

# SENIORS AND TECHNOLOGY: RESULTS FROM A FIELD STUDY

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## ABSTRACT

In this paper we discuss the results of a survey of senior citizens' interaction with information technology. We expected that the "digital divide" between young and old might be diminishing, and we found evidence of that. We also report on information technologies that seem to be attracting seniors and those that have not yet attracted this age group. We also report findings with regard to senior IT skill levels and how seniors are using their IT skills. Finally, we discuss some limitations of this study and suggest some motivations for future research including some suggestions of what some of that research might include.

**Keywords:** computers; senior citizens, information technology; IT utilization, elderly; IT skills, older people; IT availability, digital inclusion; quality of life; use of technology; digital divide.

## 1.0 INTRODUCTION

Senior citizens, those over age 65, continue to grow in number and means in the world's major economies. They are living longer, and better, than at any other time in recorded history. With the advent of the personal computer some thirty years ago, one would expect that this growing population would benefit from this technology revolution. However, there remains evidence of a "digital divide" between the young and the old when it comes to their respective use of computers and related technology.

Conventional wisdom seems to promote this divide, and suggests that the elderly may not have the dexterity to operate technology, that their dislike of change restricts technology adoption, and that technology is a young person's revolution. It surely seems that technology, from computing to cell phones, is not designed with the elderly in mind. To some extent this has also been true in research, particularly MIS research, where the elderly are frequently ignored in mainstream journals. Perhaps this is a mistake. Our research indicates that this divide may be shrinking. Perhaps it is time for designers, marketers, and researchers to examine whether this segment of the population deserves more consideration. We believe that, at a minimum, the topic should be investigated further and that a baseline should be established concerning seniors and technology in the MIS field. This study attempts to do that.

This paper presents the results of an empirical examination of technology behaviors for a variety of applications (computers, Internet, social media, cell phone, etc.) from a survey of 173 senior citizens. The evidence suggests that many elderly are attempting to join the mainstream of computing, but that some are

still behind and others have not joined at all. Based on the results, however, it appears the digital divide may be diminishing.

## 2.0 BACKGROUND

The elderly continue to increase their demographic proportion among populations in industrialized countries. In the United States, seniors (aged 65 and over) are the fastest growing group among all strata [30]. Population projections in the U.S. are that the number of seniors will literally double in size from 2000 to 2030 (Figure 1). In Japan, the elderly constitute over 20% of the population (the largest proportion of seniors in the world), and projections are that almost one-third of all Japanese (31.8%) will be age 65 and over by the year 2030 [29]. With such a large and growing proportion of the population, particularly in industrialized nations, it would seem that the technology revolution would have incorporated this group in terms of design, products, and even research. But this does not seem to be the case.

Many scholars have recently pointed out that there is still considerable evidence of a "digital divide" between the young and old in terms of IT adoption and use [10, 16, 17, 23, 24, 33, 34]. In two studies by McMurtrey and his colleagues [16, 17], U.S. Bureau of Labor Statistics (i.e., census data) were used to highlight gaps between the young and old in terms of Internet and computer use. Peng [23] emphasizes that studies and government statistics repeatedly show that access to computers and the Internet remains uneven. In a similar vein, Plaisant et al. [24] acknowledged that older adults are subject to the same "digital divide" accessibility as the larger population, such as differences in income and participation in the workforce. Additionally, adults are subject to age-related declines in visual and auditory sensory processes, motor skills, and cognitive abilities (p. 316). In another study from the UK, Dwivedi and Lal [8] found statistically significant differences between the age of respondents and broadband adoption. Thus, the evidence suggests that the elderly have not kept pace with the younger set in embracing the digital age, although larger percentages of older generations are online now than in the past [14].

Such a revelation does not come completely by surprise, as there are legitimate reasons why such a situation has come about. Some seniors suffer from age-related debilitations, such as declining eyesight, mobility, coordination, hand-to-eye movement, etc., that physically prevent them from utilizing IT-related devices. And most digital products are not designed with seniors in mind [17]. For instance, most technology devices employ very small plugs, wires, keyboards, interfaces, mouse, etc. that may be difficult for seniors. Most of the elderly did not grow up in the digital age and are simply unfamiliar with potential uses of IT, at best, or suffer

from cyber phobia (fear of computers) at worst. While there may be many explanations as to why this digital divide persists, there are also not many studies that have examined this phenomenon.

Additional evidence of the divide between the young and old is evident in a variety of studies from diverse disciplines. In a study from the UK, Olphert, Damodaran, and May [21] noted that while age itself is not a barrier to using digital technologies, older people tend to face other obstacles such as cost, skills, or disability. Their research suggests that many simply do not perceive the relevance of these technologies to themselves. A crucial factor appears to be a lack of awareness and understanding of the “digital world”. Similar findings were reported by Peacock and Kunemund [22], who studied the reasons for non-use and the frequency, intensity, and the socio-demographic correlates of internet use of older citizens in Europe. Agarwal, Animesh, and Prasad [1] confirmed that wealthy, young, and better educated people are more likely to be online (pp. 277-278).

Although there have been numerous studies in the area of HCI, there has been scant attention paid to the elderly in mainstream MIS research. While Czaja and Hiltz [7] highlighted the need for more investigation, few have heeded their call especially those published in top-tier MIS journals. There are a few exceptions. Lam and Lee [15] conducted a longitudinal study of internet adoption and use by older adults in Hong Kong, which is now somewhat dated in terms of data collection (2002-2003). And there have been studies that addressed the digital divide in which seniors were included, but not the focal point of the study [1].

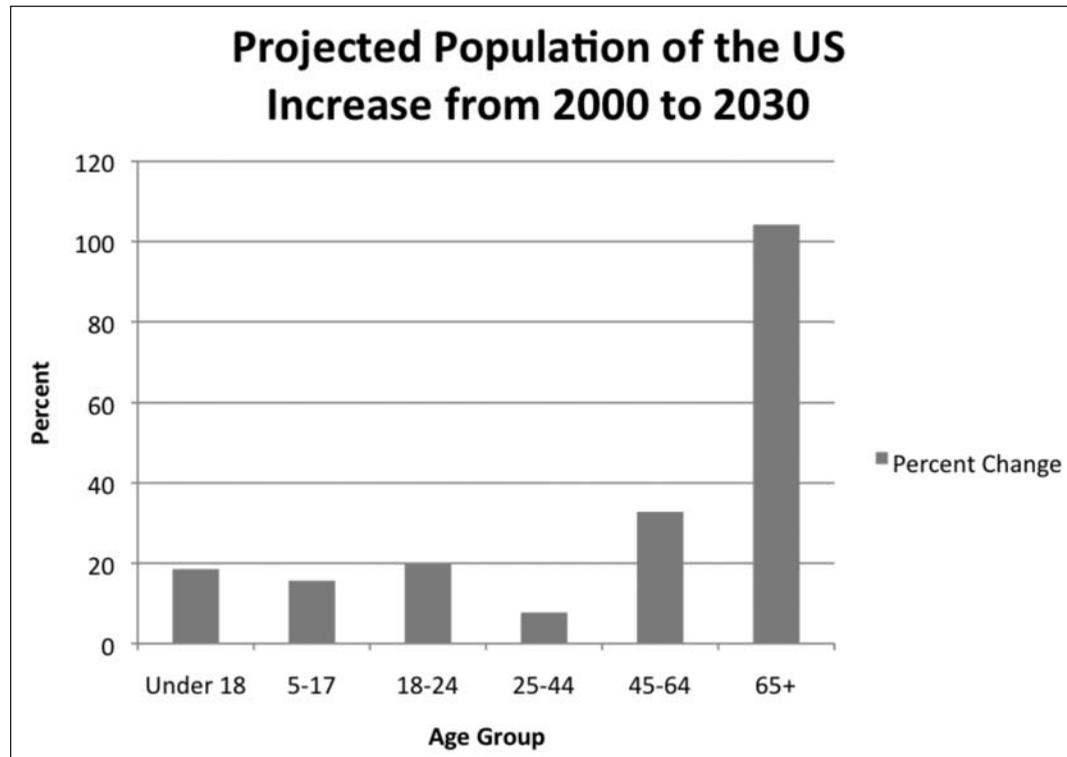
There have been two areas of research concerning seniors and technology that have been recently investigated. One area is health related and, in particular, the relationship between seniors and technology with health issues. These include topics as diverse as a multimedia computer system to support communication between caregivers and patients with dementia [2], technology and age related macular degeneration [19], and participatory

design (PD) approaches through the medium of paint [32] and pastiche scenarios and pastiche personae [4]. These latter techniques employ characters (e.g., from literature, history, and film) to create a space for the discussion of new technological developments and user experience. The second area is marketing related. There have been several studies of seniors and their buying habits, but not necessarily technology purchases [11, 13, 25].

However, there are relatively few studies in MIS concerning the elderly and technology. One potential reason is that MIS research frequently focuses on the business unit or organization, and since most of the elderly are not part of the workforce, they are not included. Another reason is the supposition that the elderly do not buy much, which limits their importance in marketing plans. There may also be an assumption that the elderly do not use much technology (i.e., the digital divide) and, therefore, it would not be useful to include them in the plethora of studies that focus on the individual in computing. We are not so sure that these assumptions are valid. How much do the elderly actually use technology? Do they buy much online? How do they perceive their technology skills? We believe that these are important questions worthy of investigation.

Figure 1 showed that seniors are vastly increasing in number; Figure 2 shows that older adults in general, from age 55 onward, have considerably more net worth than their younger counterparts. As such, it would seem intuitively obvious that this group has disposable income to spend on IT and its related wares. Yet the IT vendor community has largely ignored this group [16].

In this paper, we attempt to address some of the questions raised above and provide a baseline of technology behaviors by seniors. We are interested in those age 65 or over who are not full-time employed, since many who are in the workforce must use technology as a part of their job. Our purpose is to investigate this digital divide using “retired” seniors, to determine whether



**FIGURE 1.**  
Source: U.S. Census Bureau (2005). Population Division, Interim State Population Projections. Available at <http://www.census.gov/population/projections/52PyrmUS3.pdf> (Internet Release Date: April 21, 2005) [30].

technology is available to seniors, whether they use technology and how much, why they use it, how they use it, and what they think about their skill level. We expected to find that the divide is decreasing, that more and more seniors are entering the digital age, and that perhaps this demographic is deserving of more attention.

### 3.0 METHODOLOGY

#### 3.1 Participants

While there are many ways to gather data from seniors who are at least 65 years of age using a survey instrument, we used a direct approach in that we collected the data on site at an independent living facility in a large Midwestern city. We expected that this type of facility would provide access to a population of interest with respect to age and employment. After receiving permission from the director, one of the researchers distributed the survey to each resident's mailbox along with instructions and a stamped, addressed envelope to return it back to the researchers. We understand that selecting a single living facility negatively affects the generalizability of our results; our purpose was to gather information to set a baseline on which future studies may be compared. Still, such an approach is not unlike that employed by Campbell [5] and Smith [27] in their studies of the elderly. Convenience samples have long been used successfully in a range of research efforts in a wide variety of settings (c.f., [25], [18], [12], [3]).

A total of 287 surveys were distributed and 182 were returned by mail, for a percentage of 63.4. Of these, nine were discarded due to incomplete data, leaving a total of 173 usable responses. None had to be discarded because of age; the youngest in our sample was 67 years old. Of the 173 usable surveys, 66 were male and 101 were female (numbers do not always add to 173 because of some blank responses). The average age was 83.8 years, ranging from 67 years to 102. A majority had attended college, with 53% reporting they had at least a bachelor's degree. The vast majority of respondents were retired; only 3% were employed (a total of four). Most respondents had an income level between \$25,000

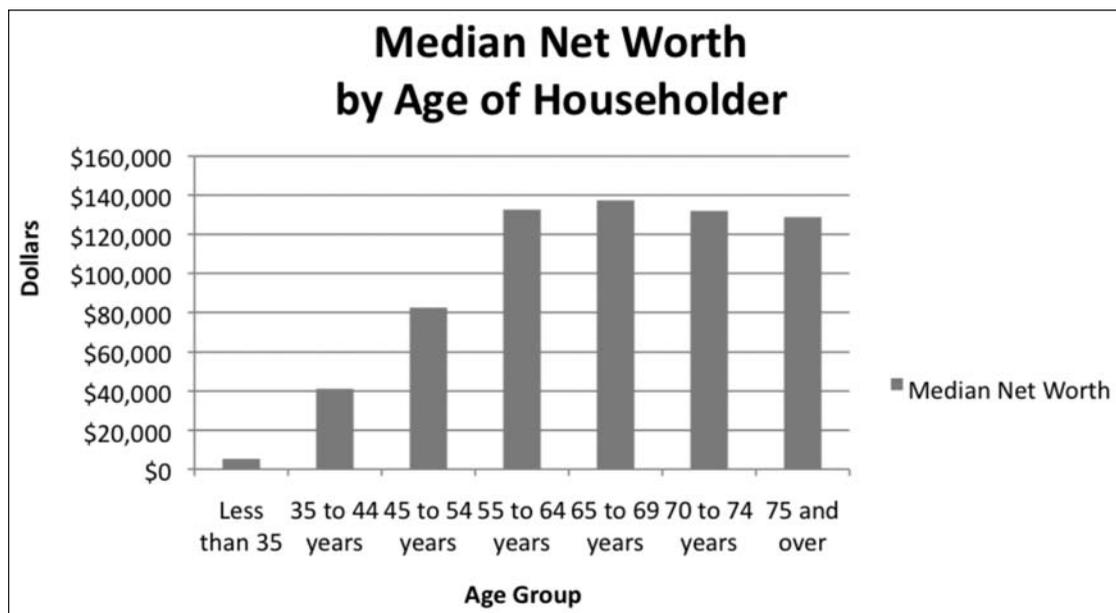
**TABLE 1. Demographic information**

<b>Age</b>	83.8 (sd = 5.7)
<b>Gender</b>	M: 66 (38%) F: 101 (58%)
<b>Education</b>	High school: 37 (21%) Some college: 42 (24%) College degree: 57 (33%) Adv. degree: 34 (20%)
<b>Income</b>	\$25,000 or less: 13 (8%) \$25,000-\$50,000: 34 (21%) \$50,000-\$75,000: 40 (25%) \$75,000-\$100,000: 31 (19%) Over \$100,000: 13 (8%)

and \$100,000, with 25% reporting a current income level between \$50,000 and \$75,000. Some of the residents owned their own transportation, some relied on living facility transportation, and some were too infirm to travel much. Demographic information is provided in Table 1.

#### 3.2 Survey

The survey used was developed using standard survey development techniques [6, 20, 28] and past instruments as a guide. Previous questionnaires were obtained from SeniorNet, the United States Census, and marketing research studies. SeniorNet is a well known advocate of IT use by senior citizens. Headquartered in San Francisco, at present it has over 200 chapters across the United States [26]. The authors are grateful to the staff at SeniorNet for providing some original questionnaires on IT use, and the results, from their studies. Earlier versions of the Current Population Survey (CPS) of the U.S. Census contained questions regarding computer and internet use that were adapted for this study. Finally, research by Reisenwitz et al. [25], Iyer and Eastman [13], and Eastman and Iyer [9] contained survey items that were utilized in the development of our research instrument.



**FIGURE 2.**

Source: U.S. Census Bureau (2008). 'Net worth and the assets of households', <http://www.census.gov/prod/2008pubs/p70-115.pdf> (Issued April, 2008) [31].

**TABLE 2. Computer Usage**

	Computers for anything	Email	Social networking	Internet (but not Email/SN)	Other than Internet
Never	49 (30%)	66 (43%)	140 (90%)	69 (45%)	84 (54%)
< Once a month	6 (4%)	4 (3%)	4 (3%)	9 (6%)	9 (6%)
Once a month	2 (1%)	3 (2%)	1 (1%)	8 (5%)	11 (7%)
Once a week	13 (8%)	8 (5%)	4 (3%)	19 (12%)	13 (8%)
Few times a week	20 (12%)	23 (15%)	2 (1%)	20 (13%)	20 (13%)
Once a day	24 (15%)	22 (14%)	4 (3%)	15 (10%)	11 (7%)
Several times a day	48 (30%)	27 (18%)	0 (0%)	15 (10%)	8 (5%)

The potential survey questions gleaned from the literature and previous instruments were refined to include those matching our research interests. A preliminary questionnaire was shared among colleagues, with some questions added, deleted, or revised. The resulting instrument was then pilot tested using a small sample of elderly computer users who provided feedback on clarity, ease of use, and objective. After incorporating these changes, the survey reached its final form.

#### 4.0 RESULTS

The survey broached a wide range of technology-related topics, but in general, covered two broad areas: computer technology and cell phones. We grouped these topics into five areas of concentration. These areas include computer availability, computer usage, perceived computer skill levels, respondents' purpose in using technology, and cell phones. It should be noted that there are some differences in results among the first four areas. For example, those that reported "never" using a computer for anything varied between 30% for computer usage to 23% for computer experience. While most percentages are similar across the areas, differences result from slightly different operationalization of constructs.

##### 4.1 Computer availability

The majority of respondents reported that they owned a desktop computer (55%), while 42% did not. In addition to desktops, 20% reported they owned a laptop. It was not clear from the survey how many owned both a desktop and a laptop, or just one or the other, but seems likely that somewhere between 60% and 70% of respondents owned a computer of some kind. On average, respondents had owned a computer 14.1 years (sd = 8.2). Of those that did not own a computer, 64% reported they had access to a computer for personal use. When accessing computers, the majority (65%) reported they used their own, but sizable minorities used common computers available for resident use (17%) or at libraries (10%). In addition, some 19% reported they used multiple ways to access computer technology (self-owned, living facility, libraries, friends, etc.).

##### 4.2 Computer usage

In the survey, computer usage was divided into four separate categories, including usage for email, social networking, Internet

use (but *not* including e-mail or social networking), and computer use *excluding* the Internet (such as word processing, spreadsheets, etc.). Additionally, a general question concerned using computers for anything. To rate usage, each of the questions had seven choices: never, less than once a month, once a month, once a week, a few times a week, once a day, and several times a day. For each of the types of usage (e-mail, etc.), more respondents reported that they never used computers than any other single frequency. For any type of computer use (the general question), 30% reported never using computers, while almost 30% (29.6%) reported using it several times a day. The majority (57%), reported using a computer at least a few times a week (or more). For e-mail usage, 43% reported they never used e-mail, followed by 18% that used it several times a day and 29% that used it either once a day or a few times a week.

One of the perhaps more surprising findings was that over 90% reported they do not use a computer for any social networking. Apparently MySpace and Facebook have not made inroads into this community. For Internet use excluding e-mail and social networking, 45% report never using it, while 26% report using it either once a week or a few times a week. Finally, over half (54%) report not using the computer for purposes not involving the Internet, such as word processing. Usage figures are presented in Table 2.

Respondents reported they had used computers approximately 13.3 years (sd = 9.1). Refining this in another question, of respondents who used computers, 33% reported using one over twenty years, 25% reported using them between ten and twenty years, and another 20% reported using them between 5 and 10 years. Only five reported using computers for less than one year. One question concerned how long a respondent had used the Internet (for those that used computers). 31% reported it was between ten and twenty years, 27% reported it was between 5 and 10 years, and 18% reported between 2 and 5 years. Almost 10% reported Internet usage less than 2 years, while 14% reported Internet usage greater than twenty years. It seems for most, that computer and Internet use was not brand new.

##### 4.3 Computer skill levels

Computer skill level was measured three ways: by self-reporting one's experience level, by reporting comfort level with computing, and by satisfaction with computing skills. All three measurements differentiated between Internet computing and computers in general (which subsumes all aspects of computing including the Internet). In addition, the experience question

**TABLE 3. Computer Experience**

	Computers for anything	Email	Social networking	Internet (but not Email/SN)	Other than Internet
Never used	36 (23%)	51 (34%)	131 (86%)	48 (31%)	62 (41%)
Others use for me	11 (7%)	5 (3%)	5 (3%)	18 (12%)	10 (7%)
Very little experience	17 (11%)	10 (7%)	11 (7%)	17 (11%)	14 (9%)
Some experience	22 (14%)	19 (13%)	5 (3%)	26 (17%)	22 (15%)
Moderate experience	55 (35%)	32 (21%)	1 (1%)	34 (22%)	27 (18%)
Quite experienced	14 (9%)	34 (23%)	0 (0%)	10 (7%)	16 (11%)
Expert	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

included other applications besides Internet and computers in general.

Respondents were asked to “rate their experience” with computers in general, e-mail, social networking, Internet (but not e-mail or social networking), and other computer applications. They could rate their experience in one of seven ways: never used (i.e., no experience), others use for me, very little experience, some experience, moderate experience, quite experienced, and expert. Interestingly, not one respondent reported being an expert in any of the domains.

For computers in general, more respondents (35%) reported moderate experience, followed by no experience (23%), some experience (14%), very little experience (11%). Only 9% reported they were quite experienced. For e-mail, 34% reported no experience, 23% were quite experienced, 21% had moderate experience, and 13% some experience. As in usage, the vast majority (86%) reported no experience in social networking. Only 7% reported very little experience, while only one reported an experience level of moderate experience (and none reported quite experienced or expert). For both Internet (but not e-mail or social networking) and other computer applications (but not Internet), the top pick was no experience (31% and 41% respectively). The next highest for both was moderate experience (22% and 18%). Experience figures are presented in Table 3.

Respondents were asked to their comfort level for both using computers and using the Internet. The choices were never used, very uncomfortable, somewhat uncomfortable, a little uncomfortable, neither comfortable nor uncomfortable, a little comfortable, somewhat comfortable, and very comfortable. The

**TABLE 4. Comfort with computing**

	Computers	Internet
Never used	48 (29%)	48 (31%)
Very uncomfortable	14 (8%)	14 (9%)
Somewhat uncomfortable	13 (8%)	14 (9%)
A little uncomfortable	15 (9%)	11 (7%)
Neither	7 (4%)	13 (8%)
A little comfortable	16 (10%)	12 (8%)
Somewhat comfortable	34 (21%)	29 (19%)
Very comfortable	18 (11%)	15 (10%)

largest number indicated they never used computers (48 for each). The next highest number for both computers and Internet was somewhat comfortable (21% and 19% respectfully). Comfort data are presented in Table 4.

The final measure of computer skill was respondent’s satisfaction with computing skills. The levels of satisfaction included don’t use, very dissatisfied, somewhat dissatisfied, neither satisfied nor dissatisfied, somewhat satisfied, and very satisfied. Like comfort, the highest response for both computing and Internet was don’t use, and the second highest was somewhat satisfied. Satisfaction with computer skills data is presented in Table 5.

#### 4.4 Purposes for computing

This section pursued the purpose for computing, that is, what respondents did when they used the computer. Respondents who reported never using a computer are excluded (typically they left this section blank). Questions revolved around two topics, both involving the Internet: what did users access, and what did they buy (e-commerce). For the first topic, one question asked respondents why they accessed the Internet in the previous year, with twenty choices (respondents could pick as many as applied). The number one reason for using the Internet was to stay in touch with family and friends (55%). Other reasons included obtaining health and medical information (36%), play games (34%), keep in touch with news and events (32%), conduct banking operations (31%), and research products (29%). Another question asked respondents to rank from 1-6 the importance of the Internet for the following activities: staying in touch with friends and family, convenient shopping, helps make purchasing decisions, keep

**TABLE 5. Satisfaction with computer skills**

	Computers	Internet
Never used	48 (29%)	48 (31%)
Don’t use	46 (30%)	48 (32%)
Very dissatisfied	14 (9%)	16 (11%)
Somewhat dissatisfied	25 (16%)	24 (16%)
Neither	14 (9%)	18 (12%)
Somewhat satisfied	35 (23%)	34 (23%)
Very satisfied	18 (12%)	11 (7%)

up with news and events, useful research tool, and opportunity to make new connections. The majority (57%) picked staying in touch with family and friends as the most important, 19% reported that the most important aspect of the Internet was using it as a research tool, and 8% reported keeping up with news was most important.

In terms of buying online, 65% of respondents reported they bought nothing online in the past year. Of the remaining 35% (which did buy online), most made between 1-5 purchases (27%), and 8% reported making between 6 and 10 purchases online. For those that bought online, the most popular product was travel related, such as plane tickets and hotel rooms (40 reported buying these online). Other items bought online included clothing/apparel (28), books or magazines (28), computer software (24), and prescription drugs (10). Despite the majority not actually buying online, many used the Internet to research products which were bought using other means. The number one researched item was travel packages (air or hotel or similar), which 39 respondents reported researching. Also included were clothing/apparel (33), autos (22), books/magazines (22), and computers and prescription drugs (12 each).

#### 4.5 Cell phones

Although the primary technology of interest was computers, we were also interested in alternate technologies, in particular smart phones. 73% of respondents reported owning a cell phone, and had used cell phones for an average of 7.9 years ( $sd = 5.5$ ). However, almost none used their cell phone to text message (only 2.5% reported texting), nor for accessing the Internet (only 3.5% reported accessing the Internet). It is unknown whether this was because the cell phones did not have the capability to text or access to the Internet, or because respondents chose not to do so. Interestingly, almost 98% reported owning a house phone (land line), which is not provided by the living facility and had to be arranged separately.

### 5.0 DISCUSSION, LIMITATIONS, AND DIRECTIONS FOR FUTURE STUDY

The purpose of this study was to discern technology behaviors among those 65 years of age and older. As the fastest growing demographic in many parts of the world today, the elderly represent a sizable proportion of the populace and one that still has monetary influence. Yet technology vendors seem to ignore this group and there seems to be a dearth of studies concerning the elderly and technology. One potential reason is that the majority of this population is not part of the workforce and mainstream research frequently centers around business organizations (and its workers). Another reason is that it may be assumed by some that this population does not have much of an impact financially (i.e., they don't spend much). But as citizens, especially in developed countries, live longer and have financial means, we believe this will change. The elderly represent a potentially significant source of consumption and influence with respect to technology, and it is hoped that this and other similar research will focus future studies concerning this population.

#### 5.1 Findings

The findings of this study provide some evidence that at least some in this population demographic are committed users

of technology, including using technology for tasks such as e-commerce. But it also shows that many have not embraced technology and remain outside this mainstream way of life. Overall our findings indicate that the digital divide is still very much evident, but that affluent seniors are using technology more than many readers might expect. This trend makes sense to us considering that, over time, more and more elderly will have had experience with technology in their younger days. In addition, affluent seniors can afford technology, and others have found that affluence is a mitigating factor with regard to the digital divide. Some of our more specific findings are summarized below.

1. **Most elderly use some technology!** Most of the elderly in our sample use some technology, and some use it in many ways. Somewhere between 55% and 70% own at least one computer, either a desktop or laptop (or perhaps both). Of those that do not own a computer, 64% reported that they had access to one. This represents a sizable portion of this particular population. Owning a computer or having access to one, of course, does not necessarily mean using one. But our usage statistics indicate that 70% of this population also uses computers (desktop or laptop). While tasks vary, 57% of the respondents use computers "several times a week" or more. This is not infrequent usage, but rather the systematic employment of technology resources. This suggests that technology is making inroads into this demographic. While our results represent only the population found in a single independent living facility, it does hint that there is some evidence that the elderly are starting to embrace technology.

2. **Internet usage is the primary motivator.** Our findings indicate that the Internet remains the primary reason that the elderly use technology, at least computer technology. Of the respondents, 52% use e-mail *at least* "once a week" (and 32% of these use it at least daily) and 56% use the Internet for purposes other than email (and social networking) at least "once a week". Compare this to the 33% that use the computer for reasons *other than the Internet* at least once a week. The Internet, therefore, seems to be the draw for using technology. The reasons given for using the Internet are what we might expect. The most important reason given was staying in touch with family and friends (85 in the sample reported this). Other top reasons: health and medical information (56), playing games (53), keeping up with news (50), banking information and tasks (48), gathering product information (45), and keeping up with investments, such as stocks (44). Perhaps the most interesting finding among these is that the third most common reason for accessing the Internet was playing online games. This would be worth pursuing for some game manufacturers and marketers; if this population likes to play online games, a whole new market may be upcoming. That said, it is possible that some were actually playing simple games on the computer hard drive, such as Solitaire, and not really going online (though the survey question did state "online games"). Still, it is worth noting that gaming was important to quite a few in this population.

3. **Social networking has not caught on.** Social networking, such as Facebook or Twitter, has obviously not attracted this population. We expected the numbers using these applications would be higher, if only to keep up with friends and family. But 90% stated they had never used social networking, and only 6% use it at least once a week. So seniors must keep up with family and friends in other ways (primarily by e-mail, it seems).

4. **Many seniors buy online (but most do not).** One of the big interests in this study was the amount of e-commerce that was conducted by seniors. Of these respondents, 35% reported buying

at least one product online in the previous year, which left 65% who reported not buying at all. However, of the 35% who did buy, many bought more than one product; indeed, 8% reported 6-10 purchases made online. About 6.5% did report that the most important thing about the Internet was “convenient shopping”, while another 6.5% rated it as the 2nd or 3rd most important aspect about the Internet. A larger percentage, however, does use the Internet to research products, including medicine (56 total reported doing this) and product information (45). But only four reported buying or selling on sites like e-Bay. Of those that do use the Internet to research product information, the most common products were travel related (39 total) and clothing/apparel (33). These findings suggest that there is a sizable minority (but no more than a third of this population) that uses technology to shop online, while the majority still does not. The reasons for not shopping online were not part of the survey, but it can be surmised that many seniors do not buy many things anyway (online or not), and some are probably physically unable to do much shopping (online or otherwise). Still, this also demonstrates that e-commerce does occur, and that a little over a third in this population conduct business online.

**5. Seniors’ skill levels are distributed bimodally.** Based on three questions (in several parts) concerning perceived skill levels, many of our seniors have little or no perceived skill, but many others have significant perceived skill. One of the questions asked respondents to rate their experience with computers in general, e-mail, social networking, Internet (but not e-mail or social networking) and computers (but not Internet). For computers in general, 40% reported their experience at no better than “very little experience” (the other two levels included in this were “never used” and “others use it for me”). For e-mail, it was 44% who had little experience (or less), for social networking it was 96%, for Internet (but not e-mail or social networking) it was 54%, and for computer applications but not Internet it was 57%. There are a lot of elderly in this sample who report little experience.

There are similar findings for the two other skill level questions. For the question asking respondents to rate comfort level in using computers, 45% reported their comfort level as “never used”, “very uncomfortable”, or “somewhat uncomfortable” for using computers in general. For using the Internet, the percentage was 49%. One question asked respondents their satisfaction with their current skill level for both computers in general and the Internet. For computers, 56% reported low satisfaction (either “don’t use”, “very dissatisfied”, or “somewhat dissatisfied”). For the Internet, the percentage was 58%. Overall, about half of our sample believed they had little or no experience, were not comfortable with technology, and were not satisfied with their skill level. This is a sizable proportion and seems reminiscent of the end-user perceptions with computers back in the early 1980s.

On the other hand, there are many in our sample who perceive that their technology skills are quite adequate. In the questions rating their experience level, 45% reported “moderately experienced” or “quite experienced” for computers in general. For e-mail, the percentage was 44%; for social networking it was less than 1%. For the last two applications, Internet (but not e-mail or social networking), the percentage was 29% and for computer applications (but not the Internet), it was 28%. Interestingly, not one person placed themselves in the highest category, rating their experience level as “expert”. In asking about comfort level for computers in general, 32% reported they were either “very comfortable” or “somewhat comfortable” (the two highest comfort levels). For Internet comfort, 28% reported the

same. Finally, in terms of satisfaction with skill level, 35% were either “very satisfied” or “somewhat satisfied” (the two highest satisfaction levels) with their skills for computers in general; for the Internet the percentage was 30%.

Overall, we found a sizable minority in our sample who were comfortable and mostly satisfied with their computing skills. This is an increase from a previous study of six years ago (Eastman and Iyer, 2004), where 20% were “very dissatisfied” with their skill level (compared to 15% in this study) and only 5.5% were “very satisfied” (compared to our 11%). This suggests that technology is making its way to more of the senior population.

**6. Cell phones are not smart phones.** While a sizable proportion of the sample reported owning a cell phone (73%), there were very few who used it to text message (2.5%) or used it for Internet purposes (3.5%). As mentioned, we do not know how many phones had the capability to text or connect to the Internet, to determine whether seniors had smart phones and didn’t use the technology or whether they didn’t have them. But clearly this is one area where senior citizens are well behind the populace in having and using a technology.

These findings suggest that almost half the seniors are enjoying the benefits of many aspects of technology, and yet half are not using technology much at all. For those that use technology, most are not newcomers and have used it for many years. It does appear that for this group of seniors, almost all had access to technology, at least in the form of computing and technology. This sample could be subdivided into two groups of almost equal size: those that use and enjoy technology, and those who do not. Those that do not seem like the prototypical “digital divide” individuals: they don’t care to use computing much at all. But the other (almost) half seems content with their usage, comfort, and skills and partakes in the benefits of the technologies.

## 5.2 Limitations

There were some obvious limitations to this study. Because we only sampled a single independent living facility, we really cannot generalize to any other population of elderly. Our goal is for this paper to act as a baseline of sorts, in the hopes that others will do similar studies and gain some consensus as to the impact of technology on the elderly. Another limitation is that all of the information was self-reported. While some data must be self-reported (attitudes and perceptions, for example), other data are more meaningful if gathered objectively. In this survey, that includes usage information and number of online purchases. Had we access to hard data like this, we would surely have used it; as it is, we report it as a limitation. This study only looked at some initial technology behaviors, such as usage, perceived skill level, and e-commerce reports. But there are many other individual characteristics that impact technology behaviors that were not included, such as attitudes toward computing (e.g., positive affect, anxiety, perceived usefulness, among many others), computer self-efficacy, and outcome expectations. In this survey we actually gathered some additional information (but space considerations prevent coverage), but there are clearly other factors that impact subsequent behaviors such as computer usage.

## 5.3 Areas of future study and conclusion

There are a number of important avenues for future research. We believe the most important is to generalize these findings to other locations and populations (of seniors). This is important

not only in the U.S., but in other industrialized nations as well. In fact, a cross-cultural study would be valuable in comparing seniors across many areas. For instance, Japan is experiencing phenomenal growth among its elderly population (Yamauchi et al., 2008) and has similar, as well as its own unique, issues it must address in order to collapse the digital divide. A comparative study might reveal cultural differences in addition to common demographic concerns. Another important area is broadening the factors examined, to include not just usage and skill behaviors, but also attitudes and other constructs important in IT adoption and use. A longitudinal study would be extremely valuable in discovering the rate of change of technology adoption by seniors.

As personal computing enters its fourth decade, we pause to consider how pervasive technology has become in industrialized countries and for most of their citizens. But not all are yet able to employ technology. While this study indicates that the digital divide between users and non-users of technology with respect to seniors may be diminishing, it appears that there is a sizable number of seniors who are physically able to employ technology, but do not. These seniors will need encouragement, training, and understanding in order to adopt technology, and we believe that highlighting the progress made by their counterparts (other seniors) will motivate technology decision makers, from designers, marketing personnel, and even researchers, to start the process of engaging all seniors who are capable. This is important not just to enhance the quality of life for seniors (even if only to stay in touch with friends and family), but because we believe that there is an untapped e-commerce potential from seniors that has not yet been exploited. We hope that this paper provides a baseline for others and ignites more research into this important topic.

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# USER'S WILLINGNESS TO PAY ON SOCIAL NETWORK SITES

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## ABSTRACT

A user's willingness to pay (WTP) on social network site (SNS) has received a great deal of attentions from academics and practitioners. The current study separates the willingness into WTP for SNS and WTP other members of SNS, and introduce a new research model to study the antecedent factors of and their influence on the two types of willingness. We find that the user's trust generated from social activities can be transferred to their trust in business transactions on SNSs, thereby influencing the willingness to pay. The user's perceived playfulness and perceived value of online connections have significant positive effects on their WTP other members of SNSs. This research contributes several new findings to SNS commercialization research, and provides multiple constructive implications to SNS and e-commerce site managers.

**Keywords:** willingness to pay, social network site, social e-commerce, economic value of social network sites

## 1. INTRODUCTION

Social network sites (SNSs) have achieved several remarkable successes in recent years. In the U.S., the number of SNS users reached 80 million in 2009 and continues growing rapidly. The advertising revenues of U.S. based SNSs are expected to reach \$1420 million by 2011, and grow to \$2.4 billion by 2013 [34]. Facing a bright future, SNS managers also recognized that the over dependence on advertising sales could be a potential obstacle for the sustainable development [20]. To broaden the revenue sources, major SNSs continuously provide new service, such as SNS games, virtual property shopping, etc., in the hope of obtaining profits from individuals' payment. However, SNS users are willing to use, but appear reluctant to pay for the service [14]. The factors that could significantly increase the user's willingness to pay (WTP) for SNSs become the most valuable and desirable information to the SNS managers [53].

The user's consumption intention on SNSs has received a great deal of attentions from e-commerce and marketing researchers as well, since the new social media are considered the foundation of an emerging consumer-to-consumer (C2C) e-marketplace where sellers can use SNS web pages and applications to display and sell products to their contacts on the social network site [49]. Some research suggests that the interpersonal trust created by online social communications will make the C2C e-transactions more effective [14] [28]. The argument partially explains why SNS users are willing to pay other members from a buyer's perspective, but neglects the effects of several other critical factors on the user's behavioral intention on SNSs. To fill the

research gap, we introduce a new theoretical model to further study how the user's psychological factors generated from online social activities influence their WTP other members of SNSs. In addition, we seek to answer whether or not there are possible relationships between these factors and the user's WTP for SNSs. We suggest that the current study will not only contribute new findings to SNS commercialization research, but also will provide multiple constructive implications to SNS and e-commerce site managers.

The remainder of this paper is organized in the following manner. The paper begins with the discussion of existing research perspectives on the user's behavioral motivation on SNSs in literature review. Consequently, we develop a new research model by integrating trust and perceived playfulness with the value based theory of the user's WTP for SNSs [33] [34]. In the fourth section, we present the methodology used for data collection. Data analyses, research findings, contributions and limitations will be discussed in the last three sections.

## 2. LITERATURE REVIEW

Prior studies suggest that current SNSs include utilitarian SNSs and hedonic SNSs [46] [52]. Utilitarian SNSs refer to the web service that aims to provide instrumental value to the users. Hedonic SNSs refer to the web service that aims to provide self-fulfilling value to the users. In the current study, we focus on the user's WTP on hedonic SNSs which take the dominant position in the SNS market [40].

To investigate the user's WTP on SNSs, researchers need to primarily understand the user's behavioral motivation on SNSs [33]. We suggest two perspectives are extensively adopted by academics, including: hedonic use perspective and social capital based view.

### 2.1 Hedonic Use Perspective

Van der Heijden [52] argues that the user's behavioral motivation includes extrinsic and intrinsic motivation. An extrinsically motivated user is driven by the expectation of certain reward or benefit external to the system-user interaction. An intrinsically motivated user is driven by benefits derived from the interaction with the system or other users in the system. In a hedonic system, the user's perceived playfulness, one of the most important intrinsic motivation, is a strong predictor of their behavioral intention [52], such as intention to adopt the system [30], and WTP for using the system [12]. The evidences have been found in several hedonic information systems, including online video game (OVG) systems [32] and mobile service

systems [26]. In SNS research, multiple studies have supported the relationship as well [46] [48]. Sledgianowski and Kulviwat [48] find that perceived playfulness has a significant positive effect on the user's intention to adopt and their actual use of SNSs. Rosen and Sherman [46] propose that researchers should investigate the user's perception of "computer playfulness" and "perceived enjoyment" before measuring the user's "behavioral intentions" on SNSs.

Although perceived playfulness appears to be a determinant factor of all user's behaviors on SNSs, and several case studies have shown that pursuing intrinsic enjoyment indeed holds a large amount of user's time on hedonic SNSs [6], little knowledge has been discovered of the relationship between the user's perceived playfulness and their WTP on SNSs. Therefore, we raise first research question (RQ):

*RQ 1: Could the user's perceived playfulness influence their WTP on SNSs (i.e., WTP for SNSs and WTP other members of SNSs)?*

## 2.2 Social Capital Based View

Social capital based view (SCV) is another mainstream perspective in SNS research. The SCV holds that the user's expectation and assessment of obtaining social capital, which specifically refers to the social network broadening and informative gains in SNS research [19], would not only influence the user to adopt SNSs [47] [48], but also would motivate him or her to consume other resources (e.g., time, money) to sustain online connections on SNSs [34] [53].

We suggest the SCV studies can be further separated into static SCV and dynamic SCV according to their epistemologies. The former collection of studies emphasize on identifying the user's purposes of using SNSs by statistically surveying groups of users. Prior study [19] finds that the motivations include: (1) Bridging social capital. The users could create new relationships with other persons on SNSs. The connections are considered *weak ties*, which could provide useful information or new perspectives for one another but typically not emotional support. (2) Bonding social capital. SNS users could use the websites to strengthen their *strong ties* with their family and offline social network. Currently, bridging social capital is the primary motivation for people to use SNSs [19].

The dynamic SCV research argues that the user's perception of social capital gains would change over time with their use of SNSs and interpersonal information exchanges [20]. The collection of studies provide additional insights into the determinant factors of the user's perception of social capital gains in different stages: (1) In the user's pre-adoptive and early adoptive stage of SNSs, the user's perceived critical mass is identified as a factor which could strongly influences the user's behavioral intentions on SNSs [53]. The user's expected number of possible relationships created on SNSs has a significant positive effect on the user's adoption of SNSs [48]; (2) Subsequently, the user would differentiate the intimacy with his or her SNS contacts according to the volume and frequency of interpersonal information exchange on the website [20] [28]. In the post-adoptive stage, the user's perceived value of online connections with other members usually determines the user's behavioral intention on SNSs [20]. Since the research context in the current study is circumscribed as the user's post-adoptive stage of SNSs, we are inclined to assume that the user's perceived value of online connections would determine the user's

consumption intention on SNSs. Several research has found that the user's perceived value has a significant positive effect on the user's WTP for SNSs [33] [34]. However, the relationship between the user's perceived value and their WTP the individuals within the online social networks remains unknown. In this research, we seek to answer the following two questions:

*RQ 2: Could the user's perceived value of online connections influence their WTP other members of SNSs when the possibility of C2C e-commerce is seen?*

*RQ 3: Since perceived playfulness plays an important role on hedonic SNSs, could this factor influence the user's perceived value of the online connections on SNSs?*

## 2.3 Trust in Web 2.0

The concept of Web 2.0 gains tremendous popularity after it was proposed by O'Reilly in 2005. Högg et al. [27] argue that Web 2.0 eliminates the entry barriers for websites and individual users to contribute contents in online communities, which proliferates the information on the Internet. On the other hand, Web 2.0 brings an issue of credibility and reliability of information [27]. Thus, the user's trust is identified as a fundamental success factor of Web 2.0 applications, such as SNSs, collaborative C2C e-shopping, etc. [28].

On SNSs, users have two major concerns when sharing privacy information, including: the information is exposed to unauthorized users, and the information fails to reach authorized users [8]. Therefore, the user's perception of that effective mechanisms are in place to assure SNS services will behave in a manner consistent with the user's favorable expectations [22]. The institutional trust will influence the user's intention and their actual behaviors [8]. Dwyer et al. [18] briefly separate the user's trust on a SNS into trust in the social network site and trust in other members of the social network site. The authors [18] find that users perceive Facebook has made more effort in providing protection for the member's privacy information than MySpace. Thus, Facebook users would reveal more privacy information (e.g., real name, email address, cell phone number, etc.) to other members than MySpace users. Extending the research [18], we raise a new question:

*RQ 4: Could the user's trust in the social network site influence their WTP for the SNS?*

Ba and Pavlou [3] argue that the interpersonal trust on the Internet generally comes from credibility and benevolence. Credibility refers to a person's belief that the other party is honest, reliable, and competent [17]. Benevolence refers to a person's belief that other persons are genuinely interested in the other partner's welfare and have intention and motives beneficial to the other party even under adverse conditions for which a commitment was not made [3][11][55]. Benevolence is based on familiarity and prior interactions, which can be found in interpersonal communications on SNSs [19]. Different from buyer's behavioral intention in C2C e-commerce, which heavily relies on the seller's credibility [3], SNS user's behavioral intention (e.g. willingness to share privacy information with others, WTP on SNS, etc.) could be influenced by both credibility and benevolence. In this study, the following research questions are raised:

RQ 5: Could the interpersonal credibility and benevolence influence the user's WTP other members of SNSs?

RQ 6: Could the interpersonal trust influence the user's perceived value of online connections?

RQ7: Since the user's adoption of SNSs and creation of online connections with new contacts occur in sequence, could the user's trust in SNS influence their trust in other members of SNS?

### 3. RESEARCH MODEL

Lopes and Galleta [33] argue that a user's expected benefit from a website is the motivation of the user's WTP for the web service. Lu and Hsiao [34] argue that the user's expected benefit can be measured by his or her perceived value, which includes emotional value, social value, price/value for money, performance/quality value. The four dimensional perceived value has a significant positive effect on the user's intention to pay subscription fees for using SNSs.

Extending the two value based theories of the user's WTP for SNSs, we propose a new research model, as shown in Figure 1.

#### 3.1 Willingness to Pay on SNSs

According to Ajzen and Fishbein [1], a person's willingness to perform (or not perform) a behavior is the immediate determinant of the person's actual behavior. Further understanding the user's WTP on SNSs will provide a solid theoretical foundation for future research on the user's actual payment on SNSs. We define WTP on SNSs as the degree to which a user intends to consume and pay money on SNSs. This generic construct includes: (1) WTP for SNS, which is defined as the degree to which a user intends to spend money on using a SNS and other services (e.g., SNS games) provided by the website; (2) WTP other members of SNS, which is defined as the degree to which a user intends to purchase products from online contacts on a SNS, when the possibility of C2C e-commerce is seen. The "other members" refer to a user's SNS contacts whom the user may have never met face-to-face. The user's WTP other members of SNS is defined

**TABLE 1: Key Features of WTP for SNS and WTP other members of SNS**

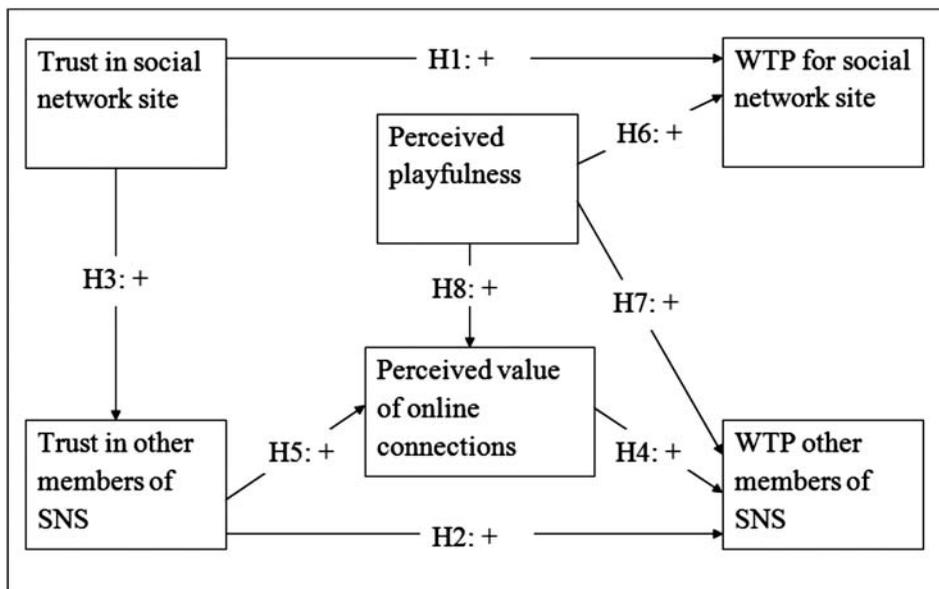
<p><b>WTP for SNS</b></p> <p>The construct is similar to the customer's intention to buy in B2C e-shopping research: (1) The payment flows from an individual to a business based website. (2) Instead of purchasing products, users are actually paying for the service provided by SNSs.</p>
<p><b>WTP other members of SNS</b></p> <p>The construct is similar to the customer's intentions to buy in C2C e-shopping research: (1) The possible e-transaction occurs between two individuals. (2) The SNS user and his or her contacts could have had information exchange for certain times before the e-transaction is initiated. Therefore, the user could have created certain degree of trust to the online contact. The transaction becomes an online equivalence to offline direct selling.</p>

on the assumption that, the user's perception of other members' primary purposes is to create social connections rather than having business relationship with him or her. The possibility of C2C e-commerce is generated when the other members attempt to sell products to the user.

Although WTP for SNS and WTP other members of SNS both refer to the degree of user's intention to pay, each construct has its own specific features, as shown in Table 1.

#### 3.2 Trust

In the current study, the user's trust in SNS is defined as the degree to which a person believes the SNS is willing to implement its promises declared to its members. The user's trust in other members of SNS is defined as the degree to which a person believes his or her contacts on the SNS are benevolent (e.g. willing to provide social support to others), honest (e.g. share real information with others) and reliable (e.g. implement promises to



**FIGURE 1: Trust Based Research Model of the User's WTP on SNSs**

others). According to the research on halo effect [41], a person's perception of central traits of an object or another person could significantly influence the person's perception of other traits of the object and the other person. Applying the logic to the current research, we suggest that the user's trust generated from social interactions, which is the user's fundamental belief on SNSs [19] [28], could significantly influence his or her belief toward potential business activities on SNSs. When a user perceives that the website or other member is attempting to sell service or products to him or her, the user could form the subjective assessment of the sellers, service quality and product quality by measuring the seller's credibility and benevolence from prior social interactions on SNSs, thereby adjusting his or her WTP. The more trust the user has, the more likely he or she would pay for the service or products. To answer RQ4 and RQ5, we introduce the following hypotheses according to the foregoing discussion:

*H1: The user's trust in SNS has a significant positive effect on the user's WTP for SNS.*

*H2: The user's trust in other members of SNS has a significant positive effect on the user's WTP the other members when the possibility of C2C e-commerce is seen.*

Lim et al. [31] argue that trust is transferable and the process occurs when the trust that a person has in a known entity is shifted to another relatively unknown entity by virtue of their association with one another. Yang et al. [55] find that, when the buyer is unsure about the post-purchase outcome in an online shopping, he or she could build the trust in the transaction result by referring to the trust generated from the information, such as the ethical performance of the vendor. We suggest the user's trust transference exists on SNSs as well. When a user becomes familiar to the social network site, but is not familiar with other members of the website, his or her trust in the website could be transferred to the trust in other members. According to Dwyer et al. [18], the more a user trusts the SNS, the more likely he or she will reveal privacy information to other members of the website. The following hypothesis will be tested to answer RQ7:

*H3: The user's trust in SNS has a significant positive effect on the user's trust in other members of SNS.*

### 3.3 Perceived Value of Online Connections

The perceived value of online connections is defined as the user's perceived weight of online connections with other members on his or her social gains. The online connections refer to the social relationships among SNS users. According to the definition, the online connections have two specific characteristics:

First, online connections are different from friendships. Price and Arnould [43] identify that friendship has four key features, including: (1) intimate self-disclosure, (2) voluntary social interaction, (3) motivated by a communal orientation, and (4) expectation for an exclusively intrinsic orientation. Compared to friendship, the online connection requires a lower degree of emotional involvement [19]. Secondly, business relationships could conflict in the user's primary expectations of online connections. When the conflict exists, a user could pay his or her contacts for

two possible reasons: (1) The user may believe the future social gains from the online connections are greater than the costs of weathering continued relational conflict. (2) The user may believe the costs of ending the online connections could be worse than the costs of remaining in it [23] [25]. The user's subjective assessment of online connections appears to have a positive relationship with WTP other members of SNSs. We introduce the following hypothesis in order to answer RQ2:

*H4: The user's perceived value of online connections has a significant positive effect on the user's WTP other members of SNS.*

The nature of online interaction requires interpersonal trust as the premise for successful communications [45]. Enders et al. [20] argue that interpersonal trust is constantly the foundation of the user's subjective assessment of whether or not to sustain the online connections with other persons on SNSs. Isafas et al. [28] argue that the user's trust in other members could increase the frequency and volume of information shared among users on SNSs, thereby improving the user's social gains from the connections. The following hypothesis will be tested to answer RQ6:

*H5: The user's trust in other members of SNS has a significant positive effect on the user's perceived value of online connections.*

### 3.4 Perceived Playfulness

Perceived playfulness refers to the degree to which a user believes that using a social network site to communicate with other members will bring him/her a sense of enjoyment and pleasure. Moon and Kim [39] argue that the user's perceived playfulness or enjoyment comes from the person's interaction with environmental factors. Prior research has shown that perceived playfulness could influence system user's intention to use and the actual use of SNSs [48]. However, the relationship between perceived playfulness and the user's WTP for the systems or the contents on the Internet may change according to the specific contexts. For instance, Chu and Lu [12] argue that the user's perceived playfulness has a significant positive effect on user's intention to buy in an online music store. Yet, Cha [7] finds that perceived playfulness has no significant effect on the user's intention to buy "virtual items" on SNSs. In the current research, we assume that the more playfulness a SNS user perceives, the more likely he or she is willing to pay on SNSs. The following two hypotheses will be tested to answer RQ1:

*H6: The user's perceived playfulness has a significant positive effect on the user's WTP for SNS.*

*H7: The user's perceived playfulness has a significant positive effect on the user's WTP other members of SNS.*

Arai and Pedlar [2] argue that a person's perceived playfulness could increase the person's engagement in social events, thereby increasing the person's perceptions of social gains. In the research of computer mediated communications, Conrad [15] finds that the student's enjoyment of online learning system could significantly

increase his or her involvement in the class, and increase the satisfaction toward the class contents and the instructor. The user's perceived playfulness obtained from interactions with other members of SNSs is likely to increase the user's willingness to share and exchange information with other members, thereby increase the user's perceived value of the online connections [39]. Therefore, we propose the following hypothesis in order to answer RQ3:

*H8: The user's perceived playfulness has a significant positive effect on the user's perceived value of online connections.*

#### 4. METHODOLOGY

We used a survey instrument to collect data from undergraduate students in a southwestern U.S. university. The subjects were all hedonic SNS users, and their ages ranged from 18 to 28 years old. Most SNS users are currently in this age interval [47]. Thus, the group of subjects represented a typical sample of the current SNS users. A total of 202 subjects were recruited to take the survey.

We went through the responses, and excluded 9 incomplete responses from data analyses. The number of usable responses was 193, or approximately 96% usable response rate. The subjects' background information is shown in Table 2.

The questionnaire items used for data collection are listed in Table 3. Each item was rated on a Likert scale of 1 = Strongly Agree to 5 = Strongly Disagree.

## 5. DATA ANALYSES

To test the proposed research model, we use Partial Least Squares (PLS) to conduct data analyses for measurement and structural models. Handling both formative and reflective indicators PLS can be used not only for theory confirmation, but also for suggesting where relationships might or might not exist as well as for suggesting propositions for later testing [29].

### 5.1 Content Validity

To ensure the content validity of questionnaire items, we conducted a thorough literature review of the relevant subjects. Subsequently, the questionnaire was pilot tested by 32 doctoral students from a broad range of research disciplines, including information systems, marketing, and psychology. The pilot test respondents were excluded from the sample used for data analyses.

### 5.2 Reliability

The assessment of the measurement model includes the estimation of internal consistency for reliability and tests of convergent and discriminant validity for construct validity [10] [29]. Cronbach's alpha and Fornell's composite reliability are calculated to test the internal consistency. As a rule of thumb, Cronbach reliability coefficients require 0.70 or higher [24], and composite reliability should be greater than 0.7 to be considered adequate [21]. The calculated values of Cronbach's alpha and

TABLE 2: Subjects' Background Information

Item	Category	Frequency	Percentage	Mean	S.D.
Age	-	-	-	23.02	2.89
Gender	Male	92	48%	-	-
	Female	101	52%	-	-
Current Education Level	Freshman	21	11%	-	-
	Sophomore	56	29%	-	-
	Junior	77	40%	-	-
	Senior	39	20%	-	-
Estimated Yearly Income	Less than \$10,000	67	35%	-	-
	\$10,000 - 15,000	54	28%	-	-
	\$15,000-20,000	29	15%	-	-
	\$20,000-25,000	20	10%	-	-
	More than \$25,000	23	12%	-	-
Years of using SNSs	More than 5 years	23	12%	-	-
	2 ~ 5 years	60	31%	-	-
	Less than 2 years	110	57%	-	-
Average Time spent on SNSs each day	More than 2 hours	20	10%	-	-
	1.5-2 hours	39	20%	-	-
	1-1.5 hours	33	17%	-	-
	30 minutes - 1 hour	44	23%	-	-
	Less than 30 minutes	57	30%	-	-

composite reliability are shown in Table 4. All calculated Cronbach's alpha and composite reliability are greater than 0.7, indicating adequate internal consistency. All Average Variance Extracted (AVE) values of constructs are greater than 0.60, indicating that more than 60% of the variance of the measurement items can be accounted for by the constructs [29].

### 5.3 Construct Validity

Construct validity can be examined by assessing convergent validity and discriminant validity [9]. Convergent validity is measured by item loading. The coefficient is considered acceptable when it is greater than 0.5 [54]. The calculated coefficients of factor loading are shown in Table 3. All calculated values are greater than 0.5, indicating the convergent validity among variables. We use the average variance extracted (AVE) to evaluate discriminant validity. The AVE from the construct should be higher than the variance shared between the construct and other variable in the model [29]. As Table 5 shows, the square roots of each AVE value are greater than the off-diagonal elements, indicating discriminant validity among variables.

### 5.4 Common Method Variance

The extent of common method bias was first assessed with Harman's one-factor test by entering all the principal constructs into a principal components factor analysis [42]. In this analysis, each principal construct explains roughly equal variance (ranging from 8% to 21% as shown in Table 3), indicating no substantial common method bias. In addition, common method bias usually results in extremely high correlations between two constructs (correlation coefficient  $r > 0.90$ ) [4]. However, as shown in Table 5, the absence of the high correlations also supports that the common method bias does not account for the study's results.

### 5.5 Structural Model Assessment

We use path coefficient and  $R^2$  to assess the structural model and path coefficient. Both path coefficient and  $R^2$  indicate model fit, e.g., how well the model is performing [29]. The

**TABLE 3: List of Questionnaire Items by Constructs**

Items	Factor Loading*
<b>Trust in social network site</b>	
<i>New Item</i>	
I believe SNSs have my information safety in minds.	1.069
SNSs give me an impression that they keep my privacy information safe.	0.880
I think SNSs make effort in implementing its promise to me.	0.829
SNSs (such as Facebook, MySpace) are trustworthy.	0.544
<i>Variance Explained</i>	
0.08	
<b>Trust in other members of SNS</b>	
<i>New Item</i>	
I feel my friends on SNSs are generally frank.	0.941
I feel my friends on SNSs are generally reliable.	0.896
Overall, my friends on SNSs are trustworthy.	0.825
I trust my friends on SNSs and share my status, pictures with them.	0.706
<i>Variance Explained</i>	
0.10	
<b>Perceived playfulness</b>	
<i>Adapted from Chung and Tan [13]</i>	
I feel pleased to meet new friends on SNSs.	0.881
Overall, I think SNSs bring lots of fun.	0.869
Social network sites are interesting.	0.801
I feel pleased to chat with my friends on SNSs.	0.763
I feel pleased to play games on SNSs.	0.690
I'm happy to keep in touch with friends on SNSs.	0.666
<i>Variance Explained</i>	
0.12	
<b>Perceived value of online connections</b>	
<i>Adapted from Lu and Hsiao [34]</i>	
I like to be close friend to my friends on SNSs.	0.995
My social network on SNSs is a valuable resource to me.	0.906
I would like to share my recent status with my friends on SNSs.	0.877
It's important to keep in touch with my friends on SNSs.	0.838
Overall, I think my friends on SNSs are important to me.	0.719
<i>Variance Explained</i>	
0.13	
<b>Willingness to pay for SNS</b>	
<i>Adapted from Lu and Hsiao [34]</i>	
I am likely to pay for service fees to have SNSs help me find new friends.	0.977
I am likely to pay for memberships on multiple SNSs.	0.971
I am likely to pay for the games on SNSs if they start charging fees.	0.946
I am likely to pay for membership renewal on SNSs.	0.926
I am likely to pay for fees to have speed dating on SNSs.	0.914
I am likely to pay for mobile service fees on SNSs.	0.913
I am likely to pay for the membership if SNSs start charging fees.	0.852
<i>Variance Explained</i>	
0.21	
<b>Willingness to pay other members of SNS</b>	
<i>Adapted from Kim et al. [29]</i>	
I am likely to make another purchase from my friends of SNSs if I need the products.	0.937
I am likely to recommend products sold by my friends of SNSs to other friends.	0.907
I am likely to donate for charity, if my friends of SNSs organize ones.	0.895
I am likely to buy the products from my friends of SNSs in priority, if I have multiple options.	0.870
I am likely to donate for charity organized by my friends of SNSs in priority, if I have multiple options.	0.857
<i>Variance Explained</i>	
0.12	

\* *Oblique rotation is employed, and loadings may be higher than 1 in some cases [44].*

**TABLE 4: Descriptive Statistics and Construct Reliability**

Construct*	Mean	Standard Deviation	Cronbach's Alpha	Composite Reliability	AVE
TSNS	2.869	1.192	0.856	0.903	0.700
TMEM	2.461	0.819	0.864	0.907	0.711
PLAY	2.104	0.982	0.866	0.901	0.606
PVNC	2.471	1.164	0.918	0.939	0.754
WTPW	4.092	1.768	0.973	0.978	0.863
WTPM	3.210	1.781	0.937	0.952	0.798

\* TSNS = Trust in SNS; TMEM = Trust in other members of SNS; PLAY = Perceived playfulness; PVNC = Perceived value of online connections; WTPW = Willingness to pay for SNS; WTPM = Willingness to pay other members of SNS

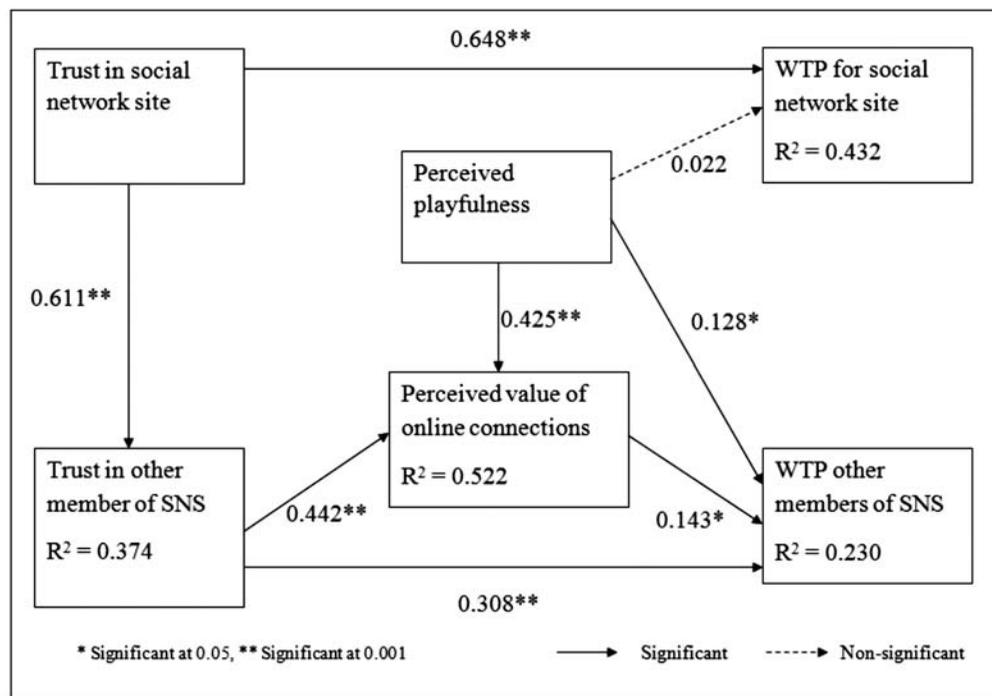
**TABLE 5: Correlations of Latent Variables**

Correlations of Latent Variables*						
	TSNS	TMEM	PLAY	PVNC	WTPW	WTPM
TSNS	<b>0.837</b>					
TMEM	0.603	<b>0.843</b>				
PLAY	0.273	0.401	<b>0.779</b>			
PVNC	0.516	0.601	0.555	<b>0.868</b>		
WTPW	0.532	0.250	0.124	0.225	<b>0.929</b>	
WTPM	0.522	0.350	0.272	0.284	0.639	<b>0.893</b>

\* All correlations are significant at the level of 0.001

**TABLE 6: Hypothesis Test**

Hypothesis	Path Coefficient $\beta$	p-value	Supported?
H1	0.648	< 0.001	Yes
H2	0.308	< 0.001	Yes
H3	0.611	< 0.001	Yes
H4	0.143	< 0.05	Yes
H5	0.442	< 0.001	Yes
H6	0.022	> 0.05	No
H7	0.128	< 0.05	Yes
H8	0.425	< 0.001	Yes



**FIGURE 2: Results of Structural Model**

structural model test results are shown in Figure 2. The test results of hypotheses are listed in Table 6.

The  $R^2$  for the user's trust in other members of SNS, perceived value of online connections, WTP for SNS and WTP other members of SNS are 0.374, 0.522, 0.432 and 0.230, indicating the model provides sufficient explanations of the variance in the constructs [50].

## 6. DISCUSSION

The results of data analyses support the following answers to the research questions: (1) For RQ1, we find that the user's perceived playfulness has a significant positive effect on the user's WTP other members of SNS. However, it has no significant effect on the user's WTP for SNS; (2) For RQ2, we find that the user's perceived value of online connections has a significant positive effect on their WTP other members of SNS; (3) For RQ3, we find that the user's perceived playfulness has a significant positive effect on the user's perceived value of the online connections on SNSs; (4) For RQ4, we find that the user's trust in SNS has a significant positive effect on the user's WTP for the website; (5) For RQ5, we find that the user's trust in other members of SNS has a significant positive effect on their WTP the other members when the possibility of C2C e-commerce is seen; (6) For RQ6, we find that the user's trust in other members of SNS has a significant positive effect on the user's perceived value of online connections. In addition, we extend the study of the user's trust on SNSs [18], and find that the user's trust in SNS has a significant positive effect on the user's trust in other members of SNS. The findings provide following contributions to the theoretical research.

### 6.1 Contributions to IS research

First, the research model draws a conceptual map which integrates trust with several propositions of business models for SNSs [20] [27] [28]. We find the user's trust influences the user's WTP on SNSs in the following ways:

(1) The user's trust directly influences their WTP on SNSs. In conceptual level, McKnight et al. [37] [38] argue that trust includes two aspects: trusting belief, which refers to a person's subjective assessment, and trusting intentions, which refer to a person's willingness to be vulnerable to the other person's actions [35]. Researchers from both e-commerce area and social network site area have conducted a variety of trust based studies to support the significant influence of trust on user's behavioral intentions. However, the e-commerce research generally focuses on the influences of the user's trusting belief [3] [29], while the SNS research focuses on the influences of the user's trusting intentions [18]. We suggest the static research perspective of trust is inapplicable to the study of the user's WTP on SNSs, since the SNS based e-commerce activities integrate business transactions with social interactions. Therefore, the user's trust building is a dynamically forming process. The user's trust generated from social activities could be transferred to their trust in business activities, thereby influencing his or her WTP on SNSs. The results of data analyses strongly support this point of view.

(2) The user's trust indirectly influences the user's WTP on SNSs. Enders et al. [20] propose a long tail

business model of SNSs, which suggests that the number of frequent contacts that a user has on SNSs will decrease over time. However, the intensity of information exchange with the frequent contacts will increase correspondingly. The user's perceived value of online connections with other members may vary according to the frequency and volume of information exchanged. Our research model extends this proposition, and finds that the user's trust could also significantly influence the user's perceived value of online connections, thereby influencing the user's WTP on SNSs.

Secondly, our research model integrates perceived playfulness with the value based theory of the user's WTP on SNSs, and finds that the user's perceived playfulness has no significant effect on the user's WTP for SNSs, but does have a significant positive effect on the user's WTP other members of SNSs. On one hand, this finding supports Cha's [7] viewpoint that increasing the user's perceived playfulness does not significantly influence the user's WTP for SNSs. On the other hand, it provides a new perspective for future research in C2C e-commerce field. McKnight et al. [37] suggest users could experience *exploratory* and *commitment* stages in C2C e-commerce activities. In the exploratory stage, the user's trust in the intermediary website and individual sellers are determinant factors of his or her behavioral intentions. In the commitment stage, when users have created certain degree of trusting belief toward the website and sellers, other factors could emerge to influence the buyer's behavioral intentions. As we find in the current study, the user's perceived playfulness is a significantly influencing factor of their WTP other members of SNSs. This implies that the buyer's intrinsic enjoyment could influence the buyer's intention to purchase when a certain degree of trust has been created in C2C e-marketplaces. Therefore, we suggest that, when users have gradually adopted e-shopping, e-auctions, and several other C2C e-commerce activities, the next important research focus should be shifted to how the other intrinsic motivation, such as enjoyment, influences the buyers to make decisions to purchase in C2C e-transactions.

### 6.2 Implications for IS practitioners

Finding an appropriate business model for SNSs is an extremely important strategic mission for practitioners (e.g. SNS managers, SNS investors) to survive in the market where new SNSs continue emerging and the competition becomes more intensive. Several major SNSs attempt to attract and encourage the users to pay by providing enjoyable services, such as online social games, music download, etc. These new features could influence user's intention to adoption of SNSs and consequently actual use [48]. However, they may not always be effective in stimulating the user's WTP for SNSs and subsequently actual payment.

On the other hand, perceived playfulness is an important factor when buyers make decisions to purchase in C2C e-transactions based on social connections. A supportive example is that, some SNS game players do not own special virtual properties, such as virtual lands in "Second Life", a 3D social networking game. To pursue the enjoyment, these players would buy the accessories from online acquaintances that have owned the properties [5]. We suggest the popularity of interpersonal virtual properties exchange provides the possibility for SNSs to become online trading agents and charge commissions by offering the service to game players.

The user's trust on SNSs and perceived value of online connections can be used as strong predictors for their WTP on SNSs. Therefore, creating the user's trust toward the social network site, keeping current users and increasing the number of new users should have the highest priority in SNS business strategies. Sacrificing the user's trust to gain profit is a dangerous movement which could destroy the foundation of the SNS's competitive advantage. It is reported that Facebook users started concerning their privacy information security, and stopped using the website, after they found out certain applications that they used were malwares sponsored by third party websites [51]. In addition, losing users implies disconnections among SNS users, which further implies the diminishing possibility of C2C e-transactions on SNSs.

## 7. LIMITATIONS

We suggest that the current study has following limitations which should be resolved in future research: (1) A survey-based strategy was adopted in the current study. It can maximize generalizability, but fails to satisfy realism or precision [16] [36]. (2) The sample is representative; however the sample size is small; (3) the  $R^2$  for user's WTP other members on SNS is relatively low.

We plan to enroll more participants to resolve the second limitation. In addition, a lab experiment would be adopted where the subjects will be presented with an experimental website so that they could have stronger perception of SNS based C2C e-commerce activities and give more accurate responses to the questionnaire items in the future study.

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# EXPLORING E-PAYMENT ADOPTION IN VIETNAM AND TAIWAN

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## ABSTRACT

The purpose of this paper is to analyze how related factors influence customers' e-payment adoption in Vietnam and Taiwan. A conceptual model is proposed with four factors: perceived ease of use, perceived usefulness (from technology acceptance model), perceived risk and information, which impact e-payment use. Beyond these factors, the adaptor's personal innovativeness in technology is used as a key moderator. The sample consists of 676 Vietnamese and Taiwanese banking services users accessed through a survey. Results confirm the effects of the above determinants on customers' choices for e-payment use and reveal the role of personal innovativeness as a moderator. Practical guidelines are provided to bank managers on how to push up the process of adopting or adapting technology in new market. A comparison between Vietnamese and Taiwanese customers' perception brings a valuable reflection for investors or managers when targeting Vietnam or Taiwan market.

**Keywords:** e-payment, TAM, uncertainty, personal innovativeness, Vietnam, Taiwan

## 1. INTRODUCTION

The determination of e-banking success is determined not only by bank and government support but also by customers' acceptance [55]. Changing customers' thoughts and habits is not easy, especially when services are associated with cash payments while cash payment is still the most popular form of money transfer. Because of the different adoption intention of each individual, the answers to the question "Why do some individuals readily adopt new information technology, while others reject them?" are still being sought. The difference can attribute to macroscopic factors such as cultural [34,77], economic and social factors [14]; however, the main reasons should attribute to personal perception of risk and uncertainty [63], lack of trust, short of information [83], inherent resistance to change, fears of invasion of personal privacy, and lack of adequate consumer awareness [24], education and participation, and a part of reason is from elements such as error or unavailable of service [25].

E-payment seems unfamiliar, artificial and inauthentic in comparison to traditional service processing methods, and customers believe that new payment processing methods expose them to new potential risks [15]. In Vietnam, most transactions are dominated by cash, since the bulk of personal consumption are done through the medium of cash. According to State Bank of Vietnam, in 2008, cash remains the main method of payment, especially among individuals which comprises more than 90 percent of retail payments. Among the total population of 84

million, it is estimated that less than 15 percent have used bank services regularly and less than 30 percent have savings in banks, and most account users are high-income earners living in urban areas or working in large companies. However, the liberalization, globalization and Vietnam's integration into WTO are opening many opportunities and threats for general Vietnam economy and the banking industry. To participate in the global economy, Vietnamese have to change their payment transaction habits to adapt to the general trend of the world. In recent years, new models of business have been appeared such as e-commerce, e-business; thus, IT has to be equipped in banking systems to enhance their quality of service. Many kinds of modern banking applications are now employed in Vietnam including online transaction, ATM and POS, payment cards, and internet banking. Moreover, the State Bank of Vietnam has made efforts to reduce the volume of cash payment transactions by planning a 2006-2009 project to increase the issuance of non-cash-transactions. Despite the preference of cash over e-payment, the attitude of the public towards e-payment has been encouraged over the past few years with the increase of bank card users and the expansion of ATM and Point-of-sale (POS) network, especially in some big cities such as Hanoi or Ho Chi Minh. As e-payment makes progress, the importance of cash has been on the decline over the past three years. But the public is still concerned about the security, lack of information on e-payment forms, and thus, is hesitant to change from traditional and simple method to automatic and electronic ones [39], which matters with the purpose of this research.

E-service is an important innovation deserving further research [7,9,52]. Most of the recent topics focus on e-commerce or e-banking innovation adoption in developed countries [11,55,63,66,68]. A few works are done to address the e-payment and solely focus on developed countries with an advantage in IT knowledge. Therefore, this research will analyze and focus upon the e-payment adoption in the developing country of Vietnam, where e-commerce and e-transactions as well as IT and e-banking systems are still young.

This study uses two important factors of TAM (Technology Acceptance Model) named perceived usefulness and perceived ease of use, along with perceived risk and information. Also, personal innovativeness in information technology (PIIT) is used as a moderator. In this study, we predict that the moderating effects of PIIT are manifest in the relationships of perceptions and information with e-payment usage. Besides, to gain a broader picture, we took a survey in Taiwan to compare with situations in Vietnam. Taiwan is one of four Asian Dragons with a high developed economy, and a high technology base. Taiwanese investors are eyeing Vietnam as an attractive destination among Asian countries. Currently, around 2,000 Taiwanese businesses

are operating in Vietnam. In 2008 alone, Taiwanese investments in Vietnam mostly focused on the fields of industrial and construction sector with 1,460 projects valued at US\$16.2 billion, accounting for 75.3 percent of Vietnam's number of FDI projects and 80.5 percent of the country's total registered FDI capital. Among projects, 1,705 are wholly foreign-invested projects capitalized at US\$16.6 billion (making up 88.6 percent in Taiwan's project number and 84.6 percent of its pledged capital in Vietnam) and 193 are joint venture projects [76]. Since most of Taiwanese projects in Vietnam involves high-tech and advanced production lines, many big Taiwanese banking companies such as Fubon, First Bank also open their branches in Vietnam to seize these business opportunities. Understanding the differences between Taiwanese and Vietnamese in e-payment adoption will be also helpful for Taiwanese banking investors to promote e-payment adoption by exploiting their Taiwan experience.

## 2. LITERATURE REVIEW

### 2.1. Motivation in Technology Acceptance Model

The Technology Acceptance Model (TAM) was developed and originally proposed by Fred Davis and Richard Bagozzi in 1989 and became a widely-studied model of information system (IS) usage and IS acceptance behavior. TAM has been widely adopted in a variety of field settings and across a broad range of IS applications: e-mail [78], spreadsheets [1], microcomputer usage [30], group support systems [13], and expert systems [33]. These applications are mainly focused on the influence of perceived usefulness, attitude toward use, behavior intention, and actual usage behavior. Recently, more and more studies have expressed their concerns about the appropriateness and comprehensiveness of TAM [36,49,54,71] which are TAM's deficiencies in accounting for human factors, emotional factors and social influence factors.

Motivation can be defined as the reasoning for people to do certain things. A motive is a need within someone to attain something, which is a key element in achieving effective performance. To motivate someone requires giving him/her an incentive, which in some minds, can be viewed as an underlying form of manipulation [23]. Toward using an information system, motivation should be included as predictors of perceived usefulness and behavior intention [17]. In TAM, perceived usefulness captures extrinsic motivation and relevant instrumentality. Motivators relate to the drive to perform a behavior to achieve specific goals/rewards, and these motivators are captured by the construct of perceived usefulness in previous studies [17,79,80]. In order to build an integrated and innovative model, this study employs perceived usefulness and perceived ease of use from the TAM model to synthesize and extend the existing work.

*E-payment Use (EU):* E-payment is defined as payments made via the automated clearing house, commercial card systems (purchasing card, travel & entertainment cards and fleet cards) are wire transfers as electronic [61]. E-payment use is indicated as attitude, which is referred to the person's positive or negative feelings toward a particular behavior that are influenced by individual beliefs [68]; thus people seem to place more trust in their habits than in machines, in a visible action rather than an invisible method. Based on the level development of the country and the state of the banking system, the degree to which e-payment use differs [61]. Many Vietnamese customers perceive e-payments as ATM, credit or debit cards, but there also exist

credit, transfer/direct debit, internet banking, mobile banking, phone banking, e-money and prepaid card in Vietnam. Service card banking has set up and developed since the beginnings of e-payment and has dominated the electronic payment market in Business-to-Customer e-commerce; excepting ATM/credit/debit cards, other forms of e payment are only at primitive stages.

*Perceived Usefulness (PU):* A new product or service that does not help people more easily perform their jobs and life, or is too abstract to be useful, will be easily eliminated [44]. Many aspects can evaluate the usefulness of a system which is "the degree to which a person believes that using a system would improve his or her performance" [20]. Perceived usefulness has a strong determinant of usage intentions [81] and, on e-banking adoption, can be measured as a multi-dimensional quality with attributed variables such as transaction speed, user-friendliness, user experience, accuracy, convenience and so on [44]. It is also known as performance expectancy when people think that based on advantages of innovation, IT can help them enhance productivity and aid work performance [18,19]. In the context of e-payment, perceived usefulness means that the system can be available and helpful for customers at any time and any place, and therefore, can be considered as the comprehensive ability of customers in integrating e-payment into their daily activities [35]. In a different respect, the usefulness can be captured as the attention of potential adopters' views about the innovation when offering alternatives choices with the same performing abilities [2]. In other words, an innovative system is believed to be of high usefulness when it adapts to the needs of people and connects closely to the use, productivity, performance, effectiveness and satisfaction [48]. Perceived usefulness is an important indicator for technology acceptance [18,54,85] and sometimes has a strong impact on IT/IS use [27,31,64]. Also, the usefulness is an important factor to keep alive a system in a busy and modern society, step by step replacing works using various manipulations. Thus, when perceived usefulness of the system goes up, it will attract the number of users intending to use the new system [62].

*Perceived Ease of Use (PEU):* Innovative technology systems that are perceived to be easier to use and less complex will have a higher likelihood of being accepted and used by potential users. Perceived ease of use is "the degree to which a person believes that using a particular system would be free of effort" [18]. Focusing on an individual's perception about the level of efforts needed to use a system, perceived ease of use can be regarded as process expectancy [19]. An ease-of-use system should have friendly interfaces such as clear and visible steps, suitable content and graphical layouts, helpful functions, clear commands, and easy understand error messages. Awareness about the ease or difficulty of use of a new system sometimes is based on the knowledge and age of user [74]. Highly educated and younger users are not hesitant to try a new IT system. On the other hand, lower educated or older users think that high tech systems are very complicated. The original TAM model emphasized the importance of PU over PEU as the key determinant of acceptance. Most beginning studies [18,51] or even some recent researches [72] have not discovered a direct link between PEU and system use, leading to PEU is being treated as the "second factor" [10]. More and more studies have proven the direct effect of PEU on new system use [27]. Some have shown that PEU has a direct and equal [3,87] or even stronger effect than PU [28,31,62]. The lower the perceived complexity of using a service provided by internet banking, the more positive will the attitude of the consumer toward using the internet banking service [43].

## 2.2. Perceived Risk and Information as Uncertainty

Risk, uncertainty, and dearth of information are main reasons which cause people to avoid adapting new technology [63,83]. This study uses term 'uncertainty' to embrace risk and information which are serious concerns among technology adapters.

*Perceived Risk (PR)*, in customer behavior research, is introduced as any action of a consumer which may lead to unpleasant consequences [58] or the consumer's expectation of suffering loss in pursuit of a desired outcome. Therefore, perceived risk is a multi-dimensional construct with overall risk which is divided into financial, psychological, performance, physical and social loss [32,46] or risk of losing personal control (money, data and times), risk of losing face and system failure [88]. However, risk normally rises from individual subjective and is difficult to capture objectively [70]. Separating it into sub-dimensions sometime is not accurate and cannot assess all the relevant dimensions of risks, especially when the study focuses on a risky service like e-payment. It is difficult to conceptually define and discriminate every risk dimension in e-payment use adoption.

No one can refuse the role of risk in the decision to adopt new technology systems. Especially, risk perception can easily escalate in an e-banking service, which customers transact with no personal face to face contact or cash in hand. Customers generally want to master their own acts and know or see directly the cause and the consequences of their own and others [11]. Advantages of e-payment can help customer to reduce distance of a payment transaction, but customers are still not willing to accept this since they do not have full control over their own behaviors and system process [63]. Using e-payment, customers always have concerns about potential finance risks, such as the capacity of money loss during the transaction process, perceived threats to privacy, and personal information leak [86]. The perceived risk regarding e-payment use can be considered involved in two concerns: information and customer's money transmitted via the system is safe, and the system is enough trustworthy in handling customer information and managing their financial assets [40]. When using the system, customers often have to be concerned with personal information stolen, manipulated or misused without their knowledge [21]. If these happen, it is believed that they will lose control of personal data, and more importantly, consumers fear that their details may be used inappropriately. Therefore, the issue of security and privacy are important items of perceived risk [8,56,73,82]. Perceived risk measures a customer's assessment of the confidence in e-payment and level of their trust when using the system through security and privacy level of the system.

The intangible nature of electronic transactions tends to heighten the consumer's perception of risk. Customers are more aware of the existence of potential risk because they use the system more and have better understanding of it. Perceived risk is believed to be a predictor and barrier to e-payment use [84], and plays a negative role in individuals' decision to adopt e-payment [40]. It significantly influences consumers' purchasing decisions, in which it involved the probability of unpredictable, unpleasant and costly consequences connected with those decisions [10]. Many consumers have been slow to adopt financial e-services because of risk concerns [15]. Whether such risks actually exist or not, consumers tend to persist about those if they hold the perception or believe they are at risk. A common and widely recognized obstacle to electronic payment use is the lack of

security and privacy over e-payment, which are one of the most important challenges that banks are facing [11].

*Information on E-payment (IE)*. The information which customers have about the products has been improved and such information is one of the major factors directly affecting new product adoption, especially information on a new applied technology systems [63]. Finding information is the process by which consumers gather information about goods or services before purchasing or using it [69]. When applying a new system, customers may be at an early stage in learning and processing; therefore, customers often look for related e-payment information relating to the bank supplying e-payment forms, (dis)advantages of e-payment, the features, benefits or operation of the systems, and even amount of customers trust in using this system and security protections. In a larger realm, companies were more likely to share and collect information to reduce information asymmetry if more partners and peer companies had adopted e-business or new information technology [5,37,53].

E-payment offers a virtual and sensitive service involved in customer's finance and involved in applying high and new technology. The concept of information also refers to information technology of the product and can include e-payment experiences, consumer's skills or ability obtained by using the services/products or study from any resources including the knowledge transfer [59]. Thus, information on e-payment combines with experience, context, interpretation, and reflection about the e-payment products or services [16].

Customers are less interested in general information when using e-banking and seek information specifics relating to personal account details [45]. They do not appreciate banking information being pushed on them, and are indifferent to financial information unless it is directly related to their specific financial requirements. Customers trust in the new product/service because they know about it, and helpful knowledge about it often makes people more confident in using it. On the contrary, people who do not have any information or idea about the system tend to rarely use the system. Since the use of the system is fairly new to many people, low awareness is a major factor which makes people not to adopt it [67] and experienced users have more positive attitudes to using e-payment [12,38].

## 2.3. Role of Personal Innovativeness in Technology (PIIT)

Some individuals are, by their nature, willing to take the risk of trying out an innovation while others are suspicious of new ideas and are hesitant to change their current practice. Also, innovativeness relates to the degree of how the earlier adoption of new ideas of individuals compare with other members [65]. Individuals are characterized as innovative if they are early to adopt an innovation, and highly innovative individuals are active information seekers about new ideas and are willing to cope with high level of uncertainty and to develop more positive intention toward acceptance [24]. Therefore, personal innovativeness refers to individuals' willingness to change and accept risky venture. If individuals are more willing to take risks, they are more likely to engage in innovative behavior [48]. Thus, in IT context, personal innovativeness in technology (PIIT) is the willingness of an individual to try out any new information technology [3], which segments potential adopter into what characterizes as innovators, early adopters, early and late majority adopters and laggards [64], and explains how an individual belonging to each adopter category reacts differently to the introduction of an innovation [85]. In the

context of e-payment, an individual's innovative personality has been explored as a concept of risk-taking tendencies, since an innovative behavior toward e-payment involves unavoidable risk and uncertainty [54].

Individuals with higher PIIT like to experiment with IT innovations; also, they are usually the first in their group or society to feel more comfortable and confident when using a new system. Thus, consumers with higher PIIT levels may prefer using e-payment services than receiving service physically [21], and innovativeness moderates the impact of perceived beliefs of use respectively on e-payment usage [3,42,57,74]. The expectation of moderation implies that for the same mix of channels, individuals with higher PIIT will develop more positive perceptions about the innovation, and in this case the innovation relates to the perception about using e-payment. Individual innovativeness differently influence links between perceptions, information and e-payment use[50].

PIIT is an important concept for examining the acceptance of information technology innovations and the effects of PIIT are manifest in technology acceptance behavior through its relationships with beliefs or perceptions [4]. PIIT can serve as a key moderator of the consequences of the innovation characteristics of both perceived usefulness and ease of use [4,27,85,86]. As the first researcher considering PIIT as a moderator, Agrwal and Prasada [4] explained that "as an antecedent moderator, PIIT determines the relative use of alternate channels of information utilized for the development of perceptions. As a consequence moderator, it epitomizes the risk-taking propensity that exists in certain individuals and not in others."

Cultivating and boosting individual innovativeness will become as important as improving the perceptions of innovation characteristics. Individual's innovativeness is an important determinant of how people perceive the specific attributes of the technology. People who have high level of personal innovativeness tend to not pay much attention to risk elements instead focus their attention on perceived advantages of the product [65]. Therefore, although actual adoption is a function of personal innovativeness, the perception of risk may not have much to do with actual adoption [29]. Individual innovativeness captured by PIIT will be a moderator of the relationships between perceptions about a new IT and usage intention, and "insofar as individuals with higher PIIT are more prone to take risks, it is reasonable to expect them to develop more positive intentions toward the use

of an innovation, given the same level of perceptions as a less innovative individual" [3]. Similarly, O'Cass and Fenech [60] suggested that highly innovative users are more likely to develop more positive attitude toward new technologies. That personal innovativeness would interact with attitude to influence intention to search and intention to purchase. Overall, the greater the level of personal innovativeness, the greater was the likelihood that attitude would lead to higher intention to search and intention to purchase innovations [41]. Also responding to the call by Agarwal and Prasad [4] for "additional studies that examine the measure further with different samples and different technologies", we further assess the moderating role of individual innovativeness captured by PIIT by adding and testing PIIT effects as the moderation factor shown in Figure 1.

### 3. RESEARCH MODEL AND HYPOTHESES

Based on the above discussion and shown in the Figure 1, we propose six hypotheses as following:

- Hypothesis 1a:* Customers' perceived ease of use has a positive impact on their e-payment use.
- Hypothesis 1b:* Customers' perceived usefulness has a positive impact on their e-payment use.
- Hypothesis 2a:* Customers' perceived risk negatively affects their e-payment use.
- Hypothesis 2b:* The level of information on e-payment received by customers has a positive impact on their e-payment use.
- Hypothesis 3a:* Customers' personal innovativeness in technology moderates the influence of the motivation (perceived ease of use, perceived usefulness) on their e-payment use
- Hypothesis 3b:* Customers' personal innovativeness in technology moderates the influence of uncertainty (perceived risk, information) on their e-payment use.

### 4. RESEARCH METHOD AND DESIGN

#### 4.1. Measurement

The study used a two-part questionnaire. The first part is used to collect respondents' demographic information including

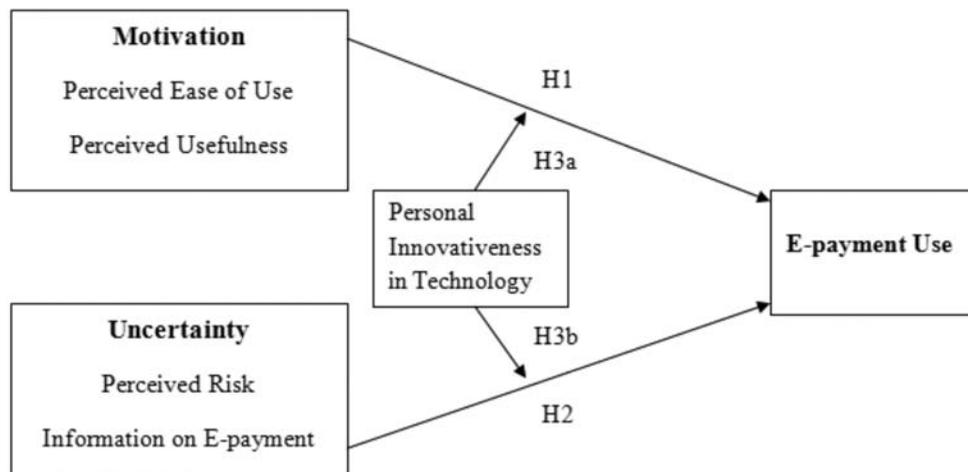


FIGURE 1. Conceptual model of this study

gender, marital status, age, educational level, working field and their income. And the second part using seven-point Likert scales, ranging from (1) “strongly disagree” to (7) “strongly agree”, investigated all constructs of research model. The questionnaire items were mostly adopted and revised from relevant prior research [18,47,62,63,68,80], with necessary validation and wording changes tailored to the e-payment system, and translated into the Vietnamese and Chinese languages by using double translations by two couples of researchers who had a psychology background and were proficient both in English and Chinese or Vietnamese. In detail, to measure the perceived ease of use, six items which are adapted and modified from the studies of Davis et al. [18], Park and Chen [62]. Questionnaire items of perceived usefulness were adopted and modified from studies of Venkatesh and Morris [80] and Park [62]. Perceived risk is measured by six items, based on the research of Pikkarainen et al. [63]. However, one important point is that the meanings of those items are opposite to original (not good) meaning of risk (eg. “Using an e-payment is financially secure”, “I trust in the technology which an e-payment is using” or “I am not worried about the security of an e-payment”). Thus, to have a right measurement, we should have a reverse conclusion to the final result. Information on E-payments (IE) is measured by three questionnaire items adopted from the

research of Pikkarainen [63]. Finally, three questionnaire items were adopted from Shih [68] to measure the use of e-payments and four items modifying from the work of Lu [47] are used to measure personal innovativeness in technology.

#### 4.2. Data Collection

Since the study aims to examine the effects of various variables on the e-payment adoption, a self-administered questionnaire and random respondent selection method was used to target the respondents who are using e-payment. A total of 700 questionnaires were distributed to randomly selected customers at e-payment centers, banks, ATM places, companies and stock market centers during three months of November 2009 to January 2010 in both Vietnam and Taiwan. In particular, we focus Vietnamese respondents in three biggest cities in three areas cross Vietnam which are Hanoi, Hochiminh city, and Da Nang; meanwhile Taiwanese respondents are selected randomly in some cities and provinces. A total of 692 completed questionnaires were returned. Sixteen questionnaires were discarded because of incomplete data [54], leaving 676 usable questionnaires for this study including 323 for Taiwanese and 353 for Vietnamese. The Table 1 describes the characteristics of respondents in details.

**TABLE 1. Demographic data of the sample**

Attributes	Categories	Vietnamese respondents		Taiwanese respondents	
		Frequency	Percentage (%)	Frequency	Percentage (%)
Gender	Male	176	49.9	172	53.3
	Female	177	50.1	151	46.7
Marital Status	Single	177	50.1	241	77.7
	Married	160	45.3	48	14.9
	Divorced/Separated	16	4.6	34	7.4
Age ( years)	Below 20	5	1.4	12	3.7
	20-29	204	57.8	217	67.2
	30-39	81	22.9	59	18.3
	40-49	30	8.5	28	8.7
	Over 50	33	9.3	7	2.2
Education	Vocational school	5	1.4	1	0.3
	High School	22	6.2	33	10.2
	College	248	70.3	129	39.9
	Graduate school	78	22.1	160	49.5
Working field	IT industry	41	11.6	42	13.0
	Service industry	33	9.3	49	15.2
	Manufacturing	56	15.9	33	10.2
	Banking	33	9.3	4	1.2
	Government agencies	114	32.3	13	4.0
	Student	36	10.2	136	42.1
	Other	40	11.3	46	14.2
Monthly Income (USD)	Less than 200	221	62.6	117	36.2
	200-500	94	26.6	20	6.1
	500-1000	35	9.9	135	41.8
	1000-3000	3	0.9	45	13.9
	Over 3000	0	0	6	4.0

**TABLE 2: Factor analysis for each construct (results for Taiwanese data in brackets)**

Research Construct	Factors	Number of Items	Eigen values	Factor Loadings	Cronbach's $\alpha$
<b>Motivation</b>	Perceived Ease of Use	6	3.837 (4.757)	0.741-0.848 (0.856-0.909)	0.887 (0.947)
	Perceived Usefulness	5	3.792 (4.433)	0.844-0.891 (0.932-0.954)	0.920 (0.968)
<b>Uncertainty</b>	Perceived Risk	6	3.783 (4.019)	0.711-0.854 (0.601-0.897)	0.882 (0.898)
	Information on E-payment	3	2.253 (3.719)	0.843-0.890 (0.754-0.903)	0.834 (0.807)
<b>Personal Innovativeness</b>	Personal Innovativeness	4	2.743 (2.959)	0.681-0.878 (0.814-0.924)	0.844 (0.881)
<b>E-payment Use</b>	E-payment Use	3	2.347 (2.641)	0.861-0.898 (0.927-0.956)	0.861 (0.931)

KMO = 0.895,  $\chi^2 = 941.15$ , df = 15, p < 0.001 (KMO = 0.86,  $\chi^2 = 932.28$ , df = 15, p < 0.001)

**TABLE 3: Correlation Matrix(results for Taiwanese data in brackets)**

	SD	1	2	3	4	5	6
<b>PEU</b>	0.8792 (1.0392)	1.000					
<b>PU</b>	0.9612 (1.2364)	0.636 (0.523)	1.000				
<b>PR</b>	0.9864 (1.2314)	0.388 (0.397)	0.489 (0.521)	1.000			
<b>IE</b>	1.0039 (1.1010)	0.528 (0.630)	0.583 (0.618)	0.567 (0.603)	1.000		
<b>EU</b>	0.9121 (1.1847)	0.581 (0.620)	0.611 (0.663)	0.509 (0.648)	0.610 (0.716)	1.000	
<b>PIIT</b>	0.9661 (1.1878)	0.623 (0.510)	0.543 (0.535)	0.397 (0.549)	0.529 (0.600)	0.731 (0.693)	1.000

All correlations significant at p < 0.01. Average variance extracted displayed in the diagonal.

About fifty percent of Vietnamese respondents are female, while more than half of Taiwanese are male. Half of Vietnamese and about eighty percent of Taiwanese are single; very few are divorced, but the number of Taiwanese divorced people is higher. The majority of Vietnamese and Taiwanese respondents are between twenty and twenty nine years old, followed by those of thirty to forty years old. Seventy percent of Vietnamese and forty percent of Taiwanese have bachelor's diploma, but fifty percent of Taiwanese and only twenty two percent of Vietnamese hold graduate degrees. Most Vietnamese respondents work in government agencies, while the rest number equally work in IT industry, service industry, manufacturing, banking, are students, or are in another industry. Otherwise, about half of Taiwanese respondents are students, followed by number of respondents working in IT industry, service industry. Monthly income shows a big difference when most of the Vietnamese earn less than \$500 per month, meanwhile, the Taiwanese respondents achieve mostly more than that and even reach to \$3000 or more (for students, their income includes both financial support from family and wage of part-time job).

**TABLE 4: Collinearity Statistics**

	Taiwanese data		Vietnamese data	
	Tolerance	VIF	Tolerance	VIF
<b>PEU</b>	0.527	1.898	0.477	2.098
<b>PU</b>	0.654	1.530	0.481	2.079
<b>PR</b>	0.69	1.449	0.637	1.569
<b>IE</b>	0.336	2.979	0.508	1.969
<b>PIIT</b>	0.665	1.503	0.543	1.843
Dependent Variable: UF				

## 5. DATA ANALYSIS AND RESULTS

“Content validity deals with how representative and comprehensive the items are in creating the scale, which is assessed by examining the process by which scale items are generated. Content validity in this study should be relatively acceptable

since the various parts of questionnaire were all adapted from the literature” [54]. In addition, a pre-test was conducted to validate the research instrument within the targeted context and make sure the validity of the translated questionnaires. It was conducted with thirty Vietnamese and twenty five Taiwanese respondents to identify some misunderstanding in words and use the feedback to amend the translated questionnaire by making some items clearer, and adding follow-up introduction. The questionnaire was developed in English, and then translated into Vietnamese and Taiwanese using the translation-back-translation method as recommended by Tripp-Reimer [75].

### 5.1. Reliability tests

This research used a principal component factor analysis and the varimax rotated method to extract relevant factors with an eigen value of greater than 1. Two essential criteria in terms of the values of factor loadings are that they be greater than 0.5 and the differences in factor loadings between each larger than 0.3 are ensured in specification. In the reliability analysis, the item-to-total correlation must be larger than 0.5 and Cronbach’s coefficient alpha ( $\alpha$ ) must be larger than 0.6 [26]. Table 2 illustrates the results of factor analysis for each construct of this study. Table 3 and Table 4 show the results of correlation matrix and collinearity statistics, respectively. From the above criteria, all factors were generally reliable and acceptable. And there is not multicollinearity because Tolerance is above 0.1; and VIF is less than 10. Thus, it could be concluded that the constructs of this study were reliable and valid.

### 5.2. Hypotheses testing

Regression analysis method is used to verify the influence of motivation and uncertainty of e-payment use. In addition, to verify the moderating role of personal innovativeness in IT, hierarchical regression analysis is applied because it is an accessible data-analytic technique contained in major statistical packages [22]. The data of two groups of respondents are separately analyzed in order to have a clear result in two different nation contexts.

As shown in Table 5, perceived usefulness and ease of use, perceived risk and information have significant effects on e-payment use for both Taiwanese and Vietnamese data. These results prove the support for hypotheses 1a, 1b and hypothesis 2a, 2b. Moreover, the results also show that personal innovativeness in technology seems to directly impact e-payment use, either. The moderator role of personal innovativeness in technology on those relationships is mostly not significant, except on relationship between motivation and e-payment use for Vietnamese data.

To clearly understand the form of the interaction, it is necessary to explore it further,

and one way is to plot predicted values for the outcome variable (depression) for representative groups [22]. A common practice is to choose groups at low (-1 SD from the mean) and high (1 SD from the mean) values of the continuous variable. Here we plotted scores for low-PIIT and high-PIIT at low (-1 SD) and high (1 SD) levels of independent variables (perceived ease of use, perceived usefulness, perceived risk, and information on technology) (see Figure 2 for Vietnamese data and Figure 3 for Taiwanese data). Predicted values were obtained for each group by multiplying the respective unstandardized regression coefficients for each variable by their appropriate value (e.g., -1, 1 for standardized variables) for each variable in the equation (see Frazier and Andrew [22] for more detail on how to calculate the scores).

To measure whether there exists a role of moderator, we can test the significance of the slopes for each group. If the interaction is significant, the slope is different from each other but not whether each slope differs from zero. Thus, looking at diagrams in Figure 2 and Figure 3, we can define that the slopes differ from zero in two cases (one for Taiwanese and one for Vietnamese)

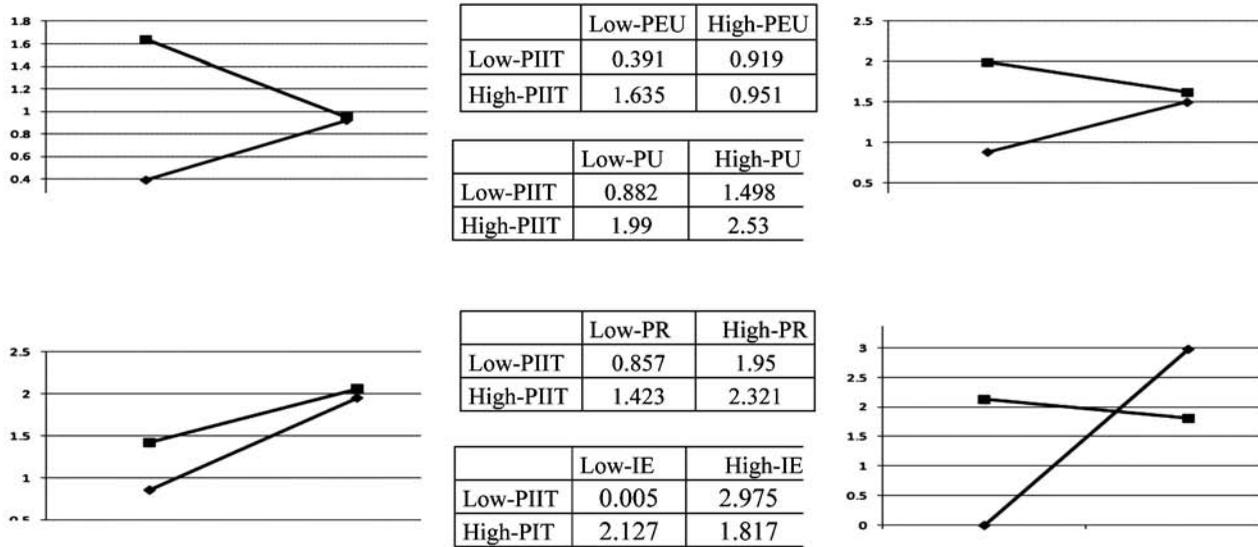
**TABLE 5: Testing Direct and Moderator Effects Using Hierarchical Multiple Regression (results for Taiwanese data in brackets)**

Step and variable	Beta	SE B	Adjust R <sup>2</sup>
<b>Perceived Ease of Use</b>			
Step 1			
Perceived Ease of Use	0.523***(0.211***)	0.046 (0.047)	
PIIT	0.366***(0.569***)	0.047 (0.043)	.590 (.555)
Step 2			
PEU	0.242*(0.493*)	0.141 (0.205)	
PIIT	0.006(0.853***)	0.177 (0.205)	
PEU x PIIT	0.070*(-0.053)	0.033 (0.038)	.591 (.556)
<b>Perceived Usefulness</b>			
Step 1			
Perceived usefulness	0.423***(0.289***)	0.040 (0.199)	
PIIT	0.385***(0.535***)	0.047 (0.038)	.475 (.600)
Step 2			
PU	0.309***(0.390***)	0.037 (0.180)	
PIIT	0.224***(0.633*)	0.077 (0.174)	
PU x PIIT	0.097***(-.0019)	0.010 (0.033)	.591 (.601)
<b>Perceived Risk</b>			
Step 1			
Perceived Risk	0.508***(0.241***)	0.052 (0.034)	
PIIT	0.400***(0.591***)	0.048 (0.035)	.455 (.590)
Step 2			
Perceived Risk	0.401**(0.474***)	0.178 (0.187)	
PIIT	0.324***(0.776***)	0.130 (0.150)	
Perceived Risk x PIIT	0.024(-0.042)	0.039 (0.033)	.456 (.591)
<b>Information in Technology</b>			
Step 1			
Information	0.534***(0.712***)	0.049 (0.050)	
PIIT	0.282***(0.192***)	0.048 (0.048)	.574 (.557)
Step 2			
Information	0.241(0.733***)	0.149 (0.160)	
PIIT	0.665***(0.212)	0.146 (0.158)	
Information x PIIT	-0.820(-0.005)	0.033 (0.030)	.576 (.579)

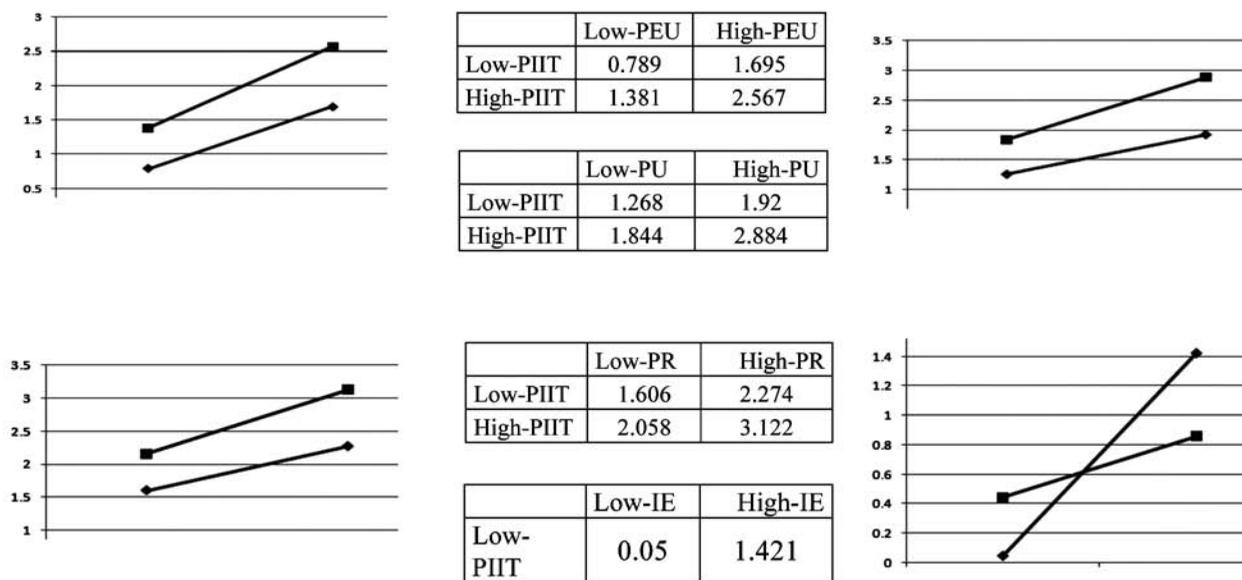
Note: \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

**TABLE 6: t-tests of research factors for Taiwanese and Vietnamese respondents**

Research Variables	Value		P-value (2-tailed)	t-value	df
	Vietnamese	Taiwanese			
Perceived Ease of Use	5.3660	5.1295	0.053	-1.938	428
Perceived Usefulness	5.3047	4.5043	0.000	-5.530	427
Perceived Risk	4.7788	3.3622	0.000	-12.254	428
Information on E-payment	4.8380	4.3426	0.000	-4.063	428
PIIT	5.4206	4.3228	0.000	-9.014	428
E-payment Use	5.4922	4.4654	0.000	-7.974	428



**FIGURE 2.** Plot of significant interaction of personal innovativeness in technology (PIIT) x independent variables (Vietnamese data). Solid diamonds = low-PIIT; solid squares = high-PIIT



**FIGURE 3.** Plot of significant interaction of personal innovativeness in technology (PIIT) x independent variables (Taiwanese data). Solid diamonds = low-PIIT; solid squares = high-PIIT

and have trend to differ from zero (because two lines in other cases have directions to joint points). These can conclude that personal innovativeness in technology moderate the relationship between information in technology and e-payment use, and tend to moderate other relationships either.

### 5.3. Comparison

Independent — Simple t-test was employed to identify the difference in attitudes towards research factors between Taiwanese and Vietnamese respondents. Two criteria are used to measure the level of difference:  $t < -1.96$  or  $t > 1.96$ , and  $P < 0.05$ .

Six factors measuring four constructs in this study were evaluated by both Taiwanese and Vietnamese. Table 6 shows the results of t-test. It indicates that there are significant differences between Vietnamese and Taiwanese in most of all factors. Moreover, we can still compare the level of difference. It is obvious that all measurement in Vietnamese respondents is higher than that in Taiwanese respondents. The explanation for this can be seen in the discussion section.

## 6. DISCUSSION

For both Vietnamese and Taiwanese customers, perceived ease of use and usefulness tend to significantly impact their use intention as in the original TAM model and other research, as well as in Theory of Reason Action [6,18,27,31,37,64]. Therefore, to encourage people to use new technology, especially e-payment system, concerns about product characteristics should be considered. It is obviously understandable that customers often welcome and quickly adopt new technology products which are beneficial and not too complicated to use. Aside from motivation, factors that bar or limit use intention such as risk and lack of information are also taken into much consideration because they have significant influence, too. Specifically, perceived risk often affects negative use intention as proposed in previous research [10,15,40,84]. Risks sometimes overcome motivation factors and often have more power to change customers' opinions. Of course, in bad mode for business, this keeps managers aware elements of security or information causing negative attitudes to consumers.

The study partially supports the significant role of the moderator of personal innovativeness in technology on other links. We call this 'partial support' for two reasons: (1) with our data and regression method, only two results for Vietnamese respondents prove the existence of a moderator on relations of perceived ease of use, perceived usefulness, and e-payment use; and (2) when using further method to test, we found that moderators surely exist and impact the influence of information in technology on e-payment use for both Vietnamese and Taiwanese respondents; meanwhile, other direct relationships tend to be impacted by moderators. Therefore, although personal innovativeness in technology is supported to have direct influence on e-payment use in our study and similarly to some other research [47] which did not consider PIIT as a moderator, the role of moderator of PIIT also exists, especially among Vietnamese customers' perception. This situation could be understandable when comparing the differences between Taiwanese and Vietnamese users which draw to us some interesting points. All values of research variables in Vietnamese data are higher than those in Taiwanese one, which implies Vietnamese users consider all items of those variables more important and will be affected by those factors more strongly

than Taiwanese users. This can be explained by developments of e-payment systems in two countries. Taiwan with strong economics and high-tech development has applied e-payment systems in banking for long time. Taiwanese customers used and tested its quality for decades, and at this time, they seem have equal and average measurements on the system as well as their usage. Meanwhile, along with recent fast-developing economics, Vietnam is adapting and adopting clusters of technologies from outside, and the e-payment system came with Vietnamese customers for a short time. E-payment system is new and modern for many Vietnamese people and has not been applied by the entire banking network which is less strong and beneficial than that in Taiwan. It is a new technology, few people use and few banks apply, that new users consider a lot of concerns involved this system even including moderating factors.

Sharing some cultural aspects which both nations had from historical influences by Chinese culture in history implies similar behaviors in society among their people. Therefore, the differences in e-payment adoption as well as IS practice in Vietnam and Taiwan present mostly their national development status, especially in economics and education. Taking the respondent characteristics can provide a clearer explanation because individual factors such as education, job status, and experience are correlated with user attitudes [37]. The Taiwanese' monthly income is about four times higher than the Vietnamese's, which is obvious when Taiwan has a highly developed economics with GDP of \$717.7 billion, and Vietnam, even having a recently fast economic growth, is a developing country with GDP of \$258.1 billion (2009 est. by Central Intelligence Agency). Other while, Taiwan's developed economics has brought a better education system in quality (three of Taiwan's universities are in Top 500 Best University in the world based on the website of top universities, none is Vietnam's) and quantity (Literacy: 96.1% in Taiwan and 90.3% in Vietnam).

## 7. CONCLUSION

This study aimed to establish an integrated research model to predict and understand customers' intention to adopt e-payment in Vietnam and Taiwan. The proposed model in this research incorporated TAM and other related factors to provide a more comprehensive investigation covering both technical and social aspects of customers' perception of e-payment use. Empirical data were collected from a field survey in developing and developed countries to verify the fitness of the hypothetical model, and additionally, we catch the differences in adopting new technology.

This research is a response to the need of integrating the TAM model in information innovation decades. Parsimonious models such as the TAM provide a core set of elements [80], but they should be developed and expanded differently along with the innovation, especially in information technology. To be practically useful, these models need to be extended to capture innovation-specific features. The adoption models are of interest to researchers and can indeed be applied, with some extension, in the design and implementation of the innovations themselves. Moreover, it expands previous research by addressing the subject in the different context as explained in the literature review part. The results support findings from other researches [6,18,27,31,37,64], especially provide more robustness in moderating effects. The study focuses on portraying the Vietnamese scenario and comparing with Taiwanese scenario on this topic, since previous

researches have been usually without considering the innovation-specific factors, and carried out only in developed countries, it might imply more for the developing countries such as Vietnam.

Among the managerial implications, we demonstrated that understanding customers' perceptions on new products, especially new information technology, can be a managerial tool in different phases of the development process, from concept initiation to design and implementation to customer support [81]. The customers' decision to adopt a new technology depends more on beliefs about the innovation's features (although not necessarily equivalent to the actual set of features) and the attitude toward it. Thus, it is important to understand users' beliefs and how they affect their adoption intentions for the purpose of attracting more customers and pushing up the process of adopting or adapting technology in new markets. In addition, we highlight the challenge of promoting partnerships among all the bank system in Vietnam as a means of successfully transferring technology. It is widely accepted that top management support and technology champions are required for supporting the adoption and diffusion of innovative technologies [53]. Technologies as well as other new systems need time to be applied and used familiarly, so what is happening in adopting new technology in Vietnam as well as other developing or undeveloped countries is an after-but-forward step to the current status in countries with highly developed economics like Taiwan. New users have more concerns involved the technology they adopt.

This study is not without limitations. The factors in our model cannot express all aspects of the situation; thus other factors involved should be added in further research. In addition, the sample includes a number of Vietnamese and Taiwanese users which may be is not enough to surely confirm moderating effect, and generalization of the results should be made cautiously.

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