Individual Differences and Domain Specific Innovativeness in Online Banking Adoption

By

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A thesis submitted in conformity with the requirements for the degree of Master of Applied Science
Mechanical and Industrial Engineering
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Abstract

This thesis examines attitudes towards online banking in the United States through an online survey of over 300 participants recruited using the Mechanical Turk Crowdsourcing service. I begin by examining the communication preferences inventory (CPI) and validate the three factors that had been found in previous research and propose a shorter 12-item version of the CPI. I then examine predictors of domain-specific innovativeness in the adoption of online banking. The CPI and the TPI (Technology Profile Inventory) are both found to be more predictive than demographic variables, with the TPI being the more strongly predictive of the two. Implications for roll-out strategies for online banking are discussed and prospects for future research on this topic are also considered.
Acknowledgments

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1 Introduction

1.1 Internet banking

While online banking was first launched in the 1980s (Cronin, 1997), it wasn’t until the opening years of the twenty-first century that online banking services were used by more than a tiny fraction of customers. In the early 2000s banks increasingly used the internet to offer customers different financial services such as: account lookup, pay bills, transfer money, etc. (Kolodinsky, Hogarth and Hilgert, 2004). Collectively, these services are known as internet banking. Internet banking has been one of the most fundamental shifts in the retail financial industry (Hernández-Murillo, Llobet and Fuentes, 2010).

Increasingly, customers prefer self-service banking using online and mobile connections over more traditional services such as branches, ATM or IVR (Heinonen, 2007; Hua, 2009). For example in 2006, 51% of Americans used online banking (Fox, 2013). Similarly, in the UK the number of online banking users has grown substantially from 3.7 million in 2000 to over 21 million in 2008 (Glenbrook Partners, 2015).

Alsajjan and Dennis (2010) noted that convenient access to bank account information at any time via a home computer or mobile device was a key benefit of online banking. For banks, provision of internet banking has become a necessity in competing with other banks, and in maintaining and attracting new customers (Gounaris and Koritos, 2008). Today and internet banking is offered by most banks around the world. Additionally, internet banking lowers the operating cost of servicing customers (Aldás-Manzano et al., 2009). Consequently, banks are investing heavily in improving their electronic banking capabilities and understand customer behaviour (Martins, Oliveira and Popovič, 2014).

However, adoption of these services in some markets has been relatively slow (Aldás-Manzano et al., 2009; Farzianpour, Pishdar, Shakib, & Toloun, 2014; Montazemi and Qahri-Saremi, 2015). Adoption of internet banking is uneven across countries, even when taking into account the increase in household internet penetration. For example, as seen in table 1, consumers in Canada and the USA have different online banking adoption rates despite both countries having high
percentages of their population with access to the internet. This difference increases when we compare Canada and USA with Mexico.

**Table 1: Internet and Online Banking penetration across North America**

<table>
<thead>
<tr>
<th>Country</th>
<th>% of population with access to the internet at home</th>
<th>% of population that uses Online Banking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>84.2</td>
<td>64.8</td>
</tr>
<tr>
<td>USA</td>
<td>78.3</td>
<td>45.1</td>
</tr>
<tr>
<td>Mexico</td>
<td>43.5</td>
<td>20.3</td>
</tr>
</tbody>
</table>


Since banks are interested in growing the adoption rates of internet banking it follows that it would be useful for banks to understand the process of new technology adoption. Understanding adoption can help banks determine who to market to, how to market these services, and how to measure the effectiveness of a particular product or service (Kolodinsky et al., 2004).

**Adoption**

Internet banking has generally increased in step with increased worldwide internet access. Although the adoption of internet banking has grown steadily over the last few years, adoption and usage vary across the globe. As shown in figure 1, Norway and Netherlands have high adoption rates, while other European countries like Poland and Portugal have much lower adoption. The root causes for these differences are likely complex and multivariate. For instance reasons may include differences in infrastructure or the stability of the financial industry in each country. This thesis examines how individual differences impact adoption and usage of electronic banking. I used a survey-based method to explore theoretically grounded set of hypotheses about the adoption of electronic banking.
Figure 1 Percentage of Individuals that use the Internet in 2013 and 2014 by European Country (Ec.europa.eu, 2015)

The factors that I considered in this study were individual differences such as: demographics, communication preferences, technology profile and innate innovativeness. At a high level this thesis focused on the following research questions:

- How do new ideas and practices get adopted within a social circle and what roles does innovativeness play

- What is the relationship between adoption of online banking and individual differences?

In the remainder of this thesis the term “electronic banking” implies both online and mobile banking.
1.2 Thesis Outline

This thesis is centered on individual differences and their influence in the adoption of internet banking. The chapters to follow are briefly introduced in the following bullet points.

- Chapter 2 is the literature review which summarizes work related to diffusion process, adoption, and individual differences.
- Chapters 3 describes the research model, hypotheses and method.
- Chapter 4 describes the statistical analysis testing the different hypothesis outlined in chapter 3.
- Chapter 5 analyses and synthesizes the different study findings, and discusses their implications for the adoption of online banking.
- Chapter 6 concludes the thesis by listing the contributions, discussing the limitations of the work, and presenting suggestions concerning future research.
2 Literature Review

This chapter summarizes previous research about the diffusion process, adoption, innovativeness and individual differences. The papers reviewed in this chapter provide a theoretical perspective on these concepts as well practical applications in diverse domains such as education, health care, electronic banking among others. Figure 2 shows a high level roadmap of the constructs reviewed in this chapter.

![Figure 2 Literature Review Roadmap](image)

This literature review covers the following four topics. First, literature related to the diffusion of new ideas is reviewed. Next, prior research on adoption of online banking is described with an emphasis on identifying factors that have shown to be correlated with increased adoption. This is followed by a discussion of individual differences focusing on previous work related to communication preferences, and on technology preferences, technology adoption, and innovativeness. One last topic not shown in figure 2, but of special importance to this thesis, is crowdsourcing for psychological research. A number of papers on this topic are reviewed that provide context relating to the usage, validation and limitations of crowdsourcing methods.
2.1 Diffusion Process

“Our problem is to learn why, given one hundred different innovations conceived of at the same time—inventions in the form of words, in mythological ideas, in industrial processes, etc.—ten will spread abroad while ninety will be forgotten” (Tarde, 1903, p. 140).

The underlying topic in the adoption of internet banking is based on the diffusion process. Attewell (1992), describes two general perspectives regarding diffusion. The first perspective views diffusion as a communication process amongst a social circle. The other, views diffusion of innovation as an economic process of cost-benefit analysis: the higher the cost the lower the diffusion. Most of the literature reviewed views diffusion as a communication process and this perspective will be discussed in the following paragraphs.

Communication of electronic banking (the innovation) precedes its adoption. The seminal work on the diffusion of new agricultural practices by Ryan, and Gross (1943) provided early insight on how ideas, concepts and products are diffused within a community. Based on this work, Beal et al., (1957) formally described the diffusion process. Their work provided the conceptual framework to understand how new practices are diffused within a community and the process to adopt or reject these new practices in different domains. The following are two key generalizations about adoption that came out of their research:

1. Adoption is a mental process
2. Adoption varies between individuals

According to Beal et al., (1957) adoption of a new idea is a mental process made up of multiple acts or stages. The fact that the authors called this process a mental process is important since it meant that user’s attitudes, preferences and perceptions need to be studied to make sense of their adoption profile. Based on customer interviews the diffusion process was described as made up of five stages as described in Table 2 below:
<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness</td>
<td>Consumer has knowledge of the existence of the new idea or innovation but lacks detailed information about it</td>
</tr>
<tr>
<td>Interest</td>
<td>Consumers actively seek more information about the idea and may formulate potential benefits of adopting the new idea</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Consumers move to seriously consider the new idea via a kind of mental simulation. They may also question the benefits relative to what they do today</td>
</tr>
<tr>
<td>Trial</td>
<td>If the evaluation proves a potential net benefit then the next step is to actually try the new idea. However, this stage is not typically full adoption but rather a controlled implementation of the idea to verify potential benefits</td>
</tr>
<tr>
<td>Adoption</td>
<td>Finally, if the trial is successful the consumer is mentally ready to fully embrace or adopt the new technology. Note: this does not mean that the new idea will always be adopted. It simply means that is has been accepted as a good viable practice within the consumer’s repertoire</td>
</tr>
</tbody>
</table>

**Table 2 Diffusion Process Stages (Beal, George M., Everett M. Rogers, and Joe M. Bohlen, 1957)**

It should be noted that this is a conceptual framework and that consumers may differ in the time they take to go through the process and also the extent to which they go sequentially from one stage to another. It should also be noted that adoption is the end result of the diffusion process. Based on earlier research with Iowa farmers, it was found that some farmers were early adopters, some took time to adopt a new idea, while others did not adopt at all (Ryan and Gross, 1943). This difference in adoption rates has been validated by other research (Wejnert, 2002). Tarde (1969) suggested that the adoption follows an S-curve as a cumulative distribution or bell-shaped curve when plotted as a frequency distribution (Figure 3).
As figure 3 shows, at the beginning there is a small proportion of consumers who adopt a new idea but as time passes the majority of people will adopt the new idea, concept, practice or technology. It should be pointed out that the rate of adoption varies due to the type of idea or innovation that is being considered and the characteristics of the individual and his/her social circle. Rogers (1997) listed the following five different factors that may affect the rate of diffusion of an innovation (in order of relative importance):

1. **Relative Advantage**: The degree that the new innovation is perceived to be better than the previous innovation.

2. **Compatibility**: The perceived compatibility of the new innovation with the needs, values and life style of the potential adopters.

3. **Complexity**: The level of difficulty of the new innovation as perceived by potential adopters.

4. **Trialability**: The degree the innovation can be experimented with or tried out before embracing the new innovation.

5. **Observability**: The extent to which the benefits from the innovation are visible to others.
As an example of the new idea, concept or practice’s complexity, Beal et al., (1957) identified three complexity categories or levels:

1. Change in material or equipment
2. Change in practice or methodology on how to use the idea, concept or machine
3. A change in both material and in practice = innovation

For some new ideas consumers may be relatively fast to adopt the idea since the change required is relatively simple to understand and evaluate. Other ideas require more profound change, and consumers will need more time and thought to accept the new idea and use it. In the context of internet banking, the adoption process must be viewed as the adoption of an innovation since consumers require totally different means to do their daily banking.

The following key elements are relevant when discussing the diffusion of new products: “(1) the innovation, defined as an idea, practice, or object perceived as new by an individual or other relevant unit of adoption, (2) which is communicated through certain channels (3) over time (4) among the members of a social system.” (Rogers, 1976). In the context of this thesis, the diffusion process could be used to study the adoption of new technology such as the internet, and a new practice such as electronic banking. By definition, diffusion is linked to communication between members of a social system. Specifically, previous work had shown that high interpersonal communication about a new product leads to more initial product purchase (Rogers, 1976). It follows then that the style, method and preferences which individuals use for interpersonal communication may influence their adoption of new ideas or products. It may also determine their influence of others to adopt a new innovation.

In conclusion, the seminal work on diffusion theory shows how internet banking can be seen as an innovation that is diffused (communicated) via different means within a social circle. It helps us frame the scope of this thesis to hypothesize possible factors that may impact diffusion and adoption of electronic banking. The next section summarizes previous work on adoption of electronic banking.
2.2 Adoption

One of the central topics of this thesis was to understand factors that influence the adoption of new technology such as internet banking. Adoption is an integral part of any industry, and thus factors affecting product adoption have received a lot of attention. In the banking industry, adoption of online banking has been studied for more than a decade. This section reviews the literature on this topic. The factors that have been shown to impact online banking adoption can be grouped into the following categories:

- Demographics, attitudes, perceptions and preferences
- Trust, Risk, Security and Privacy
- Human Contact and the influence of Reference Group
- Consumer Innovativeness
- Usefulness and Ease of Use

Some key characteristics of each of these categories are described next.

2.2.1 Demographics, Attitude, Perception and Preferences

Research on online shopping has shown that personal traits influence online purchase intentions and that these should be further investigated to help improve adoption of online shopping (Ranaweera et al., 2008). Similar findings have been found in studies focused on understanding attitude formation with respect to electronic banking. Karjaluoto, Mattila and Pento (2002) found that attitude formation is a process that takes time to set in and that is influenced by personality traits and past experiences. Demographics have also been shown to influence internet banking attitude formation and behavior Gounaris and Koritos, (2008). Research shows that typical internet banking users are highly educated, are knowledgeable about computers, and are relatively young (Yousafzai and Yani-de-Soriano, 2012). Older users have been found to have more difficulty adopting new technologies and are thus likely to have negative attitudes towards new innovations. These findings are consistent with other research that found a link between consumer demographics and product adoption (Rogers, 2003).
A number of studies have shown that adopters and non-adopters perceive online banking differently. For example, adopters perceive online banking to be more convenient, less complex and more compatible with their lifestyle. Additionally, research has shown that adopters have different perceptions in terms of ease of use, human contact and security than non-adopters of online banking (Mansumitrchai and Chiu, 2012). In particular, adopters felt that performing transactions was easy, while non-adopters perceived transactions as difficult to perform. Mansumitrchai and Chiu recommended that online banking systems should lower the technical skill required to use the channel and should have higher ease of use to help overcome barriers to adoption. Adopters value the convenience and availability of electronic banking and felt that this value proposition was compatible with their lifestyle Mansumitrchai and Chiu (2012). This is consistent with the first Rogers (1997) factor for adoption - relative advantage.

### 2.2.2 Security, Risk, Privacy and Trust

Previous studies have shown that customers using online banking perceived website security to be paramount. According to a review by Mansumitrchai and Chiu (2012) this finding was replicable across countries: Australia, Finland, UK and Thailand and consistent with previous studies. Lee (2009) found that there are different types of risks: security, financial, time, social and performance risks and that these risks were negatively correlated with the intention to adopt online banking. The key concern from end users is the perceived risk that financial transactions are not kept private (Yoon, 2010). Although this issue is also relevant when banking via a branch, the properties of the internet (continuous availability and remote access) make this issue more relevant to customers.

In terms of the impact of risk, the findings are less definitive. As a summative construct, the perceived level of risk does impact adoption of online banking. However, risk is said to be multidimensional and difficult to measure (Wang et al., 2003) thus raising difficulties in validating the impact of perceived risk.

Privacy refers to the confidentiality of the information provided by the user while using electronic banking. User perceptions of privacy rules and how well services conform to those rules likely impact the use of electronic banking (Hua, 2009).
Trust plays a critical role in a country’s economy and also in personal finances (Anneli, 2014). Trust is defined as the perceived credibility and benevolence of a target of trust. Trust definition is varied; it can be seen as a personal trait, social construct or economic choice mechanism (Alsajjan and Dennis, 2010). According to Wang et al., 2003, in the context of online banking perceived credibility is the only factor that is meaningful since a technology cannot have a sense of benevolence. Also, since perceive credibility is typically an interpersonal concept, in the context of online banking it means user perceptions regarding security and privacy impact online banking adoption (Mukherjee and Nath, 2003; Morgan and Hunt, 1994).

2.2.3 Human Contact and Reference Group

Research on buying online has shown that non-adopters prefer going to the store rather than buying online (Lian and Yen, 2013). Thus it will require some effort on the part of merchants to overcome this preference. Similar results were found in online banking where non-adopters were found to value human contact more highly (Mansumitrchai and Chiu, 2012). An implication of this finding is that knowing the communication preferences of customers may help identify consumers groups who need to receive different marketing messages or services related to electronic banking.

Trepte and Scherer (2010) described the importance of opinion leaders in influencing other people and based on a review of literature found that interpersonal communication has a bigger impact than direct media. Mansumitrchai and Al-Malkawi (2011) also referred to the influence of interpersonal communication in the adoption of online banking. They proposed that when an innovation creates uncertainty about its benefit or use, consumers rely on interpersonal communication within their social group (reference group) to seek information to reduce their concerns. This is consistent with previous work that found that behavior of consumers is influenced by the group of people they associated with (Martins, Oliveira and Popovič, 2014). Research has shown that social influence impacts intermediating variables such as perceived usefulness and perceived ease of use resulting in adoption of online banking (Montazemi and Qahri-Saremi, 2015). However, Karjaluoto et al., (2002) pointed out that banking is more personal and may be less likely influenced by reference group.
2.2.4 Previous Experience with Banking Channels and Technology

Prior Banking Experience

Previous experience with a banking channel (e.g., branch, online or mobile), and with computers, was also found to influence the adoption of another channel. Karjaluoto et al., (2002) observed that, in Finland, dissatisfaction with the branch experience led to the adoption of alternative channels such as internet banking. They also stated that satisfaction with the current branch service will be a barrier to utilize or move to other channels. Other research explains the impact of negative experiences with a service on adoption and usage of that service (Vinhal and Barreiros, 2010). This highlights the need to ensure electronic banking is designed to address customer concerns and is well integrated with other service channels such as mobile, contact center, etc.

Prior Experience with Technology

There is a substantial body of research suggesting that prior experience with technology impacts consumer perception of technology (Luarn and Lin, 2005). Research has shown that people evaluate their satisfaction with online electronic banking based on the level of experience (Yoon, 2010). According to Karjaluoto, Mattila and Pento (2002), previous studies have found that prior experiences with computers have a bigger impact in the adoption of internet banking than demographics. This finding is supported by extensive research results showing that self-efficacy with new technology impacts adoption of online banking (Wang et al., 2003). Thus, for the purpose of this thesis, technology acceptance and its impact on adoption of online banking will be considered.

2.2.5 Consumer Innate Innovativeness

Studies have hypothesised that consumer adoption of innovations has a direct impact on adoption of online banking (Farzianpour et al., 2014). The relationship between innate consumer innovativeness (ICI) and product adoption has also been studied. Im et al., (2003) noted that there has been a lack of evidence showing that higher ICI predisposition actually translates to new product adoption behavior. Their research showed that ICI is weakly related to product adoption. Finally, other research has tried to link demographics and ICI with adoption of new
products (Lassar et al., 2005). Possible links (paths) between these variables are shown in Figure 4.

![Diagram of Model of Personal Characteristics, Innate Consumer Innovativeness, and New-Product Adoption Behavior (Im et al., 2003, p.63)](image)

**Figure 4 Model of Personal Characteristics, Innate Consumer Innovativeness, and New-Product Adoption Behavior (Im et al., 2003, p.63)**

High correlations have been found for paths 1 and 2 (Figure 4). Previous studies showed that ICI and new product adoption (NPA) were related. Later research by Goldsmith et al., (1995), showed that ICI is weakly related to NPA. Goldsmith et al., (1995) found that domain specific innovativeness had a stronger relationship with NPA in the fashion and electronics domains. This finding was further supported by other research in the context of online shopping. For path 3, previous research has shown weak to no relationship between personal characteristics and ICI. Path 4 has received less research attention, although there is some evidence that personal characteristics modulate the relationship between ICI and NPA.

In summary, the literature review shows a substantial number of studies focusing on factors that affect adoption of online banking. Prior research clearly shows the impact on individual differences in terms of user attitudes, demographics, perceptions and preferences. These findings provide the impetus to explore other individual differences and new ways to measure existing factors.
2.3 Individual Differences (ID)

Individual differences (ID) refer to user factors that include personality traits, demographic variables, as well as situational variables such as experience and training (Kalmus, Realo and Siibak, 2011). One of the key principles of user centered design is to 'know the user' which can be a challenging goal (Aykin and Aykin, 1991). For any domain, including online banking, the user population includes wide ranges of expertise and experience. Users differ on features such as age, income, usage of electronic systems, and computer knowledge. Even if a population is quite similar with respect to demographics or job descriptions, users can still exhibit differences in terms of preference and work strategies (Gwizdka and Chignell, 2007).

Individual differences influence behavior across a range of domains, including education and health care. For instance, Miller and Jablin (1991) discussed the role of individual differences in affecting how new hires in an organization seek information. The authors stated that new hires with low ambiguity tolerance may resort to more direct information seeking behavior than new hires with high ambiguity tolerance (Miller and Jablin, 1991). Similar relationships have been found in internet banking, as discussed in section 2.2.

Personality is another component of individual differences. Personality is often considered to be a collection of enduring characteristics. These characteristics are expected to remain stable across diverse ranges of situations (Spence, DeYoung and Feng, 2009). This expectation has been validated in prior research. For instance, Benyon (1993) noted that Cognitive skills and personality seem to evolve over time but once acquired are difficult to change. Thus for the purpose of this thesis, individual differences have been selected as a focus since they may be more malleable and adaptable to cope with new technology such as electronic banking. The next section focuses on the individual differences that are hypothesized to impact adoption of electronic banking based on the literature reviewed so far.

2.3.1 Communication Preferences

The theoretical framework for diffusion of innovations was based on the premise that to understand how innovations are diffused one must study interaction and communication between individuals (Katz, 2006). Thus, communication preferences of a population may have an impact
on diffusion and may explain, to some extent, delayed adoption of electronic banking. The literature review findings are discussed next.

Ruppenthal and Chignell (2002) studied communication preferences of a communication service provided in the telecommunications industry. The general aim of their study was to understand consumer’s perception of a unified communication service, which allowed customers to access different services via a single account. The underlying goal was to first identify communication traits and to then use those traits to help determine customer segments. Ruppenthal and Chignell (2002) assumed that understanding user preferences might help design better services that match user expectations. They reviewed evidence showing that individual differences affect how users use or adopt different technologies. Ruppenthal and Chignell cited previous work showing that technology adoption or usage depends on the purpose of the message and the context of access to technology (Marold and Larsen, 1997). Using a survey, Ruppenthal and Chignell (2002) measured communication preferences for 179 consumers. Through factor analysis, seven communication traits were identified. Using cluster analysis on the data, three clusters differentiated users based on the seven communication factors previously identified. The three user groups were: low tech communicators, power communicators and strategic communicators. The main differences between these groups were the usage of different technologies for communications purposes and their level of acceptance and compliance in using them. This work showed the importance of individual differences as a mediating factor in user acceptance of technology. This research formed the basis for the development of the Communication Preference Inventory.

The Communication Preferences Inventory (CPI 1.0) was developed by Chignell et al., (2002) to measure individual differences in communication preferences. Factors relating to individual preferences in areas such as synchronous and asynchronous communication, work-related availability, social availability and message management were identified. The original CPI (1.0) inventory contained 62 items and was found by Chignell et al. a good predictor of self-reported newsgroup and email usage.

Based on this work Lottridge et al., (2004), developed the Communication Preference Inventory (CPI 2.0) scale, a 15-item short-form of the CPI that differentiated between different consumer types based on 3 communication preferences: Work-Related Availability, Computer –Mediated
Communication and Verbal Communication. The goal of the scale was to understand communication device preferences and to provide a tool for predicting adoption of new technology in different consumer types.

Zwaanswijk et al., (2011) studied the communication preferences of children with cancer, their parents, and survivors of cancer. They used vignettes to elicit feedback on communication preferences in terms of who should be informed and take part in treatment related decisions and how much information should be provided. The vignettes were based on seven factors that were found in previous studies to moderate the communication preferences between care givers and pediatric oncology patients. These included: main subject of the consultation, diagnosis, illness stage, prognosis, child age, child emotionality, child’s physical condition, amount of parents’ pre-existing knowledge about the illness and treatment. After each vignette a questionnaire was administrated to record communication preferences for each of the main dependent variables. ‘Health-care provider empathy’, was measured by a visual analogue scale (VAS). Under all conditions, health care provider empathy was found to be paramount. Zwaanswijk et al. also found that patients and their parents preferred to be provided information at the same time as each other. Participants differed in terms of whether information should be “pulled” or “pushed”. Some wanted information to be provided even if they had not asked for it whereas others preferred that information not be shared unless requested. The research by Zwaanswijk et al., (2011) acknowledged the importance of communication preferences as mediating factors in patient-physician relationship.

A similar study was undertaken by Farin et al., (2011). Their study looked at the communication preferences of patients with chronic illness. Their literature review identified patient-provider communication as a key component in provision of healthcare. Gramm and Kosiol (2011) sought to develop a psychometric valid scale based on communication theory and patient participation that can help determining communication preferences. Based on focus groups and cognitive interviews they developed a 32 items scale to assess the communication preferences expected from physicians. According to Gramm and Kosiol (2011), this scale integrated the communication aspects found in the literature, with the opinions of patients. The authors found that the scale was made up of the following communication preferences categories: Patient participation and patient orientation, effective and open communication, and emotionally supportive communication. The overall results show that the scale was psychometrically valid.
but required more work to validate its applicability to other illnesses and/or health providers’ professions. The work of Gramm and Kosiol, (2011) showed how communication preferences act as an intermediate variable that may affect patient-physician relationships and may influence health outcomes

Robinson and Stubberud (2012), this time in the education domain also focused on communication preferences. In their study they looked into university students’ preferences for different communication methods such as: Face to Face, Email, Telephone, Chat, Sms Texting, Paper, Facebook. Prior work had indicated that students of the net generation prefer electronic means of communication like mobile phone to face to face communication. However, Robinson and Stubberud found that, for students, face to face communication was overall most preferred, although the preferred method depended on the reason for communication. When communicating due to work/school, students preferred to use email vs SMS texting. In contrast, SMS texting was preferred to email communication when communicating socially. Finally, Robinson and Stubberud (2012) found that students did not like using Facebook for purposes of work/school communication, leading the authors to speculate that this communication method is being safeguard for strictly social communication.

In the research for this thesis the CPI 2.0 was used to measure communication preferences since it has a short form (15 questions) that is easy to administer, and is more generic than other communication related inventories and is not tied to a specific domain. The CPI 2.0 scale is shown in appendix B.

2.3.2 Technology Profile Inventory

DeYoung and Spence (2004) proposed that a technology profile is analogous to a personality profile. Similar to how a personality profile helps understand people’s behaviour under various situations; a technology profile helps us understand responses people give when interacting with information technology. Unlike a personality profile, a technology profile is not an enduring personality trait and it can change depending on the experiences a person has.

Attitudes to computers have been shown to affect behavior (Levine & Donitsa-Schmidt, 1998). DeYoung and Spence (2004) proposed that the three dominant factors in attitudes towards technology may be characterized as Confidence (vs. anxiety), Approval, and Interest.
Building on a preliminary study (DeYoung & Spence, 2004), the Technology Profile Inventory (TPI) was developed to assess attitudes toward IT. Three large factors, consistent with previous work, appear to account for most of the variance in attitudes toward IT. Based on the research evidence, the TPI provides a reliable and valid measure of these factors, Confidence, Approval, and Interest. The different subscales have been shown to measure computer and internet usage (Spence, DeYoung and Feng, 2009). The associations of the TPI with personality (via the Big Five personality traits) were generally found to be weak. This is additional indication that TPI is measuring more “soft” characteristics “about computers” than actual personality. Another important finding was that attitudes about IT could be influenced by training (Spence, DeYoung and Feng, 2009). However, training effects are lost if the skill and knowledge is not used.

Technology Acceptance Model and TPI

The Technology Acceptance Model (TAM) is a framework used to explain the adoption of information technology by the users. The TAM framework assumes that user propensity to use an information system relies on beliefs or perceptions about the information system’s usefulness and ease of use (Davis, 1989). In addition, prior research has shown that individual differences (ID) influence those beliefs and studies also have shown significance relationships between ID and adoption of new technology via TAM (Alsajjan and Dennis, 2010). There is a substantial body of research that validates the TAM model. The TAM model has been used to examine electronic banking adoption and has been extended to include other variables such as trust, perceived risk, perceived self-efficacy and cost associate with adoption (Pikkarainen et al., 2004; Wu and Wang, 2005; Luarn and Lin 2005).

For the work described in this thesis, the TPI was used to measure user’s attitudes toward online banking since it seems to measure “lower” level constructs than the TAM and it has not been used previously in the context of understanding the adoption of online banking.

2.3.3 Innovativeness

According to Rogers (2003), there has been substantial research on the rate of adoption for new ideas, the impact of the social network on individual adoption of an idea and also on the characteristics of the innovator. Diffusion of innovation at its core is a communication process that allows new ideas to flow between individuals in a social system.
Consumer researches have noted that consumer innovative behaviour is linked to heavy use of a product category (Goldsmith, 2001). In particular, the innate or natural propensity to innovate has received special attention. Since this thesis takes a user centered approach, user predisposition to innovate and its relationship to adoption of electronic banking was studied more closely. To achieve this goal the next section of this literature review focuses on the concept of consumer innovativeness and its measurement.

2.3.3.1 Consumer Innovativeness

Innovativeness is defined as the degree to which the consumer is earlier to adopt a new innovation than other consumers (Goldsmith and Hofacker, 1991). The usefulness of the innovativeness construct has been shown in multiple studies across different domains. For example, Im et al., (2003), studied the relationship between innate consumer innovativeness (ICN), personal characteristics and product adoption. Their work found that demographic characteristics such as age and income are strong predictors of new product adoption. They also found that demographic characteristics did not influence ICN and that ICN did not have an impact on product adoption.

Clement-O’Brien, Polit and Fitzpatrick (2011) studied innovativeness of Chief Nurse Officers at acute care hospitals. They explored the difference in innovativeness of CNOs in Magnet hospitals (award winning) vs. non-Magnet hospitals. Innovativeness was measured as the individual’s propensity to accept or adopt change. The Scale for Measurement of Innovativeness was use in their study, which measured perception rather than behavior. The results show that a CNO’s education and experience level directly correlated with innovativeness. So if a CNO had a masters or PhD degree he or she was more likely to accept change and lead innovations. Interestingly, there was no significant difference between Magnet hospitals and non-Magnet hospitals. This implies that innovativeness is a characteristic that can be observed in different settings and that it may be more a property of the individual than the organization.

The concept of innovativeness is of interest because it will help us shed some light on which users are willing to adopt new way of doing things. Also, it will help us develop an adoption profile base on innovativeness. The next section discusses different scales used to measure innovativeness.
2.3.3.2 Consumer Innovativeness Measuring Scales

Innovation can be conceptualized as a generic personal trait or can be assessed within the context of consumer experience with a particular domain, product or idea innovation (Goldsmith and Hofacker, 1991). Roehrich (2004), after a review of different innovativeness definitions and measuring scales, stated that, at a high level, innovativeness can be defined as the potential for organization, or consumer to display innovative behavior. Table 3 lists different theoretical innovativeness conceptualizations and corresponding measuring scales identified by Roehrich (2004).

<table>
<thead>
<tr>
<th>Author</th>
<th>Conceptual Dimensions</th>
<th>Predictive Validity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raju’(1980)</td>
<td>Newest attraction/repulsion</td>
<td>Good internal consistency and result are partially confirmed</td>
</tr>
<tr>
<td>Baumgartner and Steenkamp’s exploratory product acquisition</td>
<td>Newest attraction/repulsion</td>
<td>Predictive validity is confirmed by correlation with variety seeking behaviour and innovative behaviour. Also it has been show that this scale has high correlation with the possession of new products.</td>
</tr>
<tr>
<td>Domain Specific Innovativeness (DSI) Goldsmith and Hofacker, (1991)</td>
<td>Newest attraction/repulsion</td>
<td>Predictive validity high however, same issue with discriminant validity- one-dimensional scale</td>
</tr>
<tr>
<td>Roehrich’s (1995) scale</td>
<td>1. Need for stimulation 2. Need for uniqueness</td>
<td>Predictive validity tends to be higher with the number of new products purchased than with innovative purchase intention</td>
</tr>
<tr>
<td>Le Louarn’s scale</td>
<td>Risk attraction / aversion Attention to others opinions Newest attraction/repulsion</td>
<td>Good predictive validity. The 3 dimensions have poor correlation and only one dimension, attraction to newness was found to be correlated with innovative behaviour.</td>
</tr>
</tbody>
</table>

Table 3 Innovativeness Scales, Measurement Dimension and Predictive Validity (for full dimension definitions see Roehrich, (2004)
The DSI inventory is of particular interest because it has been validated in multiple studies and it has been shown to be a better predictor of consumer innovation than an individual’s overall innate level of innovation (O’Donnell and Sauer, 2011). Consequently, the DSI scale was chosen as the instrument to be used in assessing consumer innovativeness in this thesis. The next section reviews the DSI scale in more detail and provides a summary of related findings.

2.3.3.3 Domain Specific Innovativeness (DSI) Measuring Scale

The domain specific innovativeness scale was created to help researchers measure the innovativeness construct, which plays a central role in the diffusion of innovation (Goldsmith and Hofacker, 1991). They conducted a series of six different studies to evaluate an innovativeness scale that can be used in the context of a product that is familiar with the consumer. Their innovativeness scale was based on the highly reliable and valid scale known as the Opinion Leadership Scale (Goldsmith and Hofacker, 1991). The goal was to develop a scale that could be adapted to different domains and could help understand consumer innovative behaviour. The resulting scale from these studies was the Domain Specific Innovativeness scale (DSI) which is made up of a six item Liker-type of scale using a five point rating. In the scale, three items are positively worded and three items negatively worded. This scale has shown to be a valid method to measure the degree to which a consumer is an innovator within a specific product service (Goldsmith and Hofacker, 1991; O’Donnell and Sauer, 2011; Kim, Hunt, and Lancionic, 2015).

One of the advantages of the DSI scale is its ease of deployment and its predictive validity. Although there are many scales and approaches to measure innovativeness, the DSI items are generic and can be adapted to the domain and product under investigation. Goldsmith (2001) noted that the DSI has proven to be a useful research tool across products, domain and cultures. An example cited by Goldsmith is the use of DSI to study online shopping, where DSI positively correlated with amount of online buying behaviour. Another study, in the fashion industry, found that innovators spent more effort and money on new fashion than non-innovators. Goldsmith (2001) summarized the findings of his research related to DSI and online shopping behaviour. The results showed that higher DSI scores were associated with increased internet behaviour such as more hours of internet use and more online shopping. In addition, previous customer buying behaviour was a good predictor of future innovative behaviour. Thus, if consumers
exhibited innovative behaviour in the past, chances are that this behaviour will carry over into the future, unless an external event forces them to change their consumption habits (Goldsmith, 2001). Interestingly, in Goldsmith’s study, demographic characteristics had low to no impact on level of innovativeness.

Another study that validated the predictive power of DSI is the work by O’Donnell and Sauer (2011). They studied the innovativeness of prospective students when selecting a university major. Their goal was to determine what type of students and what percentage of students might be interested in a new or novel major. For this study the authors used the DSI scale and applied it to the education domain. A total of 250 students took part in the survey and the results indicated that students that enrolled in newly created major has higher levels of DSI, Mat SAT scores and high school averages. While there was a weak correlation between DSI and SAT scores in the study there was no significant correlation between DSI and high school grade average. The correlation may have been weak because DSI is just one variable that goes into making a final decision on selecting a major (O’Donnell and Sauer, 2011).

Finally, in the context of electronic banking, the work by Aldás-Manzano et al., (2009) found that consumer domain specific innovativeness (DSI) was an important factor in the electronic banking experience. They found that higher levels of DSI predicted electronic banking adoption and it also helped in reducing the consumer risk perception of using electronic banking channel.

For the work described in this thesis, the DSI scale will be used to assess the innovativeness of online banking users since it has been validated by multiple studies and is easy to administer.

2.4 Crowdsourcing

“Crowdsourcing represents the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (a generally large) network of people in the form of an open call” (Howe, 2006)

Crowdsourcing services such as Innocentive.com, Threadless.com, Wikipedia.org, Lego’s DesignByMe are examples of for profit and non-profit efforts that tap on the knowledge and skill of the internet community (Hammon and Hippner, 2012). Of key importance to crowdsourcing is the role of the crowd to solve or add value to problems that otherwise could not be solved inside
an organization or individual. According to Hammon and Hippner (2012) crowdsourcing can be seen as an extension of customer integration with the idealization of market solutions. However, they note that crowdsourcing goes beyond that since it could tap on knowledge from a larger user set beyond existing customers.

Crowdsourcing sites allow posting mini or small computer based tasks to be completed by a pool of e-workers. Examples of such site are Amazon, Mechanical Turks, CrowFlower, Clickworker, etc. The important aspect of these crowdsourcing sites is that these are not typical websites but rather powerful platforms that support the end to end process of posting a task, recruitment, QA work and payment fulfillment. For the most part, these services are free to join as a requestor (post a micro task) and/or as a worker (perform a micro task). As a requestor often there is a cost associated with posting a task and typically is a percentage of the task’s stipend. Some sites may require a monthly or yearly subscription fee to post and access the pool of e-workers. Examples of task posted on these sites are image classification, translations, telephone number validation, etc. However, any type of task that can be executed via a computer could be potentially posted.

The research in this thesis used crowdsourcing as the means to access a diverse population in sampling attitudes towards innovation in online banking. Through a review of available services Amazon’s Mechanical Turks (AMT) was selected as the platform that met the study requirements.

2.4.1 Amazon Mechanical Turks (MTurk)

MTurk is a digital labor market created by Amazon that uses a pool of workers to execute micro tasks that cannot be easily automated today or that require human intervention. contains a large pool of potential participants. In 2014, it is estimated that the pool base is about 500K (Paolacci and Chandler, 2014). Also, MTurk’s built-in capabilities to submit requests (tasks), recruit workers (participants), and fulfill payments make this an attractive platform (Ipeirotis, 2010).

In MTurk a requestor will post a task, set the payment, number of responses required, and any pre-screening or participant’s requirements (e.g., county of residence). Then the task is posted and made available to people in the MTurk worker pool who meet the study pre-requirements. As the task is completed, workers are paid automatically or after the requestors approve their work. An important aspect of this whole process is that recruitment is done automatically and the
requestor is not directly in contact with the MTurk workers throughout this process. Payment is withdrawn from the requestor’s account and paid directly to the workers by MTurk.

Although most tasks posted to MTurk are micro tasks, the service allows for the creation of surveys using predefined templates or link to a survey hosted on an external survey tool such as SurveyMonkey. Once a task is posted, the MTurk platform provides feedback on the number of responses received and allows the requester to cancel the job if needed. Compensation for tasks posted in MTurk can be as little as 5 cents and can increases in increments of 5 cents.

Mturk’s platform characteristics make it an attractive and easy way to conduct online surveys. A number of studies have used MTurk for the purpose of conducting Psychology and Social Sciences research (Mason and Suri, 2011). However questions have been asked as to whether or not the population sample is representative and how reliable is the data collected via MTurk is. Specifically, is the sample representative and better than typical samples used today (e.g., university students). Also what is the impact of stipend on the quality of the data? Are participants who make 0.50 cents really going to answer questions carefully or are they going to game the system? A number of papers were reviewed to investigate these questions further and are discussed below.

Sample

Research has found that the MTurk worker population was generally more diverse than the general internet population and significantly different from the university student population (Mason and Suri, 2011; Bohannon, 2011). This is a positive feature of MTurk since the university student population is not a good representation of the general population. Paolacci and Chandler (2014) also found that the MTurk worker pool is an acceptable alternative to traditional samples but warned that the samples should not be treated as representative of the general population. In addition they encourage researches to described sample characteristics and caution against assuming that a single study may replicate with other MTurk samples. They also provide best practices on how to avoid sampling techniques that may further dilute the repetitiveness of the sample. In general though, the prior research found that MTurk sample is acceptable and an improvement to typical samples used in psychological studies.
Impact of Compensation on Participation

Previous work has studied the relationship between participation and compensation. The main concern has been whether low compensation affected the quality of the responses received. Buhrmester et al., (2011) found that low compensation per task did not impact data quality but impacted the rate of the responses. A literature review carried out Paolacci and Chandler (2014) also found that there is no relationship between compensation and data quality. Researchers found that a good proportion of MTurk workers participate for other intrinsic reasons besides payment.

Data Quality

Previous studies found that MTurk data met typical data psychometric standards: test–retest reliabilities were within acceptable valuables (Holden, Dennie and Hicks, 2013). Other studies found MTurk data to be reliable and self-report of individual differences to be psychometrically valid (Paolacci and Chandler, 2014). Finally, some studies have been able to replicate a number of previous lab based studies using the MTurk marketplace. For instance, Wolfson and Bartkus (2013) was able to replicate a number of experimental economics research (e.g., endowment effect, etc.) using MTurk marketplace. Similarly, Crump, McDonnell, Gureckis (2013) replicated with some success a number of studies (e.g., Stroop, Switching experiments) and they recommend that behavioral experiments done on AMT be accepted as a valid study methodology.

In summary, the literature suggests that MTurk is an acceptable alternative to run psychological studies but more validation is needed. The expectations are that going forward MTurk platform will be more widely used in psychology and social science (Bahannon, 2011).

2.5 Summary of Literature Review

This literature review has considered the conceptualization, measurement and evaluation of individual differences in innovative behaviour in general, and in the adoption of online banking in particular. Each of the sections in this chapter will now be briefly reviewed.

First, the diffusion process provided the overreaching concept that helped frame subsequent topics. The seminal work by Ryan, and Gross (1943) framed the diffusion process as the
introduction of a new idea, practice or product via different communication mediums within a social circle. Their work showed that the diffusion of an idea takes time and is a process which varies by individuals. Also, the ease with which an idea is adopted depends on a number of intrinsic characteristics of the innovation such as relative advantage or complexity, and so on. By understanding user propensity to accept a new way of doing things the consumers can be segmented within a range of early to late adopters (Rogers, 1976). Finally, the end result of the diffusion process is the adoption of the new innovation (idea, practice or product) which links diffusion to the main topic of this thesis.

Second, factors affecting adoption of online banking were reviewed. It was found that a diverse number of factors affect the adoption of online banking that include: demographics, attitudes, perceptions and preferences, trust, risk, security and privacy, human contact and the influence of reference group, and consumer innovativeness. The key finding was that individual differences impact adoption for electronic banking. There were four factors that were of special importance for the purpose of this thesis: demographics, preferences, prior experience with computer and consumer innovativeness.

Next, the literature review focused on a cursory review of individual differences (ID). Given that diffusion process is by nature a communication processes, previous work on communication preferences was reviewed. The findings showed the importance of understanding end user communication preferences since they help improve communication within parties of a social group but also may help improve task outcome. The impact of technology profile on adoption was also reviewed. The findings provide solid evidence that user perceptions of a new technology greatly influence its adoption. We identified the technology profile inventory (TPI) as a useful tool for predicting technology adoption. It was found to be an acceptable method of measuring the impact of technology specifically since its construction includes references to newer technologies such as the internet and it may be measuring less enduring characteristics.

Then, the construct of innovativeness was reviewed in terms of conceptual definitions and measuring. The key take away was that innovativeness is part of an individual characteristic that can be measured. However, the literature reviewed showed that there are multiple definitions and inventories for this construct with varying degrees of predictive power. I distinguished between generalized and domain specific innovativeness. Past research suggested that generalized
innovativeness lacks predictive power in the context of product adoption. Domain specific innovation has been found by multiple studies to be more practical to predict the adoption of new innovations.

Finally, the power of crowdsourcing was discussed. Crowdsourcing provides access to a diverse pool of participants and it is ease to deploy. Although crowd-sourced surveys are very different from lab experiments, data quality and user engagement seem to be acceptable and have been validated in multiple studies.
3 Research Model, Hypotheses and Method

3.1 Research Model

The purpose of this thesis was to understand the role that individual differences play in the adoption of electronic banking. The end goal is to have an adoption profile of electronic banking that can help product managers to design and market more effectively these services.

Based on the literature review described in the previous chapter this thesis focus in three key basic constructs: Innovativeness, Adoption, and Individual Differences as seen in figure 5.

![High Level Conceptual Study Model](image)

**Figure 5 High Level Conceptual Study Model**

The next section described the relationships are explored in this thesis.
3.2 Research Hypotheses

The theory of diffusion of innovations described the process by which a consumer adopts an innovation (e.g., idea, product or service). Thus it follows that consumer innovativeness may have an impact on the likelihood that the innovation will be adopted. In this thesis I use Domain Specific Innovativeness (DSI) to measure innovative behaviour and I expect clustering of DSI responses to distinguish between early and late adopters:

**H1: Clusters based on Domain Specific Innovativeness (DSI) can distinguish between early and late adopters.**

The diffusion is a process where an idea is communicated through different media amongst member of a social circle. It follows that the diffusion process is a communication process between members of a social circle. Thus it is possible that communication preferences of the consumers may actually facilitate or deter the diffusion of a new innovation. Thus,

**H2: There will be significant relationships between the Communication Preference Inventory Factors and the DSI clusters.**

Electronic banking is a new technological innovation. Thus adoption of that innovation should be influenced by the user’s Technology Profile. More positive attitudes towards technology should lead to earlier adoption. This gives rise to the following hypothesis:

**H3: Technology Profile Inventory (TPI) will be able to predict or identify innovative behaviour**

Since demographics have shown to impact adoption of products including online banking, I will also test the following hypothesis:

**H4: Basic demographics, computer ownership and internet behaviour will be able to predict or identify innovative behaviour**

Finally, since innovative behaviour leads to adoption, this work attempts to build a model of how the different individual differences identify innovative behaviour. So we are interested to find a relationship between all variables, as shown in figure 6:
3.3 Method

3.3.1 Recruitment and Procedure

This study used a survey-based method to collect data on attitudes towards online banking in the United States. Respondents were recruited using the MTurk Crowdsourcing service. The only qualifying criterion used was country of residence (United States). Responses were received within 5 days of posting the task in MTurk site. A total of 350 replies were received of which 321 responses were used in the data analysis. SurveyMonkey was used to create the questionnaire and collect the data. A link to the survey was embedded as part of MTurk task. Participants were not contacted directly by the authors of the study but rather participants consented to fill in the questionnaire via the MTurk HITs dashboard. The survey consisted of 62 questions split in 4 sections that were identified to be important on the basis of the literature reviewed in chapter 2. The different measuring scales used in this study are described in section 4.2.
3.3.2 Instruments

This thesis explores the relationship between adoption of electronic banking and individual differences. The scales (CPI, TPI and DSI) selected to measure the different construct were based or adapted from previous studies to ensure content validity. In addition, a demographic questionnaire was included since previous studies have shown the impact of demographics on innovativeness and adoption.

Demographics

The demographics questionnaire was made up of three sections: general demographic information, computer ownership and usage, and online behaviour (see Appendix A). The questionnaire was based on questions found in prior research and includes age, income and education level as related to innovativeness Im et al., (2003) and adoption Karjaluoto et al., (2002).

Communication Preferences Inventory (CPI)

As noted in chapter 2, the diffusion of new products relies heavily on interpersonal communication and prior research has shown the role of communication preferences as a mediating variable that can impact end user satisfaction and even outcome (Farin, Gramm and Kosiol, 2011).

For the work described in this thesis, the short form of Communication Preferences Inventory scale was selected (The inventory is shown in Appendix B). Using this scale, users rated they agreement with CPI items using a 5-point Likert scale (1=strongly disagree, 2=disagree, 3=neither agree nor disagree, 4=agree and 5=strongly agree).

Technology Profile Inventory (TPI)

Users were questioned about their perceptions and behaviours towards computer technology and the internet since the electronic banking has a strong technical undertone. Prior research has found that user’s perceptions, prior knowledge and experience about technology have an impact in the adoption of new technology (Yousafzai and Yani-de-Soriano, 2012). For the study
described in this thesis the Technology Profile Inventory (TPI) was selected to measure user’s perceptions of new technology, see Appendix C.

**Domain Specific Innovativeness (DSI)**

The Domain Specific Innovativeness (DSI) Scale has been shown to have good predictive power consistently across studies. As a result, this scale was used in the work described in this thesis. The DSI scale was modified to include online banking as part of the scale item inventory, thus making it suitable for this study.
4 Results

4.1 Sample

A shown in table 4 the respondents were predominantly male (around 61%) with 92.5% of the participants being between 18 and 55 years of age. Almost 56% of the population had a bachelor’s degree or higher. Roughly 52% of participants self-reported as being employed in clerical, managerial or professional type jobs.

<table>
<thead>
<tr>
<th>Age</th>
<th>Percentage</th>
<th>Frequency</th>
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</thead>
<tbody>
<tr>
<td>25 or under</td>
<td>31.3%</td>
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<tr>
<td>26-40</td>
<td>45.8%</td>
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<tr>
<td>41-55</td>
<td>15.4%</td>
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<tr>
<td>56 or older</td>
<td>7.5%</td>
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<table>
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<tr>
<th>Gender</th>
<th>Percentage</th>
<th>Frequency</th>
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<tbody>
<tr>
<td>Female</td>
<td>39.2%</td>
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</tr>
<tr>
<td>Male</td>
<td>60.8%</td>
<td>194</td>
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<table>
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<tr>
<th>Education</th>
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<th>Frequency</th>
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<td>Primary school</td>
<td>5.3%</td>
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<tr>
<td>Secondary school</td>
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<td>Bachelor's degree</td>
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<tr>
<td>Master’s degree</td>
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<tr>
<td>Doctorate degree</td>
<td>1.9%</td>
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<table>
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<th>Occupation</th>
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<td>Student</td>
<td>16.6%</td>
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</tr>
<tr>
<td>Clerical work</td>
<td>13.2%</td>
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<tr>
<td>Managerial Level</td>
<td>10.7%</td>
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<tr>
<td>Professional</td>
<td>26.3%</td>
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</tr>
<tr>
<td>Self-employed</td>
<td>23.8%</td>
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<tr>
<td>Other (please specify)</td>
<td>9.4%</td>
<td>30</td>
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</table>

<table>
<thead>
<tr>
<th>Monthly Income</th>
<th>Percentage</th>
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</thead>
<tbody>
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<td>Below $4,000</td>
<td>60.2%</td>
<td>192</td>
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<tr>
<td>$4,000 - $8,999</td>
<td>21.0%</td>
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<td>$9,000 - $13,999</td>
<td>3.1%</td>
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<td>$14,000 - $18,999</td>
<td>1.3%</td>
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</tr>
<tr>
<td>$19,000 - $23,999</td>
<td>4.4%</td>
<td>14</td>
</tr>
<tr>
<td>$24,000 or above</td>
<td>10.0%</td>
<td>32</td>
</tr>
</tbody>
</table>

Table 4 Demographic Profile

4.1.1 Computer Ownership and Usage

In terms of computer usage (see table 5), more than 95% of the sample had either a desktop computer or laptop. Almost 60% of participants used a computer more than 10 hours a week and 38.9% of them used a computer for more than 20 hours a week. Thus people in the sample were
generally comfortable with using computers. This is validated by the fact that almost 100% of the participants had access to the internet and a computing device, which are required to sign up as a worker in MTurk. In the sample, 82% of the participants reported substantial experience using the internet (more than 11 years).

<table>
<thead>
<tr>
<th>Computer Ownership</th>
<th>Percentage</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desktop Computer</td>
<td>45.6%</td>
<td>145</td>
</tr>
<tr>
<td>Laptop</td>
<td>50.9%</td>
<td>162</td>
</tr>
<tr>
<td>Tablet</td>
<td>3.5%</td>
<td>11</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Computer usage per week</th>
<th>Percentage</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1</td>
<td>9.7%</td>
<td>31</td>
</tr>
<tr>
<td>1 to 5 hours</td>
<td>14.7%</td>
<td>47</td>
</tr>
<tr>
<td>5 to 10 hours</td>
<td>16.0%</td>
<td>51</td>
</tr>
<tr>
<td>10 to 20 hours</td>
<td>20.7%</td>
<td>66</td>
</tr>
<tr>
<td>over 20 hours</td>
<td>38.9%</td>
<td>124</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Internet at home</th>
<th>Percentage</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>99.4%</td>
<td>317</td>
</tr>
<tr>
<td>No</td>
<td>0.6%</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Internet Usage</th>
<th>Percentage</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 3 years</td>
<td>0.9%</td>
<td>3</td>
</tr>
<tr>
<td>3-6 years</td>
<td>4.7%</td>
<td>15</td>
</tr>
<tr>
<td>7-10 years</td>
<td>12.5%</td>
<td>40</td>
</tr>
<tr>
<td>11-14 years</td>
<td>27.9%</td>
<td>89</td>
</tr>
<tr>
<td>More than 15 years</td>
<td>53.9%</td>
<td>172</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Online and/or Mobile Banking</th>
<th>Percentage</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>95.9%</td>
<td>306</td>
</tr>
<tr>
<td>No</td>
<td>4.1%</td>
<td>13</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percentage</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check email</td>
<td>88.1</td>
<td>281</td>
</tr>
<tr>
<td>Use instant messaging</td>
<td>48.3</td>
<td>154</td>
</tr>
<tr>
<td>Shop online</td>
<td>25.7</td>
<td>82</td>
</tr>
<tr>
<td>Use online banking (check account balance, pay bill, etc.)</td>
<td>41.7</td>
<td>133</td>
</tr>
<tr>
<td>Social Networking (e.g., Facebook, Twitter, Google+)</td>
<td>60.2</td>
<td>192</td>
</tr>
</tbody>
</table>

**Table 5 Computer Ownership and Usage**

### 4.1.2 Online Behaviour

As shown in table 6, almost all the sample participants had adopted electronic banking. This is consistent with the idea that MTurk workers would prefer doing things online.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percentage</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>All the time</td>
<td>%</td>
<td>Freq.</td>
</tr>
<tr>
<td>A few times a week</td>
<td>%</td>
<td>Freq.</td>
</tr>
<tr>
<td>A few times a month</td>
<td>%</td>
<td>Freq.</td>
</tr>
<tr>
<td>Hardly Ever</td>
<td>%</td>
<td>Freq.</td>
</tr>
<tr>
<td>Never</td>
<td>%</td>
<td>Freq.</td>
</tr>
<tr>
<td>Check email</td>
<td>88.1</td>
<td>281</td>
</tr>
<tr>
<td>Use instant messaging</td>
<td>48.3</td>
<td>154</td>
</tr>
<tr>
<td>Shop online</td>
<td>25.7</td>
<td>82</td>
</tr>
<tr>
<td>Use online banking (check account balance, pay bill, etc.)</td>
<td>41.7</td>
<td>133</td>
</tr>
<tr>
<td>Social Networking (e.g., Facebook, Twitter, Google+)</td>
<td>60.2</td>
<td>192</td>
</tr>
</tbody>
</table>

**Table 6 Online Behaviour**
In terms of online behaviour, participants reported performing the following tasks (all the time) in decreasing order of importance:

1. Check email
2. Social networking
3. Instant messaging
4. Online banking
5. Online Shopping

Interestingly the top 3 tasks are all related to social communication. Thus it seems that the study participants use technology primarily for communication purposes. In terms of online banking usage, the sample is weighted towards moderate to heavy usage since more than 80% of the sample use online banking from a few times a week to all the time.

4.2 Communication Preferences

A total of 308 respondents completed the 15-item version of the CPI. In table 7, it can be seen that there is quite a lot of variability in responses within items (with standard deviations averaging around 1 or so) and there is also quite a bit of variability between items with means ranging from 2.25 (around a disagree rating) to 4.03 (an agree rating).

<table>
<thead>
<tr>
<th>CPI Items</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>I often check my business email or voicemail when I am away from the office outside of work hours.</td>
<td>3.25</td>
<td>1.294</td>
</tr>
<tr>
<td>I frequently engage in work related communications when I am away from the office outside of work hours.</td>
<td>2.94</td>
<td>1.211</td>
</tr>
<tr>
<td>I expect my business colleagues to be generally available outside of work hours.</td>
<td>2.64</td>
<td>1.132</td>
</tr>
<tr>
<td>My personal time is disrupted because it is too easy to be connected to work from home.</td>
<td>2.81</td>
<td>1.238</td>
</tr>
<tr>
<td>Writing letters to people is inefficient compared to sending email</td>
<td>3.95</td>
<td>1.079</td>
</tr>
<tr>
<td>I keep in touch with friends more now that I can communicate with them via the Internet.</td>
<td>3.87</td>
<td>1.066</td>
</tr>
<tr>
<td>I often communicate with my friends via the Internet.</td>
<td>4.03</td>
<td>1.011</td>
</tr>
<tr>
<td>I often compose and send messages as things come up.</td>
<td>3.92</td>
<td>0.979</td>
</tr>
<tr>
<td>Item</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------</td>
<td>-----</td>
</tr>
<tr>
<td>I use the Internet to maintain friendships,*</td>
<td>3.88</td>
<td>1.081</td>
</tr>
<tr>
<td>The quality of information gained from direct communication is worth the effort of arranging the communication</td>
<td>3.8</td>
<td>0.95</td>
</tr>
<tr>
<td>Completion of work tasks is faster and better when people communicate directly with speech rather than indirectly using text</td>
<td>3.53</td>
<td>1.025</td>
</tr>
<tr>
<td>Having a discussion by typing text is inefficient.</td>
<td>2.79</td>
<td>1.096</td>
</tr>
<tr>
<td>I find it difficult to communicate with a group of people who are in different geographic locations.*</td>
<td>2.25</td>
<td>1.005</td>
</tr>
<tr>
<td>I prefer talking with people directly rather than writing an email or text message.*</td>
<td>3.01</td>
<td>1.101</td>
</tr>
<tr>
<td>I prefer face-to-face meeting to more indirect forms of communication such as email and text messaging.*</td>
<td>2.99</td>
<td>1.123</td>
</tr>
</tbody>
</table>

Table 7 Means and Standard Deviations for the 15 CPI items

Correlations between CPI items were generally low to moderate with only two out of the 105 possible pairs sharing more than 50% variance (i.e., having correlations of greater than .7). These pairs were InternetFriendsFreq and InternetFriendsKeep (r=.76), and OutsideWorkEmailVoice and OutsideWorkComm (r=.75).

4.2.1 CPI Factor Analysis

Factor analysis was carried out with principal components analysis followed by Varimax rotation. Figure 7 shows the screen plot for the analysis. As expected based on the factor structure found by Lottridge et al., (2004) there are three factors above the elbow in Figure 7.
Inspection of the Rotated component matrix (Table 8) showed that the three factors were the same as the three factors found by Lottridge et al., (2004) in their analysis.

<table>
<thead>
<tr>
<th>CPI Items</th>
<th>Component 1</th>
<th>Component 2</th>
<th>Component 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>I keep in touch with friends more now that I can communicate with them via the Internet.</td>
<td>0.874</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I use the Internet to maintain friendships.*</td>
<td>0.835</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I often communicate with my friends via the Internet.</td>
<td>0.816</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I often compose and send messages as things come up.</td>
<td>0.719</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The quality of information gained from direct communication is worth the effort of arranging the communication.</td>
<td>0.583</td>
<td>0.335</td>
<td></td>
</tr>
<tr>
<td>Writing letters to people is inefficient compared to sending email.</td>
<td>0.43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I frequently engage in work related communications when I am away from the office outside of work hours.</td>
<td></td>
<td>0.897</td>
<td></td>
</tr>
<tr>
<td>My personal time is disrupted because it is too easy to be connected to work from home.</td>
<td></td>
<td></td>
<td>0.826</td>
</tr>
<tr>
<td>I expect my business colleagues to be generally available outside of work hours.</td>
<td></td>
<td></td>
<td>0.777</td>
</tr>
<tr>
<td>I often check my business email or voicemail when I am away from the office outside of work hours.</td>
<td></td>
<td></td>
<td>0.768</td>
</tr>
<tr>
<td>I prefer face-to-face meeting to more indirect forms of communication such as email and text messaging.*</td>
<td></td>
<td></td>
<td>0.842</td>
</tr>
<tr>
<td>The quality of information gained from direct communication is worth the effort of arranging the communication</td>
<td></td>
<td></td>
<td>0.841</td>
</tr>
<tr>
<td>Completion of work tasks is faster and better when people communicate directly with speech rather than indirectly using text</td>
<td></td>
<td></td>
<td>0.702</td>
</tr>
<tr>
<td>Having a discussion by typing text is inefficient.</td>
<td></td>
<td></td>
<td>0.678</td>
</tr>
<tr>
<td>I find it difficult to communicate with a group of people who are in different geographic locations.*</td>
<td></td>
<td></td>
<td>0.522</td>
</tr>
</tbody>
</table>

Table 8 Rotated Component Matrix for the Factor Analysis

The first factor in this analysis corresponded to the Verbal Communication factor, the second factor corresponded to Work Related Availability, and the third factor corresponded to computer mediated communication, the same three factors identified by Lottridge et al., (2004). I then carried out item reliability analysis to check the internal consistency of the factors using Cronbach’s Alpha, and to see if some items could be removed from the factors. After carrying out the item reliability analysis we obtained versions of each factor that each contained four
items having high internal consistency (as assessed by Cronbach’s alpha). The first factor was Work Related Availability with the following four items having a Cronbach’s alpha of .858.

<table>
<thead>
<tr>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>I expect my business colleagues to be generally available outside of work hours.</td>
</tr>
<tr>
<td>My personal time is disrupted because it is too easy to be connected to work from home.</td>
</tr>
<tr>
<td>I expect my business colleagues to be generally available outside of work hours.</td>
</tr>
<tr>
<td>I often check my business email or voicemail when I am away from the office outside of work hours.</td>
</tr>
</tbody>
</table>

The second factor was Computer-Mediated Communications with the following four items having a Cronbach’s alpha of .864

<table>
<thead>
<tr>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keep in touch with friends more now that I can communicate with them via the Internet.</td>
</tr>
<tr>
<td>I often communicate with my friends via the Internet.</td>
</tr>
<tr>
<td>I often compose and send messages as things come up.</td>
</tr>
<tr>
<td>I use the Internet to maintain friendships.</td>
</tr>
</tbody>
</table>

The third factor was verbal communications with the following four items having a Cronbach’s alpha of .792

<table>
<thead>
<tr>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completion of work tasks is faster and better when people communicate directly with speech rather than indirectly using text.</td>
</tr>
<tr>
<td>Having a discussion by typing text is inefficient.</td>
</tr>
<tr>
<td>I prefer talking with people directly rather than writing an email or text message.</td>
</tr>
<tr>
<td>I prefer face-to-face meeting to more indirect forms of communication such as email and text messaging.</td>
</tr>
</tbody>
</table>

These results suggest that a more efficient version of the CPI (which I refer to as the CPI-12) can be constructed as shown in Table 9.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Work-Related Availability (WRA)</strong></td>
<td>I often check my business email or voicemail when I am away from the office outside of work hours.</td>
</tr>
<tr>
<td></td>
<td>I frequently engage in work-related communications when I am away from the office outside of work hours.</td>
</tr>
<tr>
<td></td>
<td>I expect my business colleagues to be generally available outside of work hours.</td>
</tr>
<tr>
<td></td>
<td>My personal time is disrupted because it is too easy to be connected to work from home.</td>
</tr>
<tr>
<td><strong>Computer – Mediated Communication (CMC)</strong></td>
<td>I keep in touch with friends more now that I can communicate with them via the Internet.</td>
</tr>
<tr>
<td></td>
<td>I often communicate with my friends via the Internet.</td>
</tr>
</tbody>
</table>
I often compose and send messages as things come up.

I use the Internet to maintain friendships.

**Verbal Communication (VC)**

Completion of work tasks is faster and better when people communicate directly with speech rather than indirectly using text.

Having a discussion by typing text is inefficient.

I prefer talking with people directly rather than writing an email or text message.

I prefer face-to-face meeting to more indirect forms of communication such as email and text messaging.

<table>
<thead>
<tr>
<th>Cluster</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency</strong></td>
<td>17</td>
<td>7</td>
<td>20</td>
<td>40</td>
<td>24</td>
<td>44</td>
<td>29</td>
<td>7</td>
<td>15</td>
<td>16</td>
<td>27</td>
<td>45</td>
<td>17</td>
</tr>
</tbody>
</table>

People in clusters 1, 4, 6, and 8 are similar in that they have a relatively “flat” profile with similar scores for the three factors, with differences between the factors reflecting different levels of the assigned ratings. Clusters 1, 4, and 6 contained people who generally assigned the
midpoint of the scale while cluster 8 contained people who responded with strongly disagree. Clusters 9, 12, and 13 contained people who were high on CMC and low on the other factors. Clusters 5 and 7 contained people who were high on CMC and VC but low on WRA suggesting perhaps that they had better work-life balance than other respondents.

Figure 8 Levels of WRA, CMC, and VC across the 13 Clusters
4.2.3 Analysis of Variance between CPI and Other Factors

Analysis of variance was then used to see which demographic and other variables differed significantly between the communication preference clusters. The two clusters with the least number of respondents (clusters 2 and 8, with 7 people each) were removed and the remaining 11 clusters were used in a set of univariate ANOVAs involving the demographic and Internet Use variables. The results of the analysis are shown in Table 11. Although email use differed significantly between the clusters mean email use within clusters was high in all cases. More variation (between the clusters) was seen for the other usage variables. However usage seemed to be generally high with only email use in cluster 11 shading towards the disagree side of the scale. None of the demographic variables differed between the communication clusters.

<table>
<thead>
<tr>
<th></th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td>1.271</td>
<td>0.247</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>0.574</td>
<td>0.834</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td>1.288</td>
<td>0.237</td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td>0.806</td>
<td>0.623</td>
</tr>
<tr>
<td><strong>Computer Time</strong></td>
<td>1.583</td>
<td>0.111</td>
</tr>
<tr>
<td><strong>Internet Time</strong></td>
<td>1.543</td>
<td>0.124</td>
</tr>
<tr>
<td><strong>Email Use</strong></td>
<td>2.398</td>
<td><strong>0.01</strong></td>
</tr>
<tr>
<td><strong>Chat Use</strong></td>
<td>2.491</td>
<td><strong>0.007</strong></td>
</tr>
<tr>
<td><strong>Online Shopping</strong></td>
<td>2.027</td>
<td><strong>0.031</strong></td>
</tr>
<tr>
<td><strong>Social Media</strong></td>
<td>3.094</td>
<td><strong>0.001</strong></td>
</tr>
</tbody>
</table>

Table 11 Results of Univariate ANOVAs conducted across a set of Demographic and Internet Usage Factors
Figure 9 Differences in Internet Activities between the 11 Clusters with 15 or more respondents

In contrast the four internet activities (email use, chat use, online shopping, and use of social media) did differ significantly between the clusters, consistent with the idea that the clusters were sensitive to differences in communication preferences (Figure 9).

Table 12 The matrix of intercorrelations for the four internet activities

<table>
<thead>
<tr>
<th></th>
<th>EmailUse</th>
<th>ChatUse</th>
<th>OnlineShopping</th>
<th>SocialMedia</th>
</tr>
</thead>
<tbody>
<tr>
<td>EmailUse</td>
<td>1</td>
<td>.140*</td>
<td>.253**</td>
<td>.272**</td>
</tr>
<tr>
<td>ChatUse</td>
<td>.140*</td>
<td>1</td>
<td>.314**</td>
<td>.308**</td>
</tr>
<tr>
<td>OnlineShopping</td>
<td>.253**</td>
<td>.314**</td>
<td>1</td>
<td>.174**</td>
</tr>
<tr>
<td>SocialMedia</td>
<td>.272**</td>
<td>.308**</td>
<td>.174**</td>
<td>1</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).
Table 12 shows the matrix of intercorrelations for the four internet activities that differed significantly between the communication preference clusters. While the correlations are significant they are low to medium, with the maximum shared variance between pairs of variables being around 10% or less.

Figure 10 Communication Preference Cluster Centroids shown in Relation to Chat and Social Media Use

As can be seen in Figure 10, there is a strong relationship between the communication preference clusters and the two internet activities. Communication preference cluster 2 has the lowest amount of both Chat and Social Media use while clusters 3, 5, 11, and 12 have high use.
4.3 Domain Specific Innovativeness

4.3.1 DSI Clustering Analysis

I began by clustering all six of the innovation items using k-means analysis. After trying out a number of different partition sizes the 8 cluster solution was chosen as having a good distribution of respondents among the 8 clusters (table 13).
Table 13 Number of Cases in each Cluster

<table>
<thead>
<tr>
<th>Cluster</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>Valid</th>
<th>301</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>8</td>
<td>11</td>
<td>31</td>
<td>39</td>
<td>42</td>
<td>29</td>
<td>74</td>
<td>67</td>
<td>Missing</td>
<td>20</td>
</tr>
</tbody>
</table>

Figure 12 shows the means on the 6 innovation items across the 8 clusters. In general, high ratings for items 1, 2, and 6 are indicative of early adopters while high ratings for items 3, 4, and 5 are indicative of slower adoption. A total of 141 (46%) of the 301 respondents are in clusters 7 and 8, which contain people who are consistent in self-rating themselves as innovators [INN] or early adopters [EA] (with people in cluster 8 being more enthusiastic early adopters). Cluster 6 respondents may be classified as more border line early adopters [BEA], since although they say they are early adopters (items 1 and 2) they rate themselves as slow to sign up for new services (item 6). Cluster 3 is another border line early adopters [BEA] cluster, with a general early adopting pattern except that they claim to have fewer services than their friends. One possible explanation in this case is that they are with a group of friends who are early adopters and thus their adoption rate is only slow in comparison with those friends and is likely high compared to the rest of the population. Cluster 4 is perhaps the mirror image of cluster 3, consisting of a group of late adopters who nevertheless adopt new services earlier than their late adopting friends, borderline late adopters [BLA]. Cluster 2 consists of a group of late adopters [LA], and clusters 1 and 5 are anomalous responders who do not seem to distinguish between the different questions (with cluster 1 respondents tending to disagree with all the questions and cluster 5 respondents tending to respond with neither agree nor disagree to all the questions.)
4.3.2 Correlation between TPI and CPI Factors

Based on the correlation matrix shown in table 14, there were high correlations between the TPI factors. This means that participants that felt confident using technology also have high approval and interest about technology. All the TPI factors correlated with CPI_Computer_Mediated_Communication factors. It follows that if participants felt comfortable using computers they likely use computers as a communication medium. There was a negative correlation between TPI_Interest and CPI_Verbal Communication factor. This means that the...
more interest in technology a participant has, the less likely he or she will prefer face to face communication.

Table 14 Correlations of TPI and CPI factors

4.3.3 Analysis of Variance: Between Demographic Variables, CPI factors, and TPI and DSI Clusters

Analyses of variance were then carried out to determine which of the demographic variables, CPI factors, and TPI factors significantly differed between the innovation clusters. None of the demographic variables were statistically significant in these analyses, but the CPI factors, TPI factors and measures of internet behaviour (email, social media, and chat and online shopping use) all differed significantly between the clusters.

A series of discriminant analyses were then run to clarify the relationship between the other factors and the innovation clusters. In the first analysis all the variables that showed significant univariate differences between the clusters were included in the discriminant analysis. The
resulting discriminant functions were able to predict cluster membership with 46.8% accuracy. Table 15 shows the standardized discriminant function coefficients that were obtained. It can be seen that the first and largest discriminant function is related to TPI factors and to confidence in particular. The second discriminant function has a mixture of variables that are involved, including email use, TPI approval and interest, and the first two CPI factors (WRA and CMC). The first discriminant function accounted for 58% of the variance and the second discriminant function accounted for 16.8% of the variance.

<table>
<thead>
<tr>
<th>Function Coefficients</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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</thead>
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<td>ComputerTime</td>
<td>-0.031</td>
<td>0.083</td>
<td>0.365</td>
<td>0.324</td>
<td>0.012</td>
<td>0.308</td>
<td>-0.022</td>
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<tr>
<td>Internet Time</td>
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<td>0.226</td>
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<td>0.216</td>
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<td>0.094</td>
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<td>-0.244</td>
<td>0.002</td>
<td>-0.079</td>
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<tr>
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<td>-0.027</td>
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<tr>
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<td>0.412</td>
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<td>0.044</td>
<td>-0.123</td>
<td>-0.587</td>
<td>0.204</td>
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<td>CMC</td>
<td>0.114</td>
<td>0.357</td>
<td>0.472</td>
<td>-0.178</td>
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<td>0.471</td>
<td>-0.865</td>
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<tr>
<td>VC</td>
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<td>0.202</td>
<td>0.361</td>
<td>0.059</td>
<td>0.747</td>
<td>0.15</td>
<td>0.237</td>
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<tr>
<td>TPI Confidence</td>
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<td>-0.369</td>
<td>-0.182</td>
<td>0.844</td>
<td>0.312</td>
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<tr>
<td>TPI Approval</td>
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<td>-0.526</td>
<td>0.523</td>
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<td>-1.115</td>
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<td>TPI Interest</td>
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<td>-0.083</td>
<td>0.65</td>
<td>-0.232</td>
<td>-0.272</td>
</tr>
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</table>

**Table 15 Standardized Discriminant Function Coefficients**

Figure 13 shows the cluster centroids plotted in the resulting bivariate space defined by the first two discriminant functions obtained in this overall analysis. It can be seen that clusters one, two and five are separated from the rest of the clusters in this space with cluster 8 also being somewhat separated from the other clusters.
In the next analysis, only the three TPI factors were used as the predictor variables. Classification accuracy using discriminant functions derived from the TPI factors was significantly better than chance, with 35.5% of the respondents being correctly classified into innovation clusters based on TPI discriminant functions. Figure 14 shows the cluster centroids plotted in the resulting bivariate space defined by the first two discriminant functions obtained in this analysis.
Figure 14 Cluster Centroids Plotted as Defined by the First Two Discriminant Functions Obtained using TPI Factors

I then carried out a third discriminant analysis looking at just the TPI and CPI factors as predictors. Predictive accuracy for this analysis, at 45.5% was almost as good as the accuracy (46.8%) for when the five additional predictors of computer time, internet use, email use, and social media use and online shopping use were included in the analysis. Thus the TPI did a good job of explaining differences between innovation clusters, but the prediction was improved by adding in CPI factors and email use as predictors. The first two discriminant functions in this analysis accounted for 69.1% and 15.2% of the variance in this analysis with the first discriminant function alone accounting for almost 70% of the variance. Conversely, when the analysis was run with all the predictor variables except for the CPI and TPI factors, the accuracy of the predictions was lower, at 31.6%. Thus differences in TPI and CPI (and TPI in particular) differentiated between people with different propensities towards adoption of innovations.

Table 16 shows the standardized discriminant function coefficients for this analysis. It can be seen that although the TPI factors dominate in the first three discriminant functions there are also useful contributions from the CPI factors from the second discriminant function onwards. This is
consistent with the fact that adding the CPI factors increased predictive accuracy from 35.5% to 45.5%.

<table>
<thead>
<tr>
<th></th>
<th>Function</th>
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</thead>
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<tr>
<td></td>
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<td>VC</td>
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<td>TPI Confidence</td>
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<td>TPI Approval</td>
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<tr>
<td>TPI Interest</td>
<td>0.197</td>
</tr>
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</table>

Table 16 Standardized Discriminant Function Coefficients

Figure 15 shows the cluster centroids plotted in the resulting bivariate space defined by the first two discriminant functions obtained in this analysis, and it can be seen that this plot is very similar to the previous one.

Figure 15 Cluster Centroids Plotted as Defined by the First Two Discriminant Functions Obtained using both TPI and CPI Factors
I then re-ran the discriminant analyses but with the two anomalous clusters noted earlier (one and five) removed. Thus in these cases the discriminant analysis involved six categories (clusters) instead of eight. For an analysis with only the three CPI factors as predictors the resulting discriminant functions yielded 39% accuracy. The first discriminant function accounted for 74% of the variance and it was mainly based on CMC and VC as shown in its equation:

First discriminant function = 756*CMC + .296*WRA - .587*VC

The accuracy when the three TPI factors were used as predictors in a subsequent discriminant analysis was 45% and the first discriminant function in the analysis accounted for 89% of the variance. The corresponding equation (with standardized coefficients) for the first discriminant function was:

First discriminant function = .796*Confidence - .054*Approval + .409*Interest

Thus for prediction with the TPI factors, the prediction of innovation items was almost exclusively based on the confidence and interest factors.

Figure 16 shows the six non-anomalous cluster centroids within the bivariate space defined by the two discriminant functions. Clusters 6, 7, and 8 are early adopter clusters and clusters 2 and 4 are late adopter clusters. Thus the combination of confidence and interest predicts innovative attitudes well. Cluster 3 is an outlier due to its extreme position on the second discriminant function. The equation for the second discriminant function is:

Second discriminant function = 1.008*Interest - .507*Approval - .434*Confidence

Thus the people in cluster 3, who seem to be early adopters except that they have fewer services than their friends, tend to be high on the TPI interest factor but low on approval and confidence.
Figure 16  Innovation clusters Embedded in the Bivariate Space defined by the first two discriminant functions Derived using the TPI factors as predictors with the Six non-anomalous clusters as categories

4.3.4 Summary

In this survey, demographics did not play a role in predicting attitudes towards adoption of innovation. In contrast, TPI was the strongest differentiator of those attitudes. However, there was a significant additional benefit by including the CPI factors with the TPI factors in the predictive model. I will discuss these results further, and their implications, in the following chapter
5 Findings and Recommendations

This thesis aims to determine the individual differences that define innovative behaviour that would lead to adopting online banking. The following is a summary of the findings.

5.1 Domain Specific Innovativeness

With respect to profiles of Domain Specific Innovativeness, eight different clusters were identified. Based on the response distributions within each cluster, the eight clusters were grouped into 5 well defined segments and 1 “outlier” segment. The segments were: Innovators (INN), early adopters (EA), borderline early adopters (BEA), borderline late adopters (BLA), late adopters (LA) and anomalous adopters (AA). These segments could be akin to the diffusion of innovations segments defined by Rogers (1971). The only outlier cluster is the segment labeled anomalous adopters (n=50). The anomalous segment includes participants who tended to give the same scores to items regardless of whether the item was pointing towards, or away from, early adoption. While it might be that people in this segment are indifferent or easily influenced by members of their social circle an alternative explanation might be that they did not take the survey seriously and were simply trying to race through it as quickly as possible.

Figure 17 shows the graph that results if percentages of participants per segment are plotted across the segments. Ignoring the anomalous segment, it is evident that the study sample is made up of highly innovative participants. This is not a surprise given that by nature MTurk is an innovative technological solution recently being created and users of this platform can be viewed as “in the know” and willing to adopt new ways (risk) of doing work.
In summary, our results confirm hypothesis 1 which states that DSI can help us identify users segments associated with innovative behaviours. In general, if we compare the shape of the curve shown in figure 17 with Figure 3 in Chapter 2, we can see that innovativeness is skewed in the MTurk sample. The implication of this is that the current version of MTurk may be a good platform for testing new technologies or innovations and/or to test new ideas.

5.2 CPI and Innovative Behaviour

Based on the results obtained, the three factor structure of the short form of the Communication Preferences Inventory, as defined by Lottridge et al., (2004) was validated. The factor analysis validated the presence of the three CPI factors: Verbal Communication (VC), Work Related Availability (WRA) and Computer Mediated Communication (CMC). Furthermore the inter-item reliability results showed that three scale items could be removed without affecting the integrity of the resulting scales. The results confirmed the validity of the CPI with a larger sample size (n=308) than was used previously and with a sample in a different country (USA). It is recommended that the shorter 12 item scale (CPI-12) version of the CPI could be used in future studies. This validates part “a” of Hypothesis 2.
Second, based on the analysis of variance, CPI was found to be significantly different between innovation clusters. CPI is sensitive to differences in innovative behaviour although it only explains a portion of the variance. Thus it is recommended that the CPI be used to identify potential adopters or non-adopters of an innovation in tandem with other methods that also have sensitivity. Given that CPI measures communication preferences (and diffusion process is by nature a communication process) it seems reasonable that CPI should be at least partially predictive of innovation. This validates part “b” of hypothesis 2. However, further work needs to be carried out to determine if this is true for product and services that are less communication centric.

CPI and Demographics
Based on the cluster and Anova analyses, demographics variables such as age, income, education and sex, did not change within each communication preference cluster. This suggests that communication preferences are relatively independent of other constructs such as demographics. However, the generality of this finding should be further assessed with different samples.

CPI and Internet Behaviour
Internet behaviour did differ significantly between CPI clusters. This seems reasonable since internet behaviour should reflect communication preferences to some extent. The strongest effect was observed between CPI clusters, and Internet Chat and Social Media Use. This relationship is potentially useful for product managers to help them devise marketing strategies based on the channel of preference used by the customer segments as defined by CPI. For instance, if a customer segment frequently uses social media, then strategies to engage them with that medium could be developed.

An interesting finding is that email use within CPI clusters had the weakest variability. This is likely due to the fact that email use has almost reached saturation and that there is relatively little variance in email use left to predict. This may due to the fact that MTurk users are frequent email users, since MTurkers must have an email account to register with MTurk.

Finally, based on the discriminant functions coefficient, the CMC and VC factors are good predictors of innovative clusters or segments. This is evidenced by the discriminant function: 

\[ .756 \times \text{CMC} + .296 \times \text{WRA} - .587 \times \text{VC} \]

This result is in line with the fact that innovators or
adopters will tend to be more communicative than others either via a computer or person to
person. In conclusion, hypothesis #2 was accepted.

5.3 TPI and Innovative Behaviour

Based on the different discriminant analyses, TPI is a better predictor of innovative behavior that
the CPI, internet behaviour and demographics. Based on the cluster centroid analysis (see figure
14), it was found that the TPI provides a good basis for segmenting participants into innovation
clusters. Confidence and Interest were the two TPI subscales that had the most impact in
segmenting participants into innovation clusters. The resulting discriminant function for the TPI
analysis was:

\[ \text{First discriminant function} = 0.796 \times \text{Confidence} - 0.054 \times \text{Approval} + 0.409 \times \text{Interest} \]

The implications of TPI’s predictive power are twofold. First, it validates the TPI as a scale that
is sensitive to measure innovative behaviour. Second, for prediction with the TPI factors, the
prediction of innovation items was almost exclusively based on the confidence and interest
factors. This means that the more experienced or familiar with technology the user is, the more
likely he/she is to use other technologies such as internet banking (due to confidence). Also,
innovative users may exhibit a more curious attitude toward computers (due to the interest
factor) and have less extreme pro or con favorableness attitudes or perceptions about technology
(due to the approval factor).

Thus it may be inferred that in attempting to increase innovative behaviour it is critical to ensure
that the target audience is properly trained in and confident with new technology. Based on the
results, hypothesis 3 can be accepted and states that TPI is a good indicator of innovative
behaviour.

5.4 Demographics, Internet Behaviour and Innovative Behaviour

Based on the analysis of variance, demographics did not vary significantly between
innovativeness clusters. This is consistent with previous research that found demographics have
a weak to no impact on innovativeness behaviour as a whole.

Subsequent analysis found that internet behaviour did vary significantly within innovation
clusters but based on the discriminant analysis its contribution was found to be weak. Thus
usage of a particular technology may not necessarily indicate that the end users show innovative behaviour.

The relatively weak association between technology use and innovative behaviour may reflect the fact that technology use has become a general requirement for many work and social activities. Although hypothesis H4 was partially confirmed in this research, it should be examined further in future research.

5.5 Adoption Model

Finally, analyses of variance were carried out to determine which of the demographic variables, CPI factors, and TPI factors significantly differed between the innovation clusters. The result showed that all variables except demographics were significantly related to differences between innovative clusters. Using all three sets of variables, 46.8% prediction accuracy was obtained. However, the prediction was almost as good when only the three TPI factors and the three CPI factors were used (45.5%).

Figure 18 shows the theoretical innovation groups found in the literature in Chapter 2 overlaid on the innovation clusters found in this study. As seen in this figure the general data fits the theoretical innovation segments. Thus, we can say that both CPI and TPI are good predictors of innovation segments.
Figure 18 Theoretical innovation segments overlay with Innovation clusters defined by the first two discriminant functions Derived using the TPI factors as predictors.
6 Conclusion

Increasingly consumers are being bombarded with new products and services. Examples include the continued innovation on mobile devices with the introduction of newer device versions and device types, e.g., Apple Watch. In the financial industry this is no different, with financial institutions investing in new digital products and services with the expectation that these innovations will be well accepted and used by existing and new customers. In this thesis, I attempted to explore different measure of individual differences (CPI and TPI) and relate them to innovativeness behaviour.

The results show that individual differences in terms of CPI and TPI could be used to segment and sample population into innovation clusters.

6.1 Summary of Contributions

The main contribution of this thesis was the validation that CPI and TPI to help segment a population into innovation segments or clusters. The following are the key contributions.

1. Online banking users can be segmented into the following innovation segments using CPI and TPI: Innovators (INN), early adopters (EA), borderline early adopters (BEA), borderline late adopters (BLA), late adopters (LA) and anomalous adopters (AA).

2. CPI has been validated as a measuring instrument and a shorter 12 item scale version of CPI has been defined.

3. Internet behaviour (as defined by check email: social networking, instant messaging, online banking and online shopping) was found to differ significantly between CPI clusters.

4. Both the CPI and TPI contributed to the identification of innovative behaviour. Based on the discriminant functions coefficient, CMC and VC factors are good predictors of innovative clusters or segments. However, TPI was found to be the best predictor of innovative behavior, as compared to the CPI, internet behaviour and demographics.
5. Demographics did not impact innovative behaviour, which validates previous findings and demographics did not change based on communication preferences clusters.

6. Internet behaviour did vary significantly within innovation clusters but its contribution as defined by the discriminant analysis was weak.
6.2 Limitations

The study described in this thesis has the following challenges and limitations:

The geographical scope of this study is limited to the USA and a specific population sample. Thus the findings should be generalized carefully to other samples of counties (such as Latin American countries). Also, this study provides a snapshot of adoption, individual differences and innovativeness at one particular point in time. The sample was made up over 99% of participants who had internet at home and 95% who had already adopted online banking. This meant that the process of online banking could not be studied. While outside the scope of this thesis, understanding how people adopt technologies can help product managers develop tactics to improve the rate of adoption and should be the subject of future research.

Second, the sample represents a 95% online banking adoption rate, which is not representative of the overall rate in the USA (~68%). Consequently the sample seems to be skewed with innovators or early adopters. Thus, one must be take care not to generalize the interpreted individual differences profiles found in this study to the general sample population. As described in the future work section below, new studies will need to have screening questions to help target non-adopter users.

Third, the experience using MTurk was very positive in terms of administrating the survey and the response rate obtained. However, as demonstrated by the high percentage of internet usage, online banking adoption rate and the fact that participants are using Mtruk marketplace, the population included in this study may not be representative of actual population.

Research publications on online banking started appearing around 2000, thus “online baking” may no longer have been innovative for the study respondents. Would the results have been different if the study focussed on newer innovations like banking app for the iWatch, computer chips implants in humans, etc?. Study of cutting edge innovations brings its own set of difficulties such as even greater difficulties in finding representative samples. Given that it is fairly established in the USA and Canada at this point it is not clear if online banking is still perceived as a new innovation although it may have innovative aspects as new features continue to be rolled out.
Last but not least, one potential limitation is length of the questionnaire included in this thesis. A potential methodological improvement would be to measure the different constructs separately from each other to minimize the chance that participants respond to survey questions without due care.

6.3 Future Work

Given the importance of innovation and the push for banks to digitalize their services there is ample work that can be the focus of future research.

The present study needs to be replicated with a sample that has more representation from the non-adopters population. This is critical since it will help to understand some of the barriers that new innovations have placed on the non-adopter or late adopter profiles. In addition, the selection or characteristic of the innovation should be carefully selected (e.g., use mobile banking or iWatch) to provide the highest sensitivity of the measuring instruments.

A greater understanding of the role that culture plays on mediating innovativeness behaviour would be useful. For example, the US and Japanese cultures are different in terms of values, and both seem to be technologically innovative. How does diffusion of innovation work in these cultures? Similar studies should be run in future to understand the role of innovativeness and individual differences across countries.

Third, it would be interesting to find out how banks can better leverage social networks to reach existing and potential customers. According to one statistic Brazil (74.8%) and Mexico (43.9%) are the main users of Facebook in Latin American countries (Emaketer.com, 2015). Thus, Facebook, YouTube, etc., could be considered as platforms that can be used to diffuse banking innovations. One possible application is to devise strategies about how to diffuse information about bank services through these channels. In my search of the literature, very few studies were found on this topic in the context of online banking adoption.

The work in this thesis assumed that diffusion is just a matter of being influenced by or hearing about the idea. But as the literature review indicated, it would be useful to focus on identifying the barriers to adopt an innovation such as cost, knowledge barriers, etc. Thus, future work
could focus on the nature of adoption failures to help design better innovations that are easier to adopt.

A final possible area of research is to look at adoption not as a one-time product acquisition but rather as the adoption of services. This is particularly relevant to banks since they are in the business of offering both products and services. It would be useful to look at why people discontinue the adoption of a product since losing customers is significantly more expensive than retaining them.

In summary, the nature of the constructs touched on this thesis provides a fertile area of future research to help product managers better understand the relationship between diffusion, adoption and individual differences.
7 References


Trepte, S. and Scherer, H. (2010). Opinion leaders--Do they know more than others about their area of interest?. Communications, 35(2), pp.119--140.


8 Appendices
Appendix A: Demographic Survey

Please answer the following questions:

What is your age?
• 25 or under
• 26-40
• 41-55
• 56 or older

What is your gender?
• Female
• Male

What is the highest degree or level of school you have completed? If currently enrolled, highest degree received.
• Primary school
• Secondary school
• Bachelor’s degree
• Master’s degree
• Doctorate degree

Occupation
• Student
• Clerical work
• Managerial Level
• Professional
• Self-employed
• Others

Monthly Income
• Below $4,000
• $4,000 - $8,999
• $9,000 - $13,999
• $14,000 - $18,999
• $19,000 - $23,999
• $24,000 or above
INTERNET USAGE

Do you have a computer at home?
• Yes
• No

How many hours per week do you use your computer for work?
• Less than 1
• 1 to 5 hours
• 5 to 10 hours
• 10 to 20 hours
• over 20 hours

Do you have internet at home?
• Yes
• No

How long have you been using the internet?
• 3-6 years
• 7-10 years
• 11-14 years
• 15 years or above

ONLINE BANKING USAGE

Do you have a bank account for which you access it using an internet browser or mobile device? (also known as online and mobile banking)
• Yes • No

Do you do any of the following online and if so how often?

• Check email:
  __ All the time __ A few times a week __A few times a month __Hardly Ever __Never

• Use instant messaging:
  __ All the time __ A few times a week __A few times a month __Hardly Ever __Never

• Shop online:
  __ All the time __ A few times a week __A few times a month __Hardly Ever __Never
• Use online banking (check account balance, pay bill, transfer money, etc):
  __ All the time  __ A few times a week  __A few times a month  __Hardly Ever  __Never

• Social Networking (e.g., Facebook, tweeter, google+):
  __ All the time  __ A few times a week  __A few times a month  __Hardly Ever  __Never
Appendix B: Communication Preferences Inventory (CPI)

Using the scale below as a guide, indicate the extent to which you agree or disagree with each statement. Be as honest and as accurate as possible.

Choose one answer for each statement.

1. I often check my business email or voicemail when I am away from the office outside of work hours.
   1----------------------------2--------------------- --------3-----------------------------4------------ ---------------5
   Strongly disagree     Disagree               Neither agree nor disagree     Agree                     Strongly agree

2. I frequently engage in work-related communications when I am away from the office outside of work hours.
   1----------------------------2--------------------- --------3-----------------------------4------------ ---------------5
   Strongly disagree     Disagree               Neither agree nor disagree     Agree                     Strongly agree

3. I expect my business colleagues to be generally available outside of work hours.
   1----------------------------2--------------------- --------3-----------------------------4------------ ---------------5
   Strongly disagree     Disagree               Neither agree nor disagree     Agree                     Strongly agree

4. My personal time is disrupted because it is too easy to be connected to work from home.
   1----------------------------2--------------------- --------3-----------------------------4------------ ---------------5
   Strongly disagree     Disagree               Neither agree nor disagree     Agree                     Strongly agree

5. Writing letters to people is inefficient compared to sending email.
   1----------------------------2--------------------- --------3-----------------------------4------------ ---------------5
   Strongly disagree     Disagree               Neither agree nor disagree     Agree                     Strongly agree

6. I keep in touch with friends more now that I can communicate with them via the Internet.
   1----------------------------2--------------------- --------3-----------------------------4------------ ---------------5
   Strongly disagree     Disagree               Neither agree nor disagree     Agree                     Strongly agree

7. I often communicate with my friends via the Internet.
   1----------------------------2--------------------- --------3-----------------------------4------------ ---------------5
   Strongly disagree     Disagree               Neither agree nor disagree     Agree                     Strongly agree

8. I often compose and send messages as things come up.
   1----------------------------2--------------------- --------3-----------------------------4------------ ---------------5
   Strongly disagree     Disagree               Neither agree nor disagree     Agree                     Strongly agree
9. I use the Internet to maintain friendships.


10. The quality of information gained from direct communication is worth the effort of arranging the communication.


11. Completion of work tasks is faster and better when people communicate directly with speech rather than indirectly using text.


12. Having a discussion by typing text is inefficient.


13. I find it difficult to communicate with a group of people who are in different geographic locations.


14. I prefer talking with people directly rather than writing an email or text message.


15. I prefer face-to-face meeting to more indirect forms of communication such as email and text messaging.

Appendix C: Technology Profile Inventory

The statements below are about attitudes toward computers and the internet. Using the scale below as a guide, indicate the extent to which you agree or disagree with each statement. Be as honest and as accurate as possible.

1. I do not have trouble learning how to do things with computers.
   1-----------------------------2--------------------- --------3-----------------------------4------------ ---------------5
   Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree

2. I would be interested in finding entertainment on the internet.
   1-----------------------------2--------------------- --------3-----------------------------4------------ ---------------5
   Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree

3. I would enjoy reading magazines or books about computers.
   1-----------------------------2--------------------- --------3-----------------------------4------------ ---------------5
   Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree

4. Computers make me nervous, anxious, or tense.
   1-----------------------------2--------------------- --------3-----------------------------4------------ ---------------5
   Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree

5. I think almost everyone could benefit from using the internet.
   1-----------------------------2--------------------- --------3-----------------------------4------------ ---------------5
   Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree

6. I like to use new software.
   1-----------------------------2--------------------- --------3-----------------------------4------------ ---------------5
   Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree

7. I find dealing with computers to be stressful.
   1-----------------------------2--------------------- --------3-----------------------------4------------ ---------------5
   Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree

8. I frequently use the internet to look up things that interest me.
   1-----------------------------2--------------------- --------3-----------------------------4------------ ---------------5
   Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree
<table>
<thead>
<tr>
<th></th>
<th>I would like to see more shows about computers on TV.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strongly disagree</td>
</tr>
<tr>
<td>9.</td>
<td>I have a lot of confidence in my ability to accomplish things with computers and the internet.</td>
</tr>
<tr>
<td>10.</td>
<td>Strongly disagree</td>
</tr>
<tr>
<td>11.</td>
<td>I don’t like to use computers.</td>
</tr>
<tr>
<td>12.</td>
<td>Learning about computers and the internet is boring.</td>
</tr>
<tr>
<td>13.</td>
<td>Learning about computers can be fun even when it isn’t useful.</td>
</tr>
<tr>
<td>14.</td>
<td>Computers can be a great source of entertainment.</td>
</tr>
<tr>
<td>15.</td>
<td>I rarely find computers frustrating.</td>
</tr>
<tr>
<td>16.</td>
<td>I do not consider owning a computer to be a necessity.</td>
</tr>
<tr>
<td>17.</td>
<td>I would be interested to learn about new technology for computers or the internet.</td>
</tr>
<tr>
<td>18.</td>
<td>Strongly disagree</td>
</tr>
</tbody>
</table>
19. I wish using computers wasn’t so difficult.

   1  2  3  4  5
   Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree

20. Working with computers and the internet can be enjoyable and stimulating.

   1  2  3  4  5
   Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree

21. I don’t care to know about how computers and the internet work.

   1  2  3  4  5
   Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree

22. I often feel overwhelmed by the complexity of computers.

   1  2  3  4  5
   Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree

23. I do not find surfing the internet relaxing and pleasurable.

   1  2  3  4  5
   Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree

24. I don’t want to know more about computers than I have to.

   1  2  3  4  5
   Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree

25. I often feel I need help when using computers.

   1  2  3  4  5
   Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree

26. I don’t like to use the internet.

   1  2  3  4  5
   Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree

27. I like to think up new ways of doing things with computers.

   1  2  3  4  5
   Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree

28. I feel at ease using computers and the internet.

   1  2  3  4  5
   Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree
29. Computers are useful educational tools.

1-----------------------------2-----------------------------3-----------------------------4-----------------------------5
Strongly disagree      Disagree      Neither agree nor disagree      Agree      Strongly agree

30. I’m not interested when people discuss computers.

1-----------------------------2-----------------------------3-----------------------------4-----------------------------5
Strongly disagree      Disagree      Neither agree nor disagree      Agree      Strongly agree
Appendix D: Domain Specific Innovativeness

Online banking is also known as "Internet banking" or "Web banking." Online banking enabled customer’s access their accounts online to check account balances, pay bills, transfer money, etc.

Based on the above definitions, please answer the following questions:

1. In general, I will be among the first in my circle of friends to sign up for services like online banking when it appears
   1----------------------------2--------------------- --------3-----------------------------4------------ ---------------5
   Strongly disagree  Disagree  Neither agree nor disagree  Agree  Strongly agree

2. If I heard that services like online banking was available in the bank, I would be interested enough to sign up for it.
   1----------------------------2--------------------- --------3-----------------------------4------------ ---------------5
   Strongly disagree  Disagree  Neither agree nor disagree  Agree  Strongly agree

3. Compare to my friends I own few services like online banking.
   1----------------------------2--------------------- --------3-----------------------------4------------ ---------------5
   Strongly disagree  Disagree  Neither agree nor disagree  Agree  Strongly agree

4. In general, I am the last in my circle of friends to know the features offer by the latest version of services like online banking.
   1----------------------------2--------------------- --------3-----------------------------4------------ ---------------5
   Strongly disagree  Disagree  Neither agree nor disagree  Agree  Strongly agree

5. I would not sign up for services like online banking if I haven’t heard/tried it yet
   1----------------------------2--------------------- --------3-----------------------------4------------ ---------------5
   Strongly disagree  Disagree  Neither agree nor disagree  Agree  Strongly agree

6. I like to sign up for services like online banking before other people do.
   1----------------------------2--------------------- --------3-----------------------------4------------ ---------------5
   Strongly disagree  Disagree  Neither agree nor disagree  Agree  Strongly agree