. Rogers (2003) stated that individuals' perception of these characteristics would predict an innovation's rate of adoption.

Table 2-3: Definition of Innovation Characteristics (Rogers 2003)

Characteristics	Definition
Relative Advantage	The degree to which an innovation is perceived as being better than its precursor.
Compatibility	The degree to which an innovation is perceived as being consistent with the existing values, needs and past experiences of potential adopters.
Complexity	The degree to which an innovation is perceived as being difficult to use.
Triability	The degree to which an innovation may be experimented with before adoption.
Observability	The degree to which the results of an innovation are observable to others.

These characteristics were later applied and tested in various studies of information technology adoption (Cale and Eriksen 1994, Hoffer and Alexander 1992, Moore and Benbasat 1991, Taylor and Todd 1995b). Even the constructs Perceived Usefulness and Perceived Ease of Use in Davis's TAM (Davis 1989) can be mapped to these characteristics (specifically, Relative Advantage and Complexity).

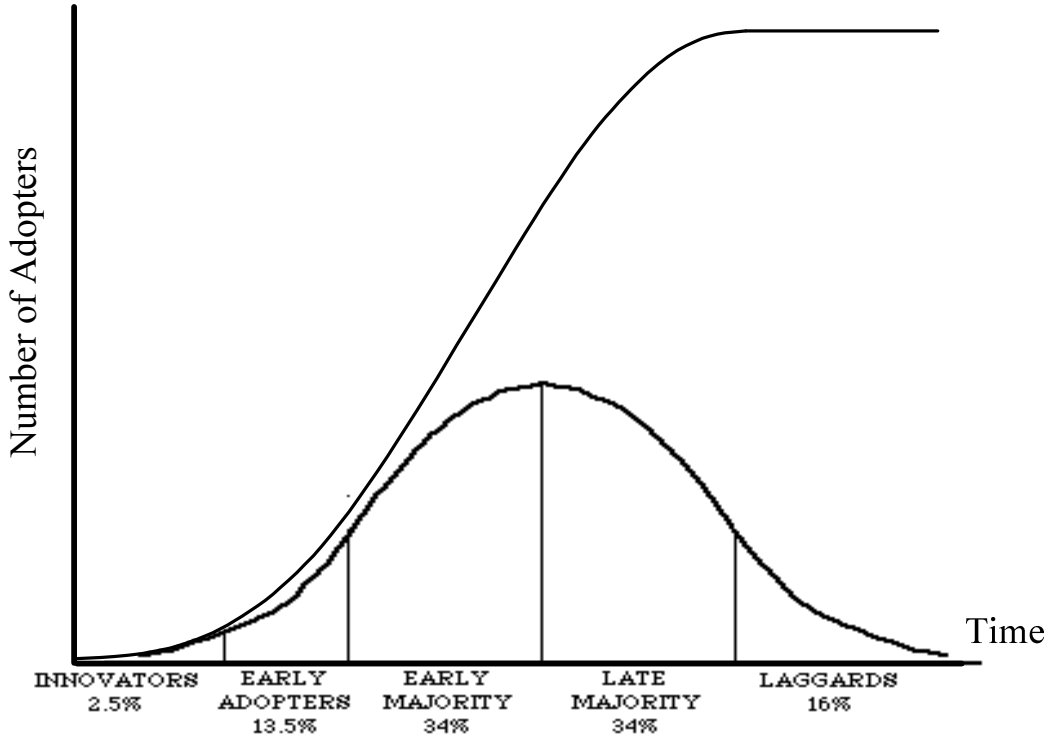
Further, Tornatzky and Klein (1982) conducted a meta analysis reviewing the relationships between ten characteristics of innovation (including the five discussed by Rogers) and adoption. They found that only Relative Advantage, Compatibility, and Complexity had consistent significant relationships across all types of innovations

assessed, and thus adoption of innovation should pay special attention to these characteristics (Moore and Benbasat 1991).

2.3.1.3 The Adopter Categories

Rogers (2003) categorized adopters into five types based on innovativeness, or "the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of a (social) system" (p.252). These five types are: Innovators, Early Adopters, Early Majority, Late Majority, and Laggards (see Figure 2-8). Rogers proposed that they would follow a bell-shaped normal curve when plotted over time. The cumulative curve is, of course, an S-shaped curve.

Figure 2-8: Adopter Categorization, S-Shaped Curve & Bell-Shaped Curve (Rogers 2003)



Bell-Shaped Curve: Number of adopters over time. -> showing categories of individual innovativeness and percentages within each category.
S-Shaped Curve: Cumulative number of adopters over time

Rogers (2003) identified that earlier adopters and later adopters in a social system differ along several dimensions. Earlier adopters tend to be higher in education, literacy, degree of upward mobility, and social status. Overall, the earlier adopters have higher socioeconomic status when compared to the later adopters. This observation is in accordance with the results in most digital inequality studies – privileged and under-privileged groups can usually be differentiated by their education attainment and socioeconomic status. The later adopters, the Late Majority and Laggards in particular, are more likely to belong to the under-privileged group.

In addition, earlier and later adopters also differ in personality and communication behavior. With regard to personality, earlier adopters tend to have greater empathy, less dogmatism, greater rationality, more favorable attitude toward science, less fatalism, and higher education and job participation (Rogers 2003). Finally, for communication behavior, earlier adopters have more social participation, better connection in social networks, more change agent contact, higher exposure to mass media, greater exposure to interpersonal communication channel, greater knowledge about innovation, and higher degree of opinion leadership.

Given the distinctive differences between groups, Rogers (2003) suggested employing an *audience segmentation strategy*. The approach that works for one group may not work for another (Rogers 2003). Therefore, he recommended that interventions be customized differently for each group, and to use specific communication channels or messages for each sub-audience.

2.3.2 Personal Exposure to Innovation: The Threshold Model of Diffusion and Mimetic Pressure

> *The heart of the diffusion process is the modeling and imitation by potential adopters of their near-peers' experiences who have previously adopted a new idea.*
>
> (Rogers 2003, p.330)

People's subjective assessment of an innovation to a large extent flows through their social networks. In making decisions about whether or not to adopt an innovation, individuals rely mainly on the experience shared from others like them who have already adopted the innovation (Rogers 2003). Individuals' *exposure*[6] (Valente 1995) to the innovation in a social system will influence their adoption behavior. Rogers indicated, "The diffusion effect is the *cumulatively* increasing degree of influence upon an individual to adopt or reject an innovation, resulting from the activation of peer networks about an innovation in a social system" (Rogers 2003, p. 234). Grannovette's (1978) threshold model of diffusion provides insight into this cumulating effect.

Granovette (1978) postulated that individuals were not homogenous in the extent to which their behavior would be influenced by the behavior of others in the social system. He defined an individual's threshold as "the proportion of the groups he would have to see join before he would do so" (p. 1422). The degree that an individual is affected by others in the social system is related to their threshold (Granovetter 1978). At the individual level, the threshold model assumes that people have different thresholds for adoption of innovation. Based on the proposition that earlier adopters might have

[6] Valente (1995) defined exposure as the proportion of adopters in one's personal network.

lower thresholds for adoption and later adopters have higher ones, this heterogeneity causes individual differences in the timing of adoption behavior (Granovette 1978). Following is an illustrative example provided by Granovette (1978):

> Imagine 100 people milling around in a square – a potential riot situation. Suppose their riot thresholds are distributed as follows: There is one individual with threshold 0, one with threshold 1, one with threshold 2, and so on up to the last individual with threshold 99. This is a distribution of thresholds. The outcome is clear and could be described as a 'bandwagon' or 'domino' effect: The person with threshold 0, the 'instigator,' engages in riot behavior – breaks a window, say. This activates the person with threshold 1. The activity of these two people then activates the person with threshold 2, and so on, until all 100 people have joined.

Earlier in the threshold model of diffusion, the concept of exposure concerns the proportion of people who have adopted the same behavior in the social system (Granovette 1978). When considering exposure to innovation, Valente (1995), however, suggested a slightly different view when *observability* and *uncertainty* are considered. Unlike publicly observable behaviors, such as rioting, for diffusion of innovation, individuals may not directly observe the behavior of every other person in the social system, and can only rely on information through their personal network. Further, because innovations are often uncertain, risky, and ambiguous (Menzel and Katz 1955), an individual will turn to those who have adopted the innovation to find more information to reduce the uncertainty (Cancian 1979). Valente (1995) thus suggested limiting the

consideration of exposure to innovation to an individual's personal network. Therefore, exposure may be conceptualized as the proportion of "prior adopters in an individual's personal network".

On the other hand, social learning theory (Bandura 1977) suggests that individuals can learn from someone with whom they are unacquainted and is not limited to direct contact in their personal network. This theory is in line with the initial idea that an individuals' exposure to innovation is the proportion of the social system that have adopted an innovation. Therefore, it is probable that both exposures in relation to the personal network and the social system should be subject to examination.

A complementary perspective to the threshold model of diffusion is the concept of "mimetic isomorphism" proposed by DiMaggio and Powell (1983). DiMaggio and Powell (1983) introduced three mechanisms of institutional isomorphic changes: coercive isomorphism, mimetic isomorphism, and normative isomorphism. These concepts of isomorphism were intended for analysis at the organization level. Among them, mimetic isomorphism results from organizations' standard response to uncertainty in the environment.

When technologies are poorly understood, goals are unclear, or the environment creates uncertainty, organizations may model themselves after other organizations in order to obtain legitimacy in the social environment (DiMaggio and Powell 1983). Organizations will mimic the behaviors of similar or equivalent organizations which occupy a comparable network position in the same industry (Burt 1987). This mimetic action can either be intentional or unintentional behavior (DiMaggio and Powell 1983),

similar to Rogers' notion that diffusion of innovation includes both planned and spontaneous diffusion behavior.

Mimetic Pressure, which refers to the cumulative portion of adopters in the social system (1997), is the driving force for the mimetic isomorphism. When facing uncertainty, such as a problem with an uncertain solution (Teo et al. 2003), the cumulative percentage of adopters in the environment will influence an organization to model the behavior of the adopters, in order to (1) minimize the information search costs (Cyert and March 1963, Levitt and March 1988), (2) economize experimentation costs (Levitt and March 1988), (3) avoid first mover risks (Lieberman and Montgomery 1988), and/or (4) avoid embarrassment if a certain behavior has been taken for granted or legitimized (Fligstein 1985, Goostein 1994)

A handful of empirical studies have shown that organizations do mimic the behavior of other organizations in the competitive environment, especially when facing uncertainty. Palmer et al. (1993) and Fligstein (1985) found that the prevalence of a multi-divisional organization form did influence later organizations to adopt such an organization structure. This effect has also been found in organizations' adoption of matrix management (Burns and Wholey 1993), municipal reform (Knoke 1982), and curriculum change in liberal art colleges (Kraatz 1995). Banker and Kauffman (1988) found that automatic teller machines (ATM) became pervasive in the banking industry before their business value was proven, presumably because firms were copying each other. Haunschild and Miner (1997) identified a positive and significant correlation between whether a firm chooses to use a specific investment bank in the current year and the number of other firms using the same bank during the prior three years. Teo et al.

(2003) also identified a significant relationship between the number of a firm's competitors adopting a financial information technology and the firm's decision to follow the action. Interestingly, evidence exists to support the idea that an organization's adoption behavior relates to the proportion of the adopters in the entire system (e.g., Burns and Wholey 1993). Evidence also exists that an organization's adoption behavior relates to the proportion of the adopters in a more specific local network (e. g. Kraatz 1995). In general, the extent of adoption of certain innovations by other members in the environment or, in other words, the mimetic pressure, will positively influence the adoption decision of a member that has not adopted the innovation.

Although the mimetic process was intended to describe the isomorphism at the organization level, it is not unreasonable to adapt this concept to assess adoption behavior at the individual level. The mimetic process and the threshold network model are actually two aspects of the same thing. These two concepts both concern one's *exposure* (Valente 1995) to innovation in the social system –that is, the cumulative proportion of adopters in the social system. When facing an innovation, an individual's *exposure* to innovation, or the cumulative proportion of adopters in the individual's personal network and the social system may jointly influence the individual to model others' behavior.

2.3.3 Diffusion of Innovation and the Theory of Planned Behavior

Within the TPB model, the construct Subjective Norm (SN) refers to an individual's perceived expectation from referent others for the individual to perform certain behavior (Mathieson 1991). The "referent others" usually mean the important people in one's personal network or social system so SN, to a certain degree, captures the social exchange aspect of the diffusion of innovation. Through the communication

between an individual and his or her contacts in their social systems, information and perspectives about the innovation are exchanged. Thus, others' beliefs about a certain innovation established through their adoption experience may flow to the individual and, in turn, influence the individual's intention and behavior.

However, SN in TPB does not explicitly capture the "aggregate" aspect of other members' behavioral influence in the social system. SN considers the "perceived expectation" from "important others" toward an individual. Unlike the exposure concept in the personal threshold model or mimetic pressure, SN does not openly consider the influence from "unimportant" or "unacquainted" members in the social system, nor does it explicitly take the aggregate or cumulative influence from others' behavior into consideration. SN is classified as a cognitive belief which focuses on personal "perception" about important others' "expectation," while the exposure to innovation is based on personal "observation" concerning other members' "behavior." The "perceived expectation from important others" is conceptually quite different from the "observed behavior of other members."

Given the limitations of TPB in capturing some important mimetic effects in DOI, to capture the diffusion effect in the digital inequality phenomenon, it is necessary to expand TPB to incorporate the aggregate/cumulative behavioral influence of other members within a social system.

2.4 Trust

2.4.1 The Importance of Trust

Trust is a widely discussed concept in social science and has been empirically examined in many fields, such as psychology, economics, and sociology, marketing, management, and information systems. Researchers have posited that trust is one of the most fundamental and critical factors of society and social order (Gefen et al. 2003, Luhmann 1979, Rotter 1971), business relationships (Chai and Pavlou 2002, Dasgupta 1988, Fukuyama 1995, Gambetta 1988, Gefen 1997, Gefen et al. 2003, Gulati 1995, Pavlou 2001), national wealth, prosperity, adaptability (Fukuyama 1995), and adoption of information technology (Fukuyama 1995, Gefen 1997).

Why is trust important in social science? Arising from the need that people have to comprehend what, when, why, and how others behave in the social environment; trust is an essential element in many economic activities (Gefen et al. 2003). Enumerating the possible outcomes and contingencies in many social situations can be overwhelming (Luhmann 1979). The high level of social complexity, which is a result of the unpredictability of others' behavior, makes it difficult and complicated for human beings to understand the social environment. To deal with such complexity, human beings adopt a variety of social complexity reduction strategies (Luhmann 1979). Luhmann (1979) indicated, "trust is required for the reduction of a future characterized by more or less indeterminate complexity" (p.15). Trust becomes the key complexity reduction strategy if rules and customs are not available to control or regulate the social environment (Luhmann 1979).

In social relationships, trust is based on a priori beliefs concerning the behaviors of others (Gambetta 1988). By trusting others, people act (perhaps irrationally) as if they know about the future (Luhmann 1979) and thus reduce perceived risk (Lewis and Weigert 1985, Luhmann 1979, Zand 1972) and believe that trustees will not take advantage of the situation. Trust thus enables interdependencies between parties and is an even more prominent determinant if the relationships, or interdependencies, between parties involve the current cost in exchange for a future, non-articulated, and non-enforceable benefit (Blau 1964, Fukuyama 1995, Gefen 1997, Lewis and Weigert 1985, Luhmann 1979). When social uncertainty exists and knowing how others will behave is difficult to predict, trust is a key factor in both social (Blau 1964) and business relationships (Fukuyama 1995, Moorman et al. 1992).

2.4.2 The Conceptualization of Trust

Previous research has conceptualized trust, both theoretically and operationally, in many different ways and, consequently, caused confusion (Gefen et al. 2003, McKnight et al. 2002, McKnight et al. 1998, Shapiro 1987). With a goal of creating a more comprehensive understanding, Gefen et al. classified researchers' views of trust into four major categories: (1) a set of specific beliefs with the integrity, competence, predictability, and benevolence (Doney and Cannon 1997, Ganesan 1994, Gefen et al. 2003), (2) an overall belief if the party of interest is trustworthy (Gefen 2000, Gefen et al. 2003, Hosmer 1995, Moorma et al. 1992), or trusting intentions (McKnight et al. 1998), or "the 'willingness' for one party to be vulnerable to the action of another" (Mayer et al. 1995, p.712), (3) the "feelings of confidence and security in the caring response" of others (Rempel et al. 1985), or (4) the combination of these factors (Gefen et al. 2003).

Some researchers have claimed that the specific beliefs are the antecedents to the overall belief (Jarvenpaa and Tractinsky 1999, Mayer and Davis 1999, Mayer et al. 1995). Doney and Canon (1997) combined these two concepts as one integrated construct. Jarvenpaa and Tractinsky (1999) labeled specific beliefs as "trustworthiness". Following the thoughts of Ajzen and Fishbein (Ajzen 1985, Ajzen 1991, Ajzen and Fishbein 1980, Fishbein and Ajzen 1975) who categorized constructs into beliefs, attitudes, intentions, and behaviors, McKnight et al. (2002) and Gefen et al. (2003) conceptualized the specific beliefs (i.e. integrity, competence, predictability, and benevolence) as the antecedents to the intentions to engaged in trust-related behaviors. This distinction between beliefs and intentions is consistent with the theoretical foundation of TRA, TPB, and TAM, and permits a theoretical integration between the trust construct and the above theories (Gefen et al. 2003).

With the distinction of various perspectives in mind, this research project adopts the notion that trust is a set of specific beliefs described by integrity, competence, predictability, and benevolence, and separated from the behavioral intention and behavior of interest.

2.4.3 Trust in Adoption and Use of ICT

Recently, trust has received significant attention in some fields of ICT, such as open source software development (Gallivan 2001, Stewart and Gosain 2001), virtual team/communities/organization (Gallivan 2001, Stewart and Gosain 2001, Tung et al. 2001), e-government (Warkentin et al. 2002), e-commerce (Gefen 2000, Gefen et al. 2003, Pavlou 2001, Pavlou and Gefen 2002), and so forth. By examining these ICT

related topics in which trust plays a pivotal role, it is noteworthy that trust has become essential for computer-mediated or Internet-related activities

Some of these studies extended the theories applied for ICT adoption and use behavior by adding the trust construct into discussion and investigation. For example, Gefen (1997) and Gefen et al. (2003) extended TAM by incorporating trust to explain how freeware and online shopping activities occur. Chai and Pavlou (2002) integrated trust into TPB to explain the cross-cultural e-commerce adoption behaviors. Relationships associated with trust were shown to be significant in these models. It is, therefore, worthwhile to consider whether trust is useful in explaining other computer-mediated or Internet-related phenomena, such as digital inequality.

2.4.4 Individuals' Trust toward Institutions in Digital Inequality

As established earlier, digital inequality concerns inequality in the access and use of ICT. Having reviewed the rationale to include trust when studying adoption and use of ICT, it is reasonable to investigate the role that trust plays in the digital inequality phenomenon.

In prior studies of digital inequality, trust has proved to be an important factor. In a study of Internet use by Ervin and Gilmore (1999), which compared European Americans and African Americans, the latter were found to have less trust in government authorities and were more likely to consider the Internet as a surveillance tool. Ervin and Gilmore (1999) argued that African Americans, as an underprivileged group, have experienced many events which violated their trust toward the government, such as "government-sanctioned medical experiments or unfulfilled political promises" (p. 406). In another study, Jackson et al. (2001) also found that African Americans, when

compared with European Americans, were more likely to believe that authorities could monitor their Web activities, which resulted in less Internet use.

The lack of trust toward government institutions based on prior resident-government interaction can also be seen in the case of southern Summerhill, Atlanta (Kvasny 2001). In order to build the Olympic Stadium neighborhood, the Atlanta city government promised the poor residents originally in southern Summerhill that a mixed-income community would be built. The promises were unfulfilled five years later and this resulted in residents' distrust toward the government. It is, therefore, apparent that individuals' trust in the government institutions may play an important role in explaining the digital inequality phenomenon.

The role of all levels of governments in supporting the diffusion of the information superhighway is pivotal and catalytic (USACNII 1996). Governmental institutions are supposed to provide leadership, stimulate competition, offer services beyond those offered by private sectors, protect intellectual property and security, and promote and ensure universal service and access, etc. (USACNII 1996). Since most initiatives to address digital inequality were sponsored or headed by local, state, or federal governments to boost the adoption and use of information technology (which would include the Internet TV project in LaGrange), it is imperative to investigate people's trust in governmental institutions and the consequences of trust or lack of trust. In this research project, the LaGrange city government was the initiator of the Internet TV project, and invested considerable financial and human resources toward that end. This project offers an opportunity to examine the role of trust in the digital inequality phenomenon.

Digital inequality researchers have suggested the importance of capturing the social aspect, rather than just the technological one, in studying the phenomenon (Kvasny 2002, Payton 2003). Trust has also been pointed out as a key factor explaining social relationships (Blau 1964, Gibb 1961, Luhmann 1979). Thus, by investigating trust, more important information can be gleaned about the social aspect of digital inequality.

2.5 Conclusion and Research Questions

2.5.1 Conclusion

Digital inequality, as discussed earlier, is a fairly complex phenomenon. Although the profile and pattern of the inequality has been revealed through many descriptive studies, the need to advance the theoretical explanation for the phenomenon remains (DiMaggio et al. 2001). Given the current stage of knowledge of digital inequality, researchers have suggested many directions for further theoretical development and investigation. This paper incorporates and looks into several of these important aspects.

The solid psychological foundation of AOI provides an excellent base to advance the theoretical development of the phenomenon. The theory of planned behavior (TPB) may offer a behavioral model explaining how and why the under-privileged and privileged behave differently. To fully assess digital inequality, it is necessary to go beyond just the technical view of the inequality and incorporate more individual, social, institutional, and contextual factors, such a government programs and pricing policies (DiMaggio et al. 2001, Jackson et al. 2001, Joseph 2001, Loges and Jung 2001, Payton 2003). TPB, when compared to other theories and models explaining technology

adoption and use, has the advantage of being able to capture important social and contextual factors (Taylor and Todd 1995b, Mathieson 1991).

Since diffusion of information technology is an important aspect of digital inequality, the knowledge from the stream of DOI can also facilitate the development of a research model for this research. The characteristics of innovation, the mimetic process, and the threshold models of diffusion will all inform this research model. Furthermore, in the literature review, I have suggested that extending TPB to incorporate individuals' trust toward government institutions is important because of the role that trust plays in the social aspect of technology acceptance, and the critical role that government institutions play in addressing digital inequality. By integrating theories in AOI, DOI, and trust, the research model is capable of examining the affective, social, contextual, institutional, and policy aspects of the phenomenon in detail. It also reflect the complex multi-faceted nature of digital inequality.

The stream of AOI has reached a high level of sophistication, but further theoretical development is still desirable, and may include adding variables related to organizational or social factors, as well as testing models with different subjects and technologies, and in different settings. (Legris et al. 2003). By applying TPB in the context of digital inequality and by integrating other factors with TPB, valuable knowledge regarding the theoretical development of AOI will be added to the literature.

2.5.2 Research Questions

As discussed in chapter 1, this paper focuses on theoretically investigating the differences in ICT innovation behavior (1) between the privileged and under-privileged groups and (2) between the people, particularly the under-privileged, at different

innovation stages (i.e. pre-adoption and post-adoption). Thus, this research focuses on two groups of people and two stages of innovation. Table 2-4 illustrates the relationship between the two dimensions.

Table 2-4: Groups vs. Innovation Stages

Stage / Groups	Non-Adopter (Pre-Adoption)	Adopter (Post-Adoption)
Privileged	***Quadrant 1*** Privileged Non-Adopters	***Quadrant 3*** Privileged Adopters
Under-Privileged	***Quadrant 2*** Under-privileged Non-Adopters	***Quadrant 4*** Under-privileged Adopters

Since my major interest lies in stimulating ICT acceptance among the under-privileged people, comparing the behavioral models of under-privileged non-adopters (quadrant 2) and adopters (quadrant 4) permits the understanding of (1) the factors that drive the under-privileged's innovation behavior at distinct phases of ICT implementation and (2) the differences between these factors. We can thus determine if digital inequality interventions should be designed differently for people at different innovation stages. Given that Behavioral Intention has been suggested as the best predictor for actual behavior (Ajzen 1985, 1991; Karahanna et al. 1999) and focusing on BI, instead of actual behavior, has been a common approach used in many AOI studies (Legris et al. 2003), I focus on BI (i.e. intention to use) as the key dependent variable in this dissertation. Therefore, for the comparison between quadrant 2 and 4, the above discussion leads to the following three research questions:

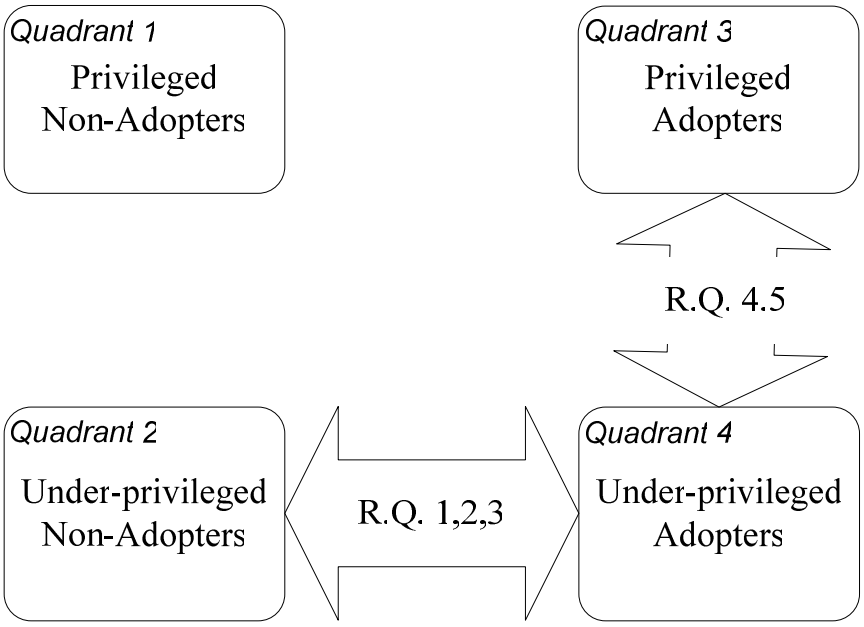
RQ 1: For under-privileged people, are there differences in the behavioral models that characterize non-adopters' and adopters' intention to use an ICT innovation? If so, does TPB help explaining these differences?

RQ 2: Where are the points of leverage for policy makers to influence intention to use an ICT innovation among under-privileged adopters and non-adopters?

RQ 3: Can TPB be meaningfully extended to include "exposure to innovation" and "trust in government"?

Figure 2-9 shows the relationships between the research questions and the related quadrants/groups.

Figure 2-9: Research Questions and Related Groups



With regard to the comparison of behavioral models between the privileged and under-privileged, I focus on contrasting privileged adopters (quadrant 3) and under-privileged non-adopters (quadrant 4). This comparison allows the investigation of (1) the

determinants of the under-privileged and privileged adopters' ICT use intention and (2) the differences between their use intention and the determinants that cause them. As a result, we can understand if policy-makers need to adopt a segmentation strategy to formulate interventions differently for the privileged and the under-privileged.

RQ 4: Are there differences in ICT use intention and factors that drive intention when we compare privileged and under-privileged adopters? If so, does TPB help explaining the differences?

RQ 5: What factors are the most influential in driving ICT use intention?

Chapter 3: Research Model, Theory Development, and Hypotheses

This chapter presents the research models and hypotheses of the two comparisons:

(1) The comparison of the behavioral models, which characterize individual behavioral intention to use ICT, between the under-privileged non-adopters and adopters.

(2) The comparison of the ICT use intention models between the under-privileged and privileged adopters.

There is one research model for each comparison. These models are first described at an overall level in section 3.1. A more detail discussion of the development of the models and hypotheses is offered in section 3.2 and 3.3 for each comparison (Figure 3-1).

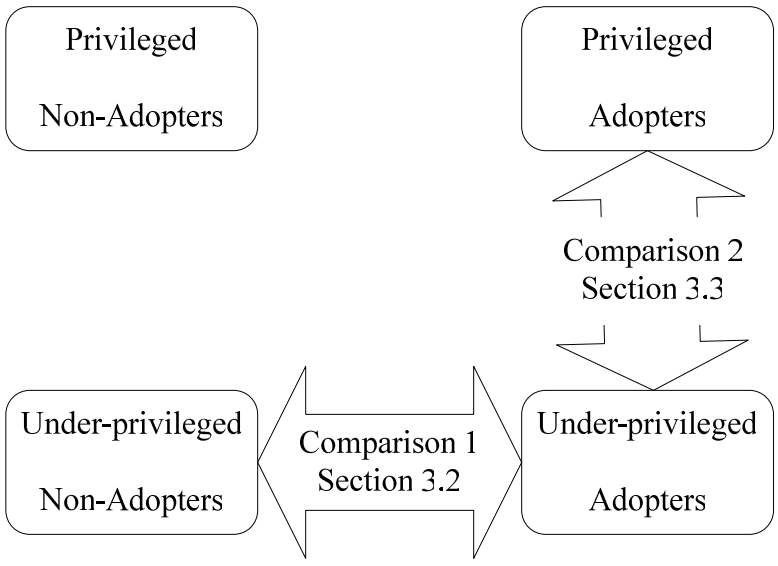


Figure 3-1: Comparisons Between Groups

3.1 Research Models

3.1.1 Modeling Behavioral Intention: Comparison 1

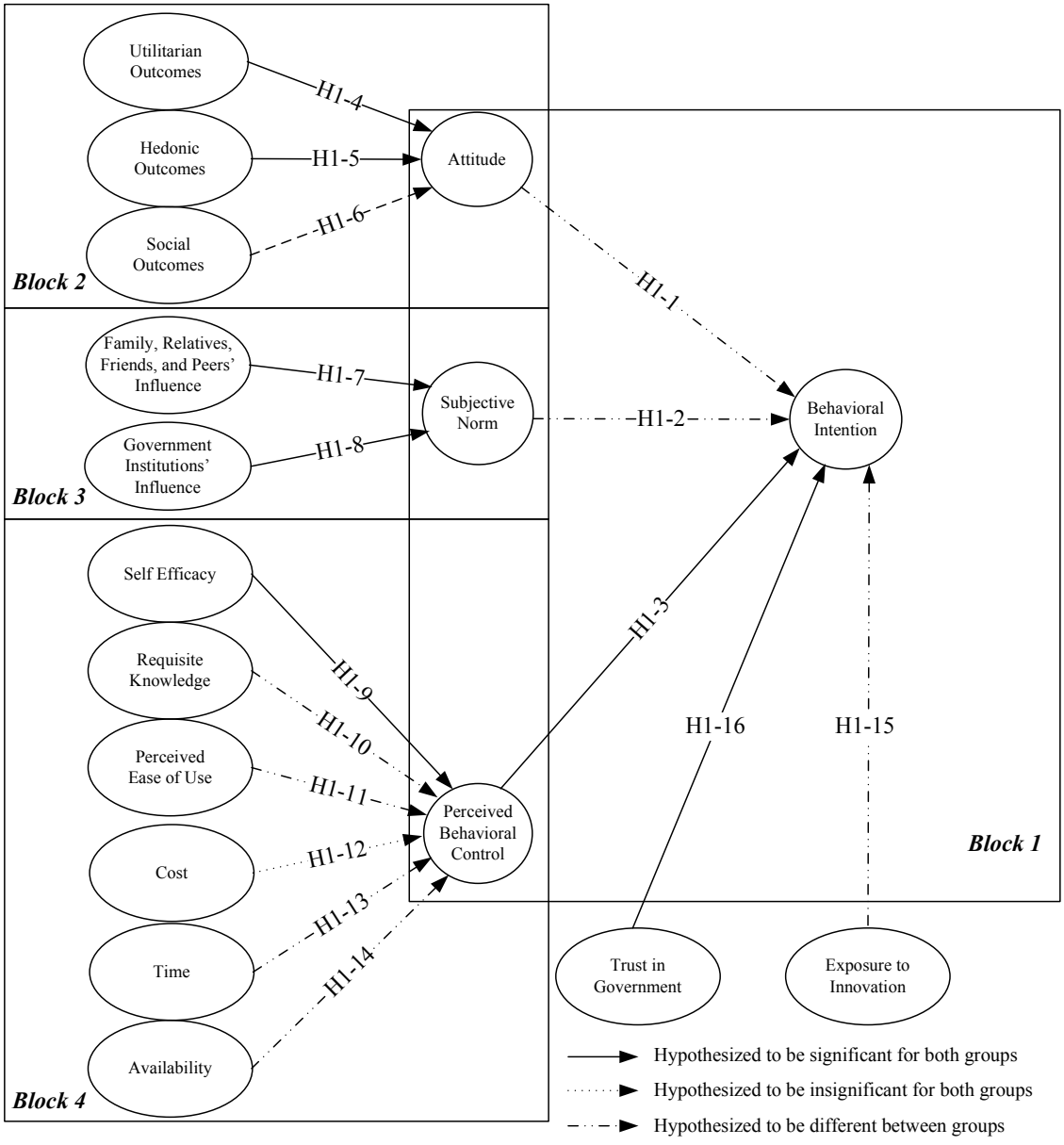


Figure 3-1-1: Research Model – Between Under-Privileged Non-Adopters and Adopters

Figure 3-1-1 presents the general research model for the comparison between the under-privileged adopters and non-adopters. This model represents the behavioral model of individuals' intention to use ICT. The key dependent variable is Behavioral Intention. Given that usage behavior only occurs after adoption, and that TRA and TPB suggest

Behavioral Intention as the best predictor of Behavior, focusing on Behavioral Intention permits meaningful comparisons between under-privileged adopters and non-adopters. For under-privileged non-adopters and adopters, the behavioral intention stands for individuals' intention to start and continue using ICT respectively. The unit of analysis for the model is the individual. The definitions of the constructs and the sources that inform these constructs are presented in Table 3-1.

Consistent with Taylor and Todd (1995) and Venkatesh and Brown (2001), a decomposed TPB (DTPB) model is proposed as a base model. The DTPB model consists of four major blocks. The first block represents the basic TPB model. The second, third, and fourth blocks represent the decomposed belief structure for Attitude (A), Subjective Norm (SN), and Perceived Behavior Control (PBC), respectively. In the first block, an individual's Attitude, Subjective Norm, and Perceived Behavioral Control influence an individual's Behavioral Intention. In the second block, Attitude is decomposed into and directly affected by specific belief dimensions, including Utilitarian Outcomes, Hedonic Outcomes, and Social Outcomes. In the third block, Subjective Norm is decomposed into and directly affected by specific belief constructs, including Family, Relatives, Friends, and Peers' Influence and Government Institutions' Influence. In the fourth block, Perceived Behavioral Control is decomposed into and influenced by two major components: Internal and External Control. Internal Control consists of Self-Efficacy (SE), Requisite Knowledge (RK), and Perceived Ease of Use (PEOU); External Control is composed of Cost, Time, and Availability. The specific belief constructs in the second, third, and the fourth blocks represent the multi-dimensionality of the major belief constructs (i.e. Attitude, Subjective Norm, and Perceived Behavioral Control).

Beyond the basic decomposed TPB model, additional constructs have been added to the model to capture important information about the social and institutional aspects in the digital inequality phenomenon, including Exposure to Innovation and individual's Trust in Government. As discussed in chapter two, TPB does not explicitly capture the contagious effect of the cumulative portion of adopters in one's personal network and the social system. The construct Exposure to Innovation was thus added to capture this effect. Exposure to Innovation is hypothesized to positively influence Behavioral Intention. Meanwhile, government institutions play a significant role in initiatives promoting universal Internet access and addressing digital inequality (USACNII 1996). Whether people trust or distrust the government may influence individuals' acceptance of the Internet (Ervin and Gilmore 1999, Jackson et al. 2001, Kvasny 2002). By adding the construct Trust in Government, I intend to capture more information to strengthen the explanatory power of the research model for the digital inequality phenomenon. Individuals' Trust in Government is hypothesized to influence Behavioral Intention.

3.1.2 Modeling Behavior: Comparison 2

The second comparison focuses on the inequality in the ICT use intention between the under-privileged and privileged adopters. With the same theoretical foundation, this model is in general similar to the behavioral intention model proposed in section 3.1.1.

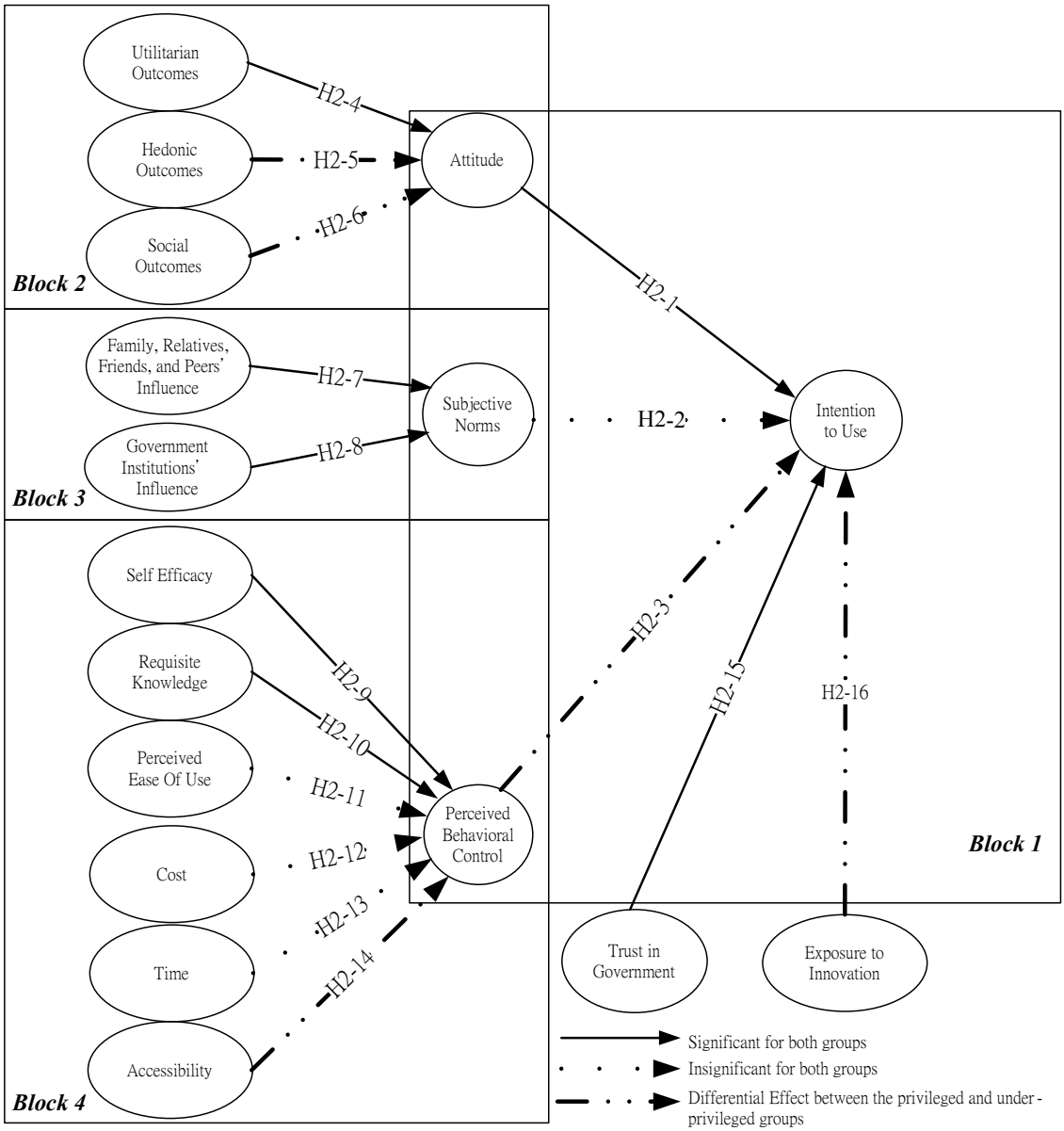


Figure 3-1-2: Research Model – ICT Use

For both models, some relationships proposed in the DTPB model have been introduced and tested separately in prior studies (see Table 4-1), but were not tested as a whole in a voluntary and non-organizational setting. In addition, these relationships have not been tested in the context of digital inequality with the presence of a government intervention, and no one has ever used the model to explain and analyze the digital inequality phenomenon.

Table 3-1: Construct Definition and Sources

Construct	Definition	Sources inform the construct
Attitude (A)	Individual's evaluation of the behavior of interest	(Ajzen 1985, 1991, Ajzen and Fishbein 1980, Ajzen and Madden 1986)
Utilitarian Outcomes (UO)	The extent to which performing the behavior enhances the effectiveness of personal related activities	(Venkatesh and Brown 2001, Compeau and Higgins 1995)
Hedonic Outcomes (HO)	The pleasure and inherent satisfaction derived from performing the behavior of interest	(Venkatesh and Brown 2001, Davis et al. 1992, Venkatesh 1999)
Social Outcomes (SO)	The social status gained because of performing the behavior	Venkatesh and Brown 2001, Rogers 2003, Fisher and Price 1992)
Subjective Norm (SN)	The perceived expectation from referent others for an individual to perform the behavior of interest	(Ajzen 1985, 1991, Ajzen and Fishbein 1980, Ajzen and Madden 1986)
Family, Relatives, Friends, and Peers' Influence (FRFP)	The perceived expectation from family, relatives, friends, and peers for an individual to perform the behavior of interest. (Peers: one that is of equal standing with another, *especially*: one belonging to the same societal group especially based on age, grade, or status /from Webster.com)	(Burnkrant and Cousineau 1975, Childers and Rao 1992, Miniard and Cohen 1979, Venkatesh and Brown 2001, Taylor and Todd 1995b, Karahanna et al. 1999)
Government Institutions' Influence (GII)	The perceived expectation from government institutions for individuals to perform the behavior of interest	(Kvasny 2002, DiMaggio and Powell 1983, Keil et al. 2003)
Perceived Behavioral Control (PBC)	An individuals' perception of existence or nonexistence of required resources and opportunities to perform the behavior of interest	(Ajzen 1985, Ajzen 1991, Ajzen and Fishbein 1980, Ajzen and Madden 1986)
Self-Efficacy (SE)	The belief in one's capabilities to organize and to execute the course of action required to attain a goal	(Bandura 1977, Compeau and Higgins 1995)
Requisite Knowledge (RK)	Knowledge required to perform the behavior of interest	(Ajzen 1985, 1991, Ajzen and Fishbein 1980, Ajzen and Madden 1986, Venkatesh and Brown 2001)
Perceived Ease of Use	The degree to which an individual believes that performing the behavior of	(Davis 1989, Davis et al. 1989)

(PEOU)	interest would be free of effort	
Cost	The cost necessary to perform the behavior of interest	(Ajzen 1985, 1991, Ajzen and Fishbein 1980, Ajzen and Madden 1986, Venkatesh and Brown 2001, Taylor and Todd 1995b)
Time	The time necessary to perform the behavior of interest	(Ajzen 1985, Ajzen 1991, Ajzen and Fishbein 1980, Ajzen and Madden 1986)
Availability	The availability of the resource to perform the behavior of interest when needed	(Taylor and Todd 1995b, Kvasny 2002, Meader et al. 2001)
Trust in Government (Trust)	The expectation that government institutions will not behave opportunistically by taking advantage of the situation	(Doney and Cannon 1997, Ganesan 1994, Gefen et al. 2003, McKnight et al. 1998, 2002)
Exposure to Innovation	The proportion of adopters in the personal network and social system	(Valente 1995, DiMaggio and Powell 1983, Palmer 1993, Fligstein 1985)
Behavioral Intention (BI)	The intention to perform the behavior of interest	(Ajzen 1985, Ajzen 1991, Ajzen and Fishbein 1980, Ajzen and Madden 1986)

3.2 Under-privileged Non-Adopters vs. Under-privileged Adopters

This section describes the development of the research model and hypotheses for under-privileged non-adopters and adopters' behavioral intention to use ICT (Figure 3-2-1). It starts with TPB and then decomposes the three belief constructs in TPB. Finally, the discussion extends to Exposure to Innovation and Trust in Government.

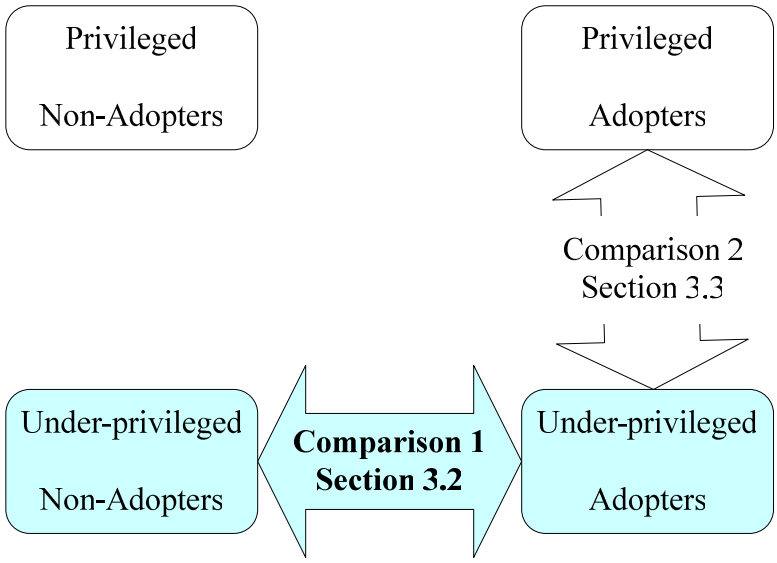


Figure 3-2-1: Under-privileged Non-Adopters vs. Adopters

Researchers, such as Rogers (2003), have viewed the innovation decision process as a temporal sequence that involves different stages (e.g. pre-adoption and post-adoption). On the other hand, studies have proposed and identified important factors for innovation decisions, such as perceived usefulness, perceived ease of use, attitude, subjective norm, and so forth (Legris et al. 2003). Theories have asserted that the salience and effect of a specific factor on individuals' innovation decisions may change as people gain more experience (Rogers 2003, Karahanna et al. 1999). Studies in

cognitive psychology (Bem 1972, Cummings and Venkatesan 1976) suggested that direct experience may alter individuals' earlier beliefs toward the behavior. Day (1969), in marketing research, argued that actual engagement with a product may change individuals' prior attitude toward it and influence the following purchasing or re-purchasing decisions. Triandis (1971) claimed that the influence of affect and social influence on one's behavior will attenuate as people have more experience. Consequently, factors important for people at the earlier stage of innovation may be different from those at the later stage. Empirical evidence in ICT studies supported this notion and found differences in antecedents of innovation behavior for people at distinct stages (Davis et al. 1989, Karahanna et al. 1999, Taylor and Todd 1995a, Thompson et al. 1994, Venkatesh and Brown 2001, Venkatesh and Davis 2000, Venkatesh and Morris 2000).

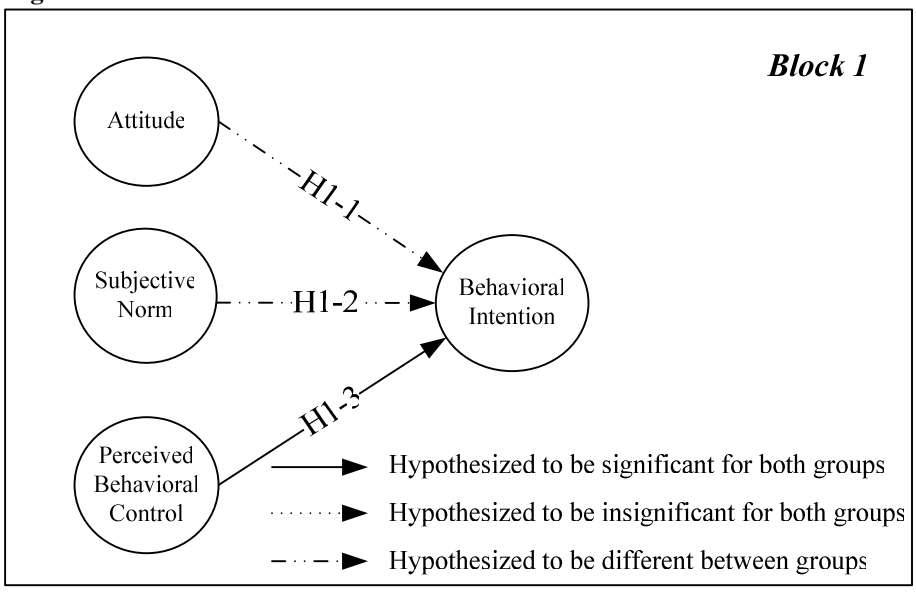
Among the theories for ICT acceptance (i.e. TAM, TRA, and TPB), TPB was selected as the theoretical foundation for the development of the research model. As discussed in section 2.2.5, TPB is ideal for studying digital inequality given its strength in capturing the complexity embedded in the phenomenon. Though I expect the relationships in TPB to hold for both under-privileged adopters and non-adopters, I also expect notable differences between the two groups.

Self-prescription theory (Bem 1972) and cognitive dissonance theory (Festinger 1957) claim that people's personal experience gained through actual behavior will alter their prior attitude toward behavior. Personal experience, compared to indirect experience, is considered to be more reliable and should somehow reflect people's attitude. Attitude based on direct experience also demonstrated higher behavioral predictive validity than attitude based on indirect experience (Fazio and Zanna 1978a, b,

Fazio and Zanna 1981). In ICT implementation, people at the earlier stage of innovation, such as non-adopters, primarily depend on indirect experience to form their beliefs (Karahanna et al. 1999). As people become more experienced in interacting with the technology, direct experience assumes higher weight in shaping attitude. Consequently, the influence of attitude on behavior tend to become stronger (Karahanna et al. 1999, Venkatesh and Morris 2000). Although attitude should be an important behavioral determinant for most individuals, it is reasonable to expect a stronger effect for adopters than non-adopters

H1-1: Attitude will have less influence on Behavioral Intention for under-privileged non-adopters than adopters.

Figure 3-2-2: TPB - Behavioral Intention Model



Triandis (1971) asserted that social norms will have a stronger behavioral impact at an earlier stage; such effect will weaken as the behavior become more routinized. People in the earlier stages of the innovation process tend to possess limited experience and information about the technology of interest, and rely more on others' opinions to

interpret the risk and uncertainty about the technology (Katz 1980, Tushman, M.). They tend to comply with important referents' opinions for them to use or not to use the technology, or Subjective Norm, in order to be looked favorably upon by these referents, regardless their personal assessment of the technology (Warshaw 1980). However, after obtaining more personal experience, they can rely more on themselves to evaluate the technology and less on external opinions. Their attention shifts from such normative influence toward the cost and benefit associated with the use of the technology (Karahanna et al. 1999, Thompson et al. 1994, Venkatesh and Morris 2000). The influence of Subjective Norm on Behavioral Intention will consequently attenuate.

H1-2: Subjective Norm will influence Behavioral Intention more strongly for under-privileged non-adopters than adopters.

In addition, under-privileged people tend to feel less control over the behavior and circumstances of their lives (Kvasny 2002, Lenhart 2002). In particular, they perceive much less control in confidence, self-esteem, resources, knowledge, or opportunities in using ICT (DiMaggio et al. 2004, Lenhart 2002). I thus expect PBC to be important in determining innovation decisions for both under-privileged adopters and non-adopters.

H1-3: Perceived Behavioral Control will influence Behavioral Intention for both under-privileged non-adopters and adopters.

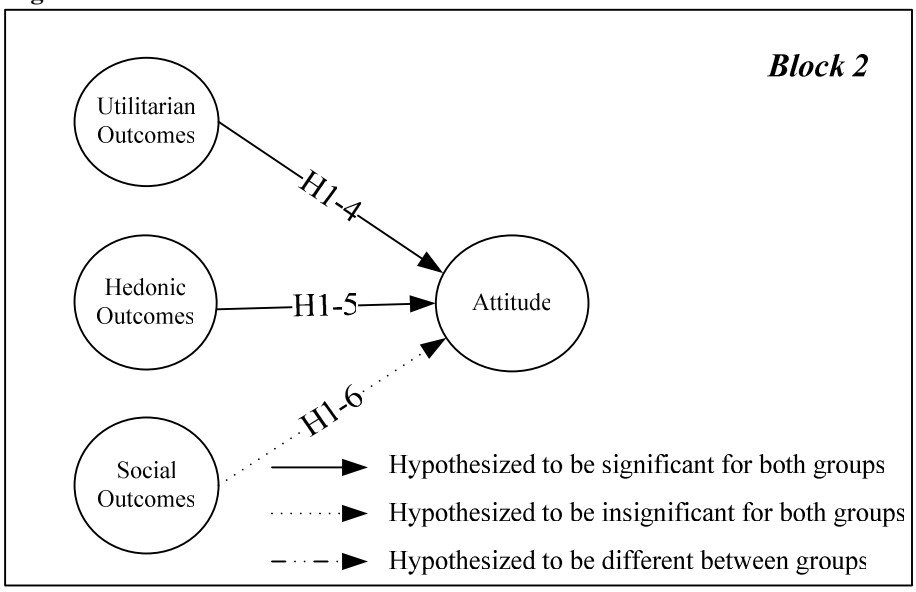
3.2.1 Decomposing TPB

Taylor and Todd (1995) and Venkatesh and Brown (2001) decomposed the three TPB belief constructs to reflect their multidimensionality and claimed such decomposition could generate managerial insights about specific factors that can

influence behavior and inform formulation of interventions. Under such decomposition, the belief constructs (A, SN, PBC) are shaped by their corresponding components, and then inform Behavioral Intention. Alternatively, some studies that drew upon decomposed TPB (DTPB) adopted a direct model approach bypassing the belief constructs and examining the direct effect from the decomposed components to Behavioral Intention. I argue that the original approach is more faithful to TPB and appropriate as it allows for the identification of (1) factors that explain the belief constructs and (2) how these belief constructs influence Behavioral Intention. Aiming to provide useful information particularly for policy-making and to be conceptually in line with TPB, I followed the original DTPB approach and decomposed belief constructs to reflect the underlying multi-dimensionality based on a detailed literature review.

3.2.2 Attitudinal Belief Structure

Figure 3-2-3: Attitudinal Belief Structure



Attitude consists of beliefs, or the expectation, about the consequences by performing a behavior (Venkatesh and Brown 2001). It is an evaluation about the cost

and benefit to execute the course of action. Compeau and Higgins' (1995) work also supports the importance of outcome expectation in performing a behavior. In their study of ICT acceptance in the context of the household, Venkatesh and Brown (2001) suggested decomposing attitudinal belief into Utilitarian Outcomes, Hedonic Outcomes, and Social Outcomes.

3.2.2.1 Utilitarian Outcomes

In typical workplace settings, individuals' decisions about adopting and using technologies are typically productivity oriented. Constructs associated with such productivity, (e.g. Perceived Usefulness (Davis 1989), Relative Advantages (Moore and Benbasat 1991, Rogers 2003), Job Fit (Thompson et al. 1991), Extrinsic Motivation (Davis et al. 1992b), and Outcome Expectation (Compeau and Higgins 1995) have demonstrated significant influence on ICT adoption and usage behavior (Agarwal and Prasad 1997, Chin and Todd 1995, Davis 1989, Gefen and Straub 1997, Igbaria et al. 1997, Mathieson 1991, Segars and Grover 1993, Taylor and Todd 1995b, Thompson et al. 1991, Venkatesh and Davis 1996). Venkatesh and Brown (2001) used the term "Utilitarian Outcomes" to adapt this rationale for ICT adoption to the household context. Given that Utilitarian Outcomes has a better match with the context of this study (i.e. household), I follow this logic and adopt it as one of the underlying belief constructs for Attitude.

Individuals' attitude toward using an ICT will change as their evaluation of the behavioral outcomes change. If the expected effectiveness derived from using the information technology increase/decrease, attitude toward using the ICT should also

change in the same direction (Davis 1989, Davis et al. 1989, Taylor and Todd 1995a, Taylor and Todd 1995b).

H1-4: Utilitarian Outcomes will positively influence Attitude for both under-privileged non-adopters and adopters.

3.2.2.2 Hedonic Outcomes

Venkatesh and Brown (2001) suggested Hedonic Outcomes as another underlying attitudinal belief. Hedonic Outcomes refers to the pleasure and inherent satisfaction derived from performing a behavior (Venkatesh and Brown 2001). Consumer research has depicted Hedonic Outcomes as the joyfulness derived from consuming or using a product (Babin et al. 1994, Hirschman and Holbrook 1982, Holbrook and Hirschman 1982). Unlike information technologies used in the work environment, ICT used at home such as video games (e.g. Play Station, Nintendon, Game-box, and etc.) and PC-based games may provide entertainment value and make the process of using IT pleasant, fun, or enjoyable (Davis et al. 1992a, Holbrook et al. 1984, Malone 1981). Such technologies provide a hedonic aspect that gives users the opportunity to escape from reality and to engage in a new world (Foxall 1992, Lacher and Mizerski 1994). Recently, studies have also suggested a significant correlation between the joyfulness and the use of Internet-based information technology (Bonfadelli 2002, Hwang and Yi 2002, Jackson et al. 2001, Venkatesh 1999). In general, the hedonic aspect of using an ICT will influence an individual's evaluation of using the technology. The more joyfulness and pleasure people expect to derive from using information technology, the more positive their attitude toward using the technology should be.

H1-5: Hedonic Outcomes will positively influence Attitude for both

under-privileged non-adopter and adopters.

3.2.2.3 Social Outcomes

Social Outcomes refers to the social status gained by performing the behavior of interest (Fisher and Price 1992, Venkatesh and Brown 2001). It is the expected change of social status if one performs the behavior (Fisher and Price 1992). Rogers (2003) indicated that gaining social status is one important motivation for individuals to adopt an innovation[7]. Empirical ICT studies have also shown that the desire to strengthen one's social status is a critical factor driving one's intention to adopt ICT (Venkatesh and Brown 2001, Venkatesh and Davis 2000). The resultant referent power from adopting the innovation can give the adopter power among his or her social group, thus driving an individual's desire to pursue social outcomes. In general, people will have a more positive evaluation about the behavior if performing the behavior can lead to a higher social status. However, Rogers (2003) claimed that people with lower socio-economic status have much less concern regarding status-based motivation. For the under-privileged people, gaining social status is not a priority in their lives and thus obtains less attention.

H1-6: Social Outcomes will not influence Attitude for both under-privileged non-adopters and adopters.

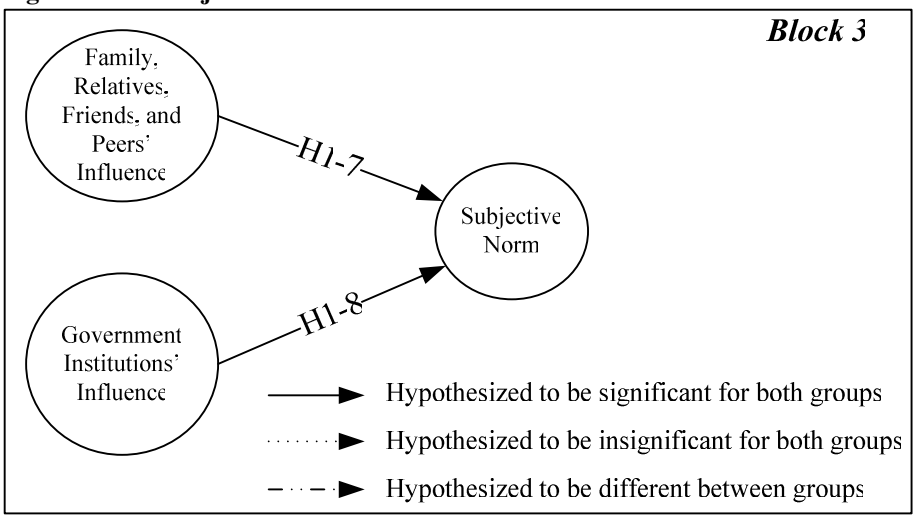
The decomposition of the attitudinal belief structure is also consistent with the perspective of motivation theory. In motivation theory, there are two major types of motivators: extrinsic and intrinsic motivation (Davis et al. 1992). Extrinsic motivation refers to the accomplishment of a designated goal, while intrinsic motivation refers to the

[7] Similar to Social Outcomes, the construct Image by Roger (2003) refers to the extent to which the adoption of innovation is perceived to enhance one's image or status in one's social system.

pleasure and satisfaction obtained by performing a specific behavior (Davis et al. 1992a, Vallerand 1997, Venkatesh and Brown 2001). Extrinsic and intrinsic motivation have demonstrated significant predictive power for behavior across a wide range of studies and domains (Vallerand 1997), including the adoption and use of ICT (Davis et al. 1992a, Venkatesh 1999, Venkatesh and Brown 2001). In this study, Utilitarian and Social Outcomes correspond to extrinsic motivation, whereas Hedonic Outcomes parallels intrinsic motivation.

3.2.3 Subjective Norm Belief Structure

Figure 3-2-4: Subjective Norm Belief Structure



Subjective Norm (SN) refers to the perceived expectation from referent others for an individual to perform the behavior of interest (Ajzen 1985, Ajzen and Fishbein 1980, Mathieson 1991). The referent others are the "people" or "groups" whose beliefs are important to the individual. Individuals are inclined to adopt a behavior if they believe they can obtain further affirmation from referents they consider important to themselves (Burt 1987). SN has also been identified as an important determinant for adoption and diffusion of ICT (Ajzen 1985, Ajzen 1991, Karahanna et al. 1999, Mathieson 1991,

Taylor and Todd 1995a, Taylor and Todd 1995b, Thompson et al. 1991).

The selection of referent others usually depends on the context of adoption and use of the information technology. For example, Karahanna et al. (1999) suggested that top management, supervisors, peers, the organization's MIS department, local computer technology experts, and friends are the salient referents in the context of adopting IT in an organization setting. Taylor and Todd (1995b) suggested peers (i.e. other students) and supervisors (i.e. professors) as the salient referents in the context of a university computer resource center. Decisions in the household are usually normatively oriented (Venkatesh and Brown 2001). Family, relatives (i.e. non-immediate family members), friends, and peers have been suggested to be referent groups that are most likely to influence individuals' behavior at home (Burnkrant and Cousineau 1975, Childers and Rao 1992, Miniard and Cohen 1979; Venkatesh and Brown 2001).

Individuals may feel more pressure if the referent others have stronger expectation for him or her to perform the behavior. Empirical evidence also suggests that the influence from these salient referents is positively associated with Subjective Norm (Karahanna et al. 1999, Taylor and Todd 1995b). The above discussion leads to the following hypotheses:

H1-7: Family, Relatives, Friends and Peers' Influence will positively influence Subjective Norm for both under-privileged non-adopters and adopters.

Government institutions are important in facilitating the diffusion of ICT innovation (King et al. 1994) and reducing digital inequality (DiMaggio et al. 2004, DiMaggio et al. 2001). Government is supposed to offer leadership, encourage

competition, provide services elsewhere not available, ensure security and privacy, endorse universal service and access, and stimulate the adoption and use of the ICT innovation (USACNII 1996). However, few digital inequality studies have examined the institutional influence upon individual ICT innovation, and researchers have suggested the need to study such institutional effects (DiMaggio et al. 2001). Among the few studies that have examined this, Kvasny (2002) indicated that institutional influence has a crucial effect on digital inequality. Lynne et al. (1995) also found that government may serve as an important referent in persuading individuals to accept technology innovations.

This concept of institutional influence is similar to DiMaggio and Powell's idea of coercive pressure (DiMaggio and Powell 1983, Teo et al. 2003). DiMaggio and Powell described coercive pressure as "… formal or informal pressures exerted on organizations by other organizations upon which they are dependent and by cultural expectation in the society within which organizations function" (p. 150). The pressure, as they indicated, may be in the form of force, persuasion, or invitation. Prior studies have found evidence that this pressure indeed influences the adoption of innovation at the organization level (e.g. Teo et al. 2003). In theory, the pressure comes from organizations and exerts its influence on other organizations. For the current study, this coercive pressure takes the form of institutional influence, which is defined as the perceived expectation from the government institutions for individuals to perform the behavior of interest. In the current study, it is thus reasonable to suspect that the city government will influence residents' adoption and use behavior. In this research, the adapted notion of coercive pressure from the institutional perspective is, therefore, captured by the construct "Government Institutions' Influence".

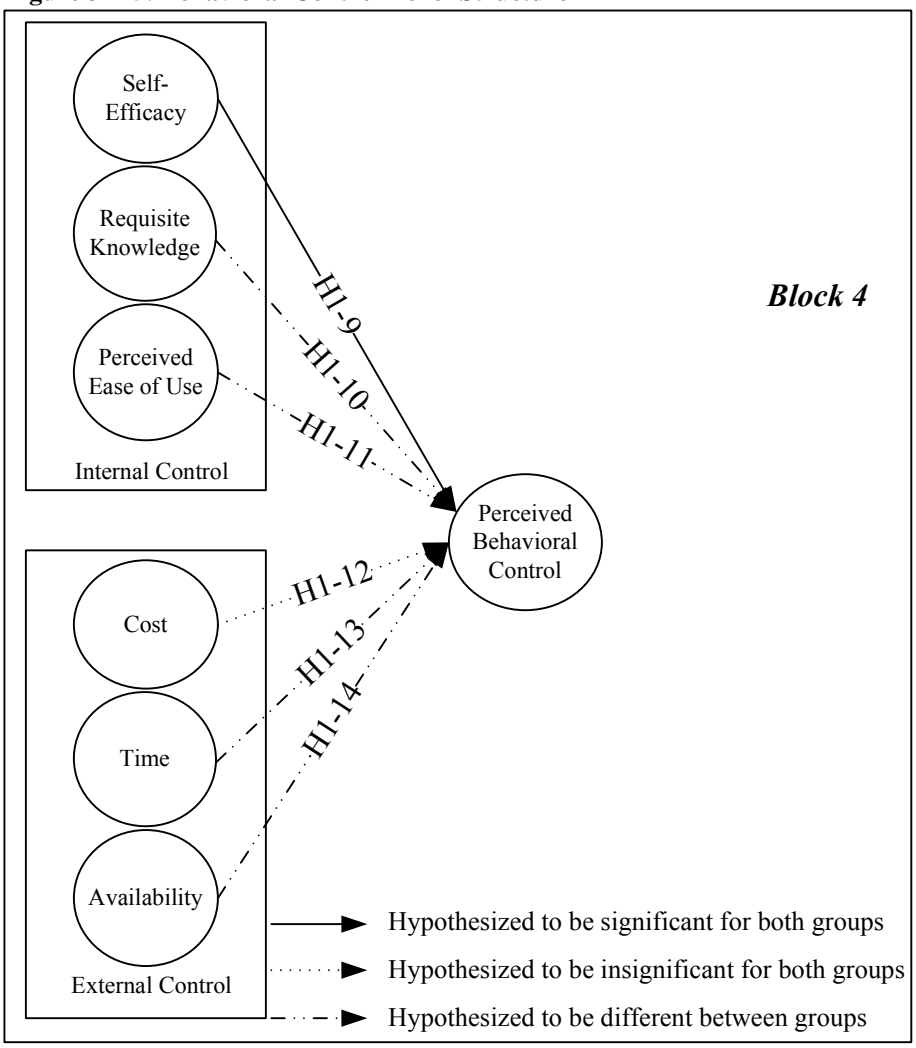
H1-8: Government Institutions' Influence will positively influence Subjective Norm for both under-privileged non-adopters and adopters.

3.2.4 Behavioral Control Belief Structure

Behavior achievement relies on both motivation (intention) and ability (behavioral control) (Ajzen 1991). General behavioral control of human behavior may be demonstrated in the form of "facilitating factors", "the context of opportunity", or "resources" (Ajzen 1991). Alhough actual behavioral control is critical in determining behavior, Perceived Behavioral Control and its impact on behavioral intention is of more psychological interest in TPB, since Perceived Behavioral Control helps to predict behavioral intention (Ajzen 1991). Perceived Behavioral Control (PBC) refers to people's perception about the existence of required resources and opportunities to perform the behavior of interest. PBC also acknowledges individuals' perception of the ease or difficulty of executing the behavior of interest (Ajzen 1991). From another point of view, PBC concerns the "barriers" that inhibit and deter Behavioral Intention and the Behavior (Ajzen 1991, Venkatesh and Brown 2001).

Ajzen (1985, 1991) further parsed PBC into Internal Control and External Control. While Internal Control refers to personal characteristics that might influence volitional control, External Control denotes facilitating factors that are external to the individual (Ajzen 1985, Ajzen 1991).

Figure 3-2-5: Behavioral Control Belief Structure



3.2.4.1 Internal Control

Internal control is conceptualized as consisting of three behavioral control beliefs: Self-Efficacy, Requisite Knowledge, and Perceived Ease of Use.

According to social cognitive theory, Self-Efficacy is defined as "the beliefs in one's capabilities to organize and execute the course of action required to produce given attainment" (Bandura 1977). Ajzen and Madden (1986) stated that TPB basically "places Self-Efficacy in a more general framework of the relations among beliefs, attitude, intentions, and behavior" (p.457). Taylor and Todd (1995b) also argued that Self-

Efficacy is related to perceived ability and indicated the appropriateness of using Self-Efficacy to represent the belief structure of the internal control of PBC. With regard to a behavior involving continuous stages (e.g. the innovation-decision process), Bandura and his associates (Bandura and Cervone 1983, Bandura and Schunk 1981, Bandura and Wood 1989) suggested that Self-Efficacy might be influential in each successive stage.

Self-efficacy, or confidence, has long been advocated as an important determinant for ICT implementation (Compeau and Higgins 1995). Eastin and LaRose (2000) argued that self-efficacy is critical in understanding digital inequality. Moreover, empirical studies have shown that lack of confidence is one of the most important reasons deterring the under-privileged from accessing and using ICT (Bishop et al. 2001, Bishop et al. 2000, Crump and Mcllroy 2003, Millward 2003, Warschauer 2003). Compeau and Higgins (1995) also demonstrated that Self-Efficacy positively influences IT usage. It is reasonable to anticipate that if an individual has higher confidence in his or her abilities to perform the behavior, he or she would feel more control over the behavior, which will in turn facilitate behavioral intention and actual behavior (Taylor and Todd 1995). Therefore,

H1-9: Self-Efficacy will positively influence Perceived Behavioral Control for both under-privileged non-adopters and adopters.

Azjen and Madden (1986) also stated that knowledge is an important internal control factor in determining actual behavior. Prior ICT studies also suggested that ”Requisite Knowledge” is an important type of barrier to technology adoption and use (Mathieson 1991, Taylor and Todd 1995b, Venkatesh and Brown 2001). Requisite Knowledge here refers to knowledge required to perform the behavior of interest.

Without necessary knowledge for executing the course of action, it is unlikely that individuals can perform the behavior without problems. Not possessing the required knowledge for using ICT may prohibit adoption and use. The lack of Requisite Knowledge as a behavioral barrier has shown negative influence toward adoption behavior in prior ICT studies (Compeau and Higgins 1995, Venkatesh and Davis 1996). Studies showed that lack of knowledge represents a psychological barrier for the under-privileged to start engaging with ICT (Lenhart 2003). Even if they start using the technology, their relatively low knowledge level often prevents them from fully exploring the potential of the technology (Hargittai 2002). Rogers (2003) pointed out that lack of an adequate level of operational knowledge may deter initial adoption intention to accept innovation, but problems about precisely how to *use* a technology surface after people start using it. The seriousness of the lack of knowledge is intensified after adoption.

H1-10: Requisite Knowledge will influence Perceived Behavioral Control to a lesser degree for under-privileged non-adopters than adopters.

The third belief for internal control is Perceived Ease of Use (PEOU), which has also been suggested as an important internal control factor for PBC (Ajzen 1991, Ajzen and Driver 1992, Mathieson 1991, Venkatesh and Brown 2001). Indicating the inverse relationship between Complexity (Rogers 2003) and PEOU, Davis (1989) defined PEOU as "the degree to which a person believes that using a particular system would be free of effort." Ajzen and Driver (1992) claimed that PBC is related to the perceived ease or difficulty of performing the behavior of interest. Mathieson (1991) also indicated that PEOU corresponds to the internal control factor of PBC. Venkatesh and his associates

(Venkatesh 1999, Venkatesh and Brown 2001, Venkatesh and Davis 1996) described and empirically demonstrated difficulty-in-use as a barrier for technology adoption.

However, PEOU might have differential effects across under-privileged non-adopters and adopters when an easy-to-use technology, such as the Internet TV, is available. Technological complexity is one of the major reasons for ICT non-use (Lenhart 2002) and people strongly desire easy-to-use technologies (Katz and Aspden 1997). Some research found that the influence of PEOU on ICT acceptance is reduced after people have more direct experience (Thompson et al. 1994). Adopters become more familiar with the technology, and PEOU is less likely to be a significant factor for continued use. This should be especially true when people are provided with easy-to-use technologies. Actual engagement with these technologies allows users to experience such user-friendly attributes, thus alleviating their pre-adoption concerns about the complexity in using the technology. Thus,

H1-11: Perceived Ease of Use will influence Perceived Behavioral Control more strongly for under-privileged non-adopters than adopters.

PEOU also implies a *match* between the respondent's capabilities and the skills required by the system (Mathieson 1991). It is neither the capabilities owned by the individual, nor the skills required by the system, but the fit between the two. Unlike Self-Efficacy which focuses one's belief in his or her ability to perform the behavior, PEOU relates to the design of the technology and how this fits the user's capability (Taylor and Todd 1995b). PEOU and Self-Efficacy are two distinguishable and distinct constructs (Taylor and Todd 1995b, Venkatesh and Davis 2000). The three constructs, Self-Efficacy, Requisite Knowledge, and Ease of Use are interrelated but conceptually distinct.

3.2.4.2 External Control

External control is decomposed into three behavioral control beliefs: Cost, Time, and Availability. External control factors include external resources or situational factors needed to achieve behavioral goals (Ajzen 1985). Prior research has indicated that these external control factors may include money, time (Ajzen 1985, 1991, Ajzen and Madden 1986), and availability (Kvasny 2002, Meader et al. 2001, Taylor and Todd 1995b). Resources, such as money and time, are important in determining peoples' behavior (Ajzen and Madden 1986). Prior research in ICT (Venkatesh and Brown 2001) and digital inequality (Keil et al. 2003, Kvasny and Keil 2002, Youtie et al. 2004) have indicated that cost and time are external barriers for ICT acceptance. Taylor and Todd (1995), Meader et al. (2001), and Kvasny (2002) have also implied that the availability of ICT may serve as another barrier for use behavior.

Cost, as an economic barrier, is a significant barrier for ICT diffusion (Katz and Aspden 1997, Rogers 2003, Venkatesh and Brown 2001). Unlike information goods, such as radio or television, information services like telephone or the Internet may diffuse at a lower speed (Schement and Forbes 1998). The cost to access information goods involves only the one-time-charge, while the cost to subscribe to information services includes the one-time-charge, as well as the user-related cost (e.g. the monthly bills for the telephone or Internet service provider). The service cost usually drives off marginal users (Mueller and Schement 2001). For under-privileged people typically with lower socio-economic status, both the acquisition and service cost could be financially prohibitive. However, if government interventions, such as the free Internet TV initiative, incorporate financial subsidies to provide free devices and connection, cost should not be

a significant factor for the under-privileged's behavioral control.

H1-12: Cost will not influence Perceived Behavioral Control for both under-privileged non-adopters and adopters.

Ajzen (1985, 1991) and Ajzen and Madden (1986) have clearly pointed out Time as a critical resource to perform a behavior. It is quite obvious that even an individual who has a favorable attitude, strong subjective norm, and all of the necessary resources cannot execute the course of action without time. In general, for people who are very busy in some activities, whether they are rich or poor, there is less disposable time to be allocated to other activities, such as using the Internet. Lack of time has been identified as a significant reason for ICT non-use (Lenhart 2002, Lenhart et al. 2003, Trotter 2001). De Haan and Huysman (2002) also found that ICT *non-users* typically have much less leisure time than users. Given that ICT non-users consist mostly of the under-privileged, lack of time therefore may be a more serious problem for under-privileged non-adopters than adopters.

H1-13: Time will influence Perceived Behavioral Control more strongly for under-privileged non-adopters than adopters.

Availability, or the accessibility of the technology when needed, stands as another behavioral barrier for the under-privileged. In many situations, technologies are in possession but not available when people want to use them. In a study about the use of a computer resource center, Taylor and Todd (1995b) showed that whether or not there are enough computers available for all the students who want to use the center concurrently might present a barrier for ICT use. In the case of the Atlanta community technology center, Kvasny (2002) identified the logistical barrier that residents have to travel to the

institutions where access to the technology is available. Therefore, when there are more users than the units of technologies, or when the location of the technology is not convenient, availability can surface as a behavioral barrier for people to use technology at will. Given the under-privileged's lower control over resources, they may have a higher possibility to encounter this challenge.

Furthermore, the implementation of ICT generally starts after the decision to use the technology, although it may be postponed because of problems like logistical issues (Rogers 2003). As challenges like resource competition and logistical inconvenience will be more likely to emerge after people start to interact with the technology, the availability issue will be more salient for adopters than non-adopters.

H1-14: Availability will influence Perceived Behavioral Control to a lesser degree for under-privileged non-adopters than adopters.

3.2.4 Exposure to Innovation

In the context of diffusion of innovation (DOI), DiMaggio and Powell (1983) proposed the concept of *mimetic pressure* to represent the effect of the cumulative percentage of adopters in shaping a non-adopter's innovation behavior. Innovations are often uncertain, risky, and ambiguous. When an organization faces uncertainty and risk, such mimetic pressure will influence non-adopters to model other adopters' behavior to minimize information search costs, reduce the cost of experimentation, avoid first mover risk, and avoid embarrassment (Teo et al. 2003). Prior empirical research has detected this effect in various industries (Palmer 1993, Fligstein 1985, Teo et al. 2003).

A similar conceptualization is offered at the individual level by Valente (1995) who suggested that *Exposure to Innovation* through the cumulative proportion of

adopters in one's personal network, influences individual adoption behavior. Although Subjective Norm in TPB also represents social influence, it does not capture this aggregate mimetic pressure. Further, Subjective Norm focuses solely on the "expectation" from "important others", while *Exposure to Innovation* accounts for the "observed" aggregate behavior signals in the overall social network. Therefore, this concept is conceptually distinct from Subjective Norm. The larger the proportion of adopters in an individual's personal network, the more likely the individual will mimic others' behavior (DiMaggio and Powell 1983, Rogers 2003, Valente 1995).

Valente (1995) further found that late adopters, however, might be less responsive to such pressure and thus take a longer time to, if ever, adopt an innovation (Rogers 2003, p.359). Thus, mimetic pressure may have a differential effect between early and later adopters. The above discussion leads to the following hypothesis.

H1-15: Exposure to Innovation will influence Behavioral Intention less strongly for under-privileged non-adopters than adopters.

3.2.5 Trust in Government

As discussed in section 2.4 in detail, Trust has received significant attention in many fields of ICT (Gallivan 2001, Gefen 2000, Gefen et al. 2003, Pavlou 2001, Pavlou and Gefen 2002, Stewart and Gosain 2001, Tung et al. 2001, Warkentin et al. 2002). Some researchers have extended ICT-related theories by adding Trust. For instance, Gefen (1997) and Gefen et al. (2003) extended TAM by adding Trust to explain freeware and online shopping activity. Chai and Pavlou (2002) integrated trust into TPB to explain cross-cultural e-commerce adoption behavior. Trust has shown significant impact in these models and plays an important role in ICT-related activities.

In section 2.4.2, trust is conceptualized as a set of specific beliefs with integrity, competence, predictability, and benevolence, separated from behavioral intention and behavior (Gefen et al. 2003, McKnight et al. 2002). This distinction between beliefs and intentions is consistent with the theoretical foundation of TRA, TPB, and TAM. Such consistency permits a theoretical integration between the trust construct and the above theories (Gefen et al. 2003). Individuals' Trust in Government Institutions, in the context of the current study, is defined as individuals' expectation that government institutions will not behave opportunistically by taking advantage of them. Trust deals with the belief that the trusted party will fulfill its commitments. It is one's belief that the trusted party will behave in a dependable (Kumar et al. 1995a), ethical (Hosmer 1995), and socially appropriate manner (Zucker 1986).

The lack of trust is often argued as the reason for various social problems (Rossiter and Pearce 1975). In the context of digital inequality, individuals' trust in government institutions can be an important social factor. Ervin and Gilmore (1999) found that African Americans tend to have less trust in government, treat the Internet as a surveillance tool, and are consequently less likely to use the Internet. Jackson et al. (2001) and Kvasny (2002) also identified a similar pattern for the under-privileged. For the Internet TV project in LaGrange, some residents questioned if the city government was spying on their personal life via the Internet (Keil et al. 2003, Kvasny and Keil 2004). The mayor of the city of LaGrange speculated that one reason for non-adoption was that some residents distrusted the government and worried about giving up some personal privacy by using the Internet (Keil et al. 2003). The city manager also believed that some

residents would choose not to adopt and use the information technology because of the misconception that the government would spy on the residents (Kvasny and Keil 2004).

It is thus expected that individuals' Trust in Government may influence Behavioral Intention. The higher the trust one has in government institutions, the more likely he or she would intend to use the Internet.

H1-16: Trust in Government will positively influence Behavioral Intention for both under-privileged non-adopters and adopters.

3.3 Under-privileged Adopters vs. Privileged Adopters

This section presents the theoretical development of the research model and hypotheses for the comparison between under-privileged and privileged adopters. The research model is similar to the model in the prior section. The hypotheses, on the other hand, are different from the prior model, since the groups of concern change. The discussion unfolds in the following same sequence: it begins with TPB, then the three belief structures, and finally Exposure to Innovation and Trust in Government.

Figure 3-3-1: Under-privileged Adopters vs. Privileged Adopters

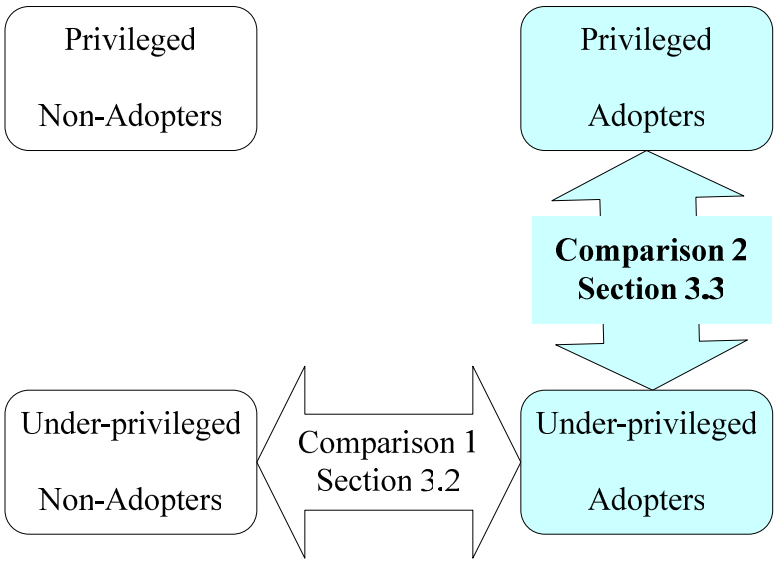
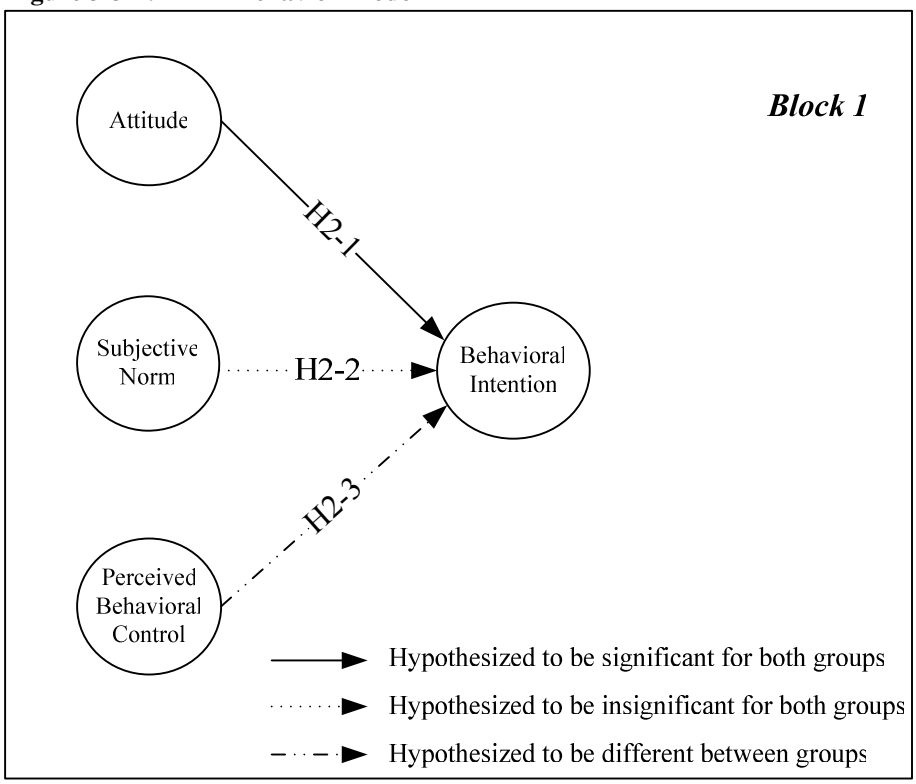


Figure 3-3-2: TPB - Behavior Model



To begin with, I expect some propositions in TPB to be true. However, the influence of SN and PBC needs further elaboration in this comparison. First, consistent with TPB, Attitude is expected to affect Behavioral Intention. Hence,

H2-1: Attitude will positively influence Behavioral Intention for both under-privileged and privileged adopters.

Triandis (1971) argued that once behavior takes place and becomes routinized, the impact of social norms decreases. People turn to their own experiences gained in actual behavior to evaluate behavioral consequences, and rely less on referents opinions. Evidence has shown that the influence of SN in BI attenuates after individuals start using ICT, as their attention shifts more toward outcome expectations (Karahanna et al. 1999). Given the focus on ICT usage after adoption, I expect this relationship from SN to BI to be insignificant.

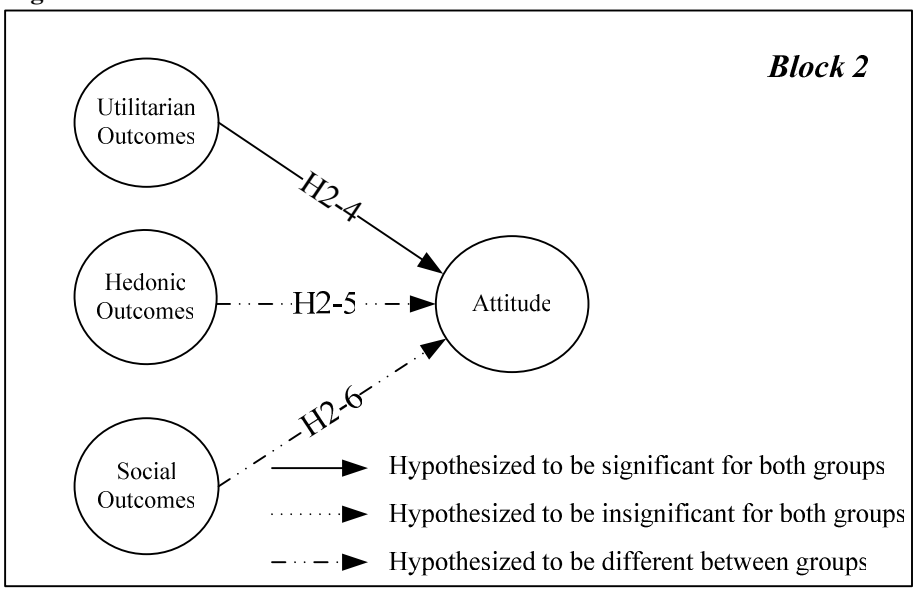
H2-2: Subjective Norm will *not* influence Behavioral Intention for either under-privileged or privileged adopters.

Further, the under-privileged usually feel less control over the situations and behavior of their lives (Lenhart 2003, Kvasny 2002). Prior digital inequality research suggested that they tend to lack self-assurance, self-esteem, skills, opportunities, and necessary resources to use ICT. However, this is seldom the case for the privileged. Therefore, it is reasonable to expect Perceived Behavioral Control to exert a stronger behavioral influence for the under-privileged.

H2-3: Perceived Behavioral Control will influence Behavioral Intention more strongly for under-privileged than privileged adopters.

3.3.1 Attitudinal Belief Structure

Figure 3-3-3: Attitudinal Belief Structure



According to Venkatesh and Brown, attitudinal belief structure is decomposed into Utilitarian Outcomes, Hedonic Outcomes, and Social Outcomes. Motivation theory suggests that both extrinsic and intrinsic motivations are important in determining an individual's behavioral attitude (Davis et al. 1992a). While Utilitarian and Social Outcomes are analogous to extrinsic motivation, Hedonic Outcomes is equivalent to intrinsic motivation.

As discussed earlier, productivity oriented outcome expectations are important affective motivation for ICT acceptance. This is expected to be true for both privileged and under-privileged adopters.

H2-4: Utilitarian Outcomes will positively influence Attitude for both under-privileged and privileged adopters.

However, Hedonic Outcomes and Social Outcomes may influence these two groups differently. Recent digital inequality studies have suggested that the under-

privileged, as compared to the privileged, tend to use ICT more for entertainment purpose (Bonfadelli 2002, Shah et al. 2001). One possible explanation is that the pleasure and satisfaction derived from using a technology is more important for the under-privileged than the privileged. It is possible that Hedonic Outcomes have a stronger behavioral effect for the under-privileged.

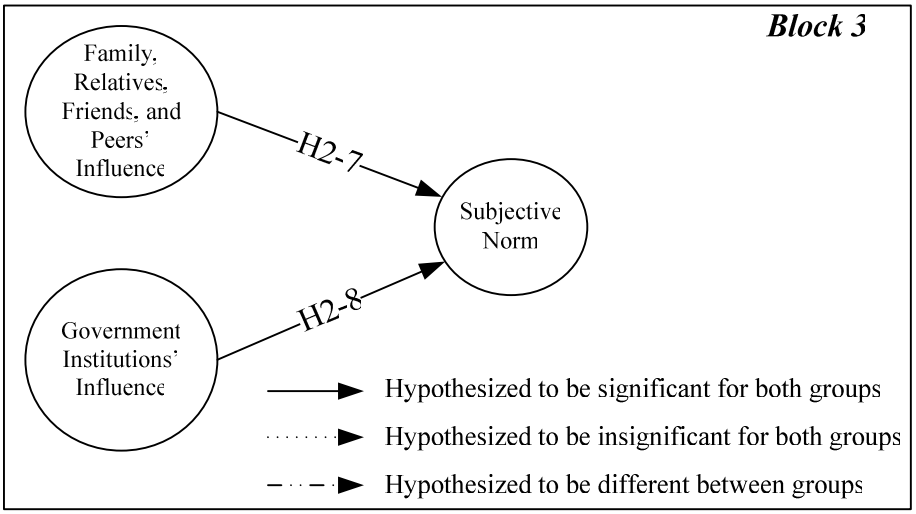
H2-5: Hedonic Outcomes will influence Attitude more strongly for under-privileged adopters than privileged adopters.

Gaining social status has been recognized as a major reason for individuals to accept new innovations (Fisher and Price 1992, Rogers 2003). Empirical studies in ICT acceptance have also supported this assertion (Venkatesh and Brown 2001, Venkatesh and Davis 2000). If using a technology symbolically represents a higher social status, people may like to adopt and use the technology. Nevertheless, Rogers (2003) argued that social status is not a priority in the under-privileged group. Thus, its impact may be higher for the privileged than the under-privileged.

H2-6: Social Outcomes will have less influence on Attitude for under-privileged adopters than privileged adopters.

3.3.2 Subjective Norm Belief Structure

Figure 3-3-4: Subjective Norm Belief Structure



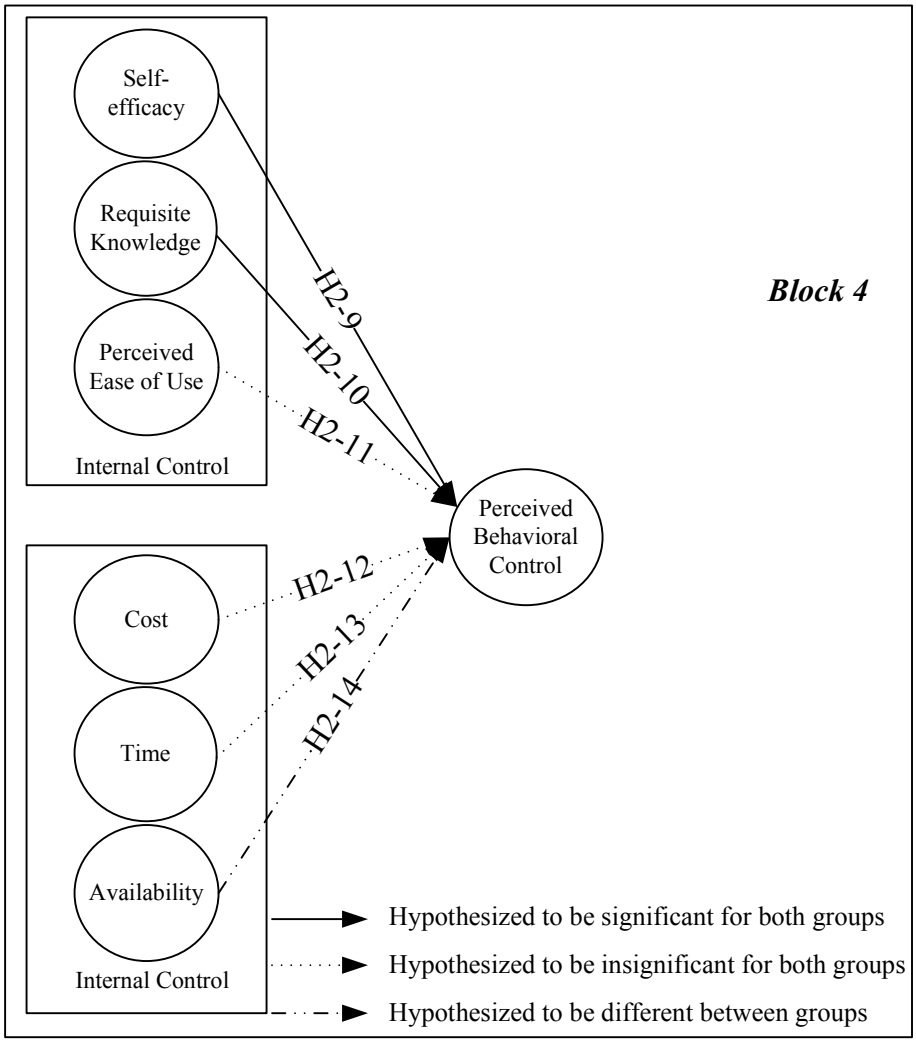
Applying the same logic in the section 3.2.3, Subjective Norm belief structure is decomposed into (1) Family, Relatives, Friends, and Peers' Influence, and (2) Government Institutions' Influence. These two constructs are expected to inform Subjective Norm for both groups.

H2-7: Family, Relatives, Friends, and Peers' Influence will affect Subjective Norm for both under-privileged and privileged adopters.

H2-8: Government Institutions' Influence will affect Subjective Norm for both under-privileged and privileged adopters.

3.3.3 Behavioral Control Belief Structure

Figure 3-3-5: Behavioral Control Belief Structure



3.3.3.1 Internal Control

Following the decomposition structure in section 3.2, Self-Efficacy, Requisite Knowledge, and Perceived Ease-of-Use are proposed to influence Internal Control.

Self-Efficacy, or confidence, has been suggested as the key for behavioral control and predicting behavior (Bandura 1977). Its impact on ICT acceptance has also been detected (Compeau and Higgins 1995, Taylor and Todd 1995b).

H2-9: Self-Efficacy will influence Perceived Behavioral Control for both

under-privileged and privileged adopters.

Requisite Knowledge is a critical factor for ICT acceptance (Venkatesh and Davis 1996). Its' impact on diffusion of innovation is especially salient at the implementation stage (Rogers 2003). Therefore,

H2-10: Requisite Knowledge will influence Perceived Behavioral Control for both under-privileged and privileged adopters.

With the provision of user-friendly ICT, the difficulty in using ICT shall not be a barrier for continued usage. After actual usage, adopters have more direct experience than before adoption. This direct experience also serves to increase their familiarity with the technology, thus minimizing the effect of PEOU.

H2-11: Perceived Ease-of-Use will not influence Perceived Behavioral Control for either under-privileged or privileged adopters.

3.3.3.2 External Control

External Control is represented by Cost, Time, and Availability. Given most digital inequality intervention focus on providing economic resources, particular the LaGrange free Internet initiative, cost should be of no concern for adopters.

H2-12: Cost will not influence Perceived Behavioral Control for either under-privileged or privileged adopters.

Lack of time is an important barrier for performing behavior (Ajzen and Madden 1986). Evidence in digital inequality studies suggested that lack of time is a reason for ICT non-use (Lenhart et al. 2003), and non-users tend to have less spare time for this activity (De Haan and Huysmans 2002). However, no significant evidence has so far

indicated that those who already used the Internet perceive time as a barrier for continued usage. Information and communication technologies are mostly designed to enhance people's productivity and efficiency, including saving time. Adopters may sense or experience such advantage and are thus not as likely to see lack of time as a barrier. Instead, the less time one has, the more likely s/he would use ICT.

H2-13: Time will not influence Perceived Behavioral Control for either under-privileged or privileged adopters.

Availability, as indicated in section 3.2.4.2, concerns the resource competition and logistics issues involving in ICT usage. A possessed technology may not be available when needed because others are using it or it is logistically inconvenient to use it. Such a situation tends to occur at the implementation stage. As the under-privileged have less resources in control, this type of barrier may have a more significant impact on them.

H2-14: Availability will influence Perceived Behavioral Control more strongly for under-privileged than privileged adopters.

3.3.4 Exposure to Innovation

As discussed in section 3.2.5, mimetic pressure may have a differential effect between early and later adopters. Rogers (1995) has indicated that early adopters, as compared to late adopters, tend to have higher income, education attainment, and social status. Such a profile is similar to the profile of the privileged in the context of digital inequality. Therefore, we expect Exposure to Innovation will influence BI less strongly for under-privileged non-adopters than adopters.

H2-15: Exposure to Innovation will influence Behavioral Intention less

strongly for under-privileged adopters than privileged adopters.

3.3.5 Trust in Government

Following section 3.2.6, for both groups, people's Trust in Government is hypothesized to affect their intention to use ICT.

H2-16: Trust in Government will positively influence Behavioral Intention for both under-privileged non-adopters and adopters.

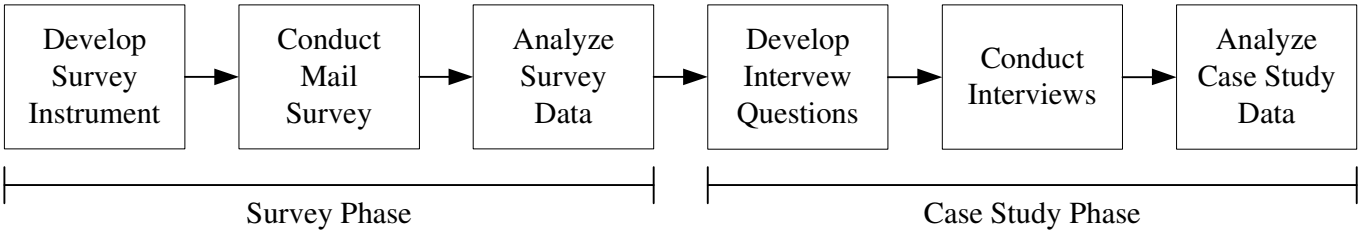
Chapter 4: Research Methodology

This chapter describes the methods employed for data collection. The research design consists of a large-scale survey and a case study. The details of the survey are first presented in section 4.3, followed by discussion of the case study in section 4.4.

4.1 Research Design

This dissertation adopts a multi-method approach for research design by combining quantitative and qualitative approaches (Brown 1997, Greene et al. 1989, Kaplan and Duchon 1988, Maxwell and Sandlow 1986, Mingers 2001, Trauth and Jessup 1988). In general, a multi-method approach is beneficial because (1) a broader scope of data is collected using different methods from various data sources, thus giving a fuller picture of phenomenon of interest (Bonoma 1985, Kaplan and Duchon 1988, Tashakkori and Teddlie 1998), (2) it allows for the complementary analysis of distinct data sources, methods, and different facets of a phenomenon, thus enriching and elaborating the research findings (Greene et al. 1989), and (3) it provides insightful explanation or stimulates further research questions when the data diverge or show conflict (Kaplan and Duchon 1988, Mingers 2001, Tashakkori and Teddlie 1998, Trauth and Jessup 1988, Trend 1979).

Figure 4-1: Research Design



The primary data collection method was a large-scale mail survey. Since the primary purpose of the data collection was to produce quantitative data for statistical analysis, a mail survey was an ideal choice for data collection (Folwer 1993). Furthermore, since the national average home penetration rates of the telephone and the Internet were about 94% (NITA 1998) and 54% (NTIA 2002), neither telephone nor Web survey would be the ideal approach to reach most subjects of interest, especially those least connected. In addition, given the limited amount of resources, including time, man-power, and budget, and considering the privacy of the respondents, a mail survey is an appropriate method for data collection (Folwer 1993, Mangione 1995).

A complementary case study (Yin 1994) was performed by collecting archival data, conducting field interviews, and analyzing gathered data. Several reasons support the case study approach in this study. First, the case study method is appropriate when cases are unique, such as the Internet TV initiative in LaGrange, Georgia. Further, case research is advantageous in investigating contemporary phenomenon with real-life context and for answering how and why questions (Yin 1994). In this research, the purposes of the case were to provide contextual information about the phenomenon of interest, to explain any confusion found in survey results, and to provide an in-depth investigation of the factors deterring the adoption and use of the Internet.

4.2 Site Selection

The selection of an ideal research site is imperative to answer the research questions:

RQ 1: For under-privileged people, are there differences in the behavioral models that characterize non-adopters' and adopters' intention to use an ICT innovation? If so, does TPB help explaining these differences?

RQ 2: Where are the points of leverage for policy makers to influence intention to use an ICT innovation among under-privileged adopters and non-adopters?

RQ 3: Can TPB be meaningfully extended to include "exposure to innovation" and "trust in government"?

RQ 4: Are there differences in ICT usage patterns and factors that drive use when we compare privileged and under-privileged groups? If so, does TPB help explaining the differences?

RQ 5: What factors are the most influential in driving ICT usage?

The free Internet TV initiative in LaGrange, Georgia was the first project in the world in which a government institution aimed to offer universal Internet services in a city. The project was intended (in part) to encourage the adoption and diffusion of ICT and address the digital inequality issue. The city government invested considerable effort and provided the leadership to offer free Internet technology to LaGrange residents. Because the city government owned the fiber optics backbone, they were able to leverage this asset and negotiate with the cable and Internet service providers to obtain a favorable

contract for the residents to connect to the information superhighway via their TV (Meader et al. 2001).

In addition, unlike PCs, the Internet TV was positioned as consumer electronics. The required knowledge to operate such a system is considerably less than that required to use a personal computer. For example, Internet TV does not require users to maintain the operating system or install application programs. The project was unique in its nature and suitable for answering the research questions.

The project was also well documented. Abundant historical data were available, such as articles in the media, descriptive survey results, case studies, conference proceedings, and working papers. The available documentation greatly facilitated theory development and instrument development, as well as data analysis.

Furthermore, the practicality of data collection is an important factor to consider for research projects, especially for doctoral dissertations. The city of LaGrange is physically close to Atlanta, Georgia, where the researcher resides. Such geographic advantage gives the researcher the luxury to collect data whenever necessary. Most importantly, the city government and council members shared a joint interest with the researcher to study and evaluate the initiative. The city government agreed to grant access for data collection and have supported the effort by providing a residential water bill list[8] and the Internet TV installation list[9] that was used for data collection.

Given the high relevancy between the research questions and the LaGrange Internet TV project, the availability of rich historical data, the adjacency of the site to the

[8] The residential water bill list contains the contact information of residents at LaGrange.
[9] The Internet TV installation list contains the contact information of the residents who installed the Internet TV.

researcher, and the support from the city government, the free Internet TV initiative in LaGrange was an ideal site for this study.

4.3 Survey Phase

4.3.1 Instrument Development

For most constructs in the research model, Likert scale items were adapted from existing scales. Using established scales increases the reliability of the instrument and avoids the enormous time and effort that would be invested in instrument development. Also, as recommended by Straub (1989), utilizing existing and validated scales enables future comparison with other research. Following Karahanna et al. (1999), two versions of the survey were developed; one for adopters and one for non-adopters. Differences of wording between the two versions of surveys were made only when absolutely needed to avoid confusion. By keeping such differences to an absolute minimum, this ensures data from both versions can be compared in data analysis (Karahanna et al. 1999). No prior measures were found for the three External Control constructs: Cost, Time, and Availability. Extant literature, media coverage, and other archival data informed the development of these three constructs. Table 4-1 lists the source of the adapted measurement items. Tables 4-2 and 4-3 list the questionnaire items for the adopter version and non-adopter version, respectively.

With the assistance of LaGrange city government, the survey instrument was pre-tested with 20 LaGrange residents. The 20 subjects consisted of 10 adopters and 10 non-adopters. Based on the feedback from these subjects, minor modifications were made prior to its full-scale administration.

Table 4-1: Sources for Measurement Items

Construct	Root Construct	Sources	Number of Items Adapted	Reliability (α) in the Source
Attitude	Attitude	(Karahanna et al. 1999)	3	0.9 (continued user) 0.94 (potential adopter)
Utilitarian Outcomes	Perceived Usefulness	(Venkatesh and Davis 1996, 2000)	4	0.96
Hedonic Outcome	Intrinsic Motivation	(Venkatesh et al. 2002)	3	0.91
Social Outcome	Image	(Venkatesh and Davis 2000) (Agarwal and Prasad 1997)	3	0.8-0.93 0.85
Subjective Norm (SN)	Subjective Norm	(Venkatesh and Davis 2000)	2	0.81 – 0.94
Family, Relatives, Friends, and Peers' Influence	Peer Influence / Normative Belief	(Karahanna, et al. 1999, Taylor and Todd 1995b)	4	0.92
Government Institutions' Influence	Peer Influence / Normative Belief	(Karahanna, et al. 1999, Taylor and Todd 1995b)	2	0.92
Perceived Behavioral Control (PBC)	Perceived Behavioral Control (PBC)	(Karahanna, et al. 1999, Taylor and Todd 1995b)	3	0.7
Self-Efficacy	Self-Efficacy	(Taylor and Todd 1995b)	3	0.85
Requisite Knowledge	Requisite Knowledge	(Youtie, et al. 2004, Venkatesh and Brown 2001)	4	N/A
Perceived Ease of Use	Perceived Ease of Use	(Venkatesh and Davis 1996)	4	0.84
Trust in Government	Trust	(Gefen et al. 2003)	7	0.9
Exposure to Innovation	Mimetic Pressure	(Fligstein 1985, Haunschild and Miner 1997, Palmer et al. 1993, Teo et al. 2003) All operationalizations are similar.	1	N/A
Behavioral Intention	Behavioral Intention	(Taylor and Todd 1995b)	3	0.91

Table 4-2: Questionnaire Items (Adopter Version)

Construct	Items
Attitude	All things considered, using the Internet TV is negative/positive. All things considered, using the Internet TV is bad/good. All things considered, using the Internet TV is harmful/helpful.
Utilitarian Outcomes	Using the Internet TV improves my performance for communication & information search. Using the Internet TV increases my productivity for communication & information search. Using the Internet TV enhances my effectiveness for communication & information search. Using the Internet TV is useful for my communication & information search.
Hedonic Outcome	Using the Internet TV is enjoyable. Using the Internet TV is pleasant. Using the Internet TV is fun.
Social Outcome	People who use Internet TV have higher standing in the community than those who don't. People who use the Internet TV have a high profile. Using the Internet TV is a status symbol.
Subjective Norm (SN)	People who influence me think that I should use the Internet TV. People who are important to me think that I should use the Internet TV.
Family, Relatives, Friends, and Peers' Influence	My family thinks that I should use the Internet TV. My relatives think that I should use the Internet TV. My friends think that I should use the Internet TV. People I work with think that I should use the Internet TV.
Government Institutions' Influence	The city government expects me to use the Internet TV. The city government thinks that I should use the Internet TV.
Perceived Behavioral Control (PBC)	I have the resources, knowledge, and ability to use the Internet TV. I can use the Internet TV. Using the Internet TV is entirely within my control.
Self-Efficacy	I feel comfortable using the Internet TV on my own. I can easily operate the Internet TV on my own. I feel comfortable using the Internet TV even if there is no one around me to tell me how to use it.
Requisite Knowledge	I have the ability and knowledge to use a keyboard. I have the ability and knowledge to switch back and forth between the Internet and TV channels. I have the ability and knowledge to follow a link from a TV channel to an Internet Web page. I have the ability and knowledge to use a mouse or cursor.

Perceived Ease of Use	My interaction with the Internet TV is clear and understandable. Interacting with the Internet TV does not require a lot of my mental effort. I find the Internet TV easy to use. I find it easy to get the Internet TV to do what I want it to do.
Trust in Government	Based on my experience with the city government in the past, I know they are honest. Based on my experience with the city government in the past, I know they care about the residents. Based on my experience with the city government in the past, I know they will not take advantage of me. Based on my experience with the city government in the past, I know they provide good services. Based on my experience with the city government in the past, I know they are predictable. Based on my experience with the city government in the past, I know they are trustworthy. Based on my experience with the city government in the past, I know they know the city and the residents well.
Exposure to Innovation	What percent of your friends and peers in LaGrange has adopted the Internet TV? (0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%) What percent of the entire LaGrange community has adopted the Internet TV? (0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%)
Behavioral Intention	I intend to continue using the Internet TV during the next three months. I intend to continue using the Internet TV for email, browsing, or searching during the next three months. I intend to continue using the Internet TV frequently during the next three months.
Cost (*)	I can't afford cable TV. Free Internet TV is not really free. I believe that the city government will start to charge for the Internet TV.
Time (*)	I don't have time to use the Internet TV. I am too busy to use the Internet TV. It is too time consuming to use the Internet TV.
Availability (*)	It is difficult for me to use the Internet TV when other members in my household want to watch TV. Using Internet TV is not as important as watching TV in my household. Many people in my household want to use Internet TV, and I don't always get to use it. The location of the TV is not convenient for me to use the Internet TV.

(*) Denoted items are created by the researcher based on extant literature, media coverage, and other archival data

Table 4-3: Questionnaire Items (Non-Adopter Version)

Construct	Items
Attitude	All things considered, using the Internet TV would be negative/positive. All things considered, using the Internet TV would be bad/good. All things considered, using the Internet TV would be harmful/helpful.
Utilitarian Outcomes	Using the Internet TV would improve my performance for communication & information search. Using the Internet TV would increase my productivity for communication & information search. Using the Internet TV would enhance my effectiveness for communication & information search. Using the Internet TV would be useful for my communication & information search.
Hedonic Outcome	Using the Internet TV would be enjoyable. Using the Internet TV would be pleasant. Using the Internet TV would be fun.
Social Outcome	People who use Internet TV have higher standing in the community than those who don't. People who use the Internet TV have a high profile. Using the Internet TV is a status symbol.
Subjective Norm (SN)	People who influence me think that I should use the Internet TV. People who are important to me think that I should use the Internet TV.
Family, Relatives, Friends, and Peers' Influence	My family thinks that I should use the Internet TV. My relatives think that I should use the Internet TV. My friends think that I should use the Internet TV. People I work with think that I should use the Internet TV.
Government Institutions' Influence	The city government expects me to use the Internet TV. The city government thinks that I should use the Internet TV.
Perceived Behavioral Control (PBC)	I would have the resources, knowledge, and ability to use the Internet TV. I would be able to use the Internet TV. Using the Internet TV would be entirely within my control.
Self-Efficacy	I would feel comfortable using the Internet TV on my own. If I want, I can easily operate the Internet TV on my own. I would feel comfortable using the Internet TV even if there is no one around me to tell me how to use it.
Requisite Knowledge	I would have the ability and knowledge to use a keyboard. I would have the ability and knowledge to switch back and forth between the Internet and TV channels. I would have the ability and knowledge to follow a link from a TV channel to an Internet Web page. I would have the ability and knowledge to use a mouse or cursor.

Perceived Ease of Use	My interaction with the Internet TV would be clear and understandable. Interacting with the Internet TV would not require a lot of my mental effort. I would find the Internet TV easy to use. I would find it easy to get the Internet TV to do what I want it to do.
Trust in Government	Based on my experience with the city government in the past, I know they are honest. Based on my experience with the city government in the past, I know they care about the residents. Based on my experience with the city government in the past, I know they will not take advantage of me. Based on my experience with the city government in the past, I know they provide good services. Based on my experience with the city government in the past, I know they are predictable. Based on my experience with the city government in the past, I know they are trustworthy. Based on my experience with the city government in the past, I know they know the city and the residents well.
Exposure to Innovation	What percent of your friends and peers in LaGrange has adopted the Internet TV? (0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%) What percent of the entire LaGrange community has adopted the Internet TV? (0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%)
Behavioral Intention	I intend to use the Internet TV during the next three months. I intend to use the Internet TV for email, browsing, or searching during the next three months. I intend to use the Internet TV frequently during the next three months.
Cost (*)	I can't afford cable TV. Free Internet TV is not really free. I believe that the city government will start to charge for the Internet TV.
Time (*)	I don't have time to use the Internet TV. I am too busy to use the Internet TV. It is too time consuming to use the Internet TV.
Availability (*)	It is difficult for me to use the Internet TV when other members in my household want to watch TV. Using Internet TV is not as important as watching TV in my household. Many people in my household want to use Internet TV, and I don't always get to use it. The location of the TV is not convenient for me to use the Internet TV.

(*) Items are created by the researcher based on extant literature, media coverage, and other archival data

4.3.2 Sample

Only residents in the city of LaGrange were eligible to subscribe to the Internet TV. Therefore, the residents of LaGrange constitute the population of the study. Based on the non-commercial water bill list provided by the LaGrange city government, there were about 9000 eligible households.[10] Among these residents, there were in general two types of subjects: adopters and non-adopters. According to the Internet TV installation list from the city government, there were about 3500 digital set-top-boxes installed, which means about 5500 households did not install the Internet TV. This ratio (39% vs. 61% for adopters and non-adopters) is comparable to the 40%-60% ratio reported by prior research (Meader et al. 2001, Youtie et al. 2004).

4.3.3 Data Collection

A cross-sectional field survey was conducted in the city of LaGrange, Georgia, in summer 2003. Since adopters were the primary interest in this study, 3500 copies of surveys were administered to adult members in adopter households (i.e. the entire population of adopters). Due to resource constraints, 2500 copies of surveys were mailed to randomly sampled households from the non-adopter population. This random sampling approach was employed to maximize the likelihood that the responded non-adopters would be representative to their population.

The survey was mailed to sampled subjects. Following the recommendation by Dillman (1978), Folwer (1993), and Mangione (1995), one week after the survey, a first wave of postcards was mailed as reminders. Three weeks after the original mail, a

[10] There are both commercial and noncommercial units in LaGrange. Since the free Internet TV was intended for the noncommercial residents, commercial units were excluded from this investigation.

second wave of postcards was mailed to non-respondents to boost the response rate (Dillman 1978, Ratneshwar and Steward 1990).

4.3.4 Control Variables

If a resident already had a computer at home that was connected to the Internet, it was very likely that the resident might choose not to have or use the Internet TV, given the overlap in the capability of accessing the Internet. Therefore, ownership of an Internet computer at home was measured in the survey.

4.4 Case Study Phase

In the case study phase, two types of data were of concern: archival (secondary) data and interview (primary) data. The following sections describe the sources and methods adopted to collect these data.

4.4.1 Archival Data

The LaGrange Internet TV project drew considerable attention from a range of media and researchers. The project was widely covered by local (e.g. LaGrange Daily News), state (e.g TechLinks 2002), and national media (e.g. Marcotte 2000). Reports are also available in many research institutions, such as the Ash Institute in Harvard University (Ash Institute 2001), the Economic Development Institute at Georgia Tech, and Georgia State University. In addition, researchers have developed working papers (e.g. Kvasny and Keil 2004, Youtie et al. 2004) and presented findings about the project in various conferences (e.g. Keil et al. 2003, Youtie et al. 2002). These data together constituted a rich body of knowledge informing the context of the project.

4.4.2 Primary Data

The interview protocol was developed after the preliminary quantitative data analysis. The main theoretical background that inspired the development of the interview questions is presented in detail in section 6.1. However, the analysis at this stage is exploratory rather than confirmatory.

The original interview protocol was sent to experts in digital inequality for evaluation and then modified based on experts' recommendation. The interview format was semi-structured and maintained the flexibility for open-ended discussion. This format permits the researcher to probe further when interesting or important aspects not conceived a priori (Bouchard 1976). The interview protocol was tested with two subjects before being administered to more interviewees. Meanwhile, a standard procedure was also established and employed to maximize the quality of the interview process and the validity of the data gathered. Appendix A shows the interview protocols.

To solicit interview subjects, two approaches were adopted. First, at the end of the mail survey, subjects were asked if they would be willing to participate in a follow up face-to-face interview. Phone calls were then made to interview the self-selected subjects. Second, the Troup County Senior Center generously granted the researcher access to solicit interviewees in the community center. The solicitation of interviewees continued until reaching "theoretical saturation" where no new information is identified (Strauss and Corbin 1998). These interviews were first tape-recorded and then transcribed for analysis. The number and profiles of the interviewees are reported in Chapter 6. In addition, if an interview involved a face-to-face visit, the researchers' personal observation of the interview subjects was noted to capture richer information.

Among the completed surveys, besides the quantitative data, many residents wrote of their experiences and opinions toward the technology, the initiative, and the city government. Some explained the reasons they did not adopt the technology or stopped using it, while others described their feelings about the project and the government. These qualitative data also constituted part of the primary data for analysis.

In addition, the researcher also conducted interviews with the city manager and council members. These data plus the interviews with residents and qualitative response in the mail surveys, together, provided a wide range of perspectives allowing the researcher to assess the situation more comprehensively.

Chapter 5: Quantitative Data Analysis & Results

This chapter presents the analysis of the quantitative data obtained via the mail survey. Section 5.1 presents the profiles of the respondents, followed by the classification of the under-privileged and privileged groups in section 5.2. Section 5.3 describes the comparison of the behavioral intention model between the under-privileged non-adopters and adopters. Next, the comparison between the under-privileged and privileged adopters is delineated in section 5.4. Finally, section 5.5 summarizes the major findings in this chapter.

Structural equation modeling (SEM) was the main technique chosen for data analysis, given its increasing popularity in behavioral scienece and its apparent strength over traditional regression-based analysis (Gefen et al. 2000, Rigdon 1998). The major benefit of SEM is its ability to test the structural model as a whole and test both structural and measurement model at the same time (Gefen et al. 2000, Rigdon 1998). This benefit reduces the possibility of capitalizing on chance by running multiple regressions and testing each hypothesis independently.

Also, unlike traditional techniques, the SEM technique explicitly models the measurement error (Hair et al. 1998, Rigdon 1998). In reality, even constructs with the best measurement properties will have certain measurement error (Hair et al. 1998). The error may derive from unreliability, measurement processes, or the influence from other constructs (Rigdon 1998). Modeling measurement error can actually provide much more accurate estimate of the causal relationships (Hair et al. 1998). Meanwhile, modeling the measurement error makes it possible to assess the quality of the measurement, which aids instrument improvement over time (Ridgon 1998).

In addition, SEM allows comparison of a model across multiple groups (Rigdon 1998), which is necessary in order to evaluate the behavioral models that compare under-privileged and privileged adopters (i.e. the second comparison). SEM also permits the comparison of path coefficients and latent construct means across multiple groups (Doll et al. 1998, MacKenzie and Spreng 1992, Marsh 1987, Marsh and Hocevar 1985, Steenkamp and Baumgartner 1998). The capability of SEM for multi-group analysis fits quite well for the purpose of this study.

Note that the multi-group analysis can only be applied in the context where a construct has the same meaning for groups involved in the comparison. This multi-group comparison technique will not be applied in the 1st comparison between the under-privileged non-adopters and adopters. Since for non-adopters, Behavioral Intention (BI), the key dependent variable, means behavioral intention to *start* using ICT; while for adopters, BI refers to intention to *continue* using ICT. As BI has two meanings in this context, it is therefore inappropriate to apply multi-group analysis in the 1st comparison. On the other hand, for the second comparison in which both groups are adopters (i.e under-privileged and privileged adopters), every construct shares the same meaning across groups, thus, making it feasible to apply the multi-group analysis technique in the second comparison.

5.1 Survey Respondents

Nine-hundred residents responded to the mail survey, yielding a raw response rate of 15%. After excluding empty and incomplete responses, 784 usable surveys were identified as usable for quantitative analysis.

To investigate possible non-response bias, a wave analysis was conducted to compare the indicators of key constructs as well as demographic profiles between the early and late respondents. Since the second wave post card reminder was mailed three weeks after the initial mail, subjects responding within three weeks were classified as early respondents, while those responding later than three weeks were classified as late respondents. The wave analysis was performed independently for adopters and non-adopters.

Table 5-1-1 shows the results of the T-test of the key variables between early and later respondents. For non-adopters, among the sixty-two variables, noticeable differences (p-value < 0.05) between early and later respondents include the third item of Attitude (p=0.035), the first item of Availability (0.009), the fifth item of Trust in Government (0.045), and the first item of Exposure to Innovation (0.014). For non-adopters, among the sixty-six variables, noticeable differences are Age (p=0.041), the first item of Social Outcomes (0.016), the second item of Intention to Use (p=0.03), and the first item of Use (p=0.025). Overall, the late respondents are quite similar to the early ones, suggesting that if there is any non-response bias, it would be minimal.

To further examine the issue of non-response bias, I adopted the general procedure used by Ravichandran and Rai (2000). Telephone interviews were made to 233 randomly sampled non-respondents. In the interview process, subjects were asked if they had received the mail surveys; if so, they were asked for the reasons behind their decisions not to respond. Table 5-1-2 displays the results of this investigation. As can be seen, the top five reasons for non-response are (1) did not receive surveys (27%), (2) did not like to fill out any survey (25%), (3) too busy and did not have time to answer the

survey (15%), (4) no one lived in the address or the one who lived here moved (11%), and (5) not interested in the survey (11%). The main reasons given for non-response were general issues that would be expected in any survey research and were not topic relevant.[11] However, a small portion of non-respondents' reasons might be specific to the survey theme, such as "did not know anything about computers" (6%), "not using LITV" (2%), and/or "did not like LITV" (1%). While caution should always be exercised when generalizing from survey data, there appears to be little evidence of any significant threat due to non-response bias.

The result of the telephone interviews also indicated some inaccuracies in the LITV installation list and the water bill list provided by the LaGrange city government. These inaccuracies may be attributed to the natural attrition or migration among the residents or an imperfect data recording process in which data might not be correctly recorded, thus compromising the data quality. By taking these issues as well as the number of non-deliverable surveys into consideration, the overall adjusted response rate was 19.5%.

Table 5-1-1: Non-Response Bias Check – Wave Analysis

Variables	Non-Adopters (P-value)	Adopters (P-value)
Income	**0.576**	**0.524**
Education Level	**0.869**	**0.715**
Gender	**0.883**	**0.178**
Age	**0.382**	**0.041**
Race	**0.455**	**0.327**
Attitude (item_1)	**0.069**	**0.594**
Attitude (item_2)	**0.055**	**0.899**
Attitude (item_3)	**0.035**	**0.713**
SN (item_1)	**0.578**	**0.156**

[11] As indicated by some researchers, the general response rate for mail survey of the general public has been decreasing to lower than 20%, 15%, and even 10% in the past few decades due to the increasing employment of such method (Hardbaugh 2002, steeh 1981). This has also been seen in some IS research (Pinsonneault and Kraemer 1993, Rai and Patnayakuni 2000, Ravichandran and Rai 2000)

SN (item_2)	**0.697**	**0.078**
PBC (item_1)	**0.253**	**0.256**
PBC (item_2)	**0.525**	**0.213**
PBC (item_3)	**0.229**	**0.107**
Utilitarian Outcomes (item_1)	**0.420**	**0.506**
Utilitarian Outcomes (item_2)	**0.405**	**0.400**
Utilitarian Outcomes (item_3)	**0.561**	**0.520**
Utilitarian Outcomes (item_4)	**0.563**	**0.916**
Hedonic Outcomes (item_1)	**0.138**	**0.111**
Hedonic Outcomes (item_2)	**0.100**	**0.262**
Hedonic Outcomes (item_3)	**0.153**	**0.166**
Social Outcomes (item_1)	**0.707**	**0.016**
Social Outcomes (item_2)	**0.804**	**0.130**
Social Outcomes (item_3)	**0.464**	**0.128**
Family, Relatives, Friends, and Peers' Inf. (item_1)	**0.968**	**0.591**
Family, Relatives, Friends, and Peers' Inf. (item_2)	**0.996**	**0.701**
Family, Relatives, Friends, and Peers' Inf. (item_3)	**0.640**	**0.369**
Family, Relatives, Friends, and Peers' Inf. (item_4)	**0.537**	**0.463**
Government Institutions' Influence (item_1)	**0.304**	**0.316**
Government Institutions' Influence (item_2)	**0.609**	**0.057**
Self-Efficacy (Item_1)	**0.712**	**0.395**
Self-Efficacy (item_2)	**0.782**	**0.340**
Self-Efficacy (item_3)	**0.779**	**0.554**
Requisite Knowledge (item_1)	**0.515**	**0.933**
Requisite Knowledge (item_2)	**0.575**	**0.785**
Requisite Knowledge (item_3)	**0.565**	**0.798**
Requisite Knowledge (item_4)	**0.393**	**0.061**
PEOU (item_1)	**0.730**	**0.697**
PEOU (item_2)	**0.983**	**0.840**
PEOU (item_3)	**0.760**	**0.756**
PEOU (item_4)	**0.895**	**0.670**
Cost (item_1)	**0.101**	**0.452**
Cost (item_2)	**0.482**	**0.826**
Cost (item_3)	**0.413**	**0.319**
Time (item_1)	**0.176**	**0.539**
Time (item_2)	**0.090**	**0.295**
Time (item_3)	**0.148**	**0.273**
Availability (item_1)	**0.009**	**0.358**
Availability (item_2)	**0.590**	**0.773**
Availability (item_3)	**0.783**	**0.399**
Availability (item_4)	**0.601**	**0.711**
Trust in Government (item_1)	**0.345**	**0.267**
Trust in Government (item_2)	**0.306**	**0.078**
Trust in Government (item_3)	**0.472**	**0.305**

Trust in Government (item_4)	**0.145**	**0.086**
Trust in Government (item_5)	**0.046**	**0.202**
Trust in Government (item_6)	**0.531**	**0.323**
Trust in Government (item_7)	**0.200**	**0.647**
Exposure to Innovation (item_1)	**0.014**	**0.378**
Exposure to Innovation (item_2)	**0.101**	**0.253**
Intention to Use (item_1)	**0.415**	**0.074**
Intention to Use (item_2)	**0.489**	**0.030**
Intention to Use (item_3)	**0.482**	**0.099**
Use (item_1)	**N/A**	**0.025**
Use (item_2)	**N/A**	**0.167**
Use (item_3)	**N/A**	**0.085**
Use (item_4)	**N/A**	**0.067**

Table 5-1-2: Reasons for Non-response

Reasons for Non-response	Percentage
Did not Receive	27%
Don't like to fill out any survey	25%
Not interested in this survey	15%
No one lives in the address or moved	11%
Too busy, don't have time	11%
The version received was wrong*	9%
Don't know anything about computers	6%
Passed away	3%
Sick or disabled to fill out he survey	2%
Not using LITV	2%
Receiving to many surveys	2%
Forgot to fill out	1%
Don't know how to fill out survey	1%
Not applicable, non-residence	1%
Don't like LITV	1%
Other reasons	4%

*In this situation, adopters received the survey for non-adopters, or non-adopters received the survey for adopters. A correct version was then mailed to these subjects if permission was granted.

5.2 Classifying Under-privileged and Privileged

Prior studies have identified that digital inequality is associated with such demographic factors as income, education, age, gender, race, geographic location, employment status, and so forth (DiMaggio et al. 2004, Lenhart 2002, Lenhart et al. 2003). Among these, income and education have been suggested as the best demographic predictors of ICT non-adoption (Lenhart 2002). I employed these two variables, each of

which is measured on an ordinal scale, to classify subjects as privileged or under-privileged. First, the two variables (income and education) used for cluster analysis show no evidence of non-response bias (see Table 5-1-1). Ward's method of hierarchical cluster analysis was then applied to these variables to extract privileged and under-privileged groups (Hair et al. 1998). The procedure classified 489 subjects into the privileged group and 295 subjects into the under-privileged group. The demographic profiles of the two groups are listed in Table 5-2-1. The results of T-test and Mann-Whitney test on demographics are displayed in Table 5-2-2. The data in these two tables suggest significant differences between two groups. The under-privileged tended to have lower household income and education level and consist of more elder and younger, African American, and female residents. In total, there were 151 under-privileged non-adopters, 144 under-privileged adopters, 182 privileged non-adopters, and 307 privileged adopters.

Table 5-2-1: Descriptive Statistics of Respondents

	Under-Privileged	**Privileged**
Household Income		
< 10k	31.9 %	0.2 %
10k – 14,999	22.7	0
15k – 24,999	24.7	4.9
25k – 34,999	7.5	17.5
35k – 49,999	2.0	21.0
50k – 74,999	0	24.5
75k – 99,999	0	14.6
> = 100k	0	17.2
Education Level		
Some Elementary/High School	29.1	0
High School Diploma	61.9	19.5
College Degree	9.0	49.1
Post Graduate	0	31.4
Age		
18-30	14.2	11.4
31-40	15.2	14.1
41-50	16.0	26.1
51-60	17.0	23.2

>60	37.6	25.3
Gender		
Male	22.9	41.6
Female	77.1	58.4
Ethnic Group		
White American	46.7	17.4
African American	49.1	79.8
Other	4.2	2.8

Table 5-2-2: Comparison of Demographics between Privileged and Under-privileged

Test	**T-Test**		**Mann-Whitney Test**	
Statistics	**T-Score**	**Sig.**	**Z-Score**	**Sig.**
Household	-34.52	0	-21.26	0
Education Level	-20.74	0	-16.84	0
Age	1.14	0.255	-1.59	0.113
Gender	5.40	0	-5.30	0
Ethnic Group	-6.58	0	-8.90	0

I subsequently conducted two additional analyses to ensure (1) the representativeness of respondents, in terms of income and education level, relative to overall LaGrange residents, and (2) the representativeness of the privileged and under-privileged extracted from the survey data.

First, the U.S. census data pertaining to the city of LaGrange was downloaded for analysis.[12] According to the U.S. census bureau, LaGrange consists of 30 block groups.[13] For each block group, median household income[14] and average education level were obtained from the census data as well as from the survey data by using the geographic information system ArchView 8.3. The high correlation of household income, as well as the education level, between the census and survey data across the 30 block groups (Table 5-2-3), plus the plausible results of the wave analysis (Table 5-2-1), suggest good representativeness of the respondents to the overall LaGrange residents.

[12] http://factfinder.census.gov/home/saff/main.html
[13] Block group is the lowest census unit where data about income and education is available.
[14] Only median household income, instead of average household income, is available via the census data.

Table 5-2-3: Correlation Between Survey and Census Data

Dimension	Correlation
Median Household Income (Survey Data versus Census Data)	0.86
Average Education Attainment (Survey Data versus Census Data)	0.88

Finally, to evaluate the representativeness of the clustered privileged and under-privileged samples, I conducted the following analysis. First, the ratio of the number of privileged respondents divided by the number of under-privileged respondents was calculated for each block group. This number represents the proportion of the privileged to under-privileged respondents in each block group. This ratio may serve as an indicator of the overall socio-economic status of the residents living in the block group. The higher the ratio, the higher the socio-economic status the block group should be. Next, the correlation values between this ratio and (a) the median household income from the census bureau data, and (b) the average education level (also from census bureau data), were calculated across the 30 block groups. The resulting high correlations (Table 5-2-4) strongly suggest that the ratio of privileged to under-privileged respondents in our sample is consistent with the income and education level of each block group according to the census data. This supports the validity of the cluster analysis and the representativeness of the clustered under-privileged and privileged groups..

Table 5-2-4: Correlation between Privileged vs. Under-privileged Ratio and Census Data

Dimension	Correlation
Ratio (# of the privileged / # of the under-privileged) **versus Median Household Income** (Across 30 block groups)	0.89
Ratio (# of the privileged / # of the under-privileged) **versus Average Education Attainment** (Across 30 block groups)	0.73

5.3 Comparison 1: Under-privileged Non-Adopters vs. Under-privileged Adopters

This section presents the analysis and results of the comparison of the behavioral intention models between under-privileged non-adopters and adopters. The measurement model was first evaluated for each group, followed by the assessment of their structural models. The hypotheses were then tested by comparing the structural differences between the structural models. The results and discussion are presented in the final section.

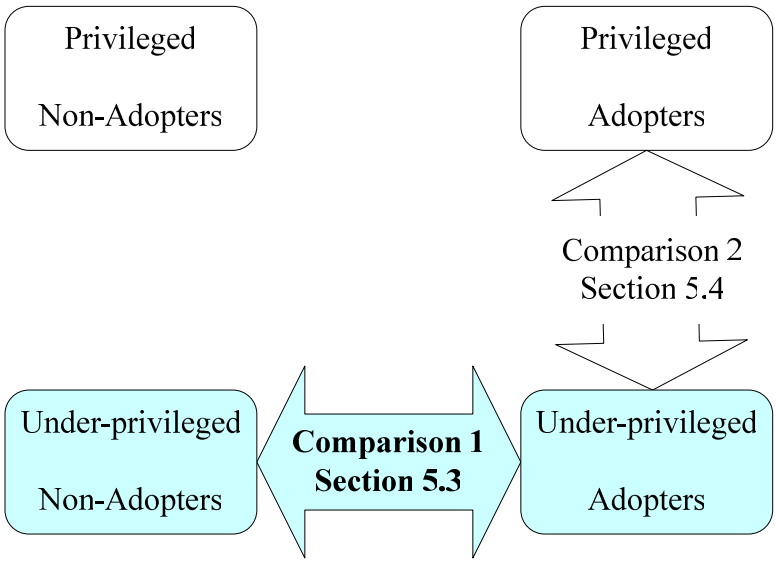


Figure 5-3-1: Under-privileged Non-Adopters vs. Adopters

5.3.1 Measurement Model

To verify construct validity, using AMOS 5.0, multiple item constructs were subjected to confirmatory factor analysis (CFA) for both groups. Given the model complexity and available sample size, a bootstrapping simulation[15] was adopted to ensure the reliability of statistical results (Agarwal and Prasad 1999, Bollen and Stine 1992,

[15] Bootstrapping technique has the advantages in overcoming statistical challenges like relative small size (versus complex models) and non-normal distributions (Bollen and Stine 1992, Stine 1989). I applied this bootstrapping approach in all analyses, including CFA and structural model testing.

Stine 1989). Two thousand sets of samples were randomly generated with sample sizes set equal to the original sample sizes (144 and 151) and then tested against the measurement model. The measurement items were assessed for their convergent validity, reliability, and discriminant validity.

The initial evaluation process revealed some small problems with the measurement models. First, the reliability of the Cost construct seemed to be relatively low. A content analysis suggested that the 2nd and 3rd items did not really represent the Cost that I intended to measure. The 2nd item asks if subjects believe the Internet TV is really free, while the 3rd items asks subjects if they expect the government will charge for the service in the future.[16] Only the 1st item asks subjects' whether the cable TV cost is a hurdle for them to connect to the Internet TV. Thus, only the 1st item was retained for analysis.

Further, for Exposure to Innovation, the 2nd item asks subjects' knowledge about the extent to which the entire LaGrange population has subscribed to the Internet TV service. About 30% of the subjects left it blank and some responded that they had no information for this question. Given the high non-response rate, this item was also dropped. This high non-response rate of the 2nd item seems to support Valente's (1995) idea that when a behavior is not observable in public, Exposure to Innovation should refer to the percentage of adopters in one's social network but not the social system. Since the adoption of the Internet TV is not observable in public, residents will have difficulty in estimating the adoption level in the city.

[16] 2nd item: "Free Internet TV is not really free."
3rd item: "I believe that the city government will start to charge for the Internet TV."

The resulting CFAs showed acceptable fit for both the under-privileged adopters and non-adopters (Table 5-3-1-1). For the non-adopters, 1978 of the 2000 cases converged. The χ^2 to degree of freedom (DF) ratio of 2.837 is smaller than the recommended 3 by Hair et al. (1998), Bollen-Stine P-value (0.159) higher than 0.05 (Bollen and Stine 1993), TLI (0.901) higher than 0.9 (Teo et al. 2003), CFI (0.909) higher than 0.9 (Gefen et al. 2003), SRMR (0.048) lower than 0.08 (Hu and Bentler 1999), and RMSEA (0.086) lower than 0.10 (Browne and Cudeck 1994).[17] For the adopter group, 1997 of the 2000 cases converged: χ^2 to DF ratio of 1.698, Bollen-Stine P-value = 0.358, SRMR = 0.059, TLI = 0.906, CFI = 0.919, and RMSEA at 0.057.

Table 5-3-1-1: Goodness of Fit Indices for the Measurement Models

Goodness of Fit Indices	Under-privileged Non-adopters	Under-privileged Adopters	Desired level
χ^2	3631.58	2173.85	smaller
Degree of Freedom (DF)	1280	1280	
χ^2 / DF	2.837	1.698	< 3
Bollen-Stine P-value	0.159	0.358	>0.05
TLI	0.901	0.906	> 0.9
CFI	0.909	0.919	> 0.9
SRMR	0.048	0.059	< 0.08
RMSEA	0.086	0.057	< 0.1

Table 5-3-1-2 presents the descriptive statistics, Cronbach's α, composite reliability, and average variance extracted (AVE) of the constructs. All internal reliabilities and composite reliabilities are higher than the suggested 0.707 (Nunnally 1978). Average variance extracted is above 0.5 for all constructs, which suggest explained variance is higher than unexplained (Segars 1997).

[17] There are different opinions about the cut-off value of RMSEA. Browne and Cudeck (1994) suggested 0.1 as the threshold, Hu and Bentler (1999) argued for 0.06, while Jarvenpaa et al. (2000) recommended 0.08.

Table 5-3-1-2: Descriptive Statistics and Reliabilities of Constructs

Construct(a)	**Under-Privileged Non-Adopters**				**Under-Privileged Adopters**			
	Mean (S.D.)	α [b]	Composite Reliability	AVE	Mean (S.D.)	α	Composite Reliability	AVE
Attitude (3)	4.64(2.42)	0.98	0.98	0.97	5.76(1.74)	0.98	0.98	0.96
Utilitarian Outcomes (4)	4.21(2.53)	0.98	0.98	0.96	5.37(1.83)	0.98	0.98	0.94
Hedonic Outcomes (3)	4.60(2.54)	0.98	0.98	0.97	5.69(1.85)	0.98	0.98	0.97
Social Outcomes (3)	2.98(2.10)	0.95	0.95	0.85	3.53(2.06)	0.91	0.95	0.87
Subjective Norm (2)	2.61(2.10)	0.95	0.97	0.95	3.83(2.16)	0.96	0.97	0.94
Fam., Rel., Fri., & Peers (4)	2.62(2.11)	0.97	0.97	0.90	4.01(2.18)	0.97	0.97	0.91
Gov. Institutions' Inf. (2)	3.14(2.30)	0.95	0.96	0.93	4.23(2.27)	0.93	0.96	0.93
Perceived Behavioral Control (3)	4.74(2.46)	0.97	0.97	0.91	5.77(1.59)	0.91	0.94	0.83
Self-Efficacy (3)	4.76(2.46)	0.96	0.97	0.94	5.89(1.68)	0.95	0.96	0.88
Requisite Knowledge (4)	5.04(2.52)	0.97	0.97	0.96	6.08(1.52)	0.94	0.96	0.86
Perceived Ease of Use(4)	4.63(2.46)	0.98	0.98	0.96	5.49(1.80)	0.92	0.94	0.80
Cost (1)	2.84(2.47)	N.A.	N.A.	N.A.	3.19(2.40)	N.A.	N.A.	N.A.
Time(3)	2.79(2.17)	0.93	0.93	0.82	2.74(1.94)	0.93	0.93	0.83
Availability(4)	2.88(1.93)	0.81	0.86	0.61	2.80(1.48)	0.71	0.80	0.53
Trust (7)	3.99(1.89)	0.97	0.97	0.85	4.66(1.61)	0.94	0.94	0.72
Exposure to Innovation (1)	0.24(0.28)	N.A.	N.A.	N.A.	0.42(0.29)	N.A.	N.A.	N.A.
Intention to Use (3)	2.93(2.27)	0.98	0.98	0.94	4.91(2.37)	0.97	0.98	0.94
Internet PC Ownership (1)	0.21(0.41)	N.A.	N.A.	N.A.	0.20(0.41)	N.A.	N.A.	N.A.

a. The number in the parentheses indicates the resulting number of items in the scale.
b. Cronbach's Alpha

Discriminant validity was first assessed by evaluating if the squared correlation between a pair of constructs is lower than the AVE of each of the two constructs (Anderson and Gerbing 1988, Segars 1997). The test was applied to every possible combination of latent constructs. Appendix B-1 and B-2 show the results of this analysis for under-privileged non-adopters and adopters, respectively. As can be seen in Appendix B-1 and B-2, each multiple-item construct is distinct from others, suggesting good discriminant validity. Next, as recommended by Anderson (1987) and Segars (1997), discriminant validity was further evaluated by testing whether the correlations between pairs of constructs are significantly different from unity. This was done through the comparison of the chi-square value of the unconstrained measurement model with all latent constructs against other CFAs in which every possible pair of constructs were set to

be unified one at a time (Baggozi et al. 1991, Gefen et al. 2003, Gefen et al. 2000, Teo et al. 2003). The chi-square of the unconstrained CFA is in general lower than any possible union of any two constructs (see Appendix B-3 for under-privileged non-adopters and B-4 for under-privileged adopters). The results of the above two analyses collectively support discriminant validity.

5.3.2 Structural Model

The structural model was independently tested for each group, and both groups fit reasonably well (Table 5-3-2-1). For the non-adopter group, the solution converged in 1971 of 2000 data sets. The χ^2 of 3736.01 with 1325 DF indicates a χ^2 to DF ratio of 2.82. The Bollen-Stine P-value at 0.134, SRMR at 0.0631, TLI at 0.901, CFI at 0.905, and RMSEA at 0.087 collectively suggest good fit. For the adopter group, the solution converged in 1995 of the 2000 cases. The χ^2 of 2244.51 with 1325 DF indicates a χ^2 to DF ratio of 1.694. The Bollen-Stine P-value at 0.328, SRMR at 0.065, TLI at 0.906, CFI at 0.917, and RMSEA at 0.069 also suggest good model fit. Figure 5-3-2 and Figure 5-3-3 present the structural models for the under-privileged non-adopters and adopters, respectively.

Table 5-3-2-1: Goodness of Fit Indices for the Structural Models

Goodness of Fit Indices	Under-privileged Non-adopters	Under-privileged Adopters	Desired level
X^2	3736.01	2244.51	smaller
Degree of Freedom (DF)	1325	1325	
X^2 / DF	2.82	1.694	< 3
Bollen-Stine P-value	0.134	0.328	>0.05
TLI	0.901	0.906	> 0.9
CFI	0.905	0.917	> 0.9
SRMR	0.0631	0.065	< 0.08
RMSEA	0.087	0.069	< 0.1

Figure 5-3-2: Structural Model for Under-Privileged Non-Adopters

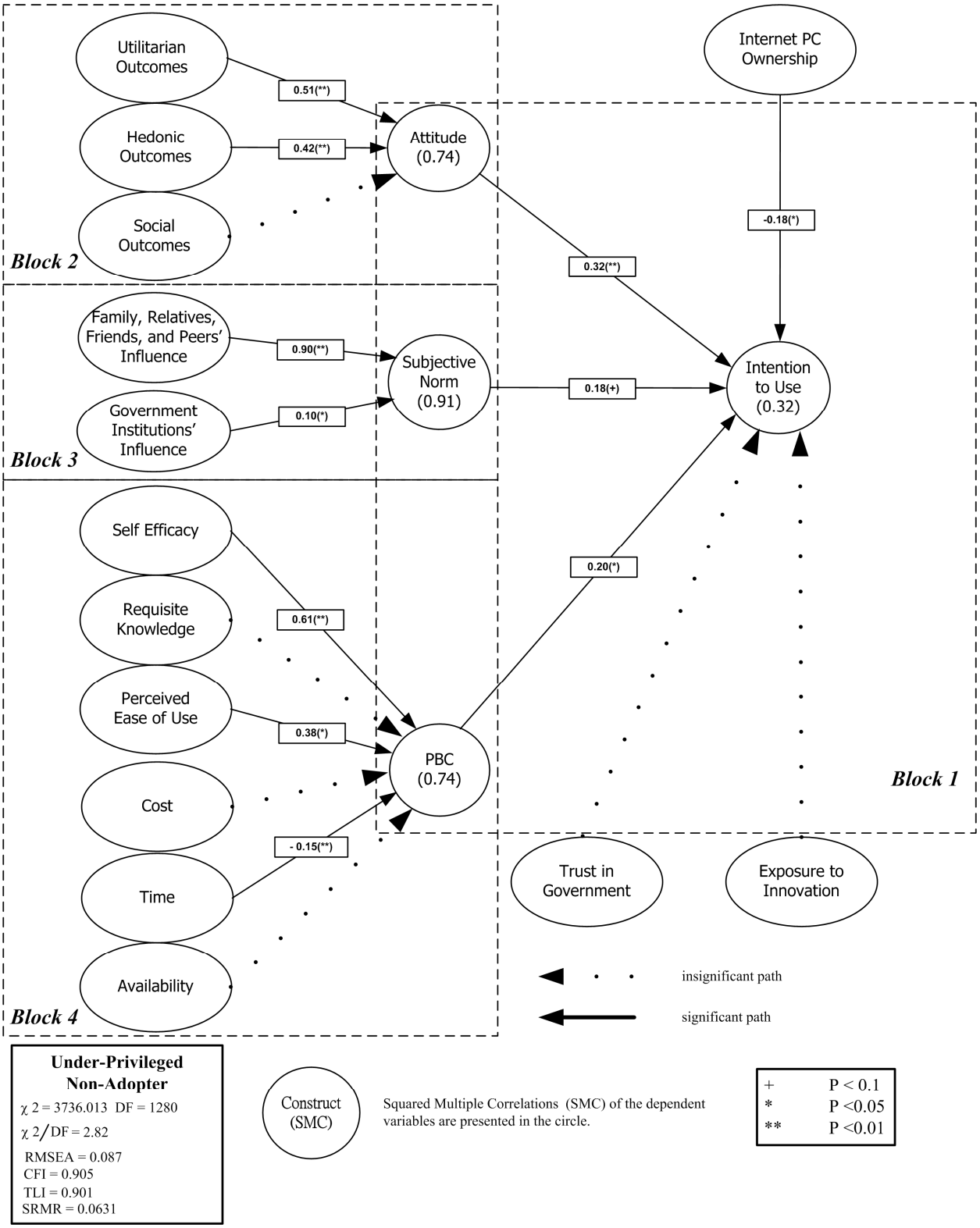
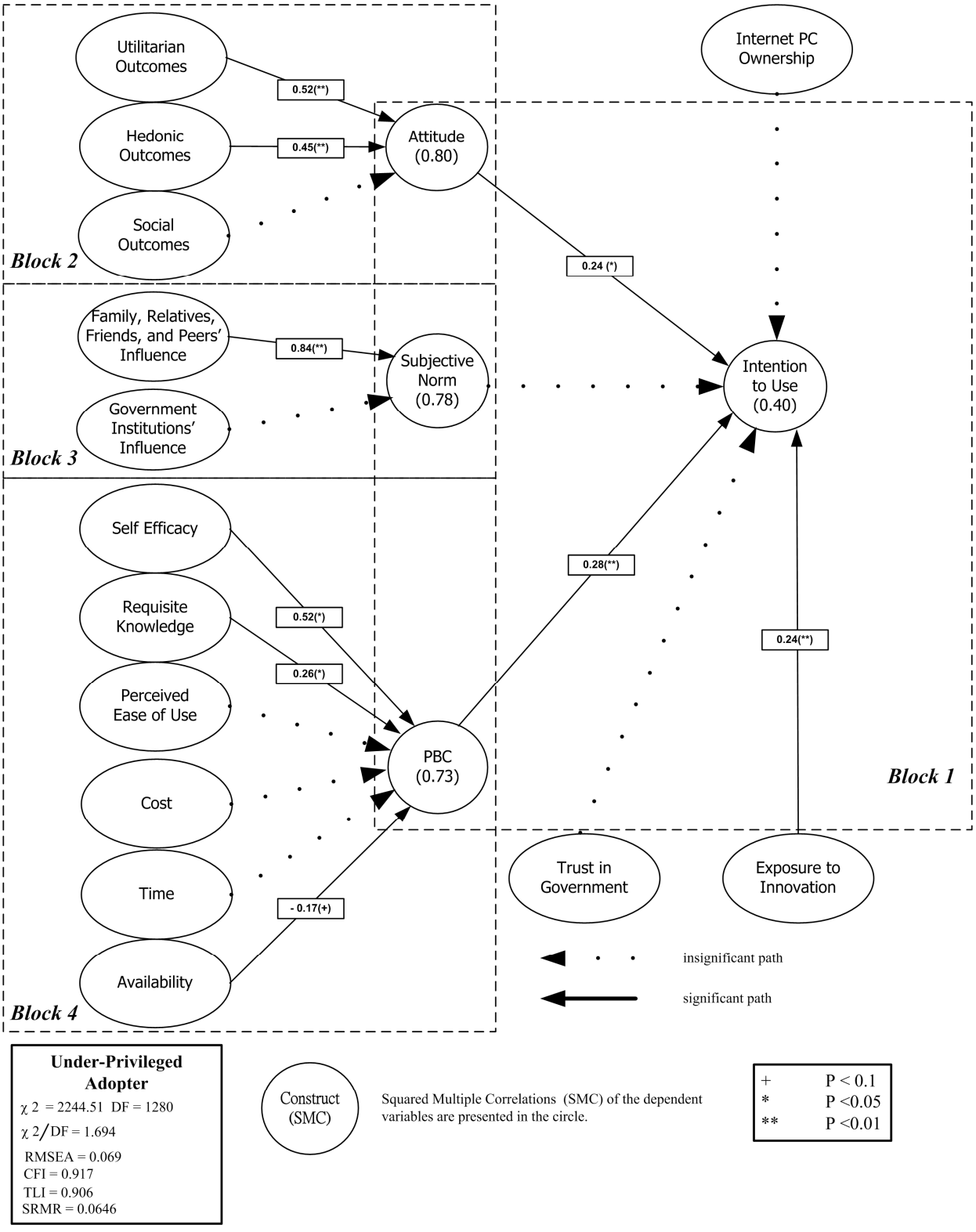


Figure 5-3-3: Structural Model for Under-Privileged Adopters



5.3.3 The Comparison of Behavioral Models

The two behavioral models were compared by examining whether a path was significant across the two models.[18] Table 5-3-3-1 lists the models comparison results; table 5-3-3-2 presents the results of hypothesis testing. The results suggest that the factors influencing ICT innovation decisions are indeed different between under-privileged adopters and non-adopters.

Table 5-3-3-1: Path Comparison Between Models

Path	Non-Adopters	Adopters	Different across groups?
Utilitarian Outcomes → Attitude	Significant	Significant	No
Hedonic Outcomes → Attitude	Significant	Significant	No
Social Outcomes → Attitude	Not Significant	Not Significant	No
Family, Relative, Friends and Peers → SN	Significant	Significant	No
Government Institutions' Influence → SN	Not Significant	Significant	*Different*
Self-Efficacy → PBC	Significant	Significant	No
Requisite Knowledge → PBC	Not Significant	Significant	*Different*
Perceived Ease of Use → PBC	Significant	Not Significant	*Different*
Cost → PBC	Not Significant	Not Significant	No
Time → PBC	Significant	Not Significant	*Different*
Availability → PBC	Not Significant	Significant	*Different*
Attitude → Intention to Use	Significant	Significant	No
SN → Intention to Use	Significant	Not Significant	*Different*
PBC → Intention to Use	Significant	Significant	No
Exposure to Innovation → Intention to Use	Not Significant	Significant	*Different*
Trust in Government → Intention to Use	Not Significant	Not Significant	No
Internet PC Ownership → Intention to Use	Significant	Not Significant	*Different*

[18] Even though the differences of the wording in the two versions of surveys were kept to a minimum, I must stress that almost every construct is conceptually different for adopters and non-adopters, except Exposure to Innovation, Trust in Government, and Internet PC ownership. Take Intention to Use (i.e. Behavioral Intention) for example, for non-adopters, it refers to the intention to start using the technology; for adopters, it means the intention to continue using the technology. Consequently, it is not meaningful to compare the latent construct means and the strength of relationships (i.e. path coefficients) across groups. I thus only assessed the structural difference by examining if a path coefficient is significant or insignificant in both behavioral models.

Table 5-3-3-2: Results of hypothesis testing

(Related Hypotheses) Path	Support
(H1-1) Attitude will have less influence on Behavioral Intention for under-privileged non-adopters than adopters.	NO
(H1-2) Subjective Norm will influence Behavioral Intention more strongly for under-privileged non-adopters than adopters.	YES
(H1-3) Perceived Behavioral Control will influence Behavioral Intention for both under-privileged non-adopters and adopters.	YES
(H1-4) Utilitarian Outcomes will positively influence Attitude for both under-privileged non-adopters and adopters.	YES
(H1-5) Hedonic Outcomes will positively influence Attitude for both under-privileged non-adopters and adopters.	YES
(H1-6) Social Outcomes will not influence Attitude for both under-privileged non-adopters and adopters.	YES
(H1-7) Family, Relatives, Friends, and Peers' Influence will positively influence Subjective Norm for both under-privileged non-adopters and adopters.	YES
(H1-8) Government Institutions' Influence will positively influence Subjective Norm for both under-privileged non-adopters and adopters.	NO
(H1-9) Self-efficacy will positively influence Perceived Behavioral Control for both under-privileged non-adopters and adopters.	YES
(H1-10) Requisite Knowledge will influence Perceived Behavioral Control to a lesser degree for under-privileged non-adopters than adopters.	YES
(H1-11) Perceived Ease of Use will influence Perceived Behavioral Control more strongly for under-privileged non-adopters than adopters.	YES
(H1-12) Cost will not influence Perceived Behavioral Control for both under-privileged non-adopters than adopters.	YES
(H1-13) Time will influence Perceived Behavioral Control more strongly for under-privileged non-adopters than adopters.	YES
(H1-14) Availability will influence Perceived Behavioral Control to a lesser degree for under-privileged non-adopters than adopters.	YES
(H1-15) Exposure to Innovation will influence Behavioral Intention less strongly for under-privileged non-adopters than adopters.	YES
(H1-16) Trust in Government will positively influence Behavioral Intention for both under-privileged non-adopters and adopters.	NO

5.3.4 Results and Discussion

Attitudinal Belief

For both adopters and non-adopters, Attitude is a common factor determining behavioral intention. Consistent with motivation theory, both Utilitarian (extrinsic) and Hedonic (intrinsic) Outcomes are important attitudinal antecedents. Therefore, for under-privileged people, emphasizing the enjoyment as well as the usefulness in ICT usage,

rather than just the usefulness, may help develop a more positive attitude toward using the technology. Social Outcomes, as suggested by Rogers (2003), is not important for the under-privileged.

Social Influence (Subjective Norm and Exposure to Innovation)

The expectation from individuals' family, relatives, friends, and peers is critical in shaping Subjective Norm for both groups. For under-privileged non-adopters, the influence of the government on SN is also significant though relatively small (Figure 5-3-2). Subjective Norm, as expected, is influential in Intention to Use for non-adopters, but not for adopters. This may lend support to the notion that the effect of SN on behavioral intention attenuates after people start using ICT (Triandis 1971) since their attention focuses more on other cognitive beliefs as direct experience increases (Karahanna et al. 1999)

On the other hand, the results suggest that the social network keeps exerting its power over innovation decisions even after ICT adoption (Figure 5-3-3), but through a mimetic mechanism. As elaborated in the earlier section, while SN focuses on the "expectation" from "important" others, Exposure to Innovation concerns the "observation" of the aggregate manifest behavior across the overall social network. For adopters, the significant path from Exposure to Innovation, or the cumulative proportion of adopters in one's social network, to Behavioral Intention represents such a mimetic effect. In fact, the results of a post hoc analysis reveal that the inclusion of this mimetic effect increases the explanation power of the dependent variable (BI) by 10%. However, this path is insignificant for non-adopters (Figure 5-3-2). This distinction might suggest that the non-adopters are less sensitive to this mimetic pressure, as compared to adopters.

Unfortunately, these non-adopters also have less exposure (24 %) than adopters (42 %),[19] indicating that under-privileged non-adopters are exposed less to signals of aggregate innovation behavior patterns in the population. From the perspective of Rogers' adopter categorization (2003), these under-privileged non-adopters may fall into the least innovative category that generally have the least exposure or are least responsive to such exposure, if any (Valente 1995).

In all, the distinctive effects of Subjective Norm and Exposure to Innovation on Behavioral Intention support the idea that these two constructs are conceptually distinct and influence ICT innovation behavior through different social mechanisms. Consequently, they may as well be operationalized and investigated as distinct constructs.

Behavioral Control

PBC, as hypothesized, is critical in determining Intention to Use for both under-privileged's adopters and non-adopters. Nonetheless, adopters and non-adopters differ in their perceptions of the importance of certain factors that can affect PBC. For non-adopters, Self-Efficacy, Perceived Ease of Use, and Time are important behavioral control antecedents; for adopters, Self-Efficacy, Requisite Knowledge, and Availability are salient ones.

Internal Control

Consistent with extant literature, Self-Efficacy is the most influential factor in determining PBC for all groups. Presumably, psychological confidence in using ICT is essential for the under-privileged in shaping their behavioral control belief. Bandura (1977) has recommended that repeated experience, vicarious learning, verbal persuasion,

[19] A T-test of Exposure to Innovation between these two groups suggests a significant difference.

and good health condition can boost one's Self-Efficacy. Designing programs that enhance the under-privileged's confidence in using ICT should help increase their behavioral control.

Meanwhile, without direct interaction with the actual technology, non-adopters seem to worry about whether the technology is easy-to-use and the level of effort needed to overcome the technological complexity. However, with actual usage experience, adopters focus more on the knowledge required for usage. Such differences may be partially attributed to the user-friendly design of the Internet TV in the current context. Thus, policy makers may address these issues for the under-privileged by focusing on 1) communicating the user-friendly design aspect of the technology before adoption, and 2) providing support for knowledge acquisition after adoption.

External Control

Cost, understandably, is not a significant factor for either non-adopters or adopters. The "free" policy seems to have eliminated economic barriers to use. However, other external barriers still exist for these under-resourced people.

Lack of time appears to be a significant constraint that prevents under-privileged non-adopters from starting to use ICT. This echoes findings in prior research that Time is a constraint for ICT non-users (Lenhart 2002, Lenhart et al. 2003, Trotter 2001). Some non-adopters in LaGrange reported that they have to work two to three jobs to support their family or they have to dedicate themselves to childcare or sick family members, leaving no time for the Internet TV. For some under-privileged people for whom life is a day-to-day struggle, using ICT is simply not a priority for daily living (Crump and Mcllroy 2003). Further, for adopters, although Time is not an issue for them, Availability

emerges as another physical barrier. Potentially, the conflict between household members who want to watch TV and those who want to use the Internet TV, the competition among members who want to use the Internet TV at the same time, and the location of the technology (e.g. the living room or the bedroom) could all create availability issues, since the Internet TV might not be available when or where it is needed. While the "free" policy can deal with the economic barrier, access- and time-related issues are likely hard to be resolved through policy intervention, given the nature of the technology used in this particular case and the reality of life's struggles facing the under-privileged.

Trust

For both groups, Trust in Government does not directly influence the under-privileged's intention to use the technology. However, it is possible that individuals' trust in other trustees, such as the technology itself or the Internet service providers, may influence their ICT use intention.

Internet PC Ownership

In the context of TPB-related factors, Exposure to Innovation, and Trust, Internet PC ownership has a dampening effect on intention to use the Internet TV for the non-adopters, but not for the adopters. The ownership of an Internet PC at home does not reduce adopters' Intention to Use. One possible explanation for this is that there might be high demand for Internet access among household members, thus they welcomed the Internet TV even though they already possessed an Internet PC.

Overall, the Internet TV serves as a good introductory technology for people with low knowledge and skill level. However, if users learn skills and expect to advance to sophisticated operations, they may have to move up to personal computers. According to

the data, 27% of the adopters considered acquiring Internet PCs because of their Internet TV experience, and 59% of these people actually converted to Internet PCs. This upgrade implies costs for hardware, software, and monthly charges for Internet connectivity. These costs might again raise the economic hurdle for members in the under-privileged group, explaining why the Internet TV did not lead to even more upgrades to Internet PCs.

5.3.5 Points of Leverage

To identify the effective leverage points to encourage non-adopters to start and adopters to continue using the technology, a path analysis was conducted to examine and prioritize each antecedent's overall impact on behavioral intention. If an antecedent had direct influence on behavioral intention, its impact was measured as the path coefficient of the relationship. However, if an antecedent (e.g. Utilitarian Outcomes) influenced behavioral intention through the mediation of other cognitive factors (Attitude), its overall impact on intention was calculated as the product of its impact on the cognitive factor ($\beta_{(UO \rightarrow Attitude)}$) and the impact of the cognitive factor on behavioral intention ($\beta_{(Attitude \rightarrow Intention\ to\ Use)}$). Table 5-3-4-1 presents the results of this analysis.

Table 5-3-4-1: Leverage Points

Antecedents	Non-adopters		Adopters	
	Impact	Priority	Impact	Priority
Utilitarian Outcomes	0.163	1	0.125	3
Hedonic Outcomes	0.134	3	0.108	4
Social Outcomes	No		No	
Family, Relatives, Friends, and Peers' Inf.	0.162	2	No	
Government Institutions' Influence	0.018	7	No	
Self-Efficacy	0.122	4	0.146	2
Requisite Knowledge	No		0.073	5
Perceived Ease of Use	0.076	5	No	
Cost	No		No	
Time	0.03	6	No	
Availability	no		0.048	6

Exposure to Innovation	no		0.24	1
Trust	no		No	

For under-privileged non-adopters, Utilitarian Outcomes, Family, Relative, Peers, and Friends' Influence, Hedonic Outcomes, and Self-Efficacy offer greater leverage to increase people's intention to start to use the technology. For adopters, Exposure to Innovation, Self-Efficacy, Utilitarian Outcomes, and Hedonic Outcomes provide more influence to encourage continued usage. Note that the impact of Exposure to Innovation on behavioral intention is particularly high for adopters. Therefore, to encourage continued ICT usage after adoption, it is critical to develop initiatives that can effectively communicate such aggregate patterns of ICT usage.

5.4 Comparison 2: Under-privileged Adopters vs. Privileged Adopters

This section describes the analysis and results of the comparison between under-privileged and privileged adopters' ICT Use models. Again, the measurement and structural models were first evaluated for each group. An invariance analysis was performed to ensure the feasibility to conduct the multi-group comparison. Proposed hypotheses were examined through the comparison of the path coefficients and construct means between two groups. Significant differences were detected and are discussed in the section 5.4.4.

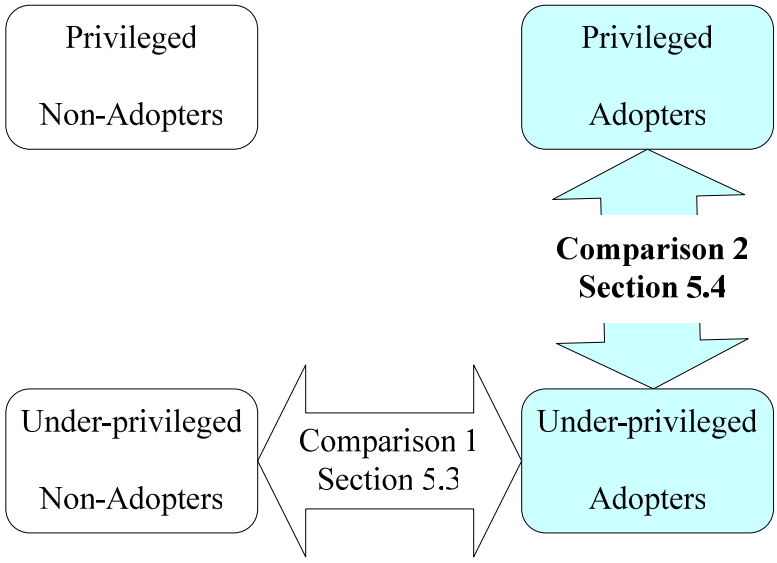


Figure 5-4-1: Under-privileged Adopters vs. Privileged Adopters

5.4.1 Measurement Model

AMOS 5.0 was adopted as the tool for Structural Equation Modeling. The bootstrapping simulation approach was again employed to deal with the issue of the relatively small sample size in a complex model, as explained in section 5.3.1. Two

thousand sets of samples were randomly generated with sample sizes set equal to the original sample sizes (307 and 144) and then tested against the measurement model. The same three items were also dropped in this analysis because of the content validity or high non-response rate.

The resulting CFAs show good fit for both privileged and under-privileged groups (Table 5-4-1-1). For the under-privileged group, 1997 of the 2000 cases converged: χ^2 to DF ratio of 1.70, Bollen-Stine p value =0.358, TLI = 0.906, SRMR = 0.057, CFI = 0.919, and RMSEA = 0.059. For the privileged group, 1963 of the 2000 cases converged: χ^2 to degree of freedom (DF) ratio of 1.85, Bollen-Stine p-value =0.28, TLI = 0.942, SRMR = 0.067, CFI = 0.95, and RMSEA = 0.053.

Table 5-4-1-1: Goodness of Fit Indices for the Measurement Models

Goodness of Fit Indices	Under-privileged Adopters	Privileged Adopters	Desired level
χ^2	2173.85	2371.18	smaller
Degree of Freedom (DF)	1280		
χ^2 / DF	1.70	1.85	< 3
Bollen-Stine P-value	0.358	0.28	>0.05
TLI	0.906	0.942	> 0.9
CFI	0.919	0.950	> 0.9
SRMR	0.059	0.067	< 0.08
RMSEA	0.057	0.053	< 0.1

Table 5-4-1-2 presents the descriptive statistics, internal and composite reliabilities, and average variance extracted of the constructs. The internal and composite reliabilities are all higher than the recommended 0.707 (Nunnaly 1978). For each construct, AVE is higher than 0.5, suggesting that the explained variance is higher than the unexplained (Segars 1997).

Table 5-4-1-2: Descriptive Statistics and Reliabilities of Constructs

Construct(a)	**Under-Privileged Adopters**				**Privileged Adopters**			
	Mean (S.D.)	α [b]	Composite Reliability	AVE[c]	Mean (S.D.)	α	Composite Reliability	AVE
Attitude (3)	5.76(1.74)	0.98	0.98	0.96	4.86(1.87)	0.98	0.98	0.95
Utilitarian Outcomes (4)	5.37(1.83)	0.98	0.98	0.94	4.09(2.18)	0.98	0.98	0.97
Hedonic Outcomes (3)	5.69(1.85)	0.98	0.98	0.97	4.27(2.26)	0.98	0.98	0.97
Social Outcomes (3)	3.53(2.06)	0.91	0.95	0.87	2.68(1.72)	0.91	0.94	0.85
Subjective Norm (2)	3.83(2.16)	0.96	0.97	0.94	2.74(2.02)	0.96	0.97	0.94
Fam., Rel., Fri., & Peers (4)	4.01(2.18)	0.97	0.97	0.91	2.84(2.02)	0.96	0.98	0.95
Gov. Institutions' Inf. (2)	4.23(2.27)	0.93	0.96	0.93	3.81(2.12)	0.96	0.97	0.95
Perceived Behavioral Control (3)	5.77(1.59)	0.91	0.94	0.83	6.05(1.49)	0.92	0.95	0.86
Self-Efficacy (3)	5.89(1.68)	0.95	0.96	0.88	5.76(1.73)	0.95	0.97	0.92
Requisite Knowledge (4)	6.08(1.52)	0.94	0.96	0.86	6.28(1.24)	0.86	0.92	0.74
Perceived Ease of Use(4)	5.49(1.80)	0.92	0.94	0.80	4.96(1.87)	0.91	0.93	0.77
Cost (1)	3.17(2.36)	N.A.	N.A.	N.A.	2.15(1.94)	N.A.	N.A.	N.A.
Time(3)	2.74(1.94)	0.93	0.93	0.83	3.18(1.95)	0.87	0.94	0.83
Availability (4)	2.80(1.48)	0.71	0.80	0.53	2.88(1.30)	0.71	0.71	0.55
Exposure to Innovation (1)	0.42(0.29)	N.A.	N.A.	N.A.	0.31(0.26)	N.A.	N.A.	N.A.
Trust (7)	4.66(1.61)	0.94	0.94	0.72	4.80(1.56)	0.96	0.96	0.80
Intention to Use (3)	4.91(2.37)	0.97	0.98	0.94	3.31(2.55)	0.97	0.98	0.96
Use (4)	4.35(2.2)	0.94	0.95	0.83	2.73(2.14)	0.96	0.97	0.90

a. The number in the parentheses indicates the resulting number of items in the scale.
b. Cronbach's Alpha
c. Average Variance Extracted

For discriminant validity, the squared correlation between a pair of constructs is supposed to be lower than the AVE of each of the two constructs (see Appendix C-1 for under-privileged adopters and C-2 for privileged adopters). As can be seen in Appendix C-1 and C-2, each multiple-item construct is distinct from others, suggesting good discriminant validity. Discriminant validity was further examined by testing whether the correlations between pairs of constructs are significantly different from unity. The chi-square of the unconstrained CFA is generally lower than any possible union of any two constructs (see Appendix C-3 for under-privileged non-adopters and C-4 for under-privileged adopters). The results of the above two analyses jointly support discriminant validity.

5.4.2 Structural Model

The structural model was independently tested against the privileged and under-privileged groups (Table 5-4-2-1). For the under-privileged group, the solution converged in 1995 of 2000 data sets. The χ^2 of 2244.51 with 1325 DF indicates a χ^2 to DF ratio of 1.694. The Bollen-Stine p value at 0.328, TLI at 0.906, SRMR at 0.065, CFI at 0.917, and RMSEA at 0.069 collectively suggest good fit. For the privileged group, the solution converged in 1983 cases. The χ^2 of 2464.528 with 1325 DF indicates a χ^2 to DF ratio of 1.86. The Bollen-Stine p value at 0.256, TLI at 0.942, SRMR at 0.072, CFI at 0.948, and RMSEA at 0.053 also suggest good model fit. Figure 5-4-2 presents the standardized path coefficients and the squared multiple correlations (SMC). Table 5-4-2-2 presents the significance of paths in both groups. The results suggest that these two models are different. The details of the differences are further examined in the next section.

Table 5-4-2-1: Goodness of Fit Indices for the Structural Models

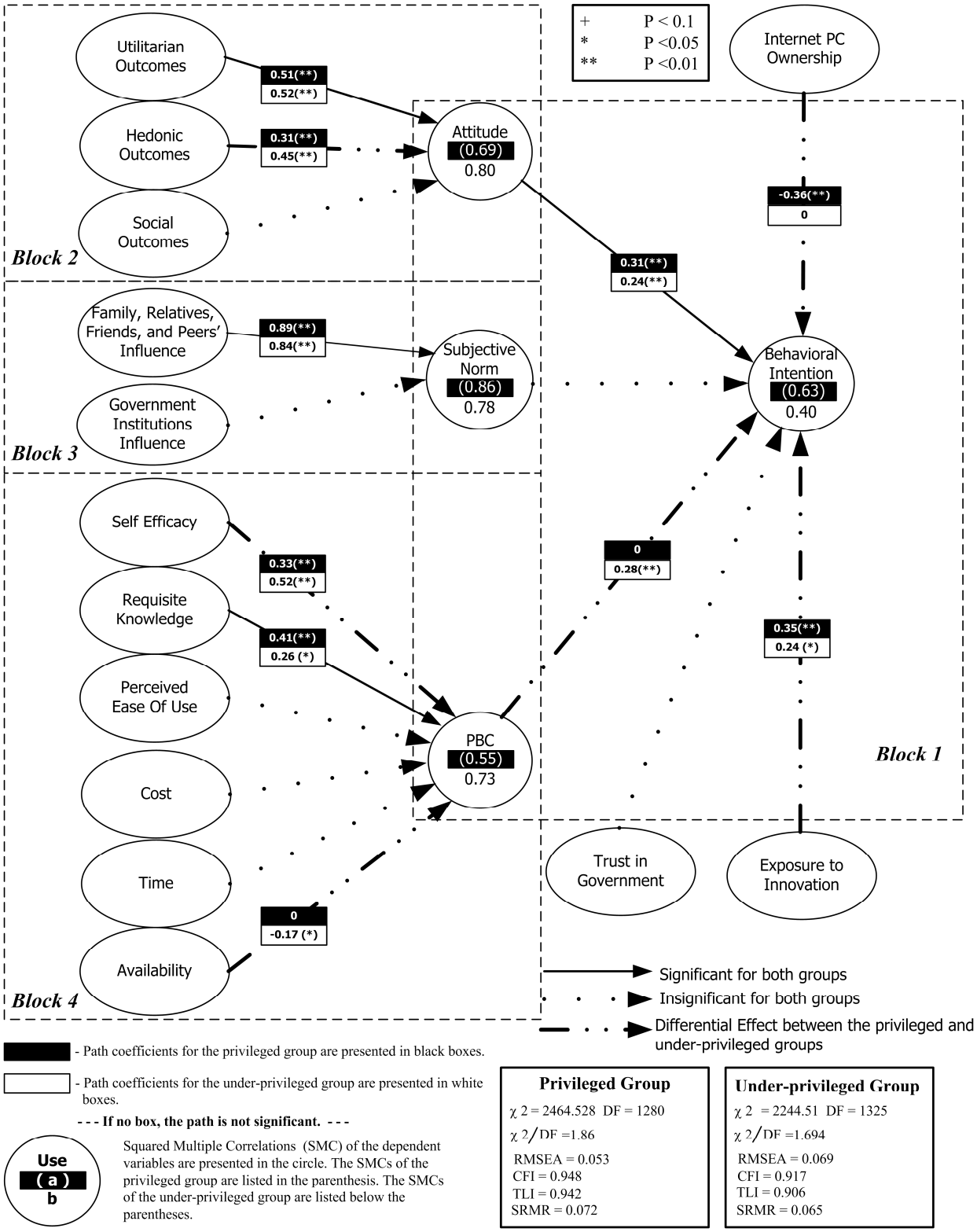
Goodness of Fit Indices	Under-privileged Adopters	Privileged Adopters	Desired level
χ^2	2244.51	2464.528	smaller
Degree of Freedom (DF)	1325		
χ^2 / DF	1.694	1.86	< 3
Bollen-Stine P-value	0.328	0.256	>0.05
TLI	0.906	0.942	> 0.9
CFI	0.917	0.948	> 0.9
SRMR	0.065	0.072	< 0.08
RMSEA	0.069	0.053	< 0.1

Table 5-4-2-2: Path Significance

Path	Under-Privileged	Privileged
1. Attitude → Behavioral Intention	S	S
2. Subjective Norm → Behavioral Intention (1)	S	S
3. Perceived Behavioral Control → Behavioral Intention	S	NS
4. Utilitarian Outcomes → Attitude	S	S
5. Hedonic Outcomes → Attitude	S	S

6. Social Outcomes → Attitude	NS	NS
7. Family, Relatives, Friends, & Peers' Influence → SN	S	S
8. Government Institutions' Influence → SN	NS	NS
9. Self-efficacy → Perceived Behavioral Control	S	S
10. Requisite Knowledge → Perceived Behavioral Control	S	S
11. Perceived Ease of Use → Perceived Behavioral	NS	NS
12. Cost→ Perceived Behavioral Control	S	S
13. Time → Perceived Behavioral Control	NS	S
14. Availability → Perceived Behavioral Control	S	S
15. Exposure to Innovation → Behavioral Intention	S	S
16. Trust in Government → Behavioral Intention	NS	NS

Figure 5-4-2: Structural Models for Under-privileged and Privileged Adopters



5.4.3 Multi-group Analysis for Differences Across Privileged and Under-Privileged Groups

Unlike the constructs in the first comparison between the under-privileged non-adopters and adopters, the constructs involved in this comparison are conceptually identical across under-privileged and privileged adopters. Such structure permits a more sophisticated mathematical analysis: multi-group analysis (Doll et al. 1998, MacKenzie and Spreng 1992, Marsh 1987). This analysis goes beyond the structural comparison employed in section 5.3 and allows for the comparison of path coefficients and latent constructs means between groups.

To make the comparison across two groups meaningful and to generate valid conclusions, it is first essential to establish measurement invariance across groups (Doll et al. 1998, MacKenzie and Spreng 1992, Marsh 1987). This requires an assessment of configural invariance, metric invariance, and scalar invariance. Configural invariance means that the patterns of item loadings are the same, or congeneric, across groups, but loadings are not necessarily the same[20] (MacKenzie and Spreng 1992). Establishing configural invariance suggests that the constructs can be conceptualized in the same way across groups and one can proceed to assess metric invariance. Metric invariance concerns whether the measures have equivalent loadings on the latent constructs across groups.[21] Scalar invariance assessment follows the establishment of metric invariance, and is concerned with consistency between cross-group differences in latent construct means and the cross-group differences in observed means.[22] Since these three invariance

[20] When modeling configural invariance, no restrictions are enforced on metrics across groups (Doll et al. 1998).
[21] When assessing metric invariance, the latent construct loadings are constrained to be equal across groups.
[22] Scalar invariance can be evaluated by constraining the intercepts of measures to be the same across groups.

models are nested, if each demonstrates good model fit, the difference between two nested models can be assessed by evaluating changes in χ^2, CFI, TLI, and Target Coefficient[23] (Doll et al. 1998). First, if the changes in these indices between the configural and metric invariance models are not significant, it is valid to assume the existence of metric invariance. Next, if the changes in indices between the metric and scalar invariance models are also insignificant, it is then appropriate to claim scalar invariance.

Table 5-4-3-1 presents the results of the measurement invariance assessment. As can been seen, each model shows good model fit. Regarding the differences in indices across these models, although the changes in χ^2 are statistically significant, the changes in CFI, TLI, and Target Coefficient are not. The results collectively suggest measurement invariance between the two groups. Comparisons of path coefficients and latent construct means are thus meaningful.

Table 5-4-3-1: Multi-group Invariance Analysis

Model	χ^2	D.F.	χ^2/D.F.	RMSEA	TLI	CFI	Target Coefficient
Configural Inv.	4711.64	2650	1.78	0.044	0.930	0.937	1.0000
Metric Inv.	4833.11	2687	1.79	0.044	0.928	0.935	0.9961
Scalar Inv.	4963.92	2742	1.81	0.045	0.925	0.932	0.9919

The individual structural paths were tested by comparing the path coefficients between the two groups (MacKenzie and Spreng 1992). Each corresponding pair of path coefficients were constrained to be equal across groups, one pair at a time, and the change in χ^2 was tested for significance at one degree of freedom. If the test shows significance, this suggests that the paths in the two groups are different. The direction of the differences (> or <) can be evaluated by comparing the estimated coefficients from

[23] Target Coefficient is defined as (N-I)/(N-U) (Marsh 1987). N: χ^2 of the independent model. I: χ^2 of the model with invariance constraint. U: χ^2 of the configural invariant model.

the two groups (MacKenzie and Spreng 1992). Six pairs of paths were found to be different across the two groups. Table 5-4-3-2 lists these paths. Table 5-4-3-3 displays the results of the hypotheses testing.

Table 5-4-3-2: Path Comparison

Path	Under-Privileged		Privileged
	standardized		standardized
Hedonic Outcomes → Attitude	0.45 **	>	0.31 **
Self-Efficacy → PBC	0.52 **	>	0.33 **
Availability → PBC	- 0.17 **	<	Not Significant
PBC → BI	0.28 **	>	Not Significant
Exposure to Innovation → BI	0.24 *	<[a]	0.35 **
Internet PC Ownership → BI	Not Significant	<	-0.36 **

The path coefficient is significant at (**: p <0.01, *: p<0.05) a: This pair of paths is marginally different (p< 0.1)

Table 5-4-3-3: Results of Hypothesis Testing

Hypotheses	Support
(H2-1) Attitude will positively influence Behavioral Intention for both under-privileged and privileged adopters.	YES
(H2-2) Subjective Norm will *not* influence Behavioral Intention for either under-privileged or privileged adopters.	YES
(H2-3) Perceived Behavioral Control will influence Behavioral Intention more strongly for under-privileged than privileged adopters.	YES
(H2-4) Utilitarian Outcomes will positively influence Attitude for both under-privileged and privileged adopters.	YES
(H2-5) Hedonic Outcomes will influence Attitude more strongly for under-privileged adopters than privileged adopters.	YES
(H2-6) Social Outcomes will have less influence on Attitude for under-privileged adopters than privileged adopters.	NO
(H2-7) Family, Relatives, Friends, and Peers' Influence will affect Subjective Norm for both under-privileged and privileged adopters.	YES
(H2-8) Government Institutions' Influence will affect Subjective Norm for both under-privileged and privileged adopters.	NO
(H2-9) Self-Efficacy will influence Perceived Behavioral Control for both under-privileged and privileged adopters.	YES
(H2-10) Requisite Knowledge will influence Perceived Behavioral Control for both under-privileged and privileged adopters.	YES
(H2-11) Perceived Ease-of-Use will not influence Perceived Behavioral Control for either under-privileged non-adopters or adopters.	YES
(H2-12) Cost will not influence Perceived Behavioral Control for either under-privileged non-adopters or adopters.	YES
(H2-13) Time will not influence Perceived Behavioral Control for either under-privileged or privileged adopters.	NO

(H2-14) Availability will influence Perceived Behavioral Control more strongly for under-privileged than privileged adopters.	YES
(H2-15) Exposure to Innovation will influence Behavioral Intention less strongly for under-privileged adopters than privileged adopters.	YES
(H2-16) Trust in Government will influence Behavioral Intention for both under-privileged non-adopters and adopters.	YES

Further, under scalar invariance, construct means were compared by constraining the construct means as zero for the privileged and allowing construct means of the under-privileged to be freely estimated. If an estimated construct mean of the under-privileged is significantly different from zero, this pair of construct means is different across groups (MacKenzie and Spreng 1992). 11 pairs of constructs are found to be different across groups. Table 5-4-3-4 lists these constructs where latent means differ across groups.

Table 5-4-3-4: Construct Mean Comparison

Constructs	Under-Privileged		Privileged
Utilitarian Outcomes	1.293 **	>	0
Hedonic Outcomes	1.413 **	>	0
Social Outcomes	0.838 **	>	0
Family, Relatives, Friends, & Peers' Influence	1.216 *	>	0
Perceived Ease of Use	0.431 *	>	0
Cost	1.020 **	>	0
Perceived Behavioral Control	-0.449 **	<	0
Exposure to Innovation	0.111 **	>	0
Behavioral Intention	0.817 **	>	0
Internet PC Ownership	-1.293 **	<	0

significant at (**: p <0.01, *: p<0.05)

5.4.4 Discussion

The results reveal significant differences between the under-privileged and privileged adopters. As can be seen in Table 5-4-3-2 and Table 5-4-3-4, these two groups not only vary in terms of the structural paths but also the construct means. The following paragraphs detail these differences, focusing first on behavior and behavioral intention, then attitudinal belief, social influence, and behavioral control.

Behavioral Intention

The results strongly suggest that people from under-privileged and privileged groups behave differently in their Internet TV usage. As shown in Table 5-4-3-4, the under-privileged exhibited higher Behavioral Intention. Borrowing the notion of "Relative Advantage" from Rogers' theory of diffusion of innovation (2003), the value of an ICT is judged in relation to other alternatives at individuals' disposal. Given the much higher Internet PC ownership (Table 5-4-3-4), the privileged group may not depend on the Internet TV as much as the under-privileged group.

Attitudinal Belief

As shown in Table 5-4-6, the under-privileged exhibited more favorable outcome expectations (i.e., utilitarian, hedonic, and social) for using the Internet TV. However, as shown in Figure 5-4-2, Utilitarian (extrinsic) Outcomes and Hedonic (intrinsic) Outcomes influenced Attitude, while Social Outcomes did not. This result is consistent with motivation theory that both extrinsic and intrinsic outcomes are important in determining behavioral attitude. As predicted, the path comparison (Table 5-4-3-2) revealed that Hedonic Outcomes (i.e., enjoyment) was more powerful in affecting Attitude for the under-privileged than the privileged. This difference suggests that, for the under-privileged, highlighting the enjoyment in ICT usage may be a useful lever for cultivating a stronger attitude toward using the technology. This may also help to theoretically explain why under-privileged people tend to use ICT more for entertainment than for "capital-enhancing" purposes (Bonfadelli 2002, DiMaggio and Hargittai 2002, DiMaggio et al. 2004).

Social Influence (Subjective Norm and Exposure to Innovation)

As shown in Figure 5-4-2, for both groups, expectation from individuals' social network, including family, relatives, friends, and peers was influential in shaping Subjective Norm, while government influence was not found to be significant. Subjective Norm, as hypothesized, was not influential in shaping Behavioral Intention for either adopter group. This is in line with the idea that the influence of Subjective Norm on Behavioral Intention is not so critical after individuals start using ICT, as people's attention might focus more on other behavioral beliefs (Karahanna et al. 1999).

Similar to the findings in the previous comparison, the results here also indicate that the social network still affects ICT post-adoption behavior through a mimetic isomorphism (DiMaggio and Powell 1983). The path comparison of the two groups shown in Table 5-4-3-2 reveals that Exposure to Innovation has a stronger influence on BI for the privileged. This suggests that the privileged are more sensitive to such a mimetic signal than the under-privileged. Such a behavioral difference is in accordance with findings in the diffusion literature that the less educated and less wealthy are generally the last to adopt innovations (Roger 1995). Across the board, the inclusion of Exposure to Innovation increases the model's explanation power in BI by 10%.

Behavioral Control

The path comparison shown in Table 5-4-3-2 reveals that Perceived Behavioral Control was crucial in determining Behavioral Intention for the under-privileged group, but not for the privileged group. This may be because the under-privileged group has lower volitional control, even though the technology is free and Cost appears not to be an important factor. Support for a direct path from PBC to Behavior for both groups (path 5,

Table 5-4-2-1) suggests that both the privileged and under-privileged encountered some kind of barriers in using the Internet TV.

Internal Control

Self-efficacy appears to be an important internal control factor for both groups. As can be seen in Table 5-4-2-1 (path 11 and path 12), Self-efficacy and Requisite Knowledge are influential for both groups in shaping PBC. However, as Table 5-4-3-2 indicates, Self-efficacy has a stronger influence on PBC for the under-privileged group. It would seem likely that psychological confidence in using ICT is more critical for the under-privileged in shaping their behavioral control belief.

Perceived Ease of Use, on the other hand, was not found to be a significant determinant of behavioral control (path 13, Table 5-4-2-1). The user-friendly design of the Internet TV might have helped the under-privileged overcome initial technical barriers. In fact, the under-privileged even demonstrate higher PEOU (Table 5-4-3-4).

External Control

Although Cost was perceived higher for the under-privileged than the privileged, (Table 5-4-3-4), it was not a significant barrier in terms of Perceived Behavioral Control (path 14, Table 5-4-2-1). This suggests that the "free" policy may have reduced the economic barrier. However, ICT Availability still posed a post-adoption barrier (path 16, Table 5-4-2-1). Potential priority conflict between watching TV and using the Internet TV, competition for limited resources, or logistical inconvenience all somehow reflect the under-privileged's relatively lower control in material or economic capital. Such access-related issues are likely to be hard to resolve, especially when TV assumes both the roles of mass media and ICT at home.

Trust

Contrary to Hypotheses 2-19, LaGrange residents' trust in the city government does not seem to affect their intention to use the technology (path 19, Table 5-4-2-1). The under-privileged and privileged groups seem to have a similar level of trust in the city government (Table 5-4-3-4).

5.5 Summary

To summarize, the findings in the quantitative data analysis reveal notable difference in the behavioral models (1) between the under-privileged at different implementation stages, and (2) between ICT adopters with different socio-demographic backgrounds. The results also identify powerful leverage points that may stimulate innovation behavior for different people at distinct innovation stage. Thus, when designing digital inequality interventions, instead of a generic approach, it is perhaps necessary to view the entire intervention as a temporal process and allocate resources differently at distinct stages of ICT implementation. It may be also helpful to employ a segmentation strategy that differentiates groups and provides assistance based on their specific needs. With this targeted approach, supply and demand can be better matched and resources can be utilized in the most efficient way to address digital inequality.

Chapter 6 Complementary Case Study

The case study aimed to achieve the following objectives: (1) to investigate the impact of the termination of the LaGrange Free Internet Initiative, (2) to understand the adoption phenomenon from a process-based perspective, and (3) to provide rich qualitative data that complements the quantitative analysis and permits insights into facilitators and barriers affecting ICT acceptance. The nature of this case analysis is complementary (Greene et al. 1989). It is not designed to triangulate with the results, such as the constructs and models, of the survey analysis. Instead, it is to gain a process-oriented perspective of the adoption behavior that cannot be learned from the variance-based approach.

The case study began in early 2004, shortly after the preliminary data analysis was completed on the survey data collected in summer 2003. By summer 2003, the Internet Service Provider (WorldGate Inc.) was in financial difficulty, and there were signs that the service might be interrupted or discontinued. The LaGrange Free Internet Initiative was eventually discontinued in October, 2003, when WorldGate ceased to provide the service and no other ISP was available to provide a similar service. The sudden termination of the LITV initiative represented an important event around which to focus the case study. The termination of the initiative could not be examined in the survey because the event had not yet occurred. As the technology and service were initially given as a gift, but then taken away, the decision to discontinue the service and its potential impact on LaGrange citizens, especially the under-privileged, provided a unique opportunity for case research.

Furthermore, while the quantitative analysis of the survey data examined the innovation decision at pre- and post-adoption stages (i.e. the 1st comparison); the innovation process may be conceptualized as consisting of more than two stages (e.g. Rogers' five stage innovation-decision

process). If the process is conceived of involving more stages, what are the key factors that promote or inhibit progress in moving from one stage to another? What are the differences between the privileged and under-privileged from a process perspective? One purpose of the case study was to investigate how important factors unfold across various stages of the process and ultimately how the process impacts ICT acceptance.

For the aforementioned reasons, a framework consisting of a re-conceptualized innovation process, as well as the potential barriers and facilitators that may affect the process, was first proposed based on a literature review. The qualitative data collection was guided by this framework. However, investigation at this stage was exploratory rather than confirmatory, since no specific relationships between the factors and process were hypothesized a priori. The framework was further developed and modified through an iterative data analysis procedure (Miles and Huberman 1994). This chapter first discusses the development of the framework and then the analysis and results of the case study. How the qualitative analysis complements the results of the quantitative analysis is also discussed.

6.1 Conceptual Framework

6.1.1 The Stage Model

Rogers (2003) suggested that the individual innovation-decision process unfolds as a series of phases, including Knowledge, Persuasion, Decision, Implementation, and Confirmation (described in section 2.3.1.1.) Studies of ICT acceptance at the organization level have also developed stage models to represent the consecutive phases of organizational ICT innovation process (Fichman 1992, Fichman 2001, Fichman and Kemerer 1997, Myers and Goes 1988). According to Fichman and his colleague (Fichman 1992, Fichman 2001, Fichman and Kemerer

1997), such an approach can describe the gradations of innovativeness among subjects being studied. As exemplified in Chapter 5 that factors affecting ICT acceptance vary across stages, a finer distinction of these stages may enable better insights and interventions with better precision and effectiveness in addressing digital inequality.

The classification of these stages may be context and/or technology specific. Fichman (2001), for example, conceptualized the stages of accepting object-oriented programming languages (OOPL) differently from those of relational database management systems (DBMS) and computer-aided software engineering (CASE). The model for OOPL consists of 1) Awareness, 2) Interest, 3) Evaluation/Trial, 4) Commitment, 5) Limited Deployment, and 6) General Development. Models for DBMS and CASE, on the other hand, include 0) No Acquisition, 1) Acquisition, 2) Commitment, 3) Limited Deployment, and 4) General Deployment. Although these models were developed for organizational studies, the stages are, in general, similar to those found in the individual innovation-decision process proposed by Rogers (2003).

In the light of the previously cited models, an adapted six stage model was first employed to guide the data collection. The six stages included 1) Awareness, 2) Interest, 3) Evaluation/Trial, 4) Installation, 5) Limited Use, and 6) General Use. Based on the context and the nature of the LaGrange Internet TV initiative and an iterative data analysis procedure, I modified the earlier model and reached the following five stage model: 1) Awareness, 2) Interest, 3) Installation, 4) Use, and 5) Upgrade to Internet PC / Discontinuance (Figure 6-1-1). The Awareness stage focuses on the ways that individuals obtain information about the project. Next, the Interest stage emphasizes the psychological development of individuals' behavioral intention before deciding whether or not to use the technology. The Installation stage looks into the actual

technology installation process. In the Use stage, the focal point is the technology implementation process. Finally, given that the service was eventually terminated, the possible outcomes include upgrading to Internet PC or discontinuing the usage. Therefore, an individual may first receive information about the Internet TV, and evaluate the technology and his/her personal situation to determine if s/he is interested. A decision about whether to accept or reject the Internet TV is made before the request for the installation and use. Finally, people either upgrade to Internet PC or discontinue their usage.

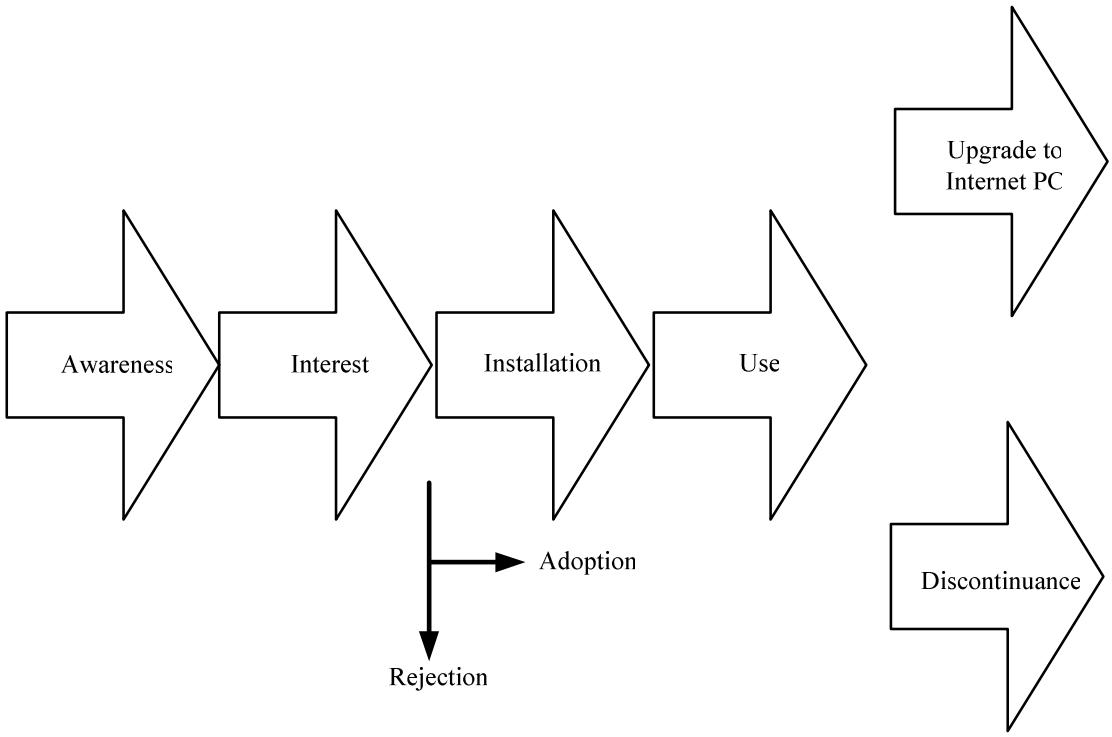


Figure 6-1-1: Internet TV Innovation Stage Model

6.1.2 Factors Affecting the Process

To identify important factors that may influence the stage model, in addition to the proposed TPB-based research models (Figure 3-1-1 & 3-1-2), I also referred to the multi-level access model proposed by Van Dijk and Hacker (2003) and the resource-based perspectives suggested by De Hann (2004) and Warschauer (2003). A further analysis suggests that the various views have a lot in common and are complementary to each other. Several factors have been identified repeatedly.

In general, the aforementioned scholars viewed digital inequality either from a barrier or a resource point of view. Van Dijk and Hacker (2003), as discussed in section 2.1.3, argued that digital inequality is a multi-faceted concept of access. The disparities in the mental access, material access, skills, and usage opportunity together contribute to the phenomenon (Table 6-1-2-1). These factors represent barriers that people have to overcome at different stages of the innovation process. Discrepancies in these factors actually reflect inequalities in material, cognitive, and social resources among the population (Van Dijk and Hacker 2003). Other researchers have studied digital inequality from a resource perspective. For example, De Haan (2004), from the consumer behavior perspective, suggested that critical resources in understanding digital inequalities include material, cognitive, and social resources (see Table 6-1-2-2). Warschauer (2003) suggested a similar resource view which said that the important resources are physical, digital, human, and social resources (see Table 6-1-2-3).

Table 6-1-2-1: Van Dijk and Hacker's View of Access (2003)

Type of Access	Definition
Mental	Lack of elementary digital experience caused by lack of interest, computer anxiety, and unattractiveness of the new technology
Material	Lack of possession of computers and network connections
Skills	Lack of digital skills caused by insufficient user-friendliness and inadequate education or social support
Usage	Lack of significant usage opportunities

Table 6-1-2-2: Resource Theory by De Haan (2004)

Type of Resources	Definition
Material Resources	1. Financial budget in household 2. Available time
Cognitive Resources	The ability to deal with symbols and information, including: 1. Literacy: the ability to use information from books, newspapers, and magazine 2. Numeracy: the ability to handle quantitative information 3. Informacy: the ability to handle information that becomes available through digital technologies
Social Resources	The access which people have to other people's sources of help and training, including: 1. access to people who possess new IT products 2. access to people who possess digital skills 3. the degree to which these people are in a position to provide information on IT

Table 6-1-2-3: Warschauer's View of Resources (2003)

Type of Resources	Definition
Physical Resources	Access to computers and telecommunication connections
Human Resources	Literacy Education
Social Resources	Support from community, institutional structure, and society structure
Digital Resources	Digital material made available online that are relevant and in diverse languages

Though bearing some differences, these frameworks offered by digital inequality researchers are, not surprisingly, quite similar. In fact, factors in the previously proposed research models (Figure 3-1-1 and 3-1-2) for the quantitative analysis are consistent with these perspectives. A comparative analysis reveals how these frameworks correspond to each other. Table 6-1-2-4 illustrates the results of this analysis. The second, third, fourth, and fifth columns show the major categories (in bold font) and the key components suggested by each framework. To synthesize these categories across frameworks, categories listed in the first column represent the factors adapted for this case study.

Table 6-1-2-4: Comparison of Relevant Frameworks

Adapted Factors	De Haan (2004)	Warschauer (2003)	Van Dijk & Hacker (2003)	Extended TPB (Figure 3-1-1 & 3-1-2)
Affective Factors			**Psychological Access**	**Attitude**
			- attitude - interest - prior experience - fear	- Utilitarian Outcomes - Hedonic Outcomes
Material Factors	**Material Resources**	**Physical Resource**	**Material Access**	**External Control**
	- household budget - Time	- computer / connection	- computer / connection	- Cost - Time - Availability
Cognitive Factors	**Cognitive Resources**	**Human Resources**	**Digital Skills**	**Internal Control**
	- informacy - numeracy - literacy	- informacy - numeracy - literacy	- inadequate education - insufficient user-friendliness	- Requisite Knowledge - PEOU - Self-Efficacy
Social Factors	**Social Resources**	**Social Resources**		**Social Influence**
	- access to people with IT products - access to people with IT skills - the degree to which these people can help	- community support -societal Support	- lack of social support[24]	- Subjective Norm - Exposure to Innovation
Institutional Factors		**Institutional support**		**Trust in Government**
Usage Opportunities		**Digital Resources**	**Usage Opportunities**	
		- relevant content - diverse languages		

As can been seen, several categories represent common factors across these frameworks, such as the material factors[25] (i.e., material resources by De Haan, physical resources by Warchauer, material access by Van Dijk and Hacker, and external control in Figure 3-2 & 3-3), the cognitive factors (i.e. cognitive resources, human resources, skills, and internal control), and the social factors (i.e. social resources and social influence). However, the affective factors (i.e. psychological access and attitudinal belief), institutional factors (i.e. institutional support and trust in government), and usage opportunities are only suggested in some of these frameworks.

[24] Van Dijk and Hacker (2003) categorized lack of social support as a cause of the lack of skills
[25] Please refer to the 1st column.

To capture the complexity associated with these factors in the context of digital inequality, the synthesized factors in the first column serve to guide the data collection and analysis in this case study. These factors were examined for their effect on the suggested innovation stage model (Figure 6-1-1). Since DiMaggio et al. (2004) stressed the importance in investigating institutional influence on digital inequality, the institutional factor is isolated from the social factor in order to examine its independent effect.

6.2 Data Analysis

6.2.1 Scope of the Analysis

The data used for analysis includes archival and primary data. The archival data contains news, reports, case studies, and conference and journal papers about the LITV initiative. The primary data consists of interview data with subjects, personal observations of the interviewed subjects, the qualitative responses in the returned mail surveys, and the interview data with the city government and council members. Table 6-2-1 illustrates the scope of the study. Among the interviewees and the subjects who returned surveys with qualitative feedbacks, 62 belong to the under-privileged and 99 belong to the privileged. The collection of multiple types of data from various sources permits more insights and renders good reliability of the case study (Miles and Huberman 1994).

Table 6-2-1: Scope of the Case Study

Number of interviews conducted with citizens	28
Number of returned surveys containing qualitative responses	147
Number of interviews with city government and council members	7
Number of archival documents collected	21

6.2.2 Data Analysis Approach

Archival data and interview data with the LaGrange city government and council members were first used to construct a chronology of the LaGrange Internet TV initiative. While plenty of historical information about the initiative had been gathered and analyzed before the large-scale mail survey, as discussed earlier in section 1.3, shortly after the survey, the LITV service was completely stopped. The additional data collected after the termination rendered a more holistic picture of the entire life cycle of the initiative. In addition, these data also facilitated understanding the infrastructural environment in which the service was provided and its influence on the initiative.

The next step was to identify the set of factors that promoted or inhibited individuals' progress along their innovation stages. Interview data with residents, and the qualitative feedback in the returned surveys, were analyzed primarily for this purpose. The coding scheme was developed based on the factors (1st column in Table 6-1-2-4) derived from the synthesis of prior literature and the research model presented in Chapter 3. The first step in this analysis involved identifying which factors demonstrated influence on individuals at a specific stage. The next step involved the identification of additional factors that were not originally recognized, but empirically showed significant influence on the innovation process. The consequential impact of individuals' innovation behavior on these factors was also assessed. The above coding process was performed for both the under-privileged and the privileged.

When a factor was first recognized to be potentially influential at a particular stage, I looked into the dataset to assess whether additional evidence existed to support the significance of such a factor. This is a variation of the pattern matching technique between theory and data

suggested by Yin (1994) and has been employed previously in several empirical studies (e.g. Keil 1995, Montealegre and Keil 2000).

The overall analysis process was very iterative in nature. Following the recommendation of Strauss and Corbin (1990) and Yin (1994), the analysis moved back and forth between the empirical data, emerging theoretical conceptualization, and existing literature (Montealegre and Keil 2000). This analysis process continued in tandem with the process of soliciting and interviewing more subjects until reaching the status of "theoretical saturation" (Glaser and Strauss 1967), where no additional information was identified.

6.3 Results and Discussion

6.3.1 The Under-privileged

Table 6-3-1 illustrates the identified salient facilitators and barriers that influence each stage of the process model of the under-privileged. The discussion starts from the left to the right of the process.

Table 6-3-1: Facilitators and Barriers at Different Stages of the Under-Privileged

Facilitators		**Affective Factor** ▪ utilitarian outcomes ▪ hedonic outcomes ▪ prior experience **Material Factor** **Cost** ▪ free ▪ cannot afford dial-up ▪ save gas to go to the library ▪ fixed income **Time** ▪ save time		**Affective Factor** ▪ positive experience **Material Factor** **Cost** ▪ enhance economic capital ▪ save-dial up cost **Time** ▪ save time **Cognitive Factor** ▪ prior experience ▪ requisite knowledge ▪ Self-exploration **Physical Factor** ▪ motion disability
	Social Factor ▪ social networks ▪ mass media (TV, Newspaper) ▪ work for the government	**Social Factor** ▪ social networks ▪ mass media (TV, News Paper) ▪ exposure to Innovation		**Social Factor** ▪ support from social networks
	Institutional Factor ▪ community center ▪ government correspondence	**Institutional Factor** ▪ community center ▪ government correspondence	**Institutional** ▪ onsite installation	**Institutional Factor** ▪ training from the TV program ▪ training from the community center ▪ support from the technical hotline
Stage	**AWARENESS**	**INTEREST**	**INSTALLATION**	**USE**
Barriers		**Affective Factor** ▪ lack of interest ▪ negative attitude ▪ lack of understanding ▪ compatibility with life style **Material Factor** **Cost** ▪ Financial priority with limited income ▪ Cable TV is too expensive **Time** ▪ need to work 2-3 jobs ▪ need to take care of family member		**Affective Factor** ▪ negative experience ▪ information available from other sources ▪ acquisition/possession of Internet PC **Material Factor** **Time** ▪ have to take care family members ▪ other activities **Availability** ▪ conflict (watching TV & using the Internet)
	Social Factor ▪ socially isolated	**Social Factor** ▪ negative impression from personal network		**Cognitive Factor** ▪ lack of knowledge
	Institutional Factor ▪ limited campaign period	**Institutional Factor** ▪ lack of trust in the government ▪ available access in the community center **Physical Factor** ▪ visual disability ▪ motion disability		**Technical Factor** ▪ connection quality ▪ limited functionality ▪ display **Physical Factor** ▪ visual disability ▪ motion disability

6.3.1.1 The Awareness Stage

About three quarter (74%) of the under-privileged claimed to have heard of the LITV initiative with the information from various sources. In the beginning of the rollout in the summer of 2000, the government coordinated with the local media (TV & newspaper) to disseminate information about the project. The government also had correspondence delivered to households to inform and invite residents to subscribe to the service. In addition, community centers like the Troup County Senior Center installed several units to introduce the technology to its participating members. Besides the official campaign by the government, people might have received the information from their personal networks. Some people obtained information even before the official launch of the project because of their personal ties with the city government. For instance, one subject responded:

> *I worked for the city and I got the information from a director. That was the first time I'd ever heard about it. Later I heard it from the local TV news*

In general, the information could be learned through personal networks, as well as mass media (Bandura 1977). There was a flood of information at the onset of the initiative, as one under-privileged subject recalled,

> *It was everywhere. It was on the local TV channel, newspaper, and everybody in the family was talking about it.*

However, some subjects did not remember being informed about this project. Among these subjects, some moved to LaGrange long after the initiative was strongly promoted. Since the period of the campaign was limited and its intensity decreased over time, newly arrived people were likely to miss this window of opportunity to be informed. Further, some of the under-privileged were quite socially-isolated, as found in prior digital inequality studies (Lenhart 2002, Lenhart et al. 2003). They tended to live by themselves and claimed to have no close

friends, family members, or relatives. There were fewer communication channels through which information about the innovation could be disseminated to this sub-group. These people, unfortunately, were also more likely to be less educated and have lower income, and belong to the lower social class. However, it is unclear to what extent they were exposed to the project through the mass media. In addition, these people also tended to express very low interest in ICT related innovation. It is possible that their low interest selectively hindered their awareness of initiatives like LITV. In the words of one under-privileged non-adopter:

Don't really pay attention to those kinds of things. We are computer ignorant!

In short, social and institutional factors strongly influenced people's awareness of the LITV initiative. Given the city government's effort, institutional factors played a critical role at this stage. However, for those socially isolated, it was more difficult for the disseminated information to reach them due to the limited communication channels available. Finally, timing was also critical in learning about an innovation, as the intensity and effect of the promotion of the innovation attenuated over time.

6.3.1.2 The Interest Stage

As can be seen in Table 6-3-1, many factors seem to be important in the Interest stage. Affective, material, social, institutional, and physical factors demonstrate noticeable influence at this stage for the under-privileged.

First, affective factors could positively persuade individuals to accept an innovation. Besides utilitarian and hedonic aspects of using the Internet TV, prior experience using related technologies might increase the likelihood in accepting LITV, too. Furthermore, material factors also contributed significantly to facilitating the innovation decision. Many under-

privileged adopters adopted the Internet TV simply because it was free. The following typical remark best exemplifies such mind set:

Hey, it's free, why not give it a try?

Meanwhile, those who were used to using the Internet in the library or other places expected to save time and cost in transportation by having Internet TV at home. Some who already had an Internet PC at home expected to adopt the Internet TV in order to save the monthly connection fees.

> *We actually did have a computer that was online. But we were online through the cable company and it was costing us a pretty good bit. When we got that (the Internet TV), we dropped the online through the cable company, and just had it through the city, so that we could save some money.*

Moreover, for the under-privileged, the information about the Internet TV from personal networks, mass media, community centers, and/or the government correspondence (social and institutional factors) may have helped persuade individuals toward using the technology. In addition, the perception that others were having similar digital technologies (Exposure to Innovation) also seemed influential. One subject recalled:

> *I think that was a great idea. I think it was because everybody almost had a computer. I kind of thought: well, it may come in handy or something and I can use one, like to learn how to use one. And I thought it could be an opportunity.*

Even with the presence of these many facilitators, under-privileged people encountered various types of barriers at this critical stage. In terms of affective factors, consistent with prior literature (Lenhart 2002, Lenhart et al. 2003), lack of interest or understanding about digital technologies were common reasons for non-adoption, as can be seen in typical responses among many under-privileged non-adopters:

I don't fool with that kind of thing!

Not interested!

What is in it for me?

Some under-privileged also had the impression that the Internet was evil and full of pornography and fraud, and thus rejected any technologies associated with the Internet. Some seniors believed that the technology was beneficial, but only for the younger generation. Still others chose not to use the technology because it was not compatible with their life style, as a retired female subject said:

> *I had a computer at work before. And I was trained through the program. But I would rather pick-up phones and talk in person.*

And another senior subject responded:

> *It is good, but for someone else. I've just been staying in the house so long. I want to go outside!*

In general, some elderly seemed to have a less favorable attitude toward the Internet TV, because of lack of interest, lack of knowledge, incompatibility with their life style, or biased perception the technology.

Material factors take different forms in deterring the under-privileged, especially the financially disadvantaged, from adopting the Internet TV. As many under-privileged people tended to have low income or be unemployed, having the basic cable service might not be the priority or could be financially burdensome:

> *Living on one check and live in the house to keep up. You know how much this thing you would like to do. It was money bias. We don't have enough money to do that.*

> *Internet may be good, but survival is more important.*

> *We don't have this because we cannot afford cable. Since I was laid off my job, I now have to work two jobs to replace the first job.*

Some under-privileged had to take several jobs to support their families or had to spend a significant amount of time to take care of important others, leaving no time for the technology. The following response from a mother of a single-parent household best illustrates this situation:

> *I am divorced and I have to take care of these three children. I know the Internet can be good, but I have to work three jobs now to support the family. When I have more time, maybe I will look into the TV Internet thing.*

Although social factors showed positive influence in prior discussion, some subjects received negative social influence. These subjects tended to have less understanding or information about the technology and depended more on others to evaluate the innovation. Some family members, such as children or spouses, might convey negative opinions about the Internet TV, causing their low interest in adoption of the technology.

In addition, components related to institutional factors at this stage included a lack of trust in the government and the alternative of obtaining Internet access in the library and community centers. As discussed earlier, some residents were suspicious about the governments' motivation behind the project and concerned if their online activities would be monitored. Some even strongly disagree with the initiative and questioned the political correctness of the project. A middle-aged, low-income African American male with a high-school education expressed his frustration as follows:

> *I don't know why the mayor instituted this initiative. I don't believe what he says. Utility bill reduction helps poor people more than free Internet. No lights, no Internet. No healthcare, no need for Internet. No public transportation, no way to get to the west Georgia Tech even with Hope scholarship. It's a big shame to make the mayor look good and get awards…. Not some computer game for people who have credit cards, what to spy on movie stars, or buy junk they can't afford or need.*

Interestingly, the reason for non-adoption, for some under-privileged, was because they could access the Internet in the senior center or the library. An observation among these subjects

was that they tended to visit these places on a regular basis, thus imposing no extra cost to access the Internet via these locations. The need to install the Internet TV at home was thus minimized.

Physical factors, which were not identified a priori, emerged as being important in deterring some under-privileged from moving forward at this stage. Physical factors were mostly related to the disabled or the elderly. Their inability to read or to exercise their body freely strongly inhibited their will to adopt the Internet TV. Their lack of mobility also reduced their exposure to innovation. An African American female with severe diabetes said:

> *I got diabetes and that causes my eye problem. I can not see! If I could see, I would like to use that TV Internet. But I don't see! Because my eye problem, I cannot go around, I see not too many people around here and have no idea who and how many of them have the Internet TV.*

To recapitulate, although some facilitators were available to enable/persuade the under-privileged to adopt the Internet TV, barriers in different forms hindered them from progressing along the innovation process.

6.3.1.3 The Installation Stage

Installing an Internet PC involves several tasks that require a certain level of knowledge. First, an individual needs to know how to operate a personal computer. Next, s/he also has to understand how to connect the PC to the Internet, either through dial-up, DSL, or Cable modem. Further, the individual needs to know how to install and set up required software in order to browse the Internet and use the email. The skills required to perform these tasks may present a technical barrier for many under-privileged people.

For the Internet TV, however, no significant barrier was observed at the Installation stage for the under-privileged. The installation program administrated by the government and the service providers seemed to successfully remove potential technical challenges for the under-

privileged. Once an interested resident contacted the service provider, the provider scheduled a time frame to visit the resident's home, and quickly installed the digital set-top-box, the keyboard, and the high speed Internet connection. No actual involvement was required from the resident. The entire process was managed by the service provider, minimizing the barriers at this stage.

This observation suggests that a well-organized installation program by the government and installation agency can be quite effective in helping the under-privileged to overcome the potential technical problems at the Installation stage. It may also explain why the institutional factor was the only salient factor, which might have suppressed the emergence of possible technical challenges and human factors as barriers at this stage.

6.3.1.4 The Use Stage

Once progressing to the use stage, under-privileged people might again experience all sorts of facilitators and barriers in their use of Internet TV (Table 6-3-1).

For affective factors, if the users perceived positive experience in their usage, they tended to become more positive about the Internet TV and were more likely to continue using it. For material factors, if using the Internet TV allowed a faster connection and eliminated their monthly connection fees, the under-privileged were inclined to continue using the Internet TV. In some cases their usage resulted in actual economic gains. For example, some residents used the Internet TV for online shopping, auction, and price comparison for groceries. They perceived tangible economic advantage through their usage. Such tangible benefit could also take the form of time and gas:

> *Instead of going to the library to look up in the encyclopedias; it is a lot easier to search information (by using the Internet TV). In fact, there was a library on the*

Internet. And it was a lot easier than going over to the library, save time and gas, too.

The influence of cognitive factors (e.g. skills) became salient at this stage. People with prior experience or knowledge in using Internet-related technologies were more likely to experience less cognitive barriers in using LITV. Although encountering some problems, they tended to be able to deal with the problems on their own:

You know, it took some trial and error on your part to learn how to use the thing. You know, it is pretty simple, compared to the computers.

Even without prior experience or knowledge, evidence in the case suggests that social and institutional factors could help facilitate the acquisition of cognitive resources. Some subjects responded that their friends, relatives, or family members informally taught them how to use the Internet TV. The government also provided an around the clock training program on TV teaching how to use the technology, as one subject recalled:

It was very good. Channel 19, it was there 24-7. You go there and they went through for 30 minutes and then right back through for another 30 minutes. You can get it anytime of the day.

Residents could also learn necessary skills in the senior center or the library where official training classes were offered. Lastly, if they needed immediate support, the service provider also offered a 24-7 hotline to help users using the Internet TV. These under-privileged, who had better cognitive resources and/or had social or institutional support in acquiring related skills, tended to have higher satisfaction with their Internet TV experience, as compared to those who experienced low-levels in these factors.

A surprising observation at this stage was the positive effect of physical disability on Internet TV usage. For example, a disabled female, who lost both of her legs, used the Internet

TV extensively as the Internet TV was her only vehicle to contact the outside world. As her husband had to work 12 hours a day, the Internet TV became her best friend. Her husband talked about his wife who passed away in August 2003:

> *That was the only thing kept her company and contact with the outside world. She liked it and messed around with that.*

On the other hand, under-privileged Internet TV adopters also faced many barriers in the use stage. Negative or unsatisfied experience at this stage usually caused them to quit using the LITV. Difficulty with *technical factors*, another aspect not identified a priori, but which emerged from the empirical data, significantly contributed toward shaping negative impressions. For instance, at the onset of the program, because the operation was not reliable, many users suffered from frequent outages and were not able to use the system successfully. Two subjects described their experiences:

> *There was a lot of trouble with Internet TV at first. The first year was absolutely terrible. Something was always wrong. The computer just cut-off all the time, and I cannot connect to the Internet. I lost the track of information I obtained or searched, and could not get back to where I was sometimes. I felt very frustrated, and several times I almost tossed it out.*

> *We had quite a bit of technical problem at first. Half of the time you couldn't establish the connection. After a month or two, they solved the problem. From the people I talked to, they had a problem not being able to get on to chat or check email.*

Although this problem was solved several months after the rollout of LITV, many novice users were left with an unpleasant first impression that might have been detrimental. The exchange and confirmation of such harmful impressions within their social networks might have spread a negative image about the service and its reliability.

In addition, some subjects complained about the limited functionalities they experienced when they wanted to save or print the information, or when the programs were not compatible:

There was something that I would like to print out, but it did not allow me to print. I have to keep a notebook to keep the information I like.

Some of the emails that I think would be important; they are in the HTML format, not being able to read it. That's the drawback. If it is in the HTML format, you will get the message that it didn't accept the format.

All the technical difficulties discussed above, to some extent, led to the frustration of the under-privileged user, thus causing some of them to discontinue their usage.

Furthermore, with regard to the affective factors, if users found the information obtained via the Internet TV was also available in other information sources that they used very often (e.g. TV, radio, or newspaper), they would not view LITV as valuable. Also, some under-privileged users later acquired Internet PCs and found the Internet TV less valuable given its limited capabilities, thus stopping their usage.

As for the material factors, some under-privileged users found that other things in life might assume higher priority (such as taking care of sick family members or young children) and did not have much disposable time for using the Internet TV. Some faced competition or inconvenience when others wanted to watch the TV or use the Internet at the same time. Two subjects recalled:

I used it like once a week on the weekend, especially on Saturday. My grand mother likes to keep up with the soap opera, so I cannot use it in the weekday. I can either use it late in the evening or Saturday or Sunday.

My husband goes to the newspaper website. He goes in everyday, every afternoon going to LaGrange Daily News website. He wouldn't even pick up the news paper. He just goes into the news paper website. The kids, my children, went in it every night. We would have to yell to get the keyboard downstairs, when their daddy got off work for him to read the news paper, because they were going to the chat-room.

Understandably, physical factors also hindered some people's Internet TV usage. For example, using the keyboard posed a problem for some, as a senior male said:

It's hard for me to type for good. I cannot get fast enough. I got a little arthritis. They kind of being slowly and sometime don't come back to the right place. And that's simply because of age. You can hardly explain it.

Some of the physical challenges were associated with the design of the online content and limitations of the Internet TV device. Some users complained about the hardship in reading emails in which blue text was displayed against a black background. Given that the Internet content was mostly designed for high resolution display devices like CRT or LCD monitors, the resolution of traditional analog TV sets did not have the ability to display enough sharpness and contrast, sometimes leading to difficulty in reading the screen. In the words of two subjects:

It's dark background with dark letters, it's hard to see. I mean, yeah, it is easy to use, but it is hard to see!

It was the email part. It was dark and the letter was dark. You know, I thought, "How do old people see this?

In short, various factors could positively and negatively influence the under-privileged's usage. Among these, technical factors and physical factors were the ones that emerged from the empirical data and had strong impact at this stage.

6.3.1.5 Usage, Impact, Upgrade to Internet PC, and Termination

Usage and Impact

The attitudes of under-privileged non-adopters who rejected the innovation tended to stay unchanged. Adopters who had negative experiences with the technology tended to have more reservations about using the technology than those who had positive experiences.

Those who were ultimately persuaded to adopt LITV and overcame or avoided factors that could negatively influence their usage tended to have favorable attitudes toward the technology. Their usage covered a variety of activities, including email, information search

(news, health, hobby, or transportation related information), online community (chat rooms, bulletin boards, and forums), shopping, auctioning, listening to music, and playing games.

One of the obvious benefits derived from their LITV usage was the enhancement of social capital among these adopters. They were able to have more frequent communication with family members and relatives, especially those who lived far away from them. As two residents responded:

> *Like I said, you can talk to sons and daughters, who live away. You can contact so many more places, and you can send them the email way up and email the letter back. Send the picture of the grand children on it. I've got one. She is about one year old now. They've been sending me pictures on it.*

> *Yes, I had it set up for email. I used to email my cousins and his wife in New Jersey all the time.*

Some users also reported participating in online communities and making friends with similar interest online. These friends could live in places far away from LaGrange, such as Washington D.C. or the United Kingdom. On the Internet, they established and maintained social ties that would not have been possible otherwise.

Some of under-privileged adopters, particularly those without prior experience in computers and the Internet, apparently acquired and developed cognitive capabilities in using these digital technologies, whether through their own efforts or the influence of social or institutional factors. However, rarely did these people discuss more sophisticated skills or uses, such as creating websites, using spreadsheets, word processors, and the like. From Gurstein's (2003) perspective, these people were passive receivers and consumers of digital information, rather than producers. This situation might be attributed to several factors. First, these people might have less motivation or needs to produce information. Second, no official training classes

or technical support were prepared for these advanced purposes, and the under-privileged might lack the knowledge to do so, as two subjects replied:

> *No, I've never got to that point to create some websites. I didn't know how to go actually setting it up.*

> *No, this one thing (creating websites) we don't know how to do.*

Another potential reason for this situation may be the technical limitations embedded with the Internet TV. As the Internet TV did not allow printing, document saving, plug-in software, and advanced applications (e.g. word processors and spreadsheets), many sophisticated uses and skills could not be practiced with such a platform. The simplicity of the technology, ironically, became a barrier for the development of advanced skills for more sophisticated applications.

Although some complained about not being able to print or save documents, many under-privileged adopters did not seem to be aware of, or concerned about, acquiring more sophisticated knowledge. Instead, they tended to feel capable of doing a range of things online, gaining knowledge, and using the technology for their own benefit, which resulted in high satisfaction with their experience. The following five subjects shared their voices:

> *Yeah, like I said. You can talk to sons, daughters, who lives way of. It's an entertainment, too. You sit around here, make a mistake on it, find out where it's at (laugh), I don't know, I find it dug out the numbers on the TV for big lottery. You can actually get anything you need and want on that thing. I enjoyed it, be honest with you.*

> *I would say so. It allowed me to gain knowledge about different things that I was interested in. It is just an overall good experience.*

> *Well, I am a heart patient. I had two open heart surgeries and I had a stroke. And I did go in there and checked out medicines, when they would change my medicines. When I had my stroke, there are things I don't understand. I would go on site and seek knowledge. You know, it did make me feel better about things. It was helpful.*

From time to time, when I said that we used it once a week, that was probably at the beginning. But as we got more familiar with it and used to it being there and around, you used it more and more. It's like, "yeah, we are going to Internet.

What we found is that we had a brother who was on the run, from the law, and we were checking the Internet all the time to see if he had got picked up, or if they had found him. You know the things you found out you can do, and found out on the Internet that you've never dreamed of.

Upgrade to Internet PC

Some of the under-privileged eventually upgraded to Internet computers or turned back to using computers they possessed before the LITV initiative. Among all the under-privileged adopters, about 47% of them were motivated to acquire an Internet PC because of the LITV experience. However, only 26% of these adopters, or 12% of all the under-privileged adopters, actually obtained a computer and connected it to the Internet.

One major reason for the upgrade was the termination of the project, while another typical reason was that their family members obtained a PC for them. For these people, if economically permitted, they would not choose to use the Internet TV if they had an Internet PC. On the other hand, some still missed the Internet TV because (1) it was free, (2) it freed up the telephone line, and (3) it was faster than dial-up.

The Termination of the Initiative

The termination of the LITV project had differential impacts on the under-privileged. For those who were not interested in the project, there was basically no influence. Also, for those who were able to upgrade to an Internet PC, the impact was also immaterial. However, for those who embraced the technology as part of their regular lives, the termination represented a

major event that caused confusion and frustration. Some of these subjects expressed their feelings about this termination:

> *I hate it when they got the thing down. I hate it because I got so accustomed to it. It was easy to log on. When the service is up, I can search much faster. I would sit back here search the web rather than watch the TV. I guess I was kind of frustrated, and then I understand the funding was gone. That's it.*
>
> *You got some people that can't leave home, and that is the only way they can pay bills online and get in touch with the world.*
>
> *I don't really understand why they stop it. Don't understand why they just couldn't offer it; why they just pull the plug on the whole project. It looks like to me if they offered us for free, they can offer it for a price, instead of saying, "Well that's it! Sorry! Charlie you can't have it no more." I thought the whole purpose of the project is to offer to you for free for a while, and after then you are going to be able to purchase the program. That was what I hope the whole deal was going to be.*

Moreover, the termination finished the friendships cultivated online. People lost contact with their friends made online when the Internet TV was not available. The loss of this kind of weak tie, however, did not seem to have a strong impact, as one subject responded:

> *I lost the contact with the friend I made over the Internet, but I don't feel really bad about that.*

The termination also meant no more electronic communication between the users and their relatives, family members, and friends. Thus, they had to go back to traditional modes of communication, such as long-distance calls, letters, or cards. In some cases, the frequency of contact dropped considerably. For instance, the female who frequently used email to communicate with her relatives in New Jersey was asked if she still kept regular contact with them after the project was stopped. She answered:

> *No, I just see them now in Christmas. And once a while I'll pick up the phone and call them. But it was really nice when we could email each other. They were both college professors. It was nice to keep in touch with them.*

Furthermore, although these people had acquired skills and developed quite positive attitudes toward the technology, material factors, such as cost and time, surfaced again as barriers for them to acquire an Internet PC or go to places where the Internet was available. As one respondent described:

> *The only reason that I couldn't use it (the Internet PC) is that I cannot afford it. But now I was kind of thinking about the computer and I would be interested in it again. But I had a lot of debt, not making enough money to continue with it. I was thinking that once I get the next month bill paid, I will go back to talk to Charter Communication and see what I can come up with.*

Another subject who knew that she could have Internet access in the library responded,

> *I know there is Internet at the library and I have my library card, but I keep my grandkids while my son and his wife work. I've usually got the two year old all day long, and then the other two get off school bus. So, I never get out. I don't really have enough time to go to the library unless something really important.*

Perhaps the quotes from two face-to-face interviews best illustrate these people's feeling about the Internet TV. In the end of our interview, one subject asked me in a quite gloomy tone:

You are going to see us back on that Internet TV, right?

Another female subject, who lived in a poor area and used the Internet TV almost on a daily basis, pleaded to me desperately:

Please don't take it away. I cannot live without it.

To sum up, the LITV initiative seemed to have a very positive impact on the under-privileged who overcame several barriers along the innovation process and institutionalized the technology into their lives. However, the deprivation of the technology from these people might have left them with considerable regret, and not every one of them would be able to go back to the Internet.

6.3.2 The Privileged

Table 6-3-2 demonstrates the identified salient facilitators and barriers that influence each stage of the process model for the privileged. Although some factors and components of the privileged's process model are similar to those of the under-privileged's, significant differences do exist.

Table 6-3-2: Facilitators and Barriers at Different Stages of the Privileged

Facilitators		**Affective Factor** ▪ utilitarian outcomes ▪ hedonic outcomes ▪ prior experience ▪ motivation to learn new things **Material Factor** **Cost** ▪ free **Availability** ▪ high demand for the Internet		**Cognitive Factor** ▪ prior experience ▪ requisite knowledge ▪ Self-exploration
	Social Factor ▪ social networks ▪ mass media (TV, News ▪ work for the government	**Social Factor** ▪ social networks ▪ mass media (TV, News Paper) ▪ exposure to Innovation		
	Institutional Factor ▪ community center ▪ government correspondence	**Institutional Factor** ▪ community center ▪ government correspondence	**Institutional Factor** ▪ onsite installation	**Institutional Factor** ▪ training from the TV program ▪ training from the community center ▪ support form the technical hotline
Stage	**AWARENESS**	**INTEREST**	**INSTALLATION**	**USE**
Barriers		**Affective Factor** ▪ negative attitude ▪ possession of Internet PC		**Affective Factor** ▪ negative experience ▪ did not live up to expectations
		Social Factor ▪ negative impression from personal		**Social Factor** ▪ negative impression from personal networks
	Institutional Factor ▪ limited campaign period			**Technical Factor** ▪ connection quality ▪ limited functionalities ▪ equipment quality

6.3.2.1 The Awareness Stage

Factors positively influencing the awareness stage for the privileged were almost the same as those for the under-privileged, including social (personal networks and mass media) and institutional factors (community centers and government correspondence). The only obvious barrier for the privileged was the limited campaign period of the initiative. However, unlike the under-privileged, the privileged were perhaps more socially connected. Overall, about 93% of privileged residents claimed to hear about the project. The ratio is mush higher than the 74% of the under-privileged. This evidence suggests that the privileged probably had more communication channels and were better informed about the initiative.

6.3.2.2 The Interest Stage

Although factors (affective, material, social, and institutional factors) affecting the privileged at the Interest stage are in general similar to those affecting the under-privileged, noteworthy differences were detected.

First, for the affective factors, utilitarian outcomes, hedonic outcomes, or prior related experience all served to stimulate interest. However, the strong motivation to learn new things in life was particular articulated by some of the privileged, which was not evident in the case of the under-privileged.

For the material factor, "free" seemed to be a powerful incentive across groups, including the privileged, as two subjects said,

I will take it because it is free.

What attracted me to the Internet TV is because it was free!

Some, who had computers which were too old for the Internet or had computers but did not have an Internet connection, were inclined to try the Internet TV. Further, those who already had an Internet PC that was shared among household members also adopted the Internet TV, hoping to use the Internet TV as an additional mean of Internet access. A female subject responded:

> *It would be nice just to use it as an adjunct computer for myself and participate in the program. You know they had a program that the city will pay for it. When my husband used the computer, I would need one for my own to keep in touch with my family and friends. Oh, I had about 20 grand children and I just came back from Korea. I wanted for my personal use."*

Meanwhile, like the under-privileged, the privileged were also influenced by information from social networks, mass media, community centers, and the government to adopt the Internet TV. Some privileged held quite positive attitudes and expectation toward the technology.

On the other hand, other privileged people were not inclined to adopt the Internet TV for various reasons which were quite different from the ones that dissuaded the under-privileged. Understandably, those who already had an Internet PC might express lower interest. Also, some did not want to tie up their TV set for the Internet. In addition, some privileged with children were not confident about the controllability of the Internet TV to prevent their children from accessing inappropriate content online, thus holding a rather conservative attitude toward the technology. One parent expressed such concern:

> *As a school media specialist, I have wondered if everything on the World Wide Web is available to homes – when perhaps children are home alone with no adult supervision. Without some type of control or access denied to certain sites, this tool (the Internet TV) could put unwanted information in the hands of children – when their parents are totally unaware of this information being available.*

Meanwhile, social factors, to some extent, influenced privileged people in a negative way. According to Rogers (2003), people with higher social status, or the privileged in this case, are usually the ones who adopt an innovation earlier. The unsteady quality of the Internet TV connection in the beginning, as discussed in section 6.3.2.4, frustrated many of these early adopters. Further, the functionality and design of the Internet TV failed to meet this group's high expectation. These negative experiences among the earliest or early adopters spread within their social networks, causing other privileged like them to not consider the Internet TV as a viable solution. As a subject recalled what she heard from others:

> *Some of my friends immediately didn't like it at all. Many of them returned it in a few months.*

If a person were predisposed negatively or neutrally toward the Internet TV, such negative information from his/her social network would only decrease the likelihood of adopting the technology. At the same time, the unenthusiastic opinions from the privileged non-adopters who did not even try out the technology might also dissuade people's intention to accept LITV.

Another apparent difference from the under-privileged was that material and institutional factors did not play an important role in influencing the privileged at this stage. This group seemed to have relatively more comfortable control over their material resources, such as money and time, and was not deterred by these factors. Neither did they describe their trust in the government as an issue for rejection.

In short, facilitators, as well as barriers, influenced the privileged at the Interest stage. Although some factors are quite similar to those affecting the under-privileged, others bear significant differences.

6.3.2.3 The Installation Stage

The installation, as delineated previously in section 6.3.1.3, was a well-controlled process. Respondents who subscribed to the service stated no problems with their installation process of the Internet TV. The installation program administrated by the government and the service provider was the key reason for such success, causing the inability of other factors (human or technical factors) to emerge as barriers.

6.3.2.4 The Use Stage

The use stage of the privileged could be characterized as a few facilitators in the face of tremendous barriers (Table 6-3-2). The composition of the barriers is very different from that of the under-privileged.

Like the under-privileged, the privileged also received the benefits from the training program via the TV channel, the classes offered in the community centers, the technical support hotline, and the support of their personal networks, although they might not need these resources as much as the under-privileged. In addition, the privileged group's prior experience and knowledge in digital technologies, as well as their potentially stronger ability to explore new technologies on their own, had better equipped them to explore the Internet TV.

However, it was their knowledge or experience with ICT that led to their high expectation toward the Internet TV. They tended to, either explicitly or implicitly, use the design, performance, quality, and functionalities of a typical Internet PC as the benchmark to evaluate the Internet TV. Thus, the limitations and drawbacks of the

Internet TV led to their disappointment. For instance, some subjects complained about the limitation of displaying web content on the TV screen:

> *We, I mean my two daughters, my wife, and me, have no trouble in using it. We didn't like it much. You couldn't get the whole screen on the TV like the computer. You couldn't see the whole thing and you have to move around to see the whole thing. Well, we can see, but we have to move around, back and forth a lot, and it moved slowly.*

> *Graphics and text on TV monitor are horrible and you cannot have "true" access to the Internet.*

> *We had a 37 inch TV, not 32 inch. To zoom in, it was too large to read and was off-the screen. We can only see 1/4th of the screen, and had to move around to read the information.*

Some also criticized the size of the keys on the wireless keyboard, the mouse on the keyboard,[26] and the response rate of the text and cursor:

> *The keyboard provided is difficult to use due to the smaller size and you have to hit the keys very hard, but slow for the text to be displayed.*

> *As I remember the keyboard, to the function you would normally use mouse for, its response didn't seem to be the same as the mouse (of a computer). It didn't have as much control.*

> *The design of the keyboard, I found it difficult to use. Maybe it was my age, I don't know. It had not very large characters. I just found it awfully difficult to use.*

Of course, the frequent outages in the first few months disappointed many of these privileged people who adopted earlier, resulting in their discontinuation of usage. Many also complained about the connection speed, as compared to other high-speed Internet solutions, such as DSL or cable modem. Similar notes appeared frequently in the survey responses and interview data:

> *Had Internet TV installed, but do not use it. We found it much too slow compared to our DSL/PC.*

[26] The mouse of the Internet TV is designed as a button placed in the upper right corner of the keyboard. The cursor on the screen moves in the direction that the button is pressed.

It is just slow. It is awkward, slow, and cumbersome.

Beside aforementioned technical issues, the limited functionality of the Internet TV could not live up to these adopters' expectations.

> *It was a real hassle thing. It had a lot of technical problems, too many technical problems. Besides, we cannot get to our daughter's homework web site. Not for education. And the information about the city, we can get it elsewhere like newspaper or TV. There is no additional value for us to keep the Internet TV.*

> *I was limited very much on what I can do with the Internet TV. It cannot print and download, sort of limited.*

At the same time, these adopters also received opinions from their social networks (social factor) conveying similar frustration or disappointment. Such social influence served only to reaffirm their personal negative experience.

> *There's been so much bad talk about it. Some people said, "Oh, I gave mine away the 2nd day", or "Oh gosh, I don't like it, I am going to get rid of it." I've never heard anybody saying a good word about it.*

To recapitulate, the privileged adopters experienced tremendous adversities at the Use stage. Their advantages in resources, backgrounds, and experiences, might easily motivate them to accept the Internet TV. However, these advantages tended to raise their expectations regarding the technology. Unfortunately, the Internet TV could not meet their expectations due to a variety of limitations associated with the Internet TV.

6.3.2.5 Usage, Impact, Termination, and Upgrade to Internet PC

Usage and Impact

Given the above issues at the Use stage, the privileged adopters' usage level was understandably much lower than that of the under-privileged, as illustrated in table 5-4-3-

4. The impact of the Internet TV, to the privileged, was relatively insignificant, as some said that the Internet TV was of no value and they could live without it. Therefore, many were indifferent to the termination of the project.

Termination and Upgrade to Internet PC

The Internet TV experience promoted some privileged adopters to acquire an Internet PC or turn back to the ones they already had before the LITV initiative. However, unlike the under-privileged, such discontinuation reflected their dissatisfaction with the technology rather than the termination of the project.

To summarize, although the privileged and under-privileged stages models have many facilitators and barriers in common, critical differences were detected in the case analysis. First, at the Awareness stage, the issue of social isolation among some under-privileged people seemed to decrease the likelihood for them to be aware of the LITV initiative. At the Interest stage, while both groups were interested in LITV because of material, social, and institutional factors, the privileged tended to be motivated more easily because of their greater experience with digital technologies and/or their aspiration for learning new things. The under-privileged, however, faced more barriers at this stage than the privileged. Unique barriers for the under-privileged include the lack of: 1) understanding about the technology, 2) compatible life styles, 3) material resources, 4) trust in the government, and 5) physical capabilities. While no differences surfaced at the Installation stage, significant discrepancies emerged at the Use stage. When using the Internet TV, many under-privileged adopters experienced positive gains in material (e.g. money), social (e.g. friendships), and cognitive (e.g. knowledge and skills) factors, which constructively reinforced their intention to continue using the technology. Meanwhile,

among some under-privileged adopters, their lower control over material resources, knowledge, and physical conditions inhibited their usage. On the other hand, the key barrier for the privileged adopters was the limitation of the Internet TV in quality and functionality, which could not live up to the expectations of the privileged. Finally, the termination of the LITV initiative seemed to have little influence on the privileged. However, for under-privileged adopters who had become accustomed to the technology, the termination meant disconnection from the Internet if they could not find alternative access or upgrade to an Internet PC. Unfortunately, upgrading to an Internet PC required resources or skills that many did not possess.

6.4 Complementary Analysis between Quantitative & Qualitative Analysis

Findings in the qualitative analysis complement those derived from the quantitative analysis in chapter 5. In fact, the qualitative analysis reveals some possible explanations for relationships identified in the quantitative analysis. On the other hand, some factors identified as important in the case analysis were statistically insignificant in the quantitative analysis. Finally, the case analysis also identifies some critical factors not discussed in the survey phase.

Some relationships identified in the path models could be better explained by the findings in the case analysis. In particular, the path from the control variable, Internet PC Ownership, to BI is insignificant for the under-privileged adopters (Figure 5-4-2). However, the path is significant for the privileged adopters (Figure 5-4-2) as well as for the under-privileged non-adopters (Figure 5-3-2).

Presumably, higher household Internet PC Ownership should reduce individuals' behavior intention, which is true for both under-privileged non-adopters and privileged adopter. But why not for under-privileged adopters? The tentative explanation offered in section 5.3 and 5.4 is that the under-privileged adopters might have experienced high demand for Internet access; therefore, even though they already had an Internet PC at home, they might still want the Internet TV. The case analysis (section 6.3.1.4 and 6.3.1.5), however, suggests another possible explanation: the under-privileged adopters might expect to use the free Internet TV because they hoped to disconnect their original Internet connection in order to save the monthly service charge. The logic of both explanations seems quite reasonable.

On the other hand, some factors that are important in the case analysis did not seem to be significant in the quantitative analysis. Time, for instance, appears to be an important factor for the under-privileged adopter in the case analysis (Table 6-3-1), both as a facilitator (save time by using the Internet TV) and a barrier (need to take care other family members). In the path model in Figure 5-3-3, however, Time is not a significant behavioral determinant for under-privileged adopters. There are two possible reasons for such a discrepancy. First, the operationalization of Time includes three items:

1. I do not have to time to use the Internet TV.
2. I am too busy to use the Internet TV.
3. It is too time consuming to use the Internet TV.

These items basically treat the construct conceptually as a barrier, but not a facilitator. They do not ask subjects if using the Internet TV saves their time. Thus, only the barrier aspect of Time was captured and assessed quantitatively.

Second, although the qualitative data suggests Time as a barrier for under-privileged adopters, the quantitative data does not statistically support this notion. This is the fundamental difference between the focus of qualitative and quantitative analyses, as the latter has a strict demand for statistical significance. As this is only a single case study, replications in multiple cases can perhaps reveal better theoretical understanding and external validity (Eisenhardt 1989, Yin 1994) of the significance of Time being a barrier and facilitator in the context of digital inequality. These two reasons, (1) conceptual and operationalizational differences and (2) statistical focus, perhaps explain most of the differences in important factors between the quantitative analysis and the case study.

Next, social and institutional factors were important for both under-privileged and privileged at the Use stage (Table 6-3-1 & 6-3-2, respectively). These two factors at the Use stage actually take the form of "support" in the case analysis. However, in the quantitative analysis, the social influence refers to either the normative or the mimetic influence; while the institutional influence means the normative influence from the government or individuals' trust in the government. As can be seen, none of these two factors in the path models touch the aspect of support. Again, it is the conceptual differences that lead to the discrepancies between the quantitative and case analyses.

Lastly, physical and technical factors are not in the a priori research model, but emerged empirically in the case study. It is quite evident that these factors should be seriously considered in future digital inequality research in order to better comprehend

the phenomenon. For example, in the Use stage of section 6.2.3.4, the privileged adopters encountered tremendous technical issues as the quality and functionality of the Internet TV could not live up to their expectations. Their inability to use the Internet TV in the ways they expected adversely influenced their usage. However, such technical difficulties were not directly measured in any constructs in the original research model. Even the construct PEOU, which comes closest to capturing these technical difficulties, was not operationalized in a way that could capture this aspect. PEOU, defined as the degree to which an individual believes that performing the behavior of interest would be free of effort, was measured by four established items adapted from prior literature

1. My interaction with the Internet TV is clear and understandable
2. Interacting with the Internet does not require a lot of my mental effort.
3. I find the Internet TV easy to use.
4. I find it easy to get the Internet TV to do what I want it to do.

The first two items seem to focus more on the mental aspect of the interaction between users and the technology. The third and the fourth item, however, can be interpreted quite subjectively as being related to mental, physical, or technical difficulties. The problems that challenged the users were not necessarily mental. They can be purely technical, such as the quality of the connection and the response rate of the text and cursor. It can also be interpreted as the limited functionalities (not able to print, save, and download), which are closest to the fourth item. In addition, it can be somewhat physical, such as the size of the keyboard, the resolution of the graphics, or the colors of the text and background. As one subject responded about the visual limitation:

It is not difficult to use, but it is hard to see!

Thus, the operationalization of PEOU may not capture the technical factors identified in the case analysis. One possible solution is to develop new constructs that could faithfully detect these technical problems, and assess their influence on PBC and BI.

6.4 Summary

This chapter presents the framework, analysis, and results of the case study. The proposed framework involves a stage model and the facilitators and barriers that characterize individuals' ICT innovation process. By examining the framework against both the under-privileged and privileged group, significant differences are identified and discussed. Finally, the complementary analysis between the results of quantitative and qualitative analyses is discussed in the last section.

Chapter 7 Conclusion

7.1 Summary of Results

This dissertation aimed to provide a theoretical explanation for digital inequality, or the disparity in the access and use of ICT across individuals with different backgrounds. Drawing on the Theory of Planned Behavior, Motivation Theory, Social Learning Theory, Diffusion of Innovation, and Trust, an extended TPB model was proposed in an attempt to explain how attitudinal, social, behavioral, and institutional factors, as a whole, may lead to the inequality in individuals' access and use of ICT.

The context in which the research questions were investigated is the LaGrange Free Internet TV initiative. This project was the first of its kind in that a city government, together with cable and Internet service providers, offered free high-speed Internet service to every household. The LITV initiative represented a unique opportunity to theoretically investigate the privileged and under-privileged's innovation behavior in response to a government intervention designed to remove economic and technical barriers for ICT access and use.

A large-scale mail survey was administrated in summer 2003 to collect data for the quantitative analysis. The proposed research model demonstrated good fit and was capable of explaining a significant amount of variance in individuals' ICT innovation behavior. The results revealed different innovation behavior patterns between the privileged and under-privileged adopters, as well as between people at pre-adoption and post-adoption stages. First, factors affecting under-privileged non-adopters' behavioral intention were different from those affecting under-privileged adopters' (comparison 1 in

Figure 7-1). Although usefulness (Utilitarian Outcomes), enjoyment (Hedonic Outcomes), and confidence (Self-Efficacy) are common factors for all under-privileged people, non-adopters are more sensitive to normative influence (Subjective Norm) whereas adopters are more sensitive to mimetic isomorphism (Exposure to Innovation). Second, factors influencing ICT use intention differ between privileged and under-privileged adopters as well (comparison 2 in Figure 7-1). Specifically, enjoyment and confidence in using ICT and Availability are more influential in shaping ICT use intention for the under-privileged than the privileged. The privileged group has a higher tendency to respond to Exposure to Innovation and tend to adopt ICT faster than the under-privileged.

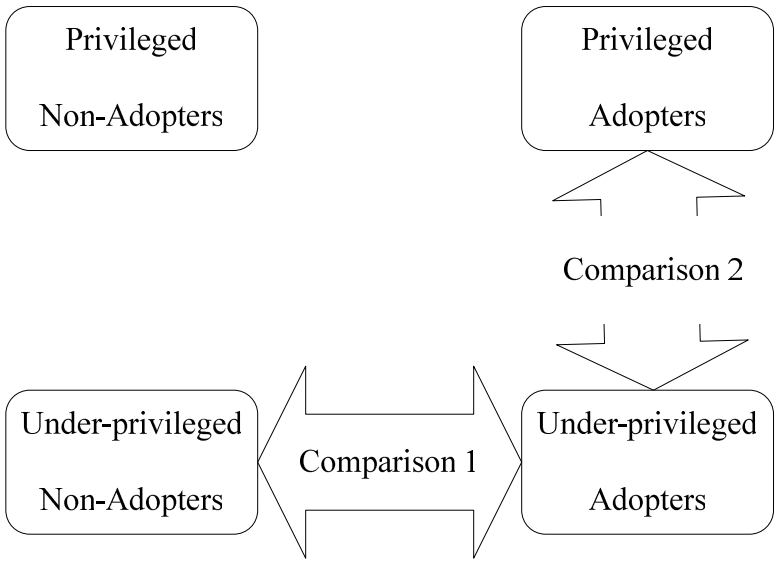


Figure 7-1: Comparisons Between Groups

A *post hoc* explanatory case study was conducted after the termination of the LITV project. The case study examined a multi-stage process model in which various barriers and facilitators may prevent or promote the progress of individuals' ICT innovation. The case study results generally supported the quantitative analysis, which

found that barriers and facilitators vary across stages along individuals' innovation process in that privileged and under-privileged face different barriers and facilitators. Furthermore, the case study identified additional factors that may be critical in explaining digital inequality, including the influences of mass media, social support, technical difficulties, and physical disabilities. Finally, the complementary analysis between the quantitative analysis and the case study provided a more comprehensive perspective of the phenomenon.

Overall, the findings of this research suggest that people's ICT innovation behaviors vary across groups and stages; therefore, rather than employing a generic approach which treats all individuals identically, digital inequality interventions should incorporate a segmentation and stepwise strategy for people with different backgrounds and at different stages of their innovation processes.

7.2 Limitations and Future Research

While digital inequality exists across different socio-demographic dimensions (DiMaggio et al. 2001), the under-privileged sample studied in this research had lower incomes and education and also consisted of more senior, African American, and female residents. Hence, the audience of this research should be cautious when generalizing the results of this study. Future research may look into other groups, such as the disabled, to investigate unique barriers (such as the physical factor identified in the case study) and facilitators of ICT usage. Such investigation can help tailor interventions to the targeted beneficiaries.

Recently, researchers have suggested the need to examine digital inequality in terms of the various ways in which ICT are used (Attewell 2001, Hargittai 2002, 2003).

Hargittai (2002), for example, looked into people's skills in locating different kinds of information online and found significant differences across individuals with different backgrounds. Although this paper examines a nomological network that informs individuals' *general* use intention, it would be worthwhile to elaborate on the concept of ICT use, such as different types and purposes of usage, and investigate its relationships with different behavioral antecedents in the context of digital inequality.

Although the quantitative analysis showed no effect from individuals' trust in the government to their innovation behavior, trust in other trustees deserves more attention. With the proliferation of computer viruses, spyware, and junk mail aimed at ICT users, will the under-privileged trust the technology and keep using it? Do the under-privileged trust the privacy warranty and transaction security provided by online merchant? How will their trust (or distrust) affect the phenomenon of digital inequality? These trust-related issues may influence whether the under-privileged will use ICT effectively and therefore merit further investigation.

Today, Internet access is becoming more pervasive than ever before. Access is more frequently available in community centers, libraries, schools, workplaces, and other public areas. The Internet is now also accessible via a variety of devices, including computers, cell phones, personal data assistants (PDA), Internet TV, and other emerging technologies. The ability to access to the Internet via these alternative locations and devices might influence the decision to adopt and use a particular technology at a specific location. It is not clear, however, whether this influence will serve to reduce or increase the likelihood to adopt and use the Internet at home. While it is reasonable to posit that the demand for the Internet at home will decrease if alternative access mechanisms are

available, it is equally logical to expect people to access the Internet even more often when they become used to a ubiquitous net environment. Although these substitutable mechanisms may influence one's innovation decisions, this research, given its focus on ICT innovation behavior at home, captures such influence by controlling household Internet PC Ownership. Future research could shed more light on the impact of all these alternative access mechanisms on home ICT usage.

Methodologically, the interview approach employed in the case study, which asked subjects to recall their perceptions about the LITV experience, could be affected by recall bias (Nisbett and Wilson 1977). The recalled memory of the respondents might be flawed for several reasons. First, it is commonly accepted that the longer the time since the event, the greater the lapse of human memory. Second, Van de Ven and Poole (1990) asserted that prior knowledge of success (acceptance) or failure (rejection or discontinuance) may bias a study's finding. A subject's recall of previous events may be biased in favor of current events. For many reasons, such as rationalization, self-presentation, simplification, and attribution (Wolfe and Jackson 1987), the informants may not reveal the complete picture. Thus, the interview results should be interpreted with this limitation in mind.

Finally, the quantitative part of this study represents a cross-sectional snapshot of the digital inequality phenomenon. A longitudinal study tracing individuals' ICT adoption and usage patterns along their innovation decision processes will yield a richer understanding of behavioral patterns, critical factors, and how these are shaped over time.

7.3 Contributions and Implications for Researchers

7.3.1 Digital Inequality

This study represents an important step toward understanding the problem of digital inequality by using a theoretically grounded approach based on the Theory of Planned Behavior (TPB), with reference to other related theories. The proposed model addresses the often-cited need to understand the intricacies of adoption and diffusion of ICT in the context of digital inequality (Bonfadelli 2002, van Dijk and Hacker 2003). It demonstrates that a TPB-based model can successfully explain a significant amount of variance in household ICT innovation behavior for both privileged and under-privileged individuals. While the extended TPB model held for both privileged and under-privileged groups, important between-group differences in ICT innovation were observed. Thus, from the standpoint of digital inequality research, this study constitutes an important contribution to the theoretical development of the phenomenon. The observed between-group differences warrant further examination as they represent promising avenues for insight into differential behavioral patterns and their causes.

Furthermore, the diversity of identified factors and the multiple stages involved in the ICT innovation process, together, exemplify the complexity of digital inequality. The findings echo prior researchers' argument that digital inequality is a complex and dynamic phenomenon (e.g. Van Dijk and Hacker 2003). This research also takes one step further to identify the key factors that can effectively address the disparity in the access and use of ICT.

Social influence appears to be a very important aspect in understanding digital inequality. People's social networks have a crucial effect on their ability to overcome

barriers to ICT access and use (Kvasny 2002, Payton 2003). Meanwhile, the mechanisms through which one's social network exerts its power can be quite complex. Specifically, social networks may affect individuals' innovation behavior through normative influence (i.e. Subjective Norm) and mimetic pressure (i.e. Exposure to Innovation) at different innovation-decision stages, respectively. Other than the above two mechanisms examined in the quantitative analysis, the case study also detected significant influence of social support at the Interest and Use stage. These mechanisms exemplify the sophisticated influence from social networks that may impact individuals' innovation behavior. This suggests the necessity for digital inequality research to explore other potential aspects of social networks and associated mechanisms.

Toward this end, researchers may turn to alternative conceptualizations of social influence. For example, Kelman (1961) suggested that social influence operates through three processes: internalization, identification, and compliance. Internalization refers to the process of receiving information from experts and internalizing the information as individual beliefs. Identification is produced by perceiving the connections with salient and likeable referents. Compliance results from the power sources' ability to reward or punish the information recipients. By decomposing social influence into these different mechanisms, a more detailed understanding can be achieved. In addition to personal networks, as evidenced in the case analysis, the mass media (e.g. TV, radio, and newspapers) exerts another type of social influence. In the early stages of the diffusion of an innovation, since very few people adopt or know about the innovation, mass media serves as an important information source for earlier adopters (Rogers 2003, Valente 1995). Early adopters may, in turn, disperse their opinions about the innovation through

their personal networks (Rogers 2003, Valente 1995). Whether early adopters' opinions are positive or negative can be consequential for potential adopters' innovation decisions. The effect of mass media on ICT innovation behavior suggests additional complexity for social influence.

This dissertation also responds to researchers' call for attention toward investigating policy and institutional influence on digital inequality. The results bear several important implications in this direction. First, institutional influence may affect digital inequality in various ways. For example, the LaGrange city government influenced individuals' innovation behavior through a variety of mechanisms. The government's influence took the forms of (1) social influence, such as social norms, individuals' trust in the government institutions, and promotional campaigns; (2) material resources, such as financial subsidies or supplying technologies and services; and (3) training, such as providing classes at the community centers, training programs via the mass media, or offering support through technical hotlines. These different forms of institutional influences suggest possible mechanisms that the government can employ to stimulate the adoption and use of ICT. Thus, a more comprehensive conceptualization of possible mechanisms of institutional influence should permit more in-depth understanding about institutional influence as well as facilitate effective policy formulation.

In addition to the different forms of institutional influence, researchers should also examine its potential limitations. Although institutions exert power through different mechanisms, there are areas beyond their influence. For instance, the under-privileged's lack of time, which affects adoption and use of ICT, may result from the need to work

two or more jobs to support their families or to dedicate time to childcare or sick family members. This type of hardship faced by the under-privileged is difficult to address via technology-centered interventions like the LITV initiative. By understanding the limitations of institutional influence, policy-makers can search for solutions or assistance from other sources to address the limitations.

Moreover, this study points out important aspects that have been overlooked in prior digital inequality research. Traditionally, digital inequality researchers have focused on the utility to be gained from technology access and use in terms of improving opportunities in one's life. Thus, when the under-privileged embrace technology for "recreational" or "entertainment" purposes, this has been seen as non-capital-enhancing. However, given that entertainment represents a key factor motivating the under-privileged to use ICT, and recreational use represents a majority of their ICT usage (Bonfadelli 2002, DiMaggio and Hargittai 2002, Shah et al. 2001), the value of entertainment in ICT use deserves careful investigation in the context of digital inequality. Studies in prestigious medical journals, such as New England Journal of Medicine, have recently shown that mental activities, such as card and chess games (which are widely available and used via ICT), can help reconnect disconnected brain cells, generate new neurons, and eventually reduce the risk of dementia, particular for the elderly (Coyle 2003, Verghese et al. 2003). Thus, the benefits of recreational ICT use should be evaluated independently for different subgroups and from a broader point of view. Meanwhile, recreational use of various technologies has been proven to deliver tremendous educational value (Sjodahl n.d.). Researchers in digital inequality should also examine the educational aspect of ICT entertainment and seek to connect recreational use

to skills and opportunities that can help improve the under-privileged's quality of life.

Next, inequality in technological means also bears complex implications for digital inequality. In his report to the U.S. government regarding the development of the next generation Internet, Kling (1998) emphasized the importance of "the physical availability of suitable equipment, including computers of adequate speed and equipped with appropriate software for a given activity." This notion of "suitable" or "appropriate" technology implies a relative fit between the user, the technology, and the task. As evident in this research, Internet TV served as an ideal introductory technology for many under-privileged people. In addition to free access, the easy-to-use design of the Internet TV required a much shorter learning process to start engaging in actual usage. It is, however, not an ideal solution for those with higher levels of knowledge or prior experience, as they may have higher expectations toward the technology and functionality, which may not meet their sophisticated needs. Thus, whether a technology is suitable depends on the capabilities and expectations of the person using the technology, and the tasks performed. Providing ultra-fast computers with all imaginable functionalities may not be appropriate for individuals with little or no knowledge about how to use it. On the other hand, a technology like Internet TV, with low knowledge barriers can be quite suitable for novices seeking to gain initial digital experience. Rather than top-notch or cutting-edge technologies, employing appropriate technologies for the level of technical knowledge of the users may also mean less expenditure provided there is a good fit between technologies, tasks, and users. Unfortunately, while most digital inequality studies suggest that inferior technologies might reduce users' benefits (DiMaggio et al. 2004), little attention has been paid toward this concept of appropriate

technical means. More research effort is necessary to elaborate on the concept of matching suitable technology to users as well as understanding its implication for the digital inequality phenomenon.

Finally, this paper is one of few studies that approach the digital inequality issue from the perspective of adoption of innovation (AOI). The solid theoretical foundation of AOI greatly facilitated the theoretical development in this research. Further, the AOI theoretical lens not only complements the theories and frameworks proposed by prior digital inequality researchers (Clement and Shade 2000, De Haan 2004, DiMaggio et al. 2004, Gurstein 2003, Jackson et al. 2001, Kvasny 2002, Van Dijk and Hacker 2003), but also offers a unique examination of the phenomenon.

7.3.2 Adoption and Diffusion of Innovation

For the field of adoption and diffusion of innovation, the findings of this research also suggest several important theoretical contributions and implications. First, this study illustrates that TPB can be meaningfully extended through the addition of Exposure to Innovation which captures the behavioral consequences of aggregate mimetic influence. As Legris et al. (2003) noted, although current IS adoption theories are useful, incorporating additional critical factors might be necessary to improve their explanatory power.

This paper also represents one of the few efforts toward investigating ICT innovation behavior in households and beyond typical workplace settings. In particular, the results identify many key factors that may not be salient in typical organizational ICT studies, yet exert significant influence on individuals' ICT innovation behavior in the context of digital inequality. Behavioral control, for instance, is a critical issue when a

lack of cognitive and material resources is of concern. Further, this research identifies different types of social mechanisms that can significantly impact individuals' ICT acceptance at different stages of the innovation process. Such evidence exemplifies the dynamics and intricacies of social influence. These findings, as a whole, illustrate the complexity involved in the adoption and diffusion of ICT in non-workplace settings. Future research in this context should hence pay special attention to factors that may influence the complexity of and its implications on ICT acceptance.

Next, while most ICT adoption studies have viewed the presence or lack of certain key factors as reasons for acceptance, rejection, or discontinuance, the case study explores both facilitators and barriers that may affect individuals' innovation decisions. The diversity and effects of the identified barriers provide important explanations for rejection and discontinuance. In addition, the LaGrange Internet TV initiative provides an excellent context to examine people's innovation behavior when certain barriers are removed, and others remain. The results of this study suggest that simply removing some barriers is not enough to attain effective ICT adoption and use. However, it is uncertain whether the removal of all barriers is necessary and sufficient to achieve better results. Little is known about the relative importance between the provision of facilitators and the removal of barriers. More research is necessary toward this direction as it holds important implications in promoting the adoption and diffusion of digital technologies.

Finally, Orlikowski and Iacono (2001) have raised the issue that IS researchers tend to focus their investigation on the influence, context, and functionality of technology; but take technology for granted and assume that technology will be trouble-free once created and implemented, thus overlooking its important implications. In this paper,

special characteristics and limitations of the Internet TV demonstrate its unique impact on people's adoption and use of ICT. The limitations of Internet TV drove away many privileged users because the technology failed to live up to their expectations. On the other hand, its user-friendly design facilitated many inexperienced users to begin their digital adventure, yet constrained their development of advanced skills for more complicated tasks. Evidently, technology itself bears important implications and requires special attention. IS researchers should treat technology as important as its influence, context, and functionality. Researchers should seriously engage in developing a good theoretical understanding about the technology artifact in order to comprehend its critical implications (Orlikowski and Iacono 2001).

7.4 Contributions and Implications for Practitioners

For practitioners, particularly public policy makers and Internet service providers, this study is important because it transcends the typical descriptive approach and offers insights through a theoretically grounded model. The results reveal the differences between models that characterize the under-privileged and privileged's innovation behavior at distinct stages of their innovation processes. That is to say, factors that affect ICT acceptance differ across groups and innovation stages. To effectively address digital inequality, it is necessary and important to formulate a segmentation and stepwise strategy that focuses on the specific issues faced by specific groups. This finding perhaps explains why most digital inequality interventions (e.g. the LITV initiative) only helped part of the targeted population, yet failed to achieve an overall success.

Furthermore, understanding which variables affect ICT innovation decisions at a specific stage of individuals' innovation decision process, especially for those under-

privileged, is critical to effectively formulate and implement policy interventions like the free Internet TV project in LaGrange. This type of initiative usually involves substantial resources from many stakeholders. Unsuccessful initiatives might signal a waste of valuable resources, which could discourage the government, residents, and other stakeholders' from orchestrating similar initiatives in the future.

The findings of this study also suggest that providing access to easy-to-use ICT alone – even at no cost – is only part of the solution. The results identify other key factors that can affect ICT use intention for under-privileged adopters and non-adopters. Understanding these factors, particularly the important ones for the under-privileged, provides points of leverage for policy makers and service providers who hope to deal with the digital inequality problem and stimulate high-speed Internet adoption and use in households. To devise effective interventions, policy-makers need to incorporate these additional factors as a whole. Usefulness, enjoyment, and confidence in using ICT are common factors that provide strong leverage to increase behavioral intention for both under-privileged adopters and non-adopters. Positive opinions and expectations of using ICT from family, relatives, peers, and friends can also be important drivers for the non-adopters to make their first move. Fostering an environment with high exposure to aggregate patterns of ICT adoption can encourage continued ICT usage for adopters.

In addition to aforementioned factors, practitioners should also pay special attention to technical and physical aspects in the interventions. To select an information and communication technology as the solution for digital inequality, policy-makers must carefully take several factors into consideration. The concept of *suitable* or *appropriate* technology (Kling 1998) offers a good reference point for this purpose. To begin with,

policy-makers and service providers should consider targeted audiences' cognitive resources (e.g. education, skills, and prior experience) and the potential tasks that users would like to perform. Providing an easy-to-use technical apparatus can reduce the cognitive barrier for the novice, whereas providing performance-oriented devices can meet the demand of more experienced users. Inappropriate technology choices may lead to the privileged's disappointment and the reinforcement of the under-privileged's frustration. Moreover, if provided with introductory technologies, inexperienced users may gradually build up their skills. However, the simple technology initially used may then ironically become an obstacle preventing the users from developing more advanced skills. Practitioners should therefore be aware of the limitations of introductory technologies, and perhaps assist users in upgrading to better solutions as their capabilities and interests develop. Lastly, the ergonomic aspect of a technology is probably as important as other aspects when physical disabilities are of concern. This is especially true for the elderly and the disabled. Without appropriate design, the physical difficulties encountered by this group of people will perhaps make them the least connected. Based on the above discussion, there is probably no single technology to address the needs of every individual. Policy-makers and service providers should strategically select suitable technical solutions for the targeted audience based on their needs and resources.

Finally, determining how to ensure sustainable ICT usage should be the focal point of any digital inequality intervention. The negative impact on many under-privileged adopters resulting from the termination of the LITV initiative highlights the importance of fostering sustainable ICT usage. The central issue concerns the critical factors required to successfully integrate ICT into the society so that people can use ICT

regularly for their benefits ("Spanning the Digital Divide" 2001). Research has suggested that these factors may be influenced by all types of policies (technology, business, human resource, tax, etc.) and policies at all levels (local, state, national, and international) ("Spanning the Digital Divide" 2001). To reach sustainable usage, orchestrated efforts from private and government institutions of all levels are necessary. Although this issue is beyond the scope of this research, the lessons learned from the LaGrange Internet TV initiative suggest its criticality in addressing digital inequality.

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Appendix A: Case Study Interview Protocol

Adopter Version

1. From where did you hear about the LaGrange Internet TV project?
2. Which information sources drew your attention?
3. Did you have any Internet/computer experience before you hear about the Internet TV project?
    a. If so, how long?
4. Did you have an Internet PC at your home before you hear about the LITV project?
5. Were you interested in the Internet TV when you first heard about it?
6. What were your initial thoughts about the Internet TV when you first heard about it?
7. Did you receive any training about the Internet TV before bringing it into your home?
8. Did you try the Internet TV before bringing it into your house?
9. What were the important factors that influenced you to acquire the Internet TV?
10. What were the factors that deterred you from acquiring the Internet TV?
    a. How did you overcome these issues?
11. Were there any challenges or problems in installing the Internet TV?
12. How would you characterize your Internet TV usage?
    a. the frequency & length
    b. the scope
    c. the purposes
    d. Did you create or develop any web pages/programs/content?
13. How did you acquire and develop the skills to use the Internet TV?
14. Were there barriers/problems that kept you from using the Internet TV more widely?

    a. If so, did you try to overcome these barriers?
        i. If so, how?
        ii. If not, why?

15. If possible, will you continue to use the Internet TV on a regular basis?

16. What are the reasons that may keep you continue using the Internet TV?

17. What are the reasons that may deter you from continue using the Internet TV?

18. If the Internet TV is not free and the service provider starts to charge, will you still use it?

19. What kinds of resources or assistance do you need to keep you continue using the Internet TV?

20. What were the reasons that motivated you to convert/upgrade to an Internet PC?

21. Did the Internet TV experience influence you to convert/upgrade to an Internet PC?

22. What kind of barriers did you encounter when converting/upgrading to an Internet PC?
    a. How did you overcome them?

23. What factors caused you to discontinue using the Internet LITV?

24. What are your current thoughts about the Internet TV?

Non-Adopter Version

1. Do you know about the Internet TV project?

2. From where did you hear about the Internet TV project?

3. What were your initial thoughts about the Internet TV project?

4. Did you have any Internet/computer experience before you hear about the Internet TV project?

5. How long had you be using the Internet/computer before you heard about the Internet TV project?

6. Did you have an Internet PC at your home before you hear about the Internet TV project?

7. Were you interested in the Internet TV when you first heard about it?

8. What were your initial thoughts about the Internet TV when you first heard about it?

9. Did you receive any training about the Internet TV?

10. Did you try the Internet TV?

11. Did you consider acquiring the Internet TV?

12. What were the factors that influenced your evaluation?

13. What were the critical issues that prevented you from acquiring the Internet TV?

    a. Did you try to overcome these issues?
        i. If so, how?
        ii. If no, why?

14. What are your current thoughts about the Internet TV?

Appendix B: Assessment of Discriminant Validity – Comparison 1

Appendix B1: Squared Correlations and Assessment of Discriminant Validity – (Under-Privileged Non-Adopters)

	Attitude	UO	HO	SO	SN	FPRF	Gov. Inf.	PBC	Self-Efficacy	Knowledge	PEOU	Cost	Time	Availability	Trust	Exposure	Intention
Attitude	0.98																
UO	0.67	0.96															
HO	0.65	0.65	0.97														
SO	0.13	0.22	0.19	0.85													
SN	0.26	0.31	0.20	0.37	0.95												
FPRF	0.28	0.35	0.23	0.28	0.74	0.90											
Gov. Inf.	0.10	0.06	0.08	0.07	0.32	0.29	0.93										
PBC	0.36	0.30	0.37	0.04	0.16	0.19	0.16	0.91									
Self-Efficacy	0.38	0.27	0.38	0.05	0.10	0.13	0.13	0.66	0.94								
Knowledge	0.29	0.20	0.31	0.06	0.08	0.11	0.08	0.53	0.72	0.96							
PEOU	0.37	0.26	0.36	0.04	0.13	0.15	0.12	0.66	0.72	0.75	0.96						
Cost	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	N/A					
Time	0.02	0.02	0.04	0.00	0.00	0.00	0.01	0.03	0.00	0.00	0.01	0.02	0.82				
Availability	0.02	0.00	0.02	0.00	0.03	0.03	0.03	0.02	0.05	0.02	0.04	0.05	0.08	0.61			
Trust	0.07	0.03	0.05	0.02	0.01	0.03	0.01	0.02	0.01	0.00	0.02	0.01	0.02	0.00	0.85		
Exposure	0.10	0.10	0.07	0.05	0.21	0.31	0.06	0.07	0.05	0.04	0.06	0.05	0.00	0.04	0.10	N/A	
Intention	0.29	0.23	0.34	0.10	0.15	0.18	0.09	0.18	0.25	0.23	0.23	0.00	0.03	0.01	0.02	0.06	0.94

Note:
AVE of every multi-item construct is shown on the main diagonal. (Cost and Exposure to Innovation are single-item constructs)
Squared correlations are off the diagonal.

Appendix B2: Squared Correlations and Assessment of Discriminant Validity – (Under-Privileged Adopters)

	Attitude	UO	HO	SO	SN	FPRF	Gov. Inf.	PBC	Self-Efficacy	Knowledge	PEOU	Cost	Time	Availability	Trust	Exposure	Intention
Attitude	0.96																
UO	0.73	0.94															
HO	0.69	0.64	0.97														
SO	0.17	0.27	0.19	0.87													
SN	0.20	0.30	0.26	0.32	0.94												
FPRF	0.26	0.34	0.32	0.24	0.75	0.91											
Gov. Inf.	0.11	0.15	0.17	0.20	0.34	0.43	0.93										
PBC	0.08	0.06	0.06	0.01	0.00	0.00	0.01	0.83									
Self-Efficacy	0.17	0.14	0.17	0.02	0.02	0.03	0.01	0.60	0.88								
Knowledge	0.13	0.10	0.11	0.01	0.01	0.01	0.00	0.49	0.59	0.86							
PEOU	0.28	0.26	0.27	0.06	0.06	0.06	0.02	0.44	0.54	0.58	0.80						
Cost	0.00	0.00	0.00	0.02	0.01	0.01	0.03	0.00	0.00	0.00	0.00	N/A					
Time	0.03	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.11	0.83				
Availability	0.04	0.02	0.01	0.00	0.00	0.01	0.03	0.04	0.02	0.01	0.02	0.11	0.08	0.53			
Trust	0.03	0.04	0.04	0.05	0.06	0.05	0.09	0.04	0.07	0.03	0.03	0.01	0.00	0.00	0.72		
Exposure	0.10	0.10	0.14	0.04	0.13	0.15	0.04	0.02	0.03	0.01	0.07	0.01	0.01	0.01	0.03	N/A	
Intention	0.22	0.27	0.26	0.06	0.11	0.12	0.04	0.14	0.29	0.13	0.18	0.00	0.04	0.04	0.03	0.16	0.94

Note:
AVE of every multi-item construct is shown on the main diagonal. (Cost and Exposure to Innovation are single-item constructs)
Squared correlations are off the diagonal.

Appendix B3: Pairwise Discriminant Analysis – (Under-Privileged Non-Adopters)

Model	χ 2	d.f.	$\Delta\chi$ 2	p-value of χ 2 test
Original	3631.58	1280		
Combining				
Intention to Use + Attitude	3652.33	1281	20.75	0.00
Intention to Use + Subjective Norm	3636.11	1281	4.53	0.03
Intention to Use + PBC	3639.07	1281	7.49	0.01
Intention to Use + Utilitarian Outcomes	3646.59	1281	15.01	0.00
Intention to Use + Hedonic Outcomes	3659.47	1281	27.89	0.00
Intention to Use + Social Outcomes	3634.82	1281	3.24	0.07
Intention to Use + Family, Relatively, Friends, and Peers' Inf.	3641.03	1281	9.45	0.00
Intention to Use + Government Institutions' Inf.	3639.59	1281	8.01	0.00
Intention to Use + Self-Efficacy	3642.43	1281	10.85	0.00
Intention to Use + Requisite Knowledge	3643.42	1281	11.84	0.00
Intention to Use + PEOU	3645.44	1281	13.86	0.00
Intention to Use + Time	3649.95	1281	18.37	0.00
Intention to Use + Availability	3635.1	1281	3.52	0.06
Intention to Use + Trust	3636.07	1281	4.49	0.03
Attitude + Subjective Norm	3648.27	1281	16.69	0.00
Attitude + PBC	3666.69	1281	35.11	0.00
Attitude + Utilitarian Outcomes	3748.44	1281	116.86	0.00
Attitude + Hedonic Outcomes	3738.71	1281	107.13	0.00
Attitude + Social Outcomes	3634.76	1281	3.18	0.07
Attitude + Family, Relatively, Friends, and Peers' Inf.	3652.06	1281	20.48	0.00
Attitude + Government Institutions' Inf.	3640.44	1281	8.86	0.00
Attitude + Self-Efficacy	3659.44	1281	27.86	0.00
Attitude + Requisite Knowledge	3650.78	1281	19.2	0.00
Attitude + PEOU	3669.14	1281	37.56	0.00
Attitude + TIME	3649.47	1281	17.89	0.00
Attitude + Availability	3646.61	1281	15.03	0.00
Attitude + TRUST	3640.34	1281	8.76	0.00
Subjective Norm + PBC	3637.19	1281	5.61	0.02
Subjective Norm + Utilitarian Outcomes	3653.26	1281	21.68	0.00
Subjective Norm + Hedonic Outcomes	3642.61	1281	11.03	0.00
Subjective Norm + Social Outcomes	3655.45	1281	23.87	0.00
Subjective Norm + Family, Relatively, Friends, and Peers' Inf.	3795.53	1281	163.95	0.00
Subjective Norm + Government Institutions' Inf.	3645.81	1281	14.23	0.00
Subjective Norm + Self-Efficacy	3643.17	1281	11.59	0.00
Subjective Norm + Requisite Knowledge	3638.04	1281	6.46	0.01
Subjective Norm + PEOU	3635.45	1281	3.87	0.05
Subjective Norm + TIME	3641.39	1281	9.81	0.00
Subjective Norm + Availability	3646.34	1281	14.76	0.00
Subjective Norm + TRUST	3634.63	1281	3.05	0.08
PBC + Utilitarian Outcomes	3659.44	1281	27.86	0.00
PBC + Hedonic Outcomes	3668.4	1281	36.82	0.00
PBC + Social Outcomes	3636.11	1281	4.53	0.03
PBC + Family, Relatively, Friends, and Peers' Inf.	3641.45	1281	9.87	0.00

PBC + Government Institutions' Inf.	3634.41	1281	2.83	0.09
PBC + Self-Efficacy	3726.44	1281	94.86	0.00
PBC + Requisite Knowledge	3682.94	1281	51.36	0.00
PBC + PEOU	3717.93	1281	86.35	0.00
PBC + TIME	3651.43	1281	19.85	0.00
PBC + Availability	3638.09	1281	6.51	0.01
PBC + TRUST	3641.81	1281	10.23	0.00
Utilitarian Outcomes + Hedonic Outcomes	3733.14	1281	101.56	0.00
Utilitarian Outcomes + Social Outcomes	3640.91	1281	9.33	0.00
Utilitarian Outcomes + Family, Relatively, Friends, and Peers' Inf.	3665.93	1281	34.35	0.00
Utilitarian Outcomes + Government Institutions' Inf.	3635.86	1281	4.28	0.04
Utilitarian Outcomes + Self-Efficacy	3648.15	1281	16.57	0.00
Utilitarian Outcomes + Requisite Knowledge	3643.65	1281	12.07	0.00
Utilitarian Outcomes + PEOU	3653.14	1281	21.56	0.00
Utilitarian Outcomes + TIME	3649.03	1281	17.45	0.00
Utilitarian Outcomes + Availability	3635.19	1281	3.61	0.06
Utilitarian Outcomes + TRUST	3635.96	1281	4.38	0.04
Hedonic Outcomes + Social Outcomes	3639.11	1281	7.53	0.01
Hedonic Outcomes + Family, Relatively, Friends, and Peers' Inf.	3646.47	1281	14.89	0.00
Hedonic Outcomes + Government Institutions' Inf.	3661.24	1281	2.93	0.09
Hedonic Outcomes + Self-Efficacy	3663.66	1281	32.08	0.00
Hedonic Outcomes + Requisite Knowledge	3655.69	1281	24.11	0.00
Hedonic Outcomes + PEOU	3668.57	1281	36.99	0.00
Hedonic Outcomes + TIME	3654.01	1281	22.43	0.00
Hedonic Outcomes + Availability	3639.27	1281	7.69	0.01
Hedonic Outcomes + TRUST	3641.31	1281	9.73	0.00
Social Outcomes + Family, Relatively, Friends, and Peers' Inf.	3647.44	1281	15.86	0.00
Social Outcomes + Government Institutions' Inf.	3638.18	1281	6.6	0.01
Social Outcomes + Self-Efficacy	3644.69	1281	13.11	0.00
Social Outcomes + Requisite Knowledge	3638.72	1281	7.14	0.01
Social Outcomes + PEOU	3643.59	1281	12.01	0.00
Social Outcomes + TIME	3636.39	1281	4.81	0.03
Social Outcomes + Availability	3636.21	1281	4.63	0.03
Social Outcomes + TRUST	3634.89	1281	3.31	0.07
Family, Relatively, Friends, and Peers' Inf. + Gov. Institutions' Inf.	3647.32	1281	15.74	0.00
Family, Relatively, Friends, and Peers' Inf. + Self-Efficacy	3635.07	1281	3.49	0.06
Family, Relatively, Friends, and Peers' Inf. + Requisite Knowledge	3643.56	1281	11.98	0.00
Family, Relatively, Friends, and Peers' Inf. + PEOU	3638.74	1281	7.16	0.01
Family, Relatively, Friends, and Peers' Inf. + TIME	3638.95	1281	7.37	0.01
Family, Relatively, Friends, and Peers' Inf. + Availability	3635.46	1281	3.88	0.05
Family, Relatively, Friends, and Peers' Inf. + TRUST	3640.01	1281	8.43	0.00
Government Institutions' Influence + Self-Efficacy	3642.72	1281	11.14	0.00
Government Institutions' Influence + Requisite Knowledge	3640.34	1281	8.76	0.00
Government Institutions' Influence + PEOU	3637.45	1281	5.87	0.02
Government Institutions' Influence + TIME	3645.83	1281	14.25	0.00
Government Institutions' Influence + Availability	3642.14	1281	10.56	0.00
Government Institutions' Influence + TRUST	3639.39	1281	7.81	0.01
Self-Efficacy + Requisite Knowledge	3744.03	1281	112.45	0.00
Self-Efficacy + PEOU	3731.93	1281	100.35	0.00
Self-Efficacy + TIME	3636.7	1281	5.12	0.02
Self-Efficacy + Availability	3646.43	1281	14.85	0.00
Self-Efficacy + TRUST	3634.39	1281	2.81	0.09
Requisite Knowledge + PEOU	3741.23	1281	109.65	0.00

Requisite Knowledge + TIME	3641.34	1281	9.76	0.00
Requisite Knowledge + ACCES	3636.09	1281	4.51	0.03
Requisite Knowledge + TRUST	3639.01	1281	7.43	0.01
PEOU + TIME	3647.48	1281	15.9	0.00
PEOU + Availability	3637.11	1281	5.53	0.02
PEOU + TRUST	3636.45	1281	4.87	0.03
TIME + Availability	3641.45	1281	9.87	0.00
TIME + TRUST	3650.94	1281	19.36	0.00
Availability + TRUST	3643.03	1281	11.45	0.00

Appendix B4: Pairwise Discriminant Analysis – (Under-Privileged Adopters)

Model	χ 2	d.f.	$\Delta\chi$ 2	p-value of χ 2 test
Original	2173.85	1280		
Combining				
Intention to Use + Attitude	2182.19	1281	8.34	0.00
Intention to Use + Subjective Norm	2181.83	1281	7.98	0.00
Intention to Use + PBC	2178.62	1281	4.77	0.03
Intention to Use + Utilitarian Outcomes	2187.3	1281	13.45	0.00
Intention to Use + Hedonic Outcomes	2186.41	1281	12.56	0.00
Intention to Use + Social Outcomes	2179.06	1281	5.21	0.02
Intention to Use + Family, Relatively, Friends, and Peers' Inf.	2177.76	1281	3.91	0.05
Intention to Use + Government Institutions' Inf.	2176.79	1281	2.94	0.09
Intention to Use + Self-Efficacy	2186.63	1281	12.78	0.00
Intention to Use + Requisite Knowledge	2179.71	1281	5.86	0.02
Intention to Use + PEOU	2178.64	1281	4.79	0.03
Intention to Use + Time	2194.39	1281	20.54	0.00
Intention to Use + Availability	2190.91	1281	17.06	0.00
Intention to Use + Trust	2180.86	1281	7.01	0.01
Attitude + Subjective Norm	2178.71	1281	4.86	0.03
Attitude + PBC	2179.11	1281	5.26	0.02
Attitude + Utilitarian Outcomes	2235.82	1281	61.97	0.00
Attitude + Hedonic Outcomes	2232.49	1281	58.64	0.00
Attitude + Social Outcomes	2176.93	1281	3.08	0.08
Attitude + Family, Relatively, Friends, and Peers' Inf.	2183.41	1281	9.56	0.00
Attitude + Government Institutions' Inf.	2180.63	1281	6.78	0.01
Attitude + Self-Efficacy	2176.78	1281	2.93	0.09
Attitude + Requisite Knowledge	2178.24	1281	4.39	0.04
Attitude + PEOU	2177.67	1281	3.82	0.05
Attitude + TIME	2194.2	1281	20.35	0.00
Attitude + Availability	2200.3	1281	26.45	0.00
Attitude + TRUST	2178.02	1281	4.17	0.04
Subjective Norm + PBC	2181.74	1281	7.89	0.00
Subjective Norm + Utilitarian Outcomes	2187.39	1281	13.54	0.00
Subjective Norm + Hedonic Outcomes	2183.98	1281	10.13	0.00
Subjective Norm + Social Outcomes	2189.49	1281	15.64	0.00
Subjective Norm + Family, Relatively, Friends, and Peers' Inf.	2287.39	1281	113.54	0.00
Subjective Norm + Government Institutions' Inf.	2199.49	1281	25.64	0.00
Subjective Norm + Self-Efficacy	2176.74	1281	2.89	0.09
Subjective Norm + Requisite Knowledge	2181.21	1281	7.36	0.01
Subjective Norm + PEOU	2182.63	1281	8.78	0.00
Subjective Norm + TIME	2181.31	1281	7.46	0.01
Subjective Norm + Availability	2178.04	1281	4.19	0.04
Subjective Norm + TRUST	2181.11	1281	7.26	0.01
PBC + Utilitarian Outcomes	2176.82	1281	2.97	0.08
PBC + Hedonic Outcomes	2182.82	1281	8.97	0.00
PBC + Social Outcomes	2180.44	1281	6.59	0.01
PBC + Family, Relatively, Friends, and Peers' Inf.	2182.14	1281	8.29	0.00
PBC + Government Institutions' Inf.	2179.69	1281	5.84	0.02

PBC + Self-Efficacy	2197.31	1281	23.46	0.00
PBC + Requisite Knowledge	2184.88	1281	11.03	0.00
PBC + PEOU	2192.76	1281	18.91	0.00
PBC + TIME	2186.74	1281	12.89	0.00
PBC + Availability	2204.2	1281	30.35	0.00
PBC + TRUST	2177.69	1281	3.84	0.05
Utilitarian Outcomes + Hedonic Outcomes	2226.21	1281	52.36	0.00
Utilitarian Outcomes + Social Outcomes	2184.88	1281	11.03	0.00
Utilitarian Outcomes + Family, Relatively, Friends, and Peers' Inf.	2193.68	1281	19.83	0.00
Utilitarian Outcomes + Government Institutions' Inf.	2177.25	1281	3.4	0.07
Utilitarian Outcomes + Self-Efficacy	2182.74	1281	8.89	0.00
Utilitarian Outcomes + Requisite Knowledge	2185.21	1281	11.36	0.00
Utilitarian Outcomes + PEOU	2177.14	1281	3.29	0.07
Utilitarian Outcomes + TIME	2195.21	1281	21.36	0.00
Utilitarian Outcomes + Availability	2192.39	1281	18.54	0.00
Utilitarian Outcomes + TRUST	2186.64	1281	12.79	0.00
Hedonic Outcomes + Social Outcomes	2179.76	1281	5.91	0.02
Hedonic Outcomes + Family, Relatively, Friends, and Peers' Inf.	2189.45	1281	15.6	0.00
Hedonic Outcomes + Government Institutions' Inf.	2178.03	1281	4.18	0.04
Hedonic Outcomes + Self-Efficacy	2180.68	1281	6.83	0.01
Hedonic Outcomes + Requisite Knowledge	2178.88	1281	5.03	0.02
Hedonic Outcomes + PEOU	2178.74	1281	4.89	0.03
Hedonic Outcomes + TIME	2195.83	1281	21.98	0.00
Hedonic Outcomes + Availability	2188.86	1281	15.01	0.00
Hedonic Outcomes + TRUST	2199.46	1281	25.61	0.00
Social Outcomes + Family, Relatively, Friends, and Peers' Inf.	2184.53	1281	10.68	0.00
Social Outcomes + Government Institutions' Inf.	2181.63	1281	7.78	0.01
Social Outcomes + Self-Efficacy	2176.74	1281	2.89	0.09
Social Outcomes + Requisite Knowledge	2179.8	1281	5.95	0.01
Social Outcomes + PEOU	2179.36	1281	5.51	0.02
Social Outcomes + TIME	2184.21	1281	10.36	0.00
Social Outcomes + Availability	2186.26	1281	12.41	0.00
Social Outcomes + TRUST	2177.07	1281	3.22	0.07
Family, Relatively, Friends, and Peers' Inf. + Gov. Institutions' Inf.	2211.41	1281	37.56	0.00
Family, Relatively, Friends, and Peers' Inf. + Self-Efficacy	2188.66	1281	14.81	0.00
Family, Relatively, Friends, and Peers' Inf. + Requisite Knowledge	2180.5	1281	6.65	0.01
Family, Relatively, Friends, and Peers' Inf. + PEOU	2177.89	1281	4.04	0.04
Family, Relatively, Friends, and Peers' Inf. + TIME	2181	1281	7.15	0.01
Family, Relatively, Friends, and Peers' Inf. + Availability	2206.48	1281	2.93	0.09
Family, Relatively, Friends, and Peers' Inf. + TRUST	2179.42	1281	5.57	0.02
Government Institutions' Influence + Self-Efficacy	2183.63	1281	9.78	0.00
Government Institutions' Influence + Requisite Knowledge	2188.88	1281	15.03	0.00
Government Institutions' Influence + PEOU	2182.19	1281	8.34	0.00
Government Institutions' Influence + TIME	2181.83	1281	7.98	0.00
Government Institutions' Influence + Availability	2178.62	1281	4.77	0.03
Government Institutions' Influence + TRUST	2187.3	1281	13.45	0.00
Self-Efficacy + Requisite Knowledge	2186.41	1281	12.56	0.00
Self-Efficacy + PEOU	2179.06	1281	5.21	0.02
Self-Efficacy + TIME	2177.76	1281	3.91	0.05
Self-Efficacy + Availability	2176.79	1281	2.94	0.09
Self-Efficacy + TRUST	2186.63	1281	12.78	0.00
Requisite Knowledge + PEOU	2179.71	1281	5.86	0.02
Requisite Knowledge + TIME	2178.64	1281	4.79	0.03

Requisite Knowledge + ACCES	2194.39	1281	20.54	0.00
Requisite Knowledge + TRUST	2190.91	1281	17.06	0.00
PEOU + TIME	2180.86	1281	7.01	0.01
PEOU + Availability	2178.71	1281	4.86	0.03
PEOU + TRUST	2179.11	1281	5.26	0.02
TIME + Availability	2235.82	1281	61.97	0.00
TIME + TRUST	2232.49	1281	58.64	0.00
Availability + TRUST	2176.93	1281	3.08	0.08

Appendix C: Assessment of Discriminant Validity – Comparison 2

Appendix C1: Squared Correlations and Assessment of Discriminant Validity – (Under-Privileged Adopters)

	Attitude	UO	HO	SO	SN	FPRF	Gov. Inf.	PBC	Self-Efficacy	Knowledge	PEOU	Cost	Time	Availability	Trust	Exposure	Intention	Use
Attitude	0.96																	
UO	0.73	0.94																
HO	0.69	0.64	0.97															
SO	0.17	0.27	0.19	0.87														
SN	0.20	0.30	0.26	0.32	0.94													
FPRF	0.26	0.34	0.32	0.24	0.75	0.91												
Gov. Inf.	0.11	0.15	0.17	0.20	0.34	0.43	0.93											
PBC	0.08	0.06	0.06	0.01	0.00	0.00	0.01	0.83										
Self-Efficacy	0.17	0.14	0.17	0.02	0.02	0.03	0.01	0.60	0.88									
Knowledge	0.13	0.10	0.11	0.01	0.01	0.01	0.00	0.49	0.59	0.86								
PEOU	0.28	0.26	0.27	0.06	0.06	0.06	0.02	0.44	0.54	0.58	0.80							
Cost	0.00	0.00	0.00	0.02	0.01	0.01	0.03	0.00	0.00	0.00	0.00	N/A						
Time	0.03	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.11	0.83					
Availability	0.04	0.02	0.01	0.00	0.00	0.01	0.03	0.04	0.02	0.01	0.02	0.11	0.08	0.53				
Trust	0.03	0.04	0.04	0.05	0.06	0.05	0.09	0.04	0.07	0.03	0.03	0.01	0.00	0.00	0.72			
Exposure	0.10	0.10	0.14	0.04	0.13	0.15	0.04	0.02	0.03	0.01	0.07	0.01	0.01	0.01	0.03	N/A		
Intention	0.22	0.27	0.26	0.06	0.11	0.12	0.04	0.14	0.29	0.13	0.18	0.00	0.04	0.04	0.03	0.16	0.94	

Note:
AVE of every multi-item construct is shown on the main diagonal. (Cost and Exposure to Innovation are single-item constructs)
Squared correlations are off the diagonal.

Appendix C2: Squared Correlations and Assessment of Discriminant Validity – (Privileged Adopters)

	Attitude	UO	HO	SO	SN	FPRF	Gov. Inf.	PBC	Self-Efficacy	Knowledge	PEOU	Cost	Time	Availability	Trust	Exposure	Intention	Use
Attitude	0.95																	
UO	0.64	0.97																
HO	0.60	0.76	0.97															
SO	0.24	0.31	0.29	0.85														
SN	0.29	0.34	0.31	0.55	0.94													
FPRF	0.33	0.39	0.33	0.52	0.79	0.95												
Gov. Inf.	0.12	0.13	0.12	0.21	0.27	0.29	0.95											
PBC	0.04	0.02	0.02	0.01	0.00	0.00	0.02	0.86										
Self-Efficacy	0.09	0.06	0.08	0.01	0.00	0.01	0.01	0.40	0.92									
Knowledge	0.02	0.01	0.02	0.00	0.01	0.00	0.00	0.39	0.43	0.74								
PEOU	0.22	0.22	0.24	0.06	0.04	0.06	0.03	0.28	0.52	0.32	0.77							
Cost	0.00	0.00	0.01	0.01	0.02	0.02	0.00	0.02	0.01	0.01	0.00	N/A						
Time	0.10	0.13	0.14	0.05	0.08	0.10	0.03	0.00	0.01	0.00	0.04	0.00	0.83					
Availability	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.09	0.55				
Trust	0.09	0.08	0.06	0.12	0.12	0.12	0.03	0.01	0.00	0.00	0.01	0.00	0.02	0.00	0.80			
Exposure	0.27	0.28	0.29	0.23	0.25	0.31	0.08	0.03	0.07	0.02	0.15	0.00	0.09	0.02	0.10	N/A		
Intention	0.38	0.43	0.43	0.19	0.26	0.30	0.08	0.02	0.08	0.02	0.20	0.01	0.16	0.03	0.08	0.35	0.96	

Note:
AVE of every multi-item construct is shown on the main diagonal. (Cost and Exposure to Innovation are single-item constructs)
Squared correlations are off the diagonal.

Appendix C3: Pairwise Discriminant Analysis – (Under-Privileged Adopters)

Model	χ 2	d.f.	$\Delta\chi$ 2	p-value of χ 2 test
Original	2173.85	1280		
Combining				
Intention to Use + Attitude	2182.19	1281	8.34	0.00
Intention to Use + Subjective Norm	2181.83	1281	7.98	0.00
Intention to Use + PBC	2178.62	1281	4.77	0.03
Intention to Use + Utilitarian Outcomes	2187.3	1281	13.45	0.00
Intention to Use + Hedonic Outcomes	2186.41	1281	12.56	0.00
Intention to Use + Social Outcomes	2179.06	1281	5.21	0.02
Intention to Use + Family, Relatively, Friends, and Peers' Inf.	2177.76	1281	3.91	0.05
Intention to Use + Government Institutions' Inf.	2176.79	1281	2.94	0.09
Intention to Use + Self-Efficacy	2186.63	1281	12.78	0.00
Intention to Use + Requisite Knowledge	2179.71	1281	5.86	0.02
Intention to Use + PEOU	2178.64	1281	4.79	0.03
Intention to Use + Time	2194.39	1281	20.54	0.00
Intention to Use + Availability	2190.91	1281	17.06	0.00
Intention to Use + Trust	2180.86	1281	7.01	0.01
Attitude + Subjective Norm	2178.71	1281	4.86	0.03
Attitude + PBC	2179.11	1281	5.26	0.02
Attitude + Utilitarian Outcomes	2235.82	1281	61.97	0.00
Attitude + Hedonic Outcomes	2232.49	1281	58.64	0.00
Attitude + Social Outcomes	2176.93	1281	3.08	0.08
Attitude + Family, Relatively, Friends, and Peers' Inf.	2183.41	1281	9.56	0.00
Attitude + Government Institutions' Inf.	2180.63	1281	6.78	0.01
Attitude + Self-Efficacy	2176.78	1281	2.93	0.09
Attitude + Requisite Knowledge	2178.24	1281	4.39	0.04
Attitude + PEOU	2177.67	1281	3.82	0.05
Attitude + TIME	2194.2	1281	20.35	0.00
Attitude + Availability	2200.3	1281	26.45	0.00
Attitude + TRUST	2178.02	1281	4.17	0.04
Subjective Norm + PBC	2181.74	1281	7.89	0.00
Subjective Norm + Utilitarian Outcomes	2187.39	1281	13.54	0.00
Subjective Norm + Hedonic Outcomes	2183.98	1281	10.13	0.00
Subjective Norm + Social Outcomes	2189.49	1281	15.64	0.00
Subjective Norm + Family, Relatively, Friends, and Peers' Inf.	2287.39	1281	113.54	0.00
Subjective Norm + Government Institutions' Inf.	2199.49	1281	25.64	0.00
Subjective Norm + Self-Efficacy	2176.74	1281	2.89	0.09
Subjective Norm + Requisite Knowledge	2181.21	1281	7.36	0.01
Subjective Norm + PEOU	2182.63	1281	8.78	0.00
Subjective Norm + TIME	2181.31	1281	7.46	0.01
Subjective Norm + Availability	2178.04	1281	4.19	0.04
Subjective Norm + TRUST	2181.11	1281	7.26	0.01
PBC + Utilitarian Outcomes	2176.82	1281	2.97	0.08
PBC + Hedonic Outcomes	2182.82	1281	8.97	0.00
PBC + Social Outcomes	2180.44	1281	6.59	0.01
PBC + Family, Relatively, Friends, and Peers' Inf.	2182.14	1281	8.29	0.00

PBC + Government Institutions' Inf.	2179.69	1281	5.84	0.02
PBC + Self-Efficacy	2197.31	1281	23.46	0.00
PBC + Requisite Knowledge	2184.88	1281	11.03	0.00
PBC + PEOU	2192.76	1281	18.91	0.00
PBC + TIME	2186.74	1281	12.89	0.00
PBC + Availability	2204.2	1281	30.35	0.00
PBC + TRUST	2177.69	1281	3.84	0.05
Utilitarian Outcomes + Hedonic Outcomes	2226.21	1281	52.36	0.00
Utilitarian Outcomes + Social Outcomes	2184.88	1281	11.03	0.00
Utilitarian Outcomes + Family, Relatively, Friends, and Peers' Inf.	2193.68	1281	19.83	0.00
Utilitarian Outcomes + Government Institutions' Inf.	2177.25	1281	3.4	0.07
Utilitarian Outcomes + Self-Efficacy	2182.74	1281	8.89	0.00
Utilitarian Outcomes + Requisite Knowledge	2185.21	1281	11.36	0.00
Utilitarian Outcomes + PEOU	2177.14	1281	3.29	0.07
Utilitarian Outcomes + TIME	2195.21	1281	21.36	0.00
Utilitarian Outcomes + Availability	2192.39	1281	18.54	0.00
Utilitarian Outcomes + TRUST	2186.64	1281	12.79	0.00
Hedonic Outcomes + Social Outcomes	2179.76	1281	5.91	0.02
Hedonic Outcomes + Family, Relatively, Friends, and Peers' Inf.	2189.45	1281	15.6	0.00
Hedonic Outcomes + Government Institutions' Inf.	2178.03	1281	4.18	0.04
Hedonic Outcomes + Self-Efficacy	2180.68	1281	6.83	0.01
Hedonic Outcomes + Requisite Knowledge	2178.88	1281	5.03	0.02
Hedonic Outcomes + PEOU	2178.74	1281	4.89	0.03
Hedonic Outcomes + TIME	2195.83	1281	21.98	0.00
Hedonic Outcomes + Availability	2188.86	1281	15.01	0.00
Hedonic Outcomes + TRUST	2199.46	1281	25.61	0.00
Social Outcomes + Family, Relatively, Friends, and Peers' Inf.	2184.53	1281	10.68	0.00
Social Outcomes + Government Institutions' Inf.	2181.63	1281	7.78	0.01
Social Outcomes + Self-Efficacy	2176.74	1281	2.89	0.09
Social Outcomes + Requisite Knowledge	2179.8	1281	5.95	0.01
Social Outcomes + PEOU	2179.36	1281	5.51	0.02
Social Outcomes + TIME	2184.21	1281	10.36	0.00
Social Outcomes + Availability	2186.26	1281	12.41	0.00
Social Outcomes + TRUST	2177.07	1281	3.22	0.07
Family, Relatively, Friends, and Peers' Inf. + Gov. Institutions' Inf.	2211.41	1281	37.56	0.00
Family, Relatively, Friends, and Peers' Inf. + Self-Efficacy	2188.66	1281	14.81	0.00
Family, Relatively, Friends, and Peers' Inf. + Requisite Knowledge	2180.5	1281	6.65	0.01
Family, Relatively, Friends, and Peers' Inf. + PEOU	2177.89	1281	4.04	0.04
Family, Relatively, Friends, and Peers' Inf. + TIME	2181	1281	7.15	0.01
Family, Relatively, Friends, and Peers' Inf. + Availability	2207.48	1281	2.94	0.09
Family, Relatively, Friends, and Peers' Inf. + TRUST	2179.42	1281	5.57	0.02
Government Institutions' Influence + Self-Efficacy	2183.63	1281	9.78	0.00
Government Institutions' Influence + Requisite Knowledge	2188.88	1281	15.03	0.00
Government Institutions' Influence + PEOU	2182.19	1281	8.34	0.00
Government Institutions' Influence + TIME	2181.83	1281	7.98	0.00
Government Institutions' Influence + Availability	2178.62	1281	4.77	0.03
Government Institutions' Influence + TRUST	2187.3	1281	13.45	0.00
Self-Efficacy + Requisite Knowledge	2186.41	1281	12.56	0.00
Self-Efficacy + PEOU	2179.06	1281	5.21	0.02
Self-Efficacy + TIME	2177.76	1281	3.91	0.05
Self-Efficacy + Availability	2176.79	1281	2.94	0.09
Self-Efficacy + TRUST	2186.63	1281	12.78	0.00
Requisite Knowledge + PEOU	2179.71	1281	5.86	0.02

Requisite Knowledge + TIME	2178.64	1281	4.79	0.03
Requisite Knowledge + ACCES	2194.39	1281	20.54	0.00
Requisite Knowledge + TRUST	2190.91	1281	17.06	0.00
PEOU + TIME	2180.86	1281	7.01	0.01
PEOU + Availability	2178.71	1281	4.86	0.03
PEOU + TRUST	2179.11	1281	5.26	0.02
TIME + Availability	2235.82	1281	61.97	0.00
TIME + TRUST	2232.49	1281	58.64	0.00
Availability + TRUST	2176.93	1281	3.08	0.08

Appendix C4: Pairwise Discriminant Analysis – (Privileged Adopters)

Model	χ 2	d.f.	$\Delta\chi$ 2	p-value of χ 2 test
Original	2371.18	1280		
Combining				
Intention to Use + Attitude	2431.36	1281	60.18	0.00
Intention to Use + Subjective Norm	2401.46	1281	30.28	0.00
Intention to Use + PBC	2375.19	1281	4.01	0.05
Intention to Use + Utilitarian Outcomes	2443.76	1281	72.58	0.00
Intention to Use + Hedonic Outcomes	2461.43	1281	90.25	0.00
Intention to Use + Social Outcomes	2388.74	1281	17.56	0.00
Intention to Use + Family, Relatively, Friends, and Peers' Inf.	2412.04	1281	40.86	0.00
Intention to Use + Government Institutions' Inf.	2374.77	1281	3.59	0.06
Intention to Use + Self-Efficacy	2379.33	1281	8.15	0.00
Intention to Use + Requisite Knowledge	2391.51	1281	20.33	0.00
Intention to Use + PEOU	2379.78	1281	8.6	0.00
Intention to Use + Time	2446.95	1281	75.77	0.00
Intention to Use + Availability	2406.58	1281	35.4	0.00
Intention to Use + Trust	2371.63	1281	0.45	0.50
Attitude + Subjective Norm	2391.54	1281	20.36	0.00
Attitude + PBC	2376.77	1281	5.59	0.02
Attitude + Utilitarian Outcomes	2510.78	1281	139.6	0.00
Attitude + Hedonic Outcomes	2500.53	1281	129.35	0.00
Attitude + Social Outcomes	2386.58	1281	15.4	0.00
Attitude + Family, Relatively, Friends, and Peers' Inf.	2404.77	1281	33.59	0.00
Attitude + Government Institutions' Inf.	2381.83	1281	10.65	0.00
Attitude + Self-Efficacy	2381.07	1281	9.89	0.00
Attitude + Requisite Knowledge	2410.76	1281	39.58	0.00
Attitude + PEOU	2376.83	1281	5.65	0.02
Attitude + TIME	2437.82	1281	66.64	0.00
Attitude + Availability	2392.19	1281	21.01	0.00
Attitude + TRUST	2375.54	1281	4.36	0.04
Subjective Norm + PBC	2392.68	1281	21.5	0.00
Subjective Norm + Utilitarian Outcomes	2410.68	1281	39.5	0.00
Subjective Norm + Hedonic Outcomes	2408.48	1281	37.3	0.00
Subjective Norm + Social Outcomes	2451.71	1281	80.53	0.00
Subjective Norm + Family, Relatively, Friends, and Peers' Inf.	2614.68	1281	243.5	0.00
Subjective Norm + Government Institutions' Inf.	2392.68	1281	21.5	0.00
Subjective Norm + Self-Efficacy	2387.66	1281	16.48	0.00
Subjective Norm + Requisite Knowledge	2439.86	1281	68.68	0.00
Subjective Norm + PEOU	2382.69	1281	11.51	0.00
Subjective Norm + TIME	2432.2	1281	61.02	0.00
Subjective Norm + Availability	2403.31	1281	32.13	0.00
Subjective Norm + TRUST	2382.43	1281	11.25	0.00
PBC + Utilitarian Outcomes	2378.47	1281	7.29	0.01
PBC + Hedonic Outcomes	2377.37	1281	6.19	0.01
PBC + Social Outcomes	2386.19	1281	15.01	0.00
PBC + Family, Relatively, Friends, and Peers' Inf.	2392.57	1281	21.39	0.00

PBC + Government Institutions' Inf.	2379.52	1281	8.34	0.00
PBC + Self-Efficacy	2389.12	1281	17.94	0.00
PBC + Requisite Knowledge	2376.91	1281	5.73	0.02
PBC + PEOU	2385.86	1281	14.68	0.00
PBC + TIME	2404.75	1281	33.57	0.00
PBC + Availability	2388.13	1281	16.95	0.00
PBC + TRUST	2393.48	1281	22.3	0.00
Utilitarian Outcomes + Hedonic Outcomes	2571.48	1281	200.3	0.00
Utilitarian Outcomes + Social Outcomes	2410.02	1281	38.84	0.00
Utilitarian Outcomes + Family, Relatively, Friends, and Peers' Inf.	2430.96	1281	59.78	0.00
Utilitarian Outcomes + Government Institutions' Inf.	2374.96	1281	3.78	0.05
Utilitarian Outcomes + Self-Efficacy	2375.36	1281	4.18	0.04
Utilitarian Outcomes + Requisite Knowledge	2407.96	1281	36.78	0.00
Utilitarian Outcomes + PEOU	2376.19	1281	5.01	0.03
Utilitarian Outcomes + TIME	2434.66	1281	63.48	0.00
Utilitarian Outcomes + Availability	2387.19	1281	16.01	0.00
Utilitarian Outcomes + TRUST	2381.13	1281	9.95	0.00
Hedonic Outcomes + Social Outcomes	2408.34	1281	37.16	0.00
Hedonic Outcomes + Family, Relatively, Friends, and Peers' Inf.	2418.19	1281	47.01	0.00
Hedonic Outcomes + Government Institutions' Inf.	2376.74	1281	5.56	0.02
Hedonic Outcomes + Self-Efficacy	2381.16	1281	9.98	0.00
Hedonic Outcomes + Requisite Knowledge	2403.19	1281	32.01	0.00
Hedonic Outcomes + PEOU	2378.86	1281	7.68	0.01
Hedonic Outcomes + TIME	2437.21	1281	66.03	0.00
Hedonic Outcomes + Availability	2384.29	1281	13.11	0.00
Hedonic Outcomes + TRUST	2380.32	1281	9.14	0.00
Social Outcomes + Family, Relatively, Friends, and Peers' Inf.	2456.24	1281	85.06	0.00
Social Outcomes + Government Institutions' Inf.	2380.31	1281	9.13	0.00
Social Outcomes + Self-Efficacy	2382.77	1281	11.59	0.00
Social Outcomes + Requisite Knowledge	2436.07	1281	64.89	0.00
Social Outcomes + PEOU	2382.49	1281	11.31	0.00
Social Outcomes + TIME	2424.2	1281	53.02	0.00
Social Outcomes + Availability	2400.83	1281	29.65	0.00
Social Outcomes + TRUST	2375.27	1281	4.09	0.04
Family, Relatively, Friends, and Peers' Inf. + Gov. Institutions' Inf.	2402.74	1281	31.56	0.00
Family, Relatively, Friends, and Peers' Inf. + Self-Efficacy	2383.38	1281	12.2	0.00
Family, Relatively, Friends, and Peers' Inf. + Requisite Knowledge	2440.98	1281	69.8	0.00
Family, Relatively, Friends, and Peers' Inf. + PEOU	2376.9	1281	5.72	0.02
Family, Relatively, Friends, and Peers' Inf. + TIME	2436.19	1281	65.01	0.00
Family, Relatively, Friends, and Peers' Inf. + Availability	2403.39	1281	32.21	0.00
Family, Relatively, Friends, and Peers' Inf. + TRUST	2379.74	1281	8.56	0.00
Government Institutions' Influence + Self-Efficacy	2386.66	1281	15.48	0.00
Government Institutions' Influence + Requisite Knowledge	2412.7	1281	41.52	0.00
Government Institutions' Influence + PEOU	2431.36	1281	60.18	0.00
Government Institutions' Influence + TIME	2401.46	1281	30.28	0.00
Government Institutions' Influence + Availability	2375.19	1281	4.01	0.05
Government Institutions' Influence + TRUST	2443.76	1281	72.58	0.00
Self-Efficacy + Requisite Knowledge	2461.43	1281	90.25	0.00
Self-Efficacy + PEOU	2388.74	1281	17.56	0.00
Self-Efficacy + TIME	2412.04	1281	40.86	0.00
Self-Efficacy + Availability	2374.77	1281	3.59	0.06
Self-Efficacy + TRUST	2379.33	1281	8.15	0.00
Requisite Knowledge + PEOU	2391.51	1281	20.33	0.00

Requisite Knowledge + TIME	2379.78	1281	8.6	0.00
Requisite Knowledge + ACCES	2446.95	1281	75.77	0.00
Requisite Knowledge + TRUST	2406.58	1281	35.4	0.00
PEOU + TIME	2371.63	1281	0.45	0.50
PEOU + Availability	2391.54	1281	20.36	0.00
PEOU + TRUST	2376.77	1281	5.59	0.02
TIME + Availability	2510.78	1281	139.6	0.00
TIME + TRUST	2500.53	1281	129.35	0.00
Availability + TRUST	2386.58	1281	15.4	0.00