Association for Information Systems
AIS Electronic Library (AISeL)

All Sprouts Content

Sprouts

11-20-2008

The Bottom-up and Horizontal Spillovers of Quality of Life from Continued ICT Use: The Case of Community Technology Centers

Angsana A. Techatassanasoontorn
Pennsylvania State University, angsanat@ist.psu.edu

Arunee Tanvisuth
Thammasat University, arunee@tu.ac.th

Follow this and additional works at: http://aisel.aisnet.org/sprouts_all

The Bottom-up and Horizontal Spillovers of Quality of Life from Continued ICT Use: The Case of Community Technology Centers

Angsana A. Techatassanasoontorn
Pennsylvania State University, USA

Arunee Tanvisuth
Thammasat University, Thailand

Abstract
The ability to access and create knowledge through the use of ICT is critical in the global information society. ICT use should enhance a process of social inclusion by enabling individuals to fully participate in society across a variety of domains related to health, education, recreation, and culture, among others. However, not everyone has access to ICTs. Recently, community technology centers have developed to be an appealing solution to promote social inclusion. Following the social inclusion framework, this research examines how continued ICT use improves quality of life (QoL) with particular emphasis on the extent of bottom-up spillover effects from domain QoL to overall QoL and horizontal spillover effects among various domain QoL. The context of our study is the Thai community technology centers supported by the Microsoft Unlimited Potential grants. The results suggest that (1) the bottom-up spillover and the horizontal spillover effects simultaneously contribute to the overall QoL, (2) the satisfaction from continued use of ICT contributes to domain QoL and domain QoL, particularly the family, self, and community domains, contributes to overall QoL, and (3) the horizontal spillover effects exhibit complex relationships that involve direct one-to-one spillover effects, domain interaction effects, and reciprocal spillover effects. The work, education, leisure, and community domains influence QoL in other domains. Implications for research and practice are discussed.

Keywords: Social inclusion, quality of life, spillover, community technology centers

Permanent URL: http://sprouts.aisnet.org/8-18

The Bottom-up and Horizontal Spillovers of Quality of Life from Continued ICT Use: The Case of Community Technology Centers

Angsana A. Techatassanasoontorn (Corresponding author)
Assistant Professor
College of Information Sciences and Technology
Pennsylvania State University
University Park, PA 16802
Phone: (814) 863-6317
Fax: (814) 865-6426
angsanat@ist.psu.edu

Arunee Tanvisuth
Lecturer
Faculty of Commerce and Accountancy
Thammasat University
Bangkok, Thailand 10200
Phone: (6681) 251-0111
Fax: (662) 225-2109
arunee@tu.ac.th

Last revised: November 10, 2008

ABSTRACT

The ability to access and create knowledge through the use of ICT is critical in the global information society. ICT use should enhance a process of social inclusion by enabling individuals to fully participate in society across a variety of domains related to health, education, recreation, and culture, among others. However, not everyone has access to ICTs. Recently, community technology centers have developed to be an appealing solution to promote social inclusion. Following the social inclusion framework, this research examines how continued ICT use improves quality of life (QoL) with particular emphasis on the extent of bottom-up spillover effects from domain QoL to overall QoL and horizontal spillover effects among various domain QoL. The context of our study is the Thai community technology centers supported by the Microsoft Unlimited Potential grants. The results suggest that (1) the bottom-up spillover and the horizontal spillover effects simultaneously contribute to the overall QoL, (2) the satisfaction from continued use of ICT contributes to domain QoL and domain QoL, particularly the family, self, and community domains, contributes to overall QoL, and (3) the horizontal spillover effects exhibit complex relationships that involve direct one-to-one spillover effects, domain interaction effects, and reciprocal spillover effects. The work, education, leisure, and community domains influence QoL in other domains. Implications for research and practice are discussed.

Keywords: Social inclusion, quality of life, spillover, community technology centers

1. INTRODUCTION

The inequality in access and use of information and communications technology (ICT) (DiMaggio et al., 2004) has received significant attention from research and policy perspectives. Some progress made in this research area is that scholars agree that the conceptualization of digital divide as an access problem is too narrow (Bertot, 2003; DiMaggio and Hargittai, 2001; Warschauer, 2004). This suggests that providing access to technology is only the initial step to address the problem and benefits can only be realized with sustained use through the support of digital, human, and social resources (DiMaggio and Hargittai, 2001; Walsham et al., 2007).

Recently, Warschauer (2004) proposed that the goal of using ICT should shift from the old concept of overcoming a digital divide to the new concept of enhancing a process of social inclusion, thus fulfilling the goal of improving people's lives. Social inclusion refers to "the extent that individuals, families, and communities are able to fully participate in society and control their own destinies, taking into account a variety of factors related to economic resources, employment, health, education, housing, recreation, culture, and civic engagement" (p. 8). This new conceptualization suggests that a more holistic understanding of the impact of ICT use on various life domain satisfaction (e.g., community, social, work, leisure, etc.) and quality of life as a whole is essential to make progress in this important research area.

However, limited theoretical understanding exists on how ICT use improves quality of life. Walsham and Sahay (2006) surveyed the literature and observed that research on ICT and development (e.g., Silva and Figueroa, 2002) has taken a rather broad perspective with the focus on a particular technology on an entire country. Therefore, the individual level of analysis is neglected in this research stream (p.20). Also, past research has examined selected dimensions of social inclusion such as health (Braa et al., 2007; Miscione, 2007), education (Warschauer,

2004), and social and culture (Kvasny and Keil, 2006). Together, these gaps suggest the strong need for theory-based research at the individual level that takes into account most if not all dimensions of social inclusion.

The purpose of this research is to gain a better understanding of the impact of the ICT use on quality of life in the context of continued ICT use based on knowledge and skills learned from community technology centers (CTCs). A hierarchy of life domains from Psychology provides a framework to understand the organization of life domains. In particular, the overall quality of life is at the top of the hierarchy, life domains (e.g., work, education, leisure, etc.) are in the middle of the hierarchy, and events within each life domain sit at the bottom of the hierarchy. The spillover theories of quality of life allow us to theorize the dynamic process of the duality of bottom-up and horizontal spillovers that concurrently contribute to the overall quality of life. In particular, the bottom-up spillover theory suggests that (dis)satisfaction with events in life domains contributes to (dis)satisfaction in those domains which then influence the overall life satisfaction. The horizontal spillover theory suggests that (dis)satisfaction with one life domain may influence (dis)satisfaction in other life domains.

This research extends the spillover theories of quality of life in a number of ways. First, despite the significance of the overall quality of life, previous studies tend to examine either the bottom-up spillover effects (e.g., Choi et al., 2007; George and Landerman, 1984; Larsen, 1978) or the horizontal spillover effects (e.g., Shepard, 1974; Kremer and Harpaz, 1982) but not both. Therefore, our understanding of the dynamics of how these two effects simultaneously influence the overall quality of life is limited. Our study addresses this gap by examining both effects simultaneously. Second, the horizontal spillover effects are theorized in the literature as simple direct effects between two life domains. However, building on Maslow (1970)'s hierarchy of

needs, we argue that the horizontal spillover effects should exhibit much more complex relationships among life domains, suggesting that the horizontal spillover effects were previously undertheorized in the literature.

Our research questions are:

- How can we develop theory-based measures of satisfaction from continued use of ICT from knowledge and skills learned from community technology centers?

- What is the extent of the bottom-up spillover effects towards the overall life satisfaction as a result of continued use of ICT based on knowledge and skills learned from community technology centers?

- What is the extent of the horizontal spillover effects among various life domains as a result of continued use of ICT based on knowledge and skills learned from community technology centers?

2. COMMUNITY TECHNOLOGY CENTERS (CTCs)

The global information society requires its participants to have the ability to access and create knowledge through the use of ICT. However, not everyone particularly those socio-economic disadvantaged can afford computers and Internet connections (Jung et al., 2001). Therefore, community technology centers (also known as telecenters) have developed to be an appealing solution to promote universal access to ICT. In the past decade, despite no official records available, the number of CTCs worldwide has grown substantially because of the promotion and financial support from a number of public, private, and international organizations (e.g., the World Bank, Canada's International Development Research Center, and Microsoft).

Our review of the literature suggests that the term CTC can be broadly defined as efforts to provide computer access and the Internet use to the target population that would otherwise not have such access (Davies et al., 2003; Servon and Nelson, 2001). CTCs differ along at least four broad dimensions: (1) goals (e.g., computer skill training, community development), (2) target population (e.g., low-income, rural residents), (3) services offered (e.g., training, community content production, equipment rental), (4) organization types (i.e., organizations that manage CTCs and operational control policies as stand-alone or a network of centers under the same administration).

In this research, we focus on CTCs that offer computer and Internet use as well as training on basic productivity software (e.g., word processing, spreadsheet, presentation, desktop publishing) and Internet skills. This is because this set of skills particularly Internet skills allow individuals to use them in a number of life activities (e.g., work, leisure, education, social, etc.).

3. THEORETICAL BACKGROUND

3.1. Quality of Life: Economic Welfare and Subjective Well-Being Perspectives

Quality of life has been a research topic of interest across a number of disciplines including Economics (Phipps, 2002; Sen, 1999), Marketing (Peterson and Malhotra, 1997; Sirgy et al., 1995), and Psychology (Diener, 1984; Diener et al., 1985), among others. Two important theoretical streams can be distinguished: (1) Sen's capability approach in Welfare Economics, and (2) the psychological underpinnings of subjective well-being.

In contrast to the mainstream welfare economics literature that analyzes welfare using preference satisfaction in a utility function (Ng, 2003), Amartya Sen (1999)'s capability approach suggests that people's welfare should be assessed in terms of their functionings and capabilities. Functionings refer to an individual's actual activities in leading one's life and states

of being. Some examples of elementary functionings are being adequately nourished, being in good health, and having mobility while more complex functionings are achieving self-respect, taking part in the community life, and being socially integrated. Capabilities refer to the various combinations of functionings an individual can achieve. The other way to think of capabilities is an individual's freedom to choose between different ways of living.

Sen's capability approach, although illuminating, is not well suited to research that examines quality of life at the individual level for two reasons. First, the capability approach has been predominantly theorizing from philosophical and conceptual reasoning, thus making it problematic to derive theoretically meaningful constructs and their relationships. Second, although the theorizing of the capability approach is at an individual welfare, Sen (1999) and others (e.g., Reddy et al., 2006; Schischka et al., 2008) have applied the framework to investigate inequality, poverty and development using case studies at the country or regional levels. See Table 1 in Kuklys and Robeyns (2005) for a review of empirical research on the capability approach.

The psychology of subjective well-being is another illuminating theory to understand quality of life. The theory roots back in the 1960s with the seminal work of Wilson (1967) who presented a broad review of subjective well-being and concluded his research with several normative attributes associated with a happy person. A widely accepted definition of subjective well-being (also referred to as quality of life, life satisfaction, and happiness) is that it involves subjective assessment of the extent of an individual's happiness and satisfaction with various wants and needs (Rice et al., 1985). Happiness is an affective component reflecting a state of mind associated with feelings of joy, serenity, and affection (Sirgy, 2002). Satisfaction is a cognitive component requiring an individual to evaluate one's circumstances against what one

thought to be an appropriate standard or goals (Diener et al., 1985). Research in the field of subjective well-being has made much progress in the past forty years.

Quality of life research suggests that an individual's life can be segmented into several life domains (Andrews and Withey, 1976). Each life domains, in turn, is organized around major life events within the domain. Seeman (1967) suggested that life domains correspond to the major institutions in modern society which include work, family, leisure, health, community, social, and culture, among others. For example, mental, physical, and social activities required by jobs and tasks are among events that define the work life domain (Sirgy et al., 2001).

Several major theoretical approaches have emerged from a strong tradition of empirical research in the field of subjective well-being. Thus, we chose to develop our theory of contribution of continued use of ICT on quality of life by drawing on the need satisfaction model (Maslow, 1970; McClelland, 1961) and the spillover theories of quality of life (Diener, 1984; Wilensky, 1960). Then, we use the integrated theories to formulate hypothesis and engage in inductive and deductive process of instrument development in the context of community-based technology centers. Next, we discuss the need satisfaction model and the spillover theories that provide the basis for our theory development.

3.2. The Need Satisfaction Model

The need satisfaction model and the spillover theories provide useful frameworks to conceptualize the processes that underlie happiness in a life domain. The basic premise of this model is that people have basic needs they seek to fulfill in each life domain. Individuals derive satisfaction in a particular life domain when events and experience related to that domain fulfill their needs. Therefore, the need satisfaction model seems to suggest that people who are successful in satisfying their needs are likely to enjoy greater subjective well-being than those

who are less successful. For example, a person reports high satisfaction of her health life domain based on positive experiences concerning health-related activities such as eating right, regular exercise, and attention to medical needs.

3.3. The Bottom-up Spillover Theory

The spillover theories of quality of life are viewed as having two broad types – Bottom-up (vertical) and Horizontal spillover. The bottom-up spillover theory suggests the relationships between satisfaction in life domains and global life satisfaction (Andrews and Withey, 1976; Campbell, 1976; Diener, 1984). In particular, the theory builds on two premises: (1) Global life satisfaction is a function of satisfaction in various life domains (e.g., family, health, work, education), and (2) Satisfaction in a specific life domain is a function of events and experience related to that domain. Essentially, the Bottom-up Spillover theory argues that the affects associated with events and experience in life domains spill over vertically to determine life domain satisfactions which in turn spill over vertically to the highest domain of life as a whole to determine overall life satisfaction.

The conceptualization of the Bottom-up Spillover theory can be mathematically illustrated through two equations:

Global life satisfaction (Global) $=$ f (Domain$_1$, Domain$_2$, … Domain$_n$);

Domain life satisfaction (Domain$_i$) $=$ f (Event$_{i1}$, Event$_{i2}$, …, Event$_{in}$);

where Domain$_i$ is the extent of individual's satisfaction in that life domain and event$_{ij}$ refers to the extent of individual's satisfaction with related events in a life domain i.

Several studies reported empirical evidence to support the Bottom-up Spillover theory. For example, studies found high correlation between the global life satisfaction with satisfaction in

the health life domain (George and Landerman, 1984; Larsen, 1978), self life domain (Diener, 1984), and work life domain (Near, 1986; Rice et al., 1980).

3.4. The Horizontal Spillover Theory

The Horizontal Spillover theory suggests that affects in one's life domain influence satisfaction or dissatisfaction in other life domains (Diener, 1984; Wilensky, 1960). For example, the positive experience one has in the leisure domain may spill over to the work domain, thus making the job less stressful. Maslow (1970)'s hierarchy of needs provides theoretical explanation of the horizontal spillover effects. The seven needs ordering from low-order needs to high-order needs include biological needs (e.g., food, water, oxygen), safety needs (physical and psychological security), social needs (e.g., need for affiliation, friendship, family), esteem needs (e.g., need for success, achievement, recognition, respect), cognitive needs (e.g., need for knowledge, meaning), aesthetics (e.g., appreciation of beauty, balance, form), and self-actualization (e.g., need for creativity, self-expression, integrity). Sirgy (2002) suggested that activities across multiple life domains tend to overlap in the manner that they satisfy these needs. For example, leisure activities may satisfy both aesthetics and social needs. Thus, it is reasonable to postulate that spillover is likely to occur between the leisure and social life domains.

Although the horizontal spillover effects highlight the influence of affects in other life domains to a focal life domain, this does not mean that related events and experience in the focal life domain does not play a role in influencing its satisfaction. In contrast, we can view the horizontal spillover and the bottom-up spillover as a combined strategy that individuals use to optimize their subjective well-beings (Sirgy, 2002). Two conditions under which horizontal spillover effects are likely to play a dominant role are (1) individuals who enjoy high positive satisfaction in one life domain may increase satisfaction in other life domains that share similar

activities and participants, thus improving the global life satisfaction, or (2) individuals who experience dissatisfaction in one life domain may try to contain such negative affect from influencing other life domains and use positive experience from other life domains to neutralize the dissatisfaction in that life domain, therefore avoiding the adverse effect on the global life satisfaction.

Several studies reported empirical evidence to support the Horizontal Spillover theory. For example, Shepard (1974) and Kremer and Harpaz (1982) showed that satisfaction or dissatisfaction with work spill over to the leisure life domain, influencing involvement and satisfaction in that domain. Crouter (1984) reported spillover influence from the family life domain and the work domain among mothers of young children.

4. THEORETICAL MODEL AND HYPOTHESIS

4.1. Theoretical Model

Integrating the hierarchy of life domains, the need satisfaction model, and the spillover theories of quality of life, we developed the theoretical models to assess the contribution of continued use of ICT based on knowledge and skills learned from CTCs towards the overall quality of life. We present the bottom-up (left) and the horizontal spillover (right) theories in Figure 1.

Similar to Choi et al. (2007), we are interested in the contribution of continued use of ICT based on knowledge and skills learned from CTCs on quality of life instead of how satisfied people are with their lives in general. Consistent with the need satisfaction model and the Bottom-up Spillover theory, satisfaction derived from activities that people use ICT in a certain life domain has direct contribution to their satisfaction in that life domain. For example, the satisfaction that people receive from using the Internet skills to search for information about

healthy eating may influence their satisfaction in the health domain. Also, satisfaction from continued ICT use in various life domains contributes to the overall life satisfaction.

Following the theorizing in the Horizontal Spillover theory, we argue that satisfaction from continued use of ICT in a particular life domain influences satisfaction in other life domains. The Horizontal Spillover theory emphasizes the direct spillover effect from one life domain to the others. However, we believe that this view represents a simplistic explanation of horizontal spillover. We then extend this theory by following Maslow (1970)'s hierarchy of needs to suggest that the horizontal spillover effects may illustrate much more complex relationships than previously theorized. In particular, we argue that the horizontal spillover effects may involve (1) the direct spillover effects, (2) the interaction spillover effects (e.g., the interaction of spillover from $domain_1$ and $domain_2$ to $domain_3$, and (3) the reciprocal spillover effects (e.g., the spillover effect from $domain_2$ to $domain_1$). For example, satisfaction from two closely related life domains (e.g., leisure and social) may contribute to satisfaction in other life domains (e.g., work). However, for the purpose of readability, we chose to depict the three types of spillover effects among three life domains. Note that it is possible that the interaction spillover effects may involve more than two life domains.

Figure 1. The Bottom-up (left) and Horizontal Spillover (right) Theories of Quality of Life from Continued Use of ICT
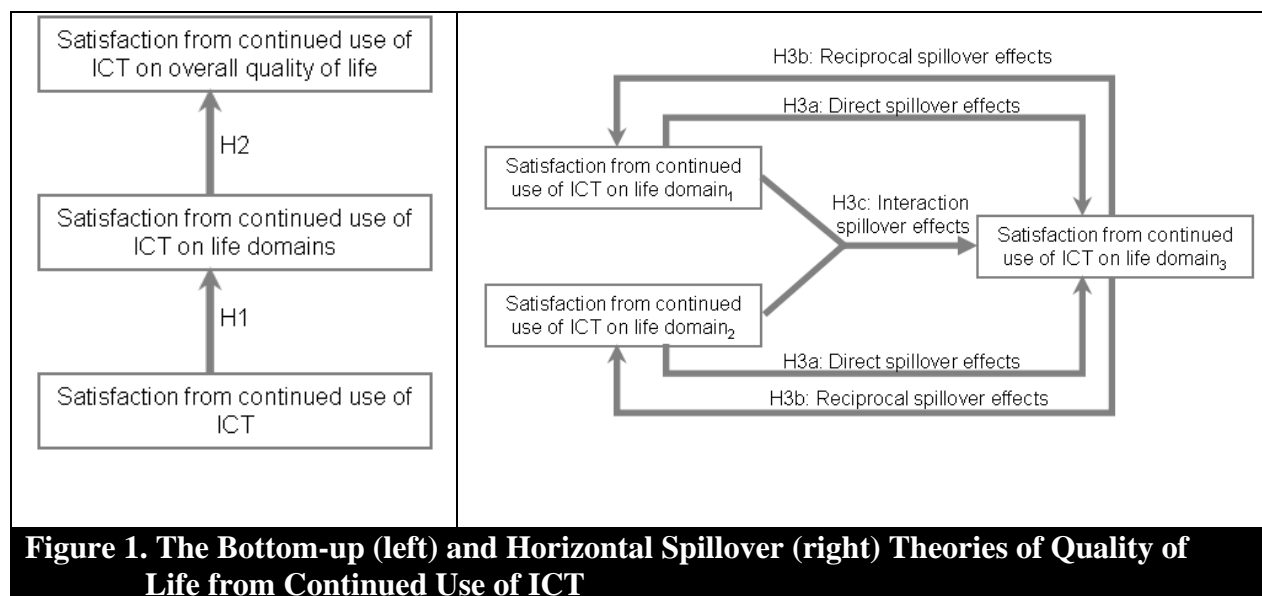
4.2. Hypotheses

Based on the Bottom-up and Horizontal Spillover theories of quality of life from continued use of ICT, we developed the following hypotheses.

Contribution of Continued Use of ICT on Domain QoL. The goal of CTCs is to enable individuals to integrate ICT into their daily lives to access and create new knowledge (O'Neil, 2002; Warschauer, 2004). Therefore, it is likely that the benefits of continued ICT use may permeate through several life domains. Evidence from several studies suggests that continued ICT use influences quality of life in several life domains including community, health, self, social, and work. For example, ICT use helps individuals learn more about their communities and develop community social capital allowing community members to work and learn together (Davies et al., 2003; Pinkett, 2003). Another study reported that ICT use positively influence participants' attitudes and perceptions of themselves, i.e., improved satisfaction in the self domain (Pinkett, 2003). Yet other studies reported that ICT use to obtain health care and wellness information contributes to satisfaction in the health domain (Cohill and Kavanaugh,

1997). Finally, ICT use can help individuals obtain job skills and learn about employment

opportunities as well as expand social networks, therefore, increasing satisfaction in the work

domain (Chow et al., 1998) and social domain (Kavanaugh, 1999). Thus, we propose the

following hypothesis:

- **Hypothesis 1 (Contribution of Continued use of ICT on domain QoL).** Satisfaction
  from continued use of ICT among activities in a life domain is positively associated with
  satisfaction in that life domain.

Contribution of Domain QoL from Continued Use of ICT on Overall QoL. To the best of

our knowledge, this research is the first study to investigate the contribution of domain QoL on

overall QoL from continued ICT use in the context of CTCs. Therefore, we have to rely on the

theoretical argument from the Bottom-up Spillover theory discussed earlier and related evidence

from ICT use in other contexts to develop this hypothesis. Choi et al. (2007), in their study of the

contribution of mobile data services on quality of life, reported that stronger contribution of

mobile data services in specific life domains lead to stronger contribution of mobile data services

on the overall quality of life. Another study by Lee et al. (2008) found that various ICTs use

(e.g., the Internet, mobile phone, DVD, MP3) fulfills basic needs for communication, staying in

touch, communication and entertainment and thus increasing QoL. Based on the evidence in the

literature, we propose the following hypothesis:

- **Hypothesis 2 (Contribution of domain QoL on overall QoL).** Satisfaction in life
  domains from continued ICT use is positively associated with overall life satisfaction.

Contribution of Domain QoL from Continued use of ICT on Other Domains. Although

there is no direct empirical evidence of horizontal spillover effects from continued ICT use,

findings from several studies seem to suggest that ICT use through CTCs can contribute to QoL

in several domains. Kvasny and Keil (2006), for example, found that individuals share

information about jobs and build social capital while working on improving computer skills to

prepare themselves for jobs. Mark et al. (1997) reported that a CTC became an integral part of the community social structure and a place to meet people, make friends, develop a sense of belonging, and learning more about the community. These findings suggest the likelihood of horizontal spillover from continued ICT use; however, the limited evidence does not allow us to hypothesize the specific life domains involved and the direction of the spillover. Nevertheless, this does not preclude us from exploring the complex dynamics of the horizontal spillover. Thus, we propose the following hypothesis:

- **Hypothesis 3a (Direct horizontal spillover effects).** Satisfaction from continued ICT use in a focal life domain positively contributes to satisfaction from continued ICT use in another life domain.

- **Hypothesis 3b (Reciprocal horizontal spillover effects).** Given that there is a direct spillover effect from a focal life domain to the other life domain, satisfaction from continued ICT use in the other life domain also positively contributes to satisfaction from continued ICT use in another life domain.

- **Hypothesis 3c (Interaction horizontal spillover effects).** Satisfaction from continued ICT use in two or more life domains positively contributes to satisfaction from continued ICT use in another life domain.

5. RESEARCH METHOD

5.1. Microsoft Unlimited Potential Community Technology Centers, Thailand

Microsoft Unlimited Potential represents the global efforts to enable social and economic empowerment through a number of initiatives including technology skills training, software and hardware donations, and low-cost laptops, among others. The program has an ambitious goal to bring the benefits of ICT to five billion people worldwide. The community technology skills program is one of the Unlimited Potential initiatives with the goal to broaden digital inclusion and workforce development by partnering with non-governmental organizations (NGOs) in CTC operations. Currently, more than 37,000 CTCs in 102 countries have been supported through grants (cash and software), instructor training, and Microsoft software skill development curriculum (e.g., Word, Excel, PowerPoint, Web design, Database, etc.).

In Thailand, four awarded NGOs have set up twenty CTCs in ten provinces throughout the country. This research works with thirteen CTCs under the supervision of three NGOS – five CTCs under the Duang Prateep Foundation (DPT), three CTCs under the Population and community development association (PDA), and five CTCs under the Kenan Institute Asia. These NGOs target different disadvantaged communities including impoverished communities in Bangkok for the DPT, rural communities in Buriram for the PDA, and suburban workforce in Pang-nga for the Kenan Institute Asia. All CTCs provide skill training to participants; however, some cover more software programs than others. This research evaluates the contribution to QoL from continued use of software and skills that all CTCs have in common (Word, Excel, Powerpoint, and Internet skills).

5.2. Instrument development

This study has three groups of constructs, "satisfaction from continued use of ICT", "satisfaction from continued use of ICT on domain QoL", and "satisfaction from continued use of ICT on overall QoL". The "satisfaction from continued use of ICT on domain QoL" is measured by one item that asks respondents about the contribution of continued ICT use on domain QoL. We adapted the validated 5-item satisfaction with life instrument from Diener et al. (1985) to measure "satisfaction from continued use of ICT on overall QoL" construct. These five items consistently asked respondents to answer the contribution from continued ICT use to QoL, for example, "Overall, my quality of life has improved to close to my ideal", "My quality of life are excellent", and "I am satisfied with my life", suggesting that the "satisfaction from continued use of ICT o overall QoL is a reflective construct.

Following the conceptualization of formative constructs as a composite of multiple measures (Diamantopoulos and Siguaw, 2006; Jarvis et al., 2003), the satisfaction from continued use of

ICT in life domains are formative constructs because ICT use in different life activities define these constructs. Following the guidelines for validating and analyzing formative constructs by Petter et al. (2007), our instrument development was conducted in two steps: (1) item generation, and (2) content validity assessment using Q-sorting. The continued use of ICT based on knowledge and skills learned from CTCs is context–specific and relates to how individuals use ICT in their life events. No existing measurement has been developed on this topic. Therefore, focus groups were used to generate use experiences and associated life domains with the goal to ensure content validity which is the most important aspect of instrument development for formative constructs (Diamantopoulos and Winklhofer, 2001; Jarvis et al., 2003). The item creation through focus groups is appropriate because participants are a part of the research population and are excellent source to inform various activities of continued ICT use (Fuller et al., 1993; Hughes and DuMont, 1993).

The focus groups were conducted across gender, age, and occupation groups. The number of focus group interviews was not predetermined; however, no additional interviews are needed when no new activities of continued ICT use were identified from the most recently interviewed focus group. Thirty participants were interviewed including ten males and twenty females in five age groups – 10-19 years old (13 participants), 20-29 years old (3 participants), 30-39 years old (4 participants), 40-49 years old (3 participants), and over 50 years old (7 participants). Five occupation groups are twelve middle-school and high-school students, two college students, twelve working adults, and four retirees or stay-at-home parents. On average, they used computers around 85 minutes a day.

During the focus group sessions, participants were asked to talk openly about activities that they use the software skills learned from CTCs. All interviews were audio-taped and transcribed.

The transcripts were used to identify use experiences and their associated life domains. Guided by the definitions of life domains in the literature, the two authors independently coded use experiences and corresponding life domains. Inter-coder reliability was 0.846 (p < .01). The disagreement on user experiences or life domains was resolved through discussion. Overall, the total of 34 different use experiences in 10 life domains was identified. The ten life domains are work, education, family, friend, consumer, leisure, social, finance, self, and community.

Next, a two-step Q-sorting (Boudreau et al., 2001; Moore and Benbasat, 2001) was used to assess content validity. In the first round, four judges who are not involved in the research were asked to examine the 34 use experience items written on index cards and sort them into the 10 pre-specified life domains and "ambiguous/does not fit" category. The Cohen's Kappa shows an average value of 0.79 which is higher than the acceptable level of 0.65 (Todd and Benbasat, 1989). The overall placement ratio of items within the correct constructs was 90%, showing a high degree of construct validity and potential reliability. The authors discussed ambiguous items with the judges and those items were modified before proceeding to the second round.

Similar to the first round, the second round of Q-sorting asked two new judges to sort the 34 use experience items, but in this round, they were not given a list of life domains and had to define their own categories. The first judge created eleven categories by differentiating between new friend and old friend domains while the other judge created nine categories by combining the friend and family domains. The judges' definitions of most categories were similar to our definitions and the Cohen's Kappa was 0.65 which is acceptable. We modified the ambiguous items according to the feedback from the second round judges.

Overall, the results from the Q-sorting suggest that the constructs establish content, convergent, and discriminant validity (Petter et al., 2007). Table 1 lists the ten life domains and examples of use experience items.

Table 1. Life domains and Use Experience Items	
Life domain	**Examples of Use Experience Items**
Work	"I use MS Word to write reports for work"
Education	"I use MS PowerPoint for class presentation"
Family	"I teach ICT knowledge and skills learned from CTCs to family members"
Friend	"I use the Internet to send e-mail to friends or chat with friends"
Consumer	"I use the Internet to search for information about products or services"
Finance	"I use MS Excel to manage personal finance"
Leisure	"I use the Internet to search for vacation locations, restaurants and other entertaining activities"
Social	"I use the Internet to find new friends"
Self	"The continued use of ICT makes me feel proud that I am smart enough to learn how to use computers"
Community	"The continued use of ICT increases community relations"

5.3. Data collection

The developed survey instrument was used to collect data needed for hypothesis testing. All the items in the three key constructs were measured on a 1 = "strongly agree" to 7 = "strongly disagree" scale, with 4 being "neutral". The response "0" (never used) was added to the questions that asked respondents to reflect the extent of satisfaction from use experiences (See Appendix A). The survey instrument was pretested with 10 subjects in Pang-Nga province and minor modifications were made prior to the data collection.

The questionnaires were collected by the authors in four CTCs in Pang-Nga province. The rest of the questionnaires were collected by CTC staff and returned to the researchers via postal mail. In all, 308 subjects responded to the survey. After excluding cases with missing data or incomplete responses, 262 surveys were retained for data analysis. Descriptive statistics are shown in Table 2.

Table 2. Descriptive Statistics of Respondents	Number of respondents	Percent
Gender		
Male	98	37.4%
Female	158	67.3%
Age group		
10 – 15	42	16.0%
16 – 19	11	4.2%
20 – 29	78	29.8%
30 – 39	81	30.9%
40 – 49	41	15.7%
> 50	8	3.0%
Education level		
Some elementary school	52	20.0%
Some high school	20	7.6%
Finishing high school	113	43.1%
Vocational degree	28	10.7%
College degree	45	17.2%
Graduate degree	1	0.38%
Income		
< 2,000 Baht	40	15.3%
2,001 – 6,000 Baht	73	27.9%
6,001 – 10,000 Baht	78	29.8%
10,000 – 20,000 Baht	35	13.4%
> 20,000 Baht	33	12.6%

6. DATA ANALYSIS AND RESULTS

6.1. Data Analysis Method for the Bottom-up Spillover Effects

Partial Least Square (PLS) was used to analyze data to evaluate the Bottom-Up Spillover theory and Fuzzy-set Qualitative Comparative Method (fsQCA) was used to analyze data to evaluate the Horizontal Spillover theory. The multi-method strategy allows us to fully test the complex relationships among satisfaction with continued ICT use in life domains, its contribution to domain QoL, and overall QoL, as well as the spillover of satisfaction in a given domain or set of domains to other domains.

PLS allows us to simultaneously examine the measurement and structural model (Gefen et al., 2000) and considers an appropriate approach for this research for a number of reasons. First,

PLS is suitable for exploratory research which fits the goal of this study (Gefen et al., 2000).

Second, PLS employs a component-based approach and can handle both formative (satisfaction

from continued use of ICT) and reflective constructs (satisfaction from continued use of ICT on

overall quality of life) (Gefen et al., 2000). Third, PLS has a minimal restriction on the sample

size and residual distributions (Chin et al., 2003). The data collected from several CTCs were

pooled together for the analysis because the results from different samples were not significantly

different. Wilk's lambda was 0.95 (F = 1.48, p-value = 0.14). Thus, the results reported are based

on the statistical analysis of the pooled data from all CTCs.

6.2. The Bottom-up Spillover Results

Measurement Model Validation

The measurement model has one reflective construct ("satisfaction from continued use of

ICT on the overall QoL") and one formative construct ("satisfaction from continued use of

ICT"). In contrast to reflective constructs, formative indicators cause the latent construct, each

indicator uniquely contributes to the latent construct and is not interchangeable, and they do not

necessarily need to covary (Jarvis et al., 2003). Since formative indicators do not need to be

correlated, it is not appropriate to conduct the conventional construct consistency assessment that

relies on common factor analysis (Petter et al., 2007). We followed the procedure suggested by

Bollen and Lennox (1991) and Diamantopoulos and Siguaw (2006) to assess construct validity

by examining item weights and evaluate reliability by examining multicollinearity. Although

some item weightings are not significant, no evidence of multicollinearity was present since the

highest variance inflation factor (VIF) was 2.03, well below the suggested cutoff of 3.3

(Diamantopoulos and Siguaw, 2006). Therefore, we did not remove the nonsignificant indicators

to retain content validity (Bollen and Lennox, 1991). Appendix B shows the mean, standard deviations of the formative indicators and the construct validity and reliability.

The convergent validity and reliability of the reflective construct ("satisfaction from continued use of ICT on the overall QoL") were evaluated by examining the item loadings and composite reliability. The convergent validity and reliability are considered acceptable because all items are significant at $p < 0.01$ level and the composite reliability is 0.85. Appendix C shows the convergent validity of the reflective construct.

The discriminant validity of all constructs was evaluated by examining the loadings and cross-loadings of item-construct loadings, and average variance extracted (AVE). Discriminant validity is established when items load higher on their hypothesized construct than on other constructs and when the square root of a construct's AVE is larger than its correlations with other constructs (Gefen and Straub, 2005). As shown in Appendix D1 and D2, all items load higher on their constructs than on other constructs and the square root of AVE for QoL is much higher than its correlations with other constructs.

Data collection from self-report surveys is susceptible to common-method bias and can threaten the validity of the study (Podsakoff et al., 2003). Common method bias relates to common method variance which refers to the spurious covariance shared among variables by the common method used in data collection (Buckley et al., 1990). Harman's single-factor test using exploratory factor analysis is one of the recommended methods to assess common method bias. Common method bias exists if a single factor is identified from the unrotated factor solution and when the first factor explains the majority of the variance in the variables (Malhotra et al., 2006; Podsakoff et al., 2003). In our unrotated factor analysis results, the first factor accounted for

37.7% of the variance and the twelve factors together accounted for 77.6% of the variance.

Therefore, we conclude that common method bias is not a concern for this study.

Structural Model Testing

We tested the Bottom-up Spillover model by simultaneously examining Hypothesis 1 and

Hypothesis 2 to estimate the influence of satisfaction from continued ICT use on domain QoL

and overall QoL. A bootstrap analysis was performed with 200 subsamples in PLS Graph 3.0 to

estimate the path coefficients and their significance. Figure 2 presents the path coefficients and

the explained variances.
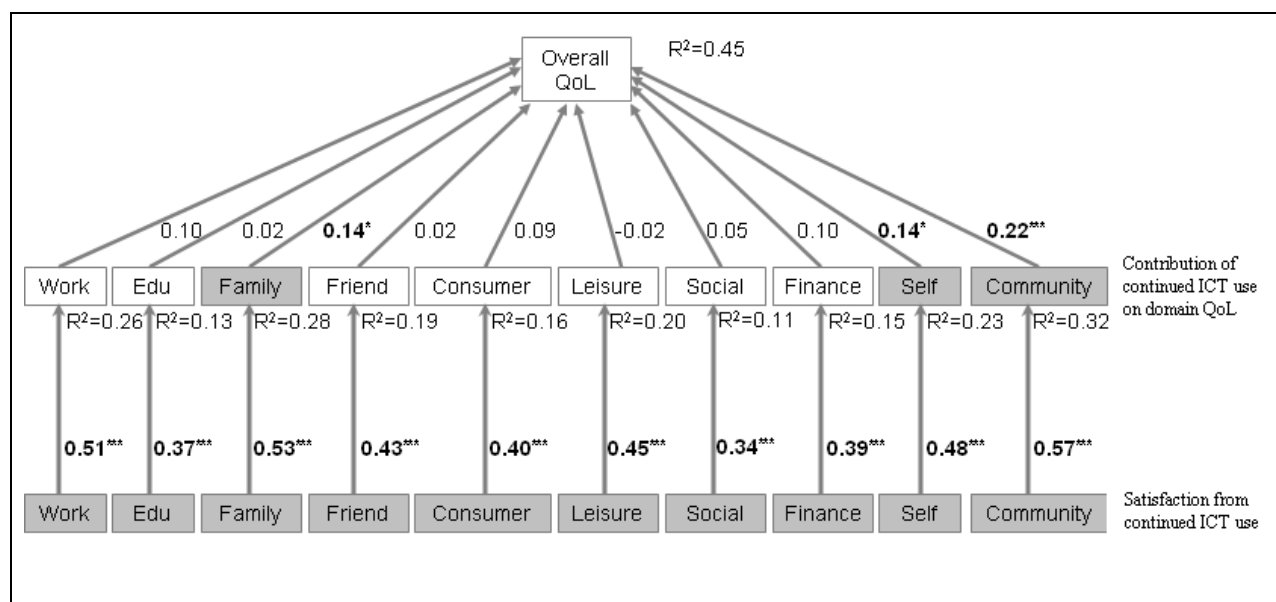
Figure 2. PLS Results for the Bottom-up Spillover Model
Note: The highlighted constructs are those that demonstrate positive significant effect.
The significance levels are: * p < .10, ** p < .05, *** p< .01.

Path coefficients from satisfaction from continued use of ICT in each life domain had

significant positive effects (p < .01) on domain QoL across all ten life domains, showing strong

support Hypothesis1. The explained variance (R^2) ranged from 0.11 (social domain) to 0.32

(community domain), suggesting that the effect is strongest in the community domain and the

weakest in the social domain. The effects of continued use of ICT on domain QoL ordered by the

strength of influence are the community domain (b = 0.57, R^2 = 0.32), the family domain (b = 0.53, R^2 = 0.28), the work domain (b = 0.51, R^2 = 0.26), the self domain (b = 0.48, R^2 = 0.23), the leisure domain (b = 0.45, R^2 = 0.20), the friend domain (b = 0.43, R^2 = 0.19), the consumer domain (b = 0.40, R^2 = 0.16), the finance domain (b = 0.39, R^2 = 0.15), the educational domain (b = 0.37, R^2 = 0.13), and finally the social domain (b = 0.34, R^2 = 0.11).

Next, we evaluated the influence of satisfaction in life domains from continued ICT use on the overall life satisfaction (Hypothesis 2). Path coefficients from three life domains had positive significant positive effect on the overall QoL, suggesting partial support of Hypothesis 2. In particular, the three domains are the community domain (b = 0.22, p < .01), the family domain (b = 0.14, p < .10), and the self domain (b = 0.14, p < .10). The overall explained variance (R^2) is 0.45.

6.3. Data Analysis Method for the Horizontal Spillover Effects

The fuzzy-set qualitative comparative method (fsQCA) was used to analyze data to evaluate the Horizontal Spillover theory. Fuzzy-set QCA is a variant of qualitative comparative methods that is designed to identify causal conditions among independent variables that relate to an outcome variable. (Ragin 1987, 2000). QCA is appropriate to use in small to moderate number of cases (e.g., N= 15 in Cress and Snow (2000) and N = 50 in Vaisey (2007)) and large number of cases (e.g., N = 1,606 in Sonnett (2004) and N = 8,328 in Braumoeller (2003)).

QCA builds on two observed characteristics shared by most social phenomena: *heterogeneity* and *causal complexity*. Heterogeneity refers to the fact that a variety of causal conditions is likely to be related to the same outcome. For example, Öz (2004) identified four different paths to international competiveness, two of which are strong local demand conditions and strong clusters combined with a favorable context for firm strategy and rivalry. Causal complexity refers to the

fact that a relevant causal condition tends to include several variables rather than a single variable. Roscigno and Hodson (2004), for example, reported nine configurations of factors with more than three independent variables that link to strikes. The extent of conflicts on the shop floor, the presence of union, and a bureaucratized work structure are among the variables included.

In QCA, cases are treated as different combinations of relevant attributes. To prepare data for QCA analysis, membership scores need to be assigned to all variables (independent and outcome variables). The original QCA method (often referred to as the crisp-set QCA) requires that all variables are simple dichotomies (presence and absence). For example, a person has either satisfied or unsatisfied QoL in the work life domain. As a convention, variables written in uppercase letters indicate their presence, and lower case letters indicate their absence. The fuzzy set extends the original QCA by allowing a variable to have varying degrees of membership in the set ranging from 0 (non-membership) to 1 (full membership). The higher value indicates that the case is more "in" a set than "out" while the lower value indicates that the case is more "out" than "in" a set.

Boolean algebra and set theory are the analytical logic to derive relevant causal conditions in the data. The Boolean approach provides a systematic method to identify logically relevant combinations of conditions among the cases. Negation (~), logical or (+) and logical and (*) are the primary Boolean algebra operations to represent the combinations of conditions associated with a certain outcome. The subset relation is then used to derive causal conditions that exhibit the outcomes. Table 3 summarizes the Boolean algebra and subset relation in fsQCA.

Table 3. Boolean Algebra and Fuzzy Subset		
Boolean operation	**Description**	**Calculation**
Negation of fuzzy set A (~A)	Membership in set not-A	~A = 1 – A
Logical and (e.g., A * B)	Membership in a combination of set A and set B	Min (A, B)
Logical or (e.g., A + B)	Membership in set A or set B	Max (A, B)
Fuzzy subset	**Description**	**Assessment**
Sufficient condition	A specific combination of causal conditions among multiple cases that exhibit the same outcome. Such combination of causal conditions constitutes a subset of the outcome and may be interpreted as sufficient for the outcome.	In fuzzy sets, a subset relation is established when membership scores in one set (e.g., combination of causal conditions) are consistently less than or equal to membership scores in another set (e.g., the outcome)

As discussed earlier, we theorize that horizontal spillover effects may involve the direct spillover effect, the interaction spillover effect, and the reciprocal spillover effect. Multiple regression analysis appears to be a potential method to evaluate this theory. However, as the number of independent variables increase, the interaction terms in a regression model can increase exponentially and easily exhaust the degree of freedom in the data. If we want to fully test the horizontal spillover effects of the nine life domains on a focal domain, 502 interaction terms are needed in a regression model. Such setup would not be possible because of the exhaustion of degree of freedom, ruling out the regression approach. In contrast to the common variance explanation in regression, QCA applies the set theory and Boolean logic in deriving causal conditions. Therefore, it does not suffer from the large degree of freedom requirement. Ragin (1987) suggested that QCA is a powerful analytical method "for addressing questions about outcomes resulting from multiple and conjunctural causes – where different conditions combine in different and sometimes contradictory ways to produce the same or similar outcomes" (p. x). Also, multicollinearity does not seem to be a problem with this approach

(Ragin, 2000). Therefore, fsQCA is well suited to analyze the horizontal spillover effects in this study.

6.4. The Horizontal Spillover Results

Fs/QCA 2.0 was used for the data analysis. Fuzzy-set QCA data can be analyzed using either the truth table algorithm or the inclusion algorithm. Since the inclusion algorithm is not available in fs/QCA 2.0, our analysis relies on the truth table approach. To examine the extent of horizontal spillover effects among life domains, our ten outcome variables are the QoL in the work, educational, family, friend, consumer, leisure, social, finance, self, and community domains. For each life domain, the independent variables are the QoL in the other nine life domains. Following Ragin (2007), our truth table analysis for each life domain follows the steps outlined in table 4.

Table 4. Fuzzy Set QCA Analysis using the Truth Table		
Step	**Description**	**Application to this study**
(1) Calibrate membership scores for all variables	Fuzzy set membership scores for all independent and outcome variables have to be between 0 and 1.	Our domain QoL variable is measured by the 7-point Likert scale. The 7-point scale from 1 to 7 was recoded to seven membership scores including 0, 0.17, 0.33, .0.50, 0.67, 0.83, and 1 respectively.
(2) Identify the empirically relevant causal conditions	This step identifies relevant causal conditions found in the data set. A relevant causal combination has a membership score greater than 0.5. By applying this rule, a list of relevant causal combinations and the number of cases is identified.	To illustrate this step, we use an example of the analysis of work QoL as an outcome variable. By applying this step, we identified 9 causal combinations with a membership score greater than 0.5. For example, the causal combination in which all other 9 domains are present has 105 cases.

Table 4. Fuzzy Set QCA Analysis using the Truth Table		
(3) Use frequency threshold to retain relevant cases	Identify the cut-off frequency threshold (number of cases) to determine if a causal combination has empirical significance to be retained for further analysis.	Since our study is exploratory, we are interested in identifying as many relevant causal conditions as possible, we set the frequency threshold to be at least 1 case.
(4) Evaluate the subset relation of causal combinations (Which causal combinations link to the outcome?)	Consistency score[1] is used to evaluate the degree to which empirical evidence is consistent with the subset relation.	We used the consistency score of at least 0.85 to determine causal conditions that relate to the outcome. Then, the outcome variables are coded "1" for these rows and "0" for the other rows that below the consistency score cut-off.
(5) Use the Quine-McCluskey algorithm to identify the minimum combinations of causal conditions necessary to trigger the outcome	The Quine-McCluskey algorithm applies Boolean minimization to reach the parsimonious solution.	To illustrate Boolean minimization, consider two causal conditions that involve A, B, and C and the outcome variable E. The first causal condition is A = 1, B = 0, C = 1, and E =1. The second causal condition is A = 1, B = 1, C = 1, and E =1. By applying Boolean minimization, we reach a more parsimonious causal combination of A = 1, C =1 because B has no effect on the outcome.

Note: [1] Consistency score $(X_i \leq Y_i) = \sum_{i=1}^{n} \frac{min(X_i, Y_i)}{X_i}$; X_i = membership scores in a causal combination, Y_i = membership scores in the outcome, i = case. The consistency score of 1 means that all of the X_i values are less than or equal to their corresponding Y_i values or a perfect theoretical subset relation. The higher consistency score is desired because it means that most cases in the data fit the subset relation. Cut-off values of 0.85 or higher is recommended (Ragin, 2006).

Table 5 shows the causal combination of the horizontal spillover results in ten life domains. We conducted the one-tailed t-test on consistency scores to compare the explanatory power of causal combinations on the satisfaction with domain QoL and dissatisfaction with domain QoL. All the t-test results are statistically significant (p < .01); therefore, the causal combinations

relationships obtained are not ambiguous. Note that we cannot obtain results from the friend and finance domains because of the limited diversity of causal conditions in both cases. In other words, there are too few empirically relevant causal combinations with cases from the data set to derive valid results.

The results strongly support Hypothesis 3a, 3b, and 3c suggesting the complex relationships of horizontal spillover effects in the case of the contribution of continued ICT use on life domains. The work QoL, for example, experienced spillover effects under two conditions: (1) the direct spillovers from the QoL in the education and leisure domains, and (2) the interaction spillover from the QoL in the education, family, leisure, self, and social domains. Similar patterns of the direct spillover and the interaction spillover effects are also observed in other life domains. Due to space limit, we will not explain in details of the horizontal spillover effects in other life domains. Similarly, we also observed the reciprocal horizontal spillover from QoL in the work domain on the educational domain. Therefore, we conclude that strong empirical evidence supports our theorizing that horizontal spillover effects are complex and extensive and include the direct spillover effects, the reciprocal spillover effects, and the interaction spillover effects. Finally, note that the work, education, leisure and to some extent the community domain QoL emerge as dominant domains in influencing QoL in other life domains.

Outcome (Y)	Causal combinations	Consistency score for Y	Consistency score for ~Y	t-test
Table 5. Horizontal Spillover Effects Results				
Work	EDU	0.91	0.25	25.02***
	LEISURE	0.92	0.24	23.69***
	EDU*FAMILY*LEISURE*SELF* SOCIAL	0.98	0.29	26.26***
Education	LEISURE	0.90	0.25	21.34***
	WORK	0.91	0.25	21.94***
	FAMILY*LEISURE*SELF*SOCIAL* WORK	0.99	0.29	23.29***
	LEISURE*SELF*SOCIAL*WORK* COMMUNITY	0.97	0.29	22.28***
Family	EDU	0.83	0.36	14.00***
	LEISURE	0.83	0.36	13.88***
	WORK	0.82	0.37	14.41***
	CONSUMER*EDU*WORK	0.94	0.41	14.77***
	EDU*LEISURE*SELF*SOCIAL*WORK	0.93	0.43	16.78***
Consumer	EDU	0.83	0.37	13.82***
	LEISURE	0.80	0.38	12.45***
	WORK	0.82	0.38	13.99***
	COMMUNITY	0.86	0.41	14.25***
	EDU*WORK	0.87	0.40	14.73***
	LEISURE*COMMUNITY	0.89	0.42	14.49***
	EDU*FAMILY*LEISURE*SELF *SOCIAL*WORK	0.94	0.46	14.62***
Leisure	EDU	0.89	0.26	20.07***
	WORK	0.90	0.26	19.96***
	COMMUNITY	0.93	0.28	21.16***
	CONSUMER*EDU*WORK	0.95	0.30	19.50***
	EDU*FAMILY*SELF*SOCIAL *WORK	0.97	0.30	21.67***
Social	EDU	0.89	0.29	21.40***
	LEISURE	0.90	0.29	21.38***
	WORK	0.89	0.29	22.15***
	EDU*FAMILY*LEISURE*SELF*WORK	0.99	0.34	23.92***
Self	LEISURE	0.90	0.29	20.70***
	CONSUMER	0.92	0.33	19.54***
	EDU	0.88	0.30	20.77***
	WORK	0.88	0.29	20.94***
	LEISURE*COMMUNITY	0.97	0.33	22.70***
	EDU*FAMILY*LEISURE*SOCIAL *WORK	0.99	0.35	22.93***
Community	EDU	0.85	0.33	18.33***
	LEISURE	0.86	0.33	17.89***
	WORK	0.87	0.33	19.20***
	LEISURE*SELF*SOCIAL*WORK	0.96	0.37	20.38***
	FAMILY*LEISURE*SELF*WORK	0.97	0.39	19.69***

7. DISCUSSION AND CONCLUSION

7.1. Key Findings

This study examines the extent of bottom-up and horizontal spillover effects in the context of continued ICT use based on knowledge and skills learned from CTCs in various life domains. Our results suggest that the spillover theories of QoL particularly the horizontal spillover theory are undertheorized. In particular, the results suggest that (1) the bottom-up spillover and the horizontal spillover effects simultaneously contribute to the overall QoL, (2) the satisfaction from continued use of ICT contributes to domain QoL and domain QoL, particularly the family, self, and community domains, contributes to overall QoL, and (3) the horizontal spillover effects exhibit complex relationships that involve direct spillover effects, interaction spillover effects, and reciprocal spillover effects. More specifically, the work, education, leisure, and community domains influence QoL in other domains.

7.2. Limitations

There are a few limitations in this study. The first limitation is related to the potential memory biases of QoL measurements. Studies (e.g., Schwarz and Strack, 1991) found that an individual's response to the extent of global life satisfaction is influenced by frequency and recency of one's experiences. In other words, a person is likely to use more-recent and more-frequent affective experiences in a certain life domain to respond to the global life satisfaction than less-recent and less-frequent affective experiences from other life domains. Our research adapted Diener et al. (1985)'s satisfaction with life scale to measure the global life satisfaction. Diener and Suh (1999) reported that such scale shows convergent validity, reliability and covaries with ratings of the number of positive and negative memory recalls. Therefore, we conclude that memory biases are not a serious concern.

Second, the Bottom-up and Horizontal Spillover theories seem to suggest a causal consequence to the relationship among domain QoL and overall QoL; however, our data is cross-sectional and not longitudinal in nature. A longitudinal research that tracks domain QoL and overall QoL over time may yield richer insights into the dynamics of bottom-up and horizontal spillovers.

7.3. Implications for Research

This research has implications for digital divide and social inclusion research. Despite the call from several researchers (e.g., Odasz, 1994; Patterson, 1997) for additional research to evaluate the impacts of community technology projects emphasizing real benefits to real people, very little is known about the continued use of ICT into daily lives and its influence on quality of life after receiving training from CTCs. This study represents an important step towards taking a holistic social inclusion approach to evaluate the benefits of CTCs on all aspects of people's lives (Warschauer, 2004).

Our findings also suggest several important contributions to the spillover theories in quality of life. Previous studies in quality of life largely focused on the bottom-up spillover effects and very few studies that examined the horizontal spillover effects have done so from a simple direct one-to-one horizontal spillover effect. Our results provide strong empirical evidence that the bottom-up and horizontal spillovers play an equally important role in shaping people's QoL. Our findings also suggest that the dynamics of horizontal spillovers involves more complex relationships than previously theorized in the literature.

7.4. Implications for Practice

CTCs serve to promote universal access to ICTs among individuals particularly the disadvantaged groups. The key questions that CTC management, donors, and policy makers

often ask are "Do CTCs make any impacts and if so, how?" (Whyte, 2000). The results from our study provide strong evidence that continued use of ICT knowledge and skills learned from CTCs in activities across various life domains improve people's QoL. Our results suggest that CTC management and instructors should emphasize or incorporate ICT use around activities relating to the self, family, and community domains during training sessions. Doing so will encourage continued ICT use in those domains which will further enhance the overall QoL. Programs to motivate the continued ICT use in the education, work, and leisure life domains should also be emphasized because QoL in those life domains may influence QoL in other life domains and indirectly enhances overall QoL.

Hudson (2001) stressed a need for systematic efforts to evaluate CTC initiatives. In particular, summative evaluation to understand the outcome and impacts of CTC is important for funding agencies and decision makers. Our theory based survey instrument can be adapted to evaluate the impacts of CTC on quality of life.

8. REFERENCES

Andrews, F.M., and Withey, S.B. (1976) Social Indicators of Well-Being: America's Perception of Life Quality, New York: Plenum Press.

Bertot, J. (2003) "The Multiple Dimensions of the Digital Divide: More than the Technology 'Haves' and 'Have Nots'," Government Information Quarterly, (20)2, pp. 185-191.

Bollen, K. A., and Lennox, R. (1991) "Conventional Wisdom on Measurement: A Structural Equation Perspective," Psychological Bulletin, 110, pp. 305–314.

Boudreau, M.C., Gefen, D., and Straub, D.W. (2001) "Validation in Information Systems Research: A State-of-the-Art Assessment," MIS Quarterly, 25(1), pp. 1-26.

Braa, J., Hanseth, O., Heywood, A., Mohammed, W., and Shaw, V. (2007) "Developing Health Information Systems in Developing Countries: The Flexible Standards Strategy," MIS Quarterly, 31(2), pp. 381-402.

Braumoeller, B. (2003) "Causal Complexity and the Study of Politics," Political Analysis, 11(3), pp. 208-233.

Buckley, M.R., Cote, J.A., and Comstock, S.M. (1990) "Measurement Errors in Behavioral Sciences: The Case of Personality/Attitude Research," Educational and Psychological Measurement, 50(3), pp. 447-474.

Campbell, A.C. (1976) "Subjective Measures of Well Being," American Psychologist, 31, pp. 117-124.

Chin, W., Marcolin, B.L., Newsted, P.R. (2003) "A Partial Least Squares Latent Variable Modeling Approach for Measuring Interaction Effects: Results from a Monte Carlo Simulation Study and an Electronic Mail Adoption Study," Information Systems Research, 14(2), pp. 189-217.

Choi, H., Im, K.S., Lee, M., and Kim, J. (2007) "Contribution to Quality of Life: A New Outcome Variable for Mobile Data Service," Journal of the Association for Information Systems, 8(12), pp. 598-618.

Chow, C., Ellis, J., Mark, J., and Wise, B. (1998) "Impact of CTCNet Affiliates: Findings from a National Survey of Users of Community Technology Centers," Education Development Center.

Cohill, A.M., and Kavanaugh, A.L. (1997) Community Networks: Lessons from Blacksburg, Virginia, Boston, MA: Artech House.

Cress, D.S., and Snow, D.A. (2000) "The Outcomes of Homeless Mobilization: The Influence of Organization, Disruption, Political Mediation, and Framing," The American Journal of Sociology, 105(4), pp. 1063-1104.

Crouter, A.C. (1984) "Spillover from Family to Work: The Neglected Side of Work-Family Interface," Human Relations, 37, pp. 425-442.

Davies, S., Pinkett R.D., and Wiley-Schwartz, A. (2003) "Community Technology Centers as Catalysts for Community Change: A Report to the Ford Foundation," Ford Foundation, New York.

Diamantopoulos, A., and Siguaw, J.A. (2006) "Formative Versus Reflective Indicators in Organizational Measure Development: A Comparison and Empirical Illustration," British Journal of Management, 17, pp. 263-282.

Diamantopoulos, A., and Winklhofer, H.M. (2001) "Index Construction with Formative Indicators: An Alternative to Scale Development," Journal of Marketing Research, 38(2), pp. 269-277.

Diener, E. (1984) "Subjective Well-Being," Psychological Bulletin, 95(3), pp. 542-575.

Diener, E., Emmons, R.A., Larsen, R.J., and Griffin, S. (1985) "The Satisfaction with Life Scale," Journal of Personality Assessment, 49, pp. 71-75.

Diener, E. and Suh, E. (1999) "National Differences in Subjective Well-Being," in Kahneman, D., Deiner, E., and Schwartz, N. (eds.) Well-being: The Foundations of Hedonic Psychology, New York: Russell-Sage.

DiMaggio, P. and Hargittai, E. (2001) "From the 'Digital Divide' to 'Digital Inequality': Studying Internet Uses as Penetration Increases," Working paper 15, Center for Arts and Cultural Policy Studies, Woodrow Wilson School, Princeton University, Princeton, New Jersey.

DiMaggio, P., Hargittai, E., Celeste, C., and Shafer, S. (2004) "From Unequal Access to Differentiated Use: A Literature Review and Agenda for Research on Digital Inequality," in Neckerman, K. (ed.) Social Inequality, New York: Russell Sage Foundation.

Fuller, T. D., Edwards, J. N., Vorakitphokatorn, S., and Sermsri, S. (1993) "Using focus groups to adapt survey instruments to new populations: Experience from a developing country," in Morgan, D.L. (ed.) Successful focus groups: Advancing the state of the art, Newbury Park, CA: Sage.

Gefen, D., and Straub, D. (2005) "A Practical Guide to Factorial Validity Using PLS-Graph: Tutorial and Annotated Example," Communications of the AIS, 16, pp. 91-109.

Gefen, D., Straub, D., and Boudreau, M-C. (2000) "Structural Equation Modeling and Regression," Communications of the AIS, 4(7), pp. 1-70.

George, L.K., and Landerman, R. (1984) "The Economic Instrumentality of Work: An Examination of the Moderating Effects of Financial Requirements and Sex on the Pay-Life Satisfaction Relationship," Journal of Vocational Behavior, 37, pp. 357-368.

Hughes, D., and DuMont, K. (1993) "Using Focus Groups to Facilitate Culturally Anchored Research," American Journal of Community Psychology, 21(6), pp. 775-803.

Hudson, H.E. (2001) "Telecentre Evaluation: Issues and Strategies,", in Latcham, C. and Walker, D. (eds.) Telecentres: Case Studies and Key Issues The Commonwealth of Learning, Vancouver, Canada.

Jarvis, C. B., MacKenzie, S.B., and Podsakoff, P.M. (2003) "A Critical Review of Construct Indicators and Measurement Model Misspecification in Marketing and Consumer Research," Journal of Consumer Research, 30(2), pp. 199–218.

Jung, J.Y., Qiu, J.L., and Kim, Y-C. (2001) "Internet Connectedness and Inequality: Beyond the 'Divide'," Communication Research, 28(4), pp. 507-525.

芽|Sprouts

Kavanaugh, A. (1999) "The Impact of Computer Networking on Community: A Social Network Analysis Approach," Telecommunication Policy Research Conference.

Kremer, Y., and Harpaz, I. (1982) "Leisure Patterns among Retired Workers: Spillover or Compensatory Trends," Journal of Vocational Behavior, 21, pp. 183-195.

Kuklys, W., and Robeyns, I. (2005) "Sen's Capability Approach to Welfare Economics," in Kuklys, W. (ed.) Amartya Sen's Capability Approach, Berlin: Springer-Verlag.

Kvasny, L., and Keil, M. (2006) "The Challenges of Redressing the Digital Divide: A Tale of Two US Cities," Information Systems Journal, 16, pp. 23-53.

Larsen, R.J. (1978) "Thirty Years of Research on the Subjective Well Being of Older Americans," Journal of Gerontology, 33, pp. 109-125.

Lee, P., Leung, L., Lo, V., and Xiong, C. (2008) "The Perceived Role of ICTs in Quality of Life in Three Chinese Cities," Social Indicator Research, 88, 457-476.

Malhotra, M.R., Kim, S.S., and Patil, A. (2006) "Common Method Variance in IS Research: A Comparison of Alternative Approaches and a Reanalysis of Past Research," Management Science, 52(12), pp. 1865-1883.

Mark, J., Cornebise, J., and Wahl, E. (1997) "Community Technology Centers: Impact on Individual Participants and Their Communities," Educational Development Center, Inc., Newton, MA.

Maslow, A.H. (1970) Motivation and Personality, New York: Harper.

McClelland, D.C. (1961) The Achieving Society, New York: The Free Press.

Miscione, G. (2007) "Telemedicine in the Upper Amazon: Interplay with Local Health Care Practices," MIS Quarterly, 31(2), pp. 403-425.

Moore, G. C., and Benbasat, I. (2001) "Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation," Information Systems Research, 2(3), pp. 192- 222.

Near, J.P. (1986) "Work and Nonwork Attitudes Among Japanese and American Workers," in Farmer, R.N. (ed.) Advances in International Comparative Management.

Ng, Y-K. (2003) "From Preference to Happiness: Towards a More Complete Welfare Economics," Social Choice Welfare, 20, pp. 307-350.

Odasz, F. (1994) "The Need for Rigorous Evaluation of Community Networks," in Cisler, S. (ed.) Ties that Bind: Building Community Networks, Apple Computer Corporation Library, Cupertino, CA.

O'Neil, D. (2002) "Assessing Community Informatics: A Review of Methodological Approaches for Evaluating Community Networks and Community Technology Centers," Internet Research: Electronic Networking Applications and Policy, 12(1), pp. 76-102.

Öz, O. (2004) "Using Boolean- and Fuzzy-Logic-Based Methods to Analyze Multiple Case Study Evidence in Management Research," Journal of Management Inquiry, 13(2), pp. 166-179.

Patterson, S. (1997) "Evaluating the Blacksburg Electronic Village," in Cohill, A., and Kavanaugh, A. (eds.) Community Networks: Lessons from Blacksburg, Norwood, MA: Artech House.

Peterson, M., and Malhotra, N.K. (1997) "Comparative Marketing Measures of Societal Quality of Life: Substantive Dimensions in 186 Countries," Journal of Macromarketing, 17, pp. 25-38.

Petter, S., Straub, D., and Rai, A. (2007) "Specifying Formative Constructs in Information Systems Research," MIS Quarterly, 31(4), pp. 623-656.

Phipps, S. (2002) "The Well-Being of Young Canadian Children in International Perspective: A Functionings Approach," Review of Income and Wealth, 48(4), pp. 493.

Pinkett, R. (2003) "Community Technology and Community Building: Early Results from the Creating Community Connections Project," The Information Society, 19, pp. 365-379.

Podsakoff, P.M., MacKenzie, S.B., Lee, N.P., and Podsakoff, N.P. (2003) "Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies," Journal of Applied Psychology, 88(5), pp. 879-903.

Ragin, C.C. (1987) The Comparative Method: Moving Beyond Qualitative and Quantitative Strategies, Berkeley, CA: University of California Press.

Ragin, C.C. (2000) Fuzzy-set Social Science, Chicago, IL: University of Chicago Press.

Ragin, C.C. (2006) "Set Relations in Social Research: Evaluating their Consistency and Coverage," Political Analysis, 14(3), pp. 291-310.

Ragin, C.C. (2007) "Qualitative Comparative Analysis Using Fuzzy Sets (fsQCA)," in Rihoux, B., and Ragin, C. (eds.) Configurational Comparative Analysis, Sage Publications.

Reddy, S.G., Visaria, S., and Asali, M. (2006) "Inter-Country Comparisons of Income Poverty Based on a Capability Approach," SSRN Working Paper.

Rice, R.W., Near, J.P., and Hunt, R.G. (1980) "The Job- satisfaction/life-satisfaction Relationship: A Review of Empirical Research," Basic and Applied Social Psychology, 1(1), pp. 37–64.

Rice, R. W., McFarlin, D. B., Hunt, R. G., & Near, J. P. (1985) "Organizational work and the perceived quality of life: Toward a conceptual model," Academy of Management Review, 10, pp. 296-310.

Roscigno, V.J., and Hodson, R. (2004) "The Organizational and Social Foundations of Worker Resistance," American Sociological Review, 69, pp. 14-39.

Schischka, J., Dalziel, P., and Saunders, C. (2008) "Applying Sen's Capability Approach to Poverty Alleviation Programs: Two Case Studies," Journal of Human Development, 9(2), pp. 229-246.

Schwarz, N., and Strack, F. (1991). "Evaluating one's life: A judgment model of subjective well-being," in Strack, F., Argyle, M., and Schwarz, N. (eds.) Subjective well-being: An Interdisciplinary perspective, Oxford: Pergamon Press.

Seeman, M. (1967) "On the Personal Consequence of Alienation and Job Satisfaction," Industrial and Labor Review, 23, pp. 207-219.

Sen, A. K. (1999) Commodities and Capabilities, Oxford: Oxford University Press.

Sen, A.K. (1999) Development as Freedom, Oxford, UK: Oxford University Press.

Servon, L.J., and Nelson, M.K. (2001) "Community Technology Centers: Narrowing the Digital Divide in Low-income, Urban Communities," Journal of Urban Affairs, 23(3-4), pp. 279-290.

Shepard, J.M. (1974) "A Status Recognition Model of Work-Leisure Relationships," Journal of Leisure Research, 6, pp. 58-63.

Silva, L., and Figueroa, E. (2002) "Institutional Intervention and the Expansion of ICTs in Latin America: The Case of Chile," Information Technology and People, 15(1), pp. 8-25.

Sirgy, M.J., Efraty, D., Siegel, P., and Lee, D-J. (2001) "A New Measure of Quality of Work Life (QWL) based on Need Satisfaction and Spillover Theories," Social Indicators Research, 55, pp. 241-302.

Sirgy, M.J., Meadow, H.L., and Samli, A.C. (1995) "Past, Present, and Future: An Overview of Quality of Life Research in Marketing," in Sirgy, M.J., and Samli, A.C. (eds.) New Dimensions in Marketing/Quality-of-Life Research, Westport, CT: Quorum Books.

Sirgy, M.J. (2002) The Psychology of Quality of Life, Boston, MA: Kluwer Academic Publishers.

Sonnett, J. (2004) "Musical Boundaries: Intersections of Form and Content," Poetics, 32(3-4), pp. 247-264.

Todd, P.A., and Benbasat, I. (1989) "An Experimental Investigation of the Impact of Computer Based Decision Aids on the Process of Preferential Choice," Working Paper, School of Business, Queen's University, Kingston, Ontario.

Vaisey, S. (2007) "Structure, Culture, and Community: The Search for Belonging in 50 Urban Communes," American Sociological Review, 72, pp. 851-873.

Walsham, G., Robey, D., and Sahay, S. (2007) "Foreword: Special Issue on Information Systems in Developing Countries," MIS Quarterly, 31(2), pp. 317-326.

Walsham, G., and Sahay, S. (2006) "Research on Information Systems in Developing Countries: Current Landscape and Future Prospects," Information Technology for Development, 12(1), pp. 7-24.

Warschauer, M. (2004) Technology and Social Inclusion: Rethinking the Digital Divide, Cambridge, MA: MIT Press.

Whyte, A. (2000) "Assessing Community Telecentres: Guidelines for Researchers," International Development Research Centre, Ottawa, ON, Canada.

Wilensky, H. (1960) "Work, Careers, and Social Integration," International Social Science Journal, 12, pp. 543-560.

Wilson, W. (1967) "Correlates of avowed happiness," Psychological Bulletin, 67, pp. 294-306.

芽|Sprouts

Appendix A. Measurement Items for Key Constructs

Construct	Item	Measures
Scale: 0 = never used, 1-7 (Strongly dissatisfied/Strongly satisfied)		
Work Life Domain	Work1	Using Word to write reports for my job
	Work2	Using Excel to calculate numbers, create tables or graphs, or collect data for my job
	Work3	Using the Internet to find information related to my job
	Work4	Using the knowledge and skills learned from the CTC to advise coworkers or supervisors
	Work5	Applying the knowledge and skills learned from the CTC to better understand how to use other computer programs at work
Edu Life Domain	Edu1	Using PowerPoint for presentation in my class
	Edu2	Using the Internet to research for information for class projects
	Edu3	Using Word to write class reports
	Edu4	Using the Internet to do self-learning
	Edu5	Using Excel as a part of mathematics or science classes
Family Life Domain	Family1	Using the topics related to computer programs to have conversations with family members
	Family2	Teaching computer programs learned from the CTC to family members
	Family3	The knowledge and skills learned from the CTC enhance family relationships and reduce a generation gap
Friend Life Domain	Friend1	Using the Internet to e-mail or chat with friends
	Friend2	Teaching the knowledge and skills learned from the CTC to friends
	Friend3	Using the knowledge and skills learned from the CTC to make special gifts (e.g., holiday cards, video clips, picture slides) for friends
Consumer Life Domain	Consumer1	Using the Internet to purchase products or services
	Consumer2	Using the Internet to search for information about products or services
	Consumer3	Using the knowledge and skills learned from the CTC to sell products
Leisure Life Domain	Leisure1	Using the Internet to read news in my spare time
	Leisure2	Using the Internet to watch movies, listen to music or engage in relaxing activities
	Leisure3	Using the Internet to find information about vacation locations, restaurants, or entertainment activities
Social Life Domain	Social1	Using the Internet to communicate with new people
	Social2	Using the Internet to find new friends
	Social3	Using the Internet to get to know others who share similar interests

Construct	Item	Measures
Finance Life Domain	Finance1	Using Excel to manage my personal finance
	Finance2	Using the knowledge and skills learned from the CTC to increase my income
	Finance3	Saving money from computer program training or hourly computer usage services
Self Life Domain	Self1	Using the knowledge and skills learned from the CTC to represent myself
	Self2	Making me proud that I have the ability to learn and use computer programs
	Self3	Being able to use computer programs that I used to depend on others to do for me before my training at the CTC
Community Life Domain	Community1	Using Word to create reports related to community work
	Community2	Using the Internet to find out information about my own community (e.g., maps, community calendar)
	Community3	Enhancing my relationships with other community members from using computers at the CTC
Scale: 1-7 (Significantly decreased/Significantly increased)		
Domain-specific contribution from continued ICT use		Change in the quality of life in (life domain) Note: The similar measure was used for all ten life domains
Scale: 1-7 (Strongly disagree/Strongly agree)		
Contribution to Quality of Life (QoL) from continued ICT use	QoL1	In most ways, my life has come closer to ideal since I started using knowledge and skills learned from CTC
	QoL2	The conditions of my life are excellent since I started using knowledge and skills learned from CTC
	QoL3	I am satisfied with my life since I started using knowledge and skills learned from CTC
	QoL4	So far, I have gotten the important things I want in life since I started using knowledge and skills learned from CTC
	QoL5	If I could life my life over, I would change almost nothing since I started using knowledge and skills learned from CTC

Appendix B. Formative Construct Validity and Reliability

Construct	Item	Mean	Std. Dev.	Weight	t-stat
Work	Work1	5.75	1.58	0.12	0.88
	Work2	5.15	1.83	0.08	0.53
	Work3	5.58	1.73	0.43	3.79***
	Work4	4.40	2.27	0.11	0.86
	Work5	5.06	2.00	0.56	3.80***
Edu	Edu1	5.03	2.01	0.05	0.26
	Edu2	5.72	1.69	0.48	2.25**
	Edu3	5.41	2.06	0.08	0.41
	Edu4	5.75	1.71	0.53	2.97***
	Edu5	3.90	2.51	0.19	1.05
Family	Family1	4.32	2.13	0.04	0.31
	Family2	4.29	2.30	0.32	2.38**
	Family3	4.38	2.28	0.73	6.00***
Friend	Friend1	4.76	2.14	0.51	3.33***
	Friend2	4.71	2.13	0.27	1.50
	Friend3	4.76	2.27	0.53	3.44***
Consumer	Consumer1	3.24	2.48	0.16	0.81
	Consumer2	3.98	2.46	0.40	1.92*
	Consumer3	3.18	2.61	0.60	2.76***
Leisure	Leisure1	4.84	2.24	0.23	1.52
	Leisure2	5.12	2.12	0.45	2.61***
	Leisure3	5.23	1.98	0.55	3.37***
Social	Social1	3.29	2.49	0.18	0.60
	Social2	3.63	2.59	0.37	1.06
	Social3	3.87	2.58	0.57	2.41**
Finance	Finance1	3.76	2.60	0.14	0.72
	Finance2	4.10	2.56	0.77	4.33***
	Finance3	5.11	2.15	0.24	1.31
Self	Self1	4.60	2.13	0.31	2.28**
	Self2	5.26	1.77	0.54	2.73***
	Self3	5.44	1.86	0.31	1.81*
Community	Community1	4.59	2.36	0.23	1.85*
	Community2	4.78	2.17	0.34	2.79***
	Community3	4.74	2.11	0.66	5.53***

Note: The significance levels are: * p < .10, ** p < .05, *** p< .01

Appendix C. Reflective Construct Convergent Validity

Construct	Item	Mean	Std. Dev.	Loading	t-stat
QoL	QoL1	5.39	1.21	0.79	26.29[***]
	QoL2	5.43	1.11	0.87	54.20[***]
	QoL3	5.90	1.01	0.66	11.34[***]
	QoL4	5.48	1.29	0.79	21.88[***]
	QoL5	4.76	1.88	0.54	8.07[***]

Note: The significance levels are: * $p < .10$, ** $p < .05$, *** $p < .01$

Appendix D. Construct Discriminant Validity

D1. Correlations among Latent Constructs and AVE (shown in diagonal)										
	Work	Edu	Family	Friend	Consumer	Leisure	Social	Finance	Self	Community	QoL
Work	n/a										
Edu	0.65	n/a									
Family	0.63	0.41	n/a								
Friend	0.70	0.53	0.70	n/a							
Consumer	0.51	0.45	0.63	0.65	n/a						
Leisure	0.59	0.59	0.43	0.60	0.52	n/a					
Social	0.47	0.39	0.57	0.67	0.80	0.52	n/a				
Finance	0.58	0.40	0.73	0.72	0.77	0.43	0.68	n/a			
Self	0.71	0.45	0.64	0.61	0.50	0.39	0.38	0.60	n/a		
Community	0.59	0.45	0.68	0.66	0.65	0.45	0.55	0.72	0.64	n/a	
QoL	0.47	0.40	0.42	0.42	0.36	0.39	0.35	0.40	0.42	0.46	**0.55**

D2. Item-Construct Loadings and Cross Loadings

	Work	Edu	Family	Friend	Consumer	Leisure	Social	Finance	Self	Community	QoL
Work1	**0.54**	0.49	0.19	0.31	0.15	0.33	0.10	0.17	0.26	0.25	0.29
Work2	**0.57**	0.45	0.27	0.49	0.35	0.33	0.36	0.33	0.32	0.31	0.23
Work3	**0.75**	0.61	0.37	0.43	0.32	0.54	0.33	0.30	0.34	0.33	0.30
Work4	**0.67**	0.40	0.68	0.73	0.59	0.42	0.52	0.61	0.64	0.56	0.35
Work5	**0.87**	0.44	0.62	0.63	0.47	0.44	0.40	0.61	0.77	0.58	0.43
Edu1	0.45	**0.57**	0.30	0.42	0.36	0.28	0.36	0.30	0.26	0.38	0.33
Edu2	0.42	**0.80**	0.13	0.25	0.17	0.38	0.16	0.09	0.18	0.16	0.30
Edu3	0.46	**0.60**	0.32	0.36	0.28	0.42	0.30	0.25	0.29	0.26	0.32
Edu4	0.55	**0.81**	0.39	0.48	0.37	0.51	0.29	0.38	0.45	0.44	0.26
Edu5	0.52	**0.55**	0.51	0.55	0.64	0.47	0.63	0.61	0.46	0.53	0.35
Family1	0.43	0.35	**0.61**	0.49	0.44	0.33	0.42	0.43	0.37	0.37	0.25
Family2	0.60	0.42	**0.84**	0.68	0.59	0.44	0.52	0.62	0.57	0.56	0.36
Family3	0.58	0.36	**0.97**	0.64	0.59	0.39	0.52	0.70	0.61	0.67	0.40
Friend1	0.48	0.43	0.41	**0.73**	0.40	0.56	0.56	0.36	0.30	0.33	0.29
Friend2	0.65	0.42	0.74	**0.77**	0.54	0.39	0.47	0.65	0.64	0.58	0.35
Friend3	0.54	0.38	0.55	**0.78**	0.56	0.39	0.48	0.68	0.53	0.61	0.33
Consumer1	0.47	0.34	0.54	0.63	**0.76**	0.44	0.63	0.62	0.39	0.49	0.30
Consumer2	0.50	0.44	0.48	0.50	**0.82**	0.53	0.57	0.60	0.43	0.53	0.27
Consumer3	0.40	0.36	0.59	0.58	**0.92**	0.40	0.78	0.72	0.45	0.61	0.35
Leisure1	0.54	0.47	0.49	0.52	0.52	**0.63**	0.43	0.48	0.36	0.38	0.17
Leisure2	0.47	0.45	0.36	0.51	0.41	**0.85**	0.50	0.37	0.29	0.34	0.26
Leisure3	0.47	0.52	0.28	0.45	0.40	**0.87**	0.35	0.29	0.32	0.38	0.42
Social1	0.41	0.35	0.42	0.54	0.69	0.48	**0.83**	0.54	0.29	0.45	0.31
Social2	0.37	0.32	0.46	0.60	0.66	0.47	**0.88**	0.59	0.29	0.46	0.32
Social3	0.46	0.38	0.57	0.62	0.76	0.46	**0.94**	0.65	0.39	0.53	0.32
Finance1	0.52	0.32	0.56	0.65	0.73	0.44	0.66	**0.72**	0.52	0.55	0.29
Finance2	0.53	0.36	0.68	0.68	0.74	0.38	0.67	**0.97**	0.51	0.68	0.37
Finance3	0.47	0.35	0.59	0.54	0.45	0.36	0.34	**0.67**	0.59	0.53	0.36
Self1	0.59	0.32	0.61	0.61	0.57	0.37	0.49	0.61	**0.77**	0.57	0.29
Self2	0.62	0.42	0.52	0.49	0.39	0.34	0.29	0.47	**0.93**	0.53	0.40
Self3	0.64	0.43	0.56	0.52	0.38	0.30	0.25	0.51	**0.86**	0.58	0.37
Community1	0.44	0.42	0.52	0.47	0.56	0.31	0.46	0.59	0.45	**0.73**	0.37
Community2	0.43	0.43	0.33	0.44	0.50	0.56	0.50	0.43	0.32	**0.70**	0.39
Community3	0.52	0.31	0.68	0.60	0.53	0.28	0.41	0.66	0.64	**0.90**	0.37
QoL1	0.50	0.36	0.36	0.42	0.35	0.44	0.29	0.39	0.43	0.40	**0.79**
QoL2	0.43	0.34	0.38	0.38	0.36	0.35	0.35	0.38	0.38	0.45	**0.87**
QoL3	0.26	0.24	0.24	0.23	0.12	0.17	0.15	0.17	0.22	0.25	**0.66**
QoL4	0.23	0.30	0.28	0.23	0.23	0.20	0.22	0.22	0.26	0.32	**0.79**
QoL5	0.16	0.16	0.25	0.18	0.21	0.12	0.26	0.25	0.10	0.20	**0.54**