QUICK RESPONSE CODES AROUND US: PERSONALITY TRAITS, ATTITUDES TOWARD INNOVATION, AND ACCEPTANCE

Hui-Yi Lo
National Chung Hsing University, the Department of Marketing
250 Kuo Kuang Rd., Taichung 402, Taiwan
hyl@dragon.nchu.edu.tw

ABSTRACT

The Quick Response (QR) code service scanned by smartphones allows users to obtain information that would otherwise be difficult for them to access on their own. However, different personality traits and attitudes toward innovations might influence an individual's acceptance of this technology. A parallel model, in which personality traits predict individuals' attitudes toward innovation, which in turn predict acceptance of QR code services, is proposed. Participants ($N = 689$) completed an online questionnaire. The original findings did not confirm all of the hypotheses, especially in terms of the desire for uniqueness. Further analysis revealed that laggards and late majority consumers hold unfavorable attitudes toward innovation and are less willing to adopt QR code services. A comparison model suggests that the degree of mediation of the effects of personality traits on service acceptance by attitudes toward innovation varies across categories of consumers.

Keywords: QR code services; Acceptance; Personality traits; Attitudes; Innovations

1. Introduction

When scanned by a mobile device, Quick Response (QR) codes provide users with immediate access to almost any information they might want. QR codes are small, two-dimensional digital images with the capacity to store a large amount of high-density data. These codes, which can encode different types of information, are used in post offices, transportation, government, business, and many other industries. Barcodes are easily stored, transferred, processed, and validated. A mobile camera with an Internet connection and a QR code reader is all that is needed to use this technology. It takes users only a few minutes to scan a QR code and retrieve the relevant information. Thus, more and more business people find them to be of great value and to have diverse applications in M-commerce (e.g., in providing a new channel for marketing communications). This digital resource may have important implications for the action a potential adopter chooses to take, because individuals adapt their attitudes and behaviors to changes in the environment. Even though a new service can enhance quality of life and improve communication efficiency, the expected benefits and improvements from these innovations can be attained only when the intended users make a decision to adopt them. A lack of user acceptance has long been identified as a key factor that leads either to a disparity between expectations and derived benefits or to failures in new services [McCarroll 1991; King 1994; Gillooly 1998; Yi et al. 2006].

Prior research has identified perceptions of usefulness, ease of use, and compatibility as key innovation characteristics that impact user acceptance of technology [Tornatzky & Klein 1982; Kwon & Zmud 1987; Sultan & Chan 2000; Al-Jabri & Sohail 2012]. Research on the technology acceptance model (TAM) has shown that users' adoption behavior is driven by their intentions, which are reinforced by their attitudes [Davis 1989; Davis et al. 1989]. A number of studies on mobile services have expanded on the TAM and considered various factors that influence behavioral intentions [Çelik & Yilmaz 2011; Hong & Tam 2006; Koenigstorfer & Groeppel-Klein 2012; Nysveen et al. 2005; Sun et al. 2013]. The outcomes of these studies have shown that the TAM is helpful in explaining a substantial number of factors that influence users' decisions to use a new innovation.

However, people react differently to a new idea, practice, or object based on differences in their attitudes toward innovation [Rogers 2003]. Psychologists explain differences between people's behavior in terms of individual differences in their dispositions. Two types of disposition are important: personality traits and attitudes. A *personality trait* is a characteristic of a person that has a pervasive influence over a broad range of different behaviors relevant to that trait. An *attitude* is an inclination to respond positively or negatively to an object, person, institution, or event. Personality traits and attitudes differ in a number of respects [Ajzen 2005]. First, attitudes are evaluative and directed toward a target. In contrast, personality traits are not evaluative and do not focus on a target. Instead, they describe a broad tendency to behave in a certain way (e.g., extraversion). Second, although both

personality traits and attitudes are assumed to be fairly stable, personality traits are generally more enduring and resistant to change than are attitudes.

Both personality traits and attitudes are latent hypothetical constructs used to explain differences between people's intentions and behavior. Attitudes are most successful as behavior predictors when attitudes and behavior are measured at the same level of specificity [Ajzen & Fishbein 1977; Ajzen 1985; Ajzen 1991]. However, the theory of planned behavior [TPB; Ajzen 1985; Ajzen 1991] states that attitudes toward a specific behavior are influenced by background factors such as personality traits. Thus, it is possible that personality traits predict a person's attitudes toward innovation, which in turn predict behavioral intention. This idea can be used to explain differences in people's preferences for QR code services. Attitudes serve a function for people [Katz 1960; Lutz 1975, 1978] by helping them determine, for example, what music to listen to or whether to buy an organic product. Because the QR code service involves several transmission devices (e.g., a mobile camera, the Internet, and a QR code reader), two people with similar personalities can have different attitudes toward this service for very different reasons. For example, if a person believes that modern electronics devices produce harmful radiation, he or she will develop an unfavorable attitude toward portable devices. As a result, this person will find it difficult to accept such mobile services. It is important to note that attitudes toward innovation can result from several different ways due to different types of conditionings (e.g., classical or instrumental). Thus, the present study intend to divide consumers' attitude into different groups by categorizing them in a way akin to that used by Rogers [2003] to create his classification. Rogers [1962, 2003] proposed five types of consumers on the basis of their take-up of innovative products (i.e., innovators, early adopters, early majority consumers, late majority consumers, and laggards). The present study identifies a reliable model that incorporates personality traits and behavioral attitudes to accurately predict the acceptance of QR code services. Moreover, we investigated whether the degree of mediation of the effects of personality traits on the acceptance of this mobile service by attitude toward innovation varies across categories of consumers.

2.   Theoretical Framework and Hypotheses
2.1. How Do Personality Traits Affect Individual Attitudes toward Innovation?

Theories of personality are diverse [Allport 1961; Cattell 1957, 1978; Eysenck & Eysenck 1975, 1985; McCrae & John 1992; Tellegen & Waller 2008]. After some debate, most personality researchers now believe that personality traits can be assessed from five-factor personality traits [McCrae & John 1992] derived from scales such as the Five-Factor Model, Hogan Personality Inventory, NEO Personality Inventory, and Revised NEO Personality Inventory [McCrae & Costa 1989; McCrae & John 1992; Tellegen & Waller 2008; De Young et al. 2013]. Even though all five dimensions are represented in a statistical factor analysis, a different selection of variables can result in a different set of dimensions within the same factor space [McCrae & John 1992]. The five-factor personality trait is usually used to measure how individuals interact with their environment (e.g., with groups or organizations), including how they respond to certain situations and the thoughts or feelings they experience [McCrae & John 1992; Goldberg 1993]. However, people interact in several social contexts each day. Thus, it is impossible to only use the five-factor traits to analyze human behavioral intentions. Yet what types of personality traits are likely to characterize people who will respond favorably to a new mobile service? Although some researchers have used the five factors to examine the causal relationship between personality traits and technology acceptance [Devaraj et al. 2008; Zhou & Lu 2011; de Vreede 2012; Oliveira et al. 2013; Svendsen et al. 2013], the predicted use of technology correlates most with group/organization interactions, such as those involving management information systems, social media, collaborative technology, an overall new product/service (as opposed to a single service or product), and so on [Devaraj et al. 2008; de Vreede 2012; Svendsen et al. 2013]. However, the present study aimed to predict acceptance of the barcode service and which types of personality traits are likely to characterize people who will respond favorably to a new mobile service. Thus, this study assumed that decisions to use a mobile service are usually personal decisions rather than group decisions. Furthermore, novelty seeking and uniqueness are more likely to characterize people who will respond favorably to something new. Therefore, this study uses *novelty seeking* and *desire for uniqueness* to measure personality instead of the five-factor personality trait.

Novelty seeking is a personality trait associated with sensory seeking for or exploratory activity in novel stimulation, impulsive decision making, and extravagance [Cloninger et al. 1993]. This trait, or the predisposition to look for new products and services [Venkatraman & Price 1990], involves differences in one's motivation to seek out originality and thus determines the adoption of innovative products [Manning et al. 1995]. Flavell [1977] showed that, when presented with two visual stimuli of equal intensity, one familiar and one novel, an infant will select the novel stimulus. Jang and Feng [2007] suggested that novelty seeking is driven by curiosity and sensation seeking. Previous studies have also proposed that these are mediated by genetic variability in the transmission of the

neurotransmitter dopamine in the hippocampal region [Cloninger et al. 1993; Cloninger et al. 1996; Maremmani et al. 2005; Miettunen et al. 2008; Naghavi et al. 2009]. Manning et al. [1995] found that novelty seeking was positively correlated with the first stages of innovation acceptance, which consist of actualized novelty seeking and product awareness. They concluded that by seeking out new information and having high levels of product awareness, novelty seekers tend to have more favorable attitudes toward acquiring innovative products. This is because novelty seeking (i.e., a background factor) influences intentions and behavior indirectly through effects on attitude [Ajzen & Fishbein 2005]. Thus, it is possible that the increasing novelty seeking will result in favorable attitudes toward new services/products.

   H1: The trait of consumer novelty seeking (CNS) is positively related to attitudes toward innovation (ATI).

   Another personality trait likely to be associated with technology acceptance is a *desire for uniqueness*. A new innovative service is likely to be initially uncommon. According to uniqueness theory, people find high levels of similarity and dissimilarity unpleasant and therefore seek to be moderately distinct from others [Lynn & Harris 1997]. The more they perceive that they are similar to others, the more unique they seek to be [Lynn & Harris 1997]. Brock [1968] argued that feelings of self-uniqueness may be enhanced by acquiring scarce products. When a resource is very hard to obtain, it is assumed to be possessed by only a few people and is perceived to be a status symbol and of higher quality [Lynn 1992; Snyder 1992; Verhallen & Robben 1994]. People compare themselves with others who do not have that resource and thereby feel unique [Emerson 1962; Lynn & Harris 1997]. The need for uniqueness is a trait that differs among individuals [Snyder 1992]: people who have a stronger need for uniqueness try to be more dissimilar from others and value scarce products/services more [Lynn 1987; Lynn & Harris 1997].

   However, based on uniqueness theory and the previous literature [Lynn 1987; Lynn & Harris 1997; Tepper 1997; Tian et al. 2001], uniqueness here consists of two main concepts: goal-directed choice counter-conformity (DUGC) and avoiding similarity (DUAS). Uniqueness involves the expression of individual differences, individuality, or a unique identity and requires creating a personal style through material possessions that reflect the self [Kron 1983]; this may involve the purchase of original, creative, unique consumer goods [Kron 1983] or the decorative collection, arrangement, and display of goods [Belk et al. 1989; Kron 1983]. Individuals show goal-directed behavior when they use goal choice counter-conformity to seek uniqueness. Thus, we define this type of uniqueness as DUGC. DUAS indicates a loss of interest in, or discontinued use of, possessions that become commonplace to move away from the normal and recreate individual differences [Tian et al. 2001]. It also implies avoiding the purchase of products and brands that are perceived as being commonplace [Tian et al. 2001]. We have chosen to use a multidimensional concept to measure uniqueness for two reasons. First, people pursue different from one another and have also learned to perceive themselves. This need for uniqueness arises because people need a stable self-concept. Thus, this self-image takes on motivational properties. This concept of uniqueness expresses the tendency to pursue uniqueness in self-distinctiveness and self-identification, and it refers to DUGC. Second, some people pursue uniqueness, but their uniqueness does not lead to social rejection and is less self-attributed. This refers to DUAS.

   No matter which concept of uniqueness we consider (DUAS or DUGC), consumers who exhibit more of this trait tend to adopt innovative services/products faster than others who exhibit less of it [Burns 1990; Amaldoss & Jain 2005]. McAlister and Pessemier [1982] suggest that a desire for social distinction via unusual products influences new product adoption and variety-seeking behavior. Simonson and Nowlis [2000] also suggested that consumers who have a great need for uniqueness tend to make unconventional choices and give unconventional explanations for making those choices. Therefore, we propose the following:

   H2a: DUGC is positively related to ATI.
   H2b: DUAS is positively related to ATI.

2.2. Decisions, Personality Traits, and Attitude: A Mediation Effect

   How do personality traits and attitudes combine to produce intentions and then behavior? The theory of reasoned action (TRA), the TPB, and the TAM are the theoretical frameworks most commonly used to explain why users accept or reject a product or service. The TRA, proposed by Fishbein and Ajzen [1975], suggests that an individual's behavior can be predicted based on his or her behavioral intention as determined by personal and social components. Behavioral beliefs refer to the probability that a behavior leads to certain outcomes. Thus, the TRA suggests that behavioral beliefs predict a person's attitudes toward innovation, which in turn predict behavioral intention. Normative beliefs are relevant to an individual's perceptions of a person's tendency to behave in a manner consistent with a reference group's belief. The TRA assumes that human beings usually behave in a sensible manner, so they are likely to enjoy favorable consequences and meet the expectations of others [Fishbein & Ajzen 1975]. Later Ajzen [1985] proposed the TPB to extend the TRA and to make the theory more comprehensive. The rationale behind the addition of perceived behavioral control to the theory is that it allows for predictions of

behaviors that are not completely under volitional control, a fact that offsets criticism of the TRA [Ajzen 1985; Ajzen 1991; Madden et al. 1992; Burton 2004]. Perceived behavioral control represents an individual's past experiences and anticipated barriers [Ajzen 1991]. When an individual thinks that he or she has more resources or chances available, he or she will anticipate facing fewer barriers and will have greater behavioral control. In other words, perceived behavioral control can be described as an extension of personal perception. Because each person perceives barriers differently, people react differently to a new service. As mentioned earlier, both personality traits and attitudes are latent hypothetical constructs used to explain differences between people's intentions and behavior. Therefore, the TPB is generally accepted as the best current account of how personality traits, attitudes toward innovation, and intention interact. It is used here as a partial research framework for explaining differences in people's preferences for QR code services.

>*H3a: CNS is positively related to acceptance of QR code services.*
>*H3b: DUGC is positively related to acceptance of QR code services.*
>*H3c: DUAS is positively related to acceptance of QR code services.*
>*H4: ATI is positively related to acceptance of QR code services.*
>*H5: The effects of personality traits (i.e., CNS, DUGC, DUAS) on intention to use QR code services (i.e., ScanLife) are significantly mediated by ATI.*

In addition, Rogers [1962, 2003] proposed five types of consumer on the basis of the take-up of innovative products (i.e., innovators, early adopters, early majority consumers, late majority consumers, and laggards). Among late majority consumers and laggards, willingness to accept innovative products is likely to be uniformly low. As a result, this variable is less likely to be a mediator in the relation between desire for uniqueness or novelty seeking and acceptance of a QR code service for consumers in those categories than for those in other categories.

>*H6: The degree of mediation of the effects of personality on service acceptance by ATI varies across* categories of consumers.

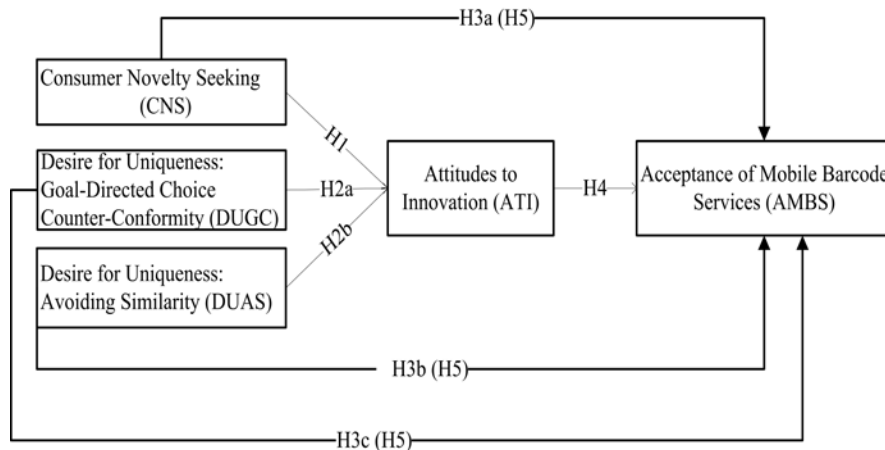Based on the aforementioned discussion, Figure 1 shows the causal paths between the variables.

Figure 1: Research Framework

3. Methods

This study used an online questionnaire–based methodology. The implementation of investigations via the Internet has become widespread, and several studies have concluded that the quality of data obtained by Web-based methods is comparable to that of data obtained by more traditional methods (e.g., laboratory studies, paper questionnaires, or telephone interviews). By using the Web to collect data, one has an increased opportunity to obtain large, demographically varied, and well-specified samples at reasonable cost. For discussions of Web-based testing, see Birnbaum [2000, 2004], Reips [2002], and Skitka and Sargis [2006].

3.1. Participants

For this investigation, a web link to a questionnaire was placed on several discussion forums (i.e., college subject pools, the Google discussion forum, the Yahoo! knowledge forum, community overview–eBay, a campus discussion forum, and the PTT Bulletin Board System of National Taiwan University). Participants were informed that by registering and filling out the entire questionnaire, they would be entered in a lottery with a first prize of NTD 3000 cash and five runner-up prizes of NTD 1000 cash. Winners were notified by e-mail.

Data were gathered from participants who visited these forums and were willing to complete the questionnaire. Valid data were obtained from 689 respondents. Data from an additional 147 respondents were invalid because the respondents failed to complete the questionnaire. Of the valid respondents, 54% were male and 46% were female. Most respondents were 19–24 years old (47%) or 25–29 years old (32%).

3.2. Questionnaire Design and Validation

The instruments used to assess attitudes toward innovation, novelty seeking, and desire for uniqueness were all derived from established psychometric scales. To assess the acceptance of the QR code service, we used mobile barcode services and a 5-point scale developed especially for this study. Before formal testing, a pilot study was conducted to eliminate any problems associated with translation. A sample of 20 Taiwanese participants who spoke both English and Traditional Chinese was collected from Yuan Ze University. The participants were asked to translate a Traditional Chinese version of the questionnaire into English. The back-translated version and the original Chinese version were compared and found to be very similar. The final versions of the four scales (Appendix 1) that were used are described next.

3.2.1. Acceptance of the QR Code Service

The current study used interactive video with a set of items to measure acceptance rather than using a single question about participants' likelihood of using the new service. Items from two pilot tests were aggregated to remove random error and increase reliability. Thus, the measure used here was appropriate for detecting relationships between the variables.

Participants viewed a video presentation that introduced them to a two-dimensional barcode service and then rated each of five statements about how acceptable it was for them to use on a 5-point scale where 1 = strongly disagree and 5 = strongly agree (e.g., "After watching the introduction to the ScanLife video, I want to try this new service").

Initial analysis revealed that the item–total correlation for the fourth statement was less than 0.5, and so this item was excluded from later stages of the analysis (Pilot test 1, $N = 112$). Pilot test 2 was again used to examine scale reliability. The rest of the four items met statistical requirements (Cronbach's alpha = 0.83, $N = 106$). Thus, four items were used in the formal study. The coefficient alpha for the remaining items was 0.85 ($N = 689$).

3.2.2. Attitudes toward Innovation

We used selected partial items from Leavitt and Walton's [1975, 1983] innovativeness scale. Their complete questionnaire is a portmanteau scale designed to measure an individual's intellectual, perceptual, and attitudinal characteristics. Only Form A of their questionnaire was used here. Item–total correlations and Cronbach's coefficient alpha were measured to assess how closely the scale items measured the underlying construct. Outlying items were then excluded. The remaining items were clearly evaluative ($\gamma < 0.5$, $\alpha = 0.82$). They measured attitudes toward innovation.

3.2.3. Novelty Seeking

The CNS scale developed by Manning, Bearden, and Madden [1995] focuses on novelty seeking motives and behaviors that relate specifically to new product consumption. The validity of this scale is supported by items reflecting a variety of new product information sources, including exposure to media and new products themselves. The empirical work that Manning et al. [1995] carried out using their scale shows that consumers who are novelty seekers are more likely to be interested in discovering new products by searching new information in the media and through retail outlets. In the present study, respondents answered all eight items on the CNS scale, but item 7 was excluded from further analysis because of its low item–total correlation ($\gamma < 0.5$). The coefficient alpha for the remaining items was 0.95.

3.2.4. Desire for Uniqueness

As mentioned earlier, we expected that consumers who tend to seek uniqueness would be more willing to choose a QR code service than those who do not tend to seek uniqueness. With regard to measurement, Lynn and Harris [1997] used a screening device to examine individual differences in the desire for consumer goods, services, and experiences that few others possess. The desire for unique consumer products scale (DUCP) was designed based on the antecedents and consequences of desire for uniqueness. Their results suggested that consumers who are desirous of scarce products are also prone to be more desirous of new products [Lynn & Harris 1997].

However, fewer people can actually acquire scarce goods than non-scarce ones. Therefore, consumers might satisfy their need for uniqueness by acquiring uncommon or difficult-to-obtain items [Brock 1968; Lynn 1991; Snyder & Fromkin 1980]. Snyder and Fromkin [1980] also suggested that individuals can find uniqueness when members of their group differ from the population at large. Therefore, we adopted the Consumer Need for Uniqueness Scale (CNUS), proposed by Tian, Bearden, and Hunter [2001]. This scale has been used more frequently in recent consumer studies [e.g., Shuk et al. 2008; Ayalla 2008]. The CNUS items were based on three concepts: creative choice counter-conformity, unpopular choice counter-conformity, and avoiding similarity. There is some overlap between DUCP and CNUS. The current study proposes a combined scale

that uses all eight items of Lynn and Harris's scale and also 13 items from Tian, Bearden, and Hunter's scale. This combined scale identifies two main facets of the desire for uniqueness: DUGC and DUAS. Items related to the aspect of unpopular choice counter-conformity were excluded from the combined scale following confirmatory factor analysis. For the rest of the items, all item–total correlations exceeded 0.5, and the coefficient alphas for these two dimensions (i.e., DUGC and DUAS) were 0.93 and 0.93 respectively, indicating high reliability.

3.2.5.   Scale Validation

As reported previously, coefficient alphas showed that each of the four scales was reliable. Composite reliability is also the most common index of the convergent validity of measures. It is used to check whether the scale items measure the construct in question or other (related) constructs. This study used both Cronbach's alpha and composite reliability to examine each construct's reliability. As shown in Table 1, all of the composite reliabilities of the constructs surpassed .83, which ensured adequate internal consistency of multiple items for each construct [Fornell & Larcker 1981].

Then confirmatory factor analysis with maximum likelihood was conducted to estimate the measurement model by verifying the underlying structure of the constructs. Discriminant validity is the extent to which a measure diverges from other, similar measures. Testing for discriminant validity involves checking whether the items measure the construct in question or other constructs. In addition, Fornell and Larcker [1981] suggested that the average variance extracted (AVE) can be used to evaluate discriminant validity (Table 1). To have adequate discriminant validity, the square root of the AVE should be greater than the construct's correlation coefficient. As shown in Table 1, the AVE for all constructs was higher than the shared variances. These results indicate that these constructs had adequate discriminant validity. Convergent validity was also supported, as the AVE clearly exceeded .50 for all dimensions [Fornell & Larcker 1981]. All five factors showed a number of strong loadings, and all variables loaded substantially on only one factor. The results of analyses provided evidence of the validity of all scales.

Table 1: Correlation Coefficients, Reliability, and Results of the Confirmatory Factor Analysis

Constructs	CNS	DUGC	DUAS	ATI	AMBS
Consumer Novelty Seeking (CNS)	**0.86**				
Desire for Uniqueness: Goal-Directed Choice Counter-Conformity (DUGC)	0.60	**0.73**			
Desire for Uniqueness: Avoiding Similarity (DUAS)	0.40	0.63	**0.85**		
Attitudes to Innovation (ATI)	0.51	0.62	0.44	**0.71**	
Acceptance of Mobile Barcode Services (AMBS)	0.49	0.44	0.21	0.55	**0.77**
Cronbach's Alpha	**0.95**	**0.93**	**0.93**	**0.82**	**0.85**
Composite reliability	**0.95**	**0.93**	**0.93**	**0.83**	**0.86**
Average Variance Extracted (AVE)	**0.74**	**0.54**	**0.73**	**0.51**	**0.60**

Note. Elements on the diagonal are the square roots of the average variance extracted (AVE)

4.   Findings

A linear structural equation model is a hypothesized pattern of linear relationships among a set of variables. Its purpose is to provide a meaningful and parsimonious explanation for observed relationships among a set of measured variables. We used structural equation modeling to test possible patterns of causal dependency between variables and to reveal the causal paths between variables. We tested whether the models fit the data better than rival specifications and whether they provided a good absolute fit to the data. Although we cannot be certain of the conclusions, the pattern that emerged provided a useful guide for our empirical study. A chi-square goodness-of-fit test was used to assess the overall fit of the model. Maximum likelihood estimation can be used to test the null hypothesis that a given model provides an acceptable fit to the observed data. However, use of the chi-square test is likely misleading for our purposes. Our sample size ($N = 689$) was larger than 200, which is the standard sample size for structural equation modeling. The larger the sample, the more likely it is that a model will be rejected and the more likely it is that Type II error will occur (rejection of a relationship that is present). In large samples even tiny differences between the observed model and the optimal-fit model may be significant. To eliminate this problem, the relative chi-square value provides an alternative measure of fit in which the chi-square fit index is divided by its degrees of freedom (χ^2/df). Its optimal value is unity. Table 2 shows that all indices of our model were acceptable [Bagozzi & Yi 1988; Bentler & Bonett 1980; Hu & Bentler 1998; Steiger 2007; Schumacker & Lomax 2004].

Table 2: Model Fit

Fit Criteria	Recommended Value		Results
χ^2/df	Between 2 and 5	Schumacker & Lomax [2004]	3.78
RMSEA	<0.07	Steiger [2007]	0.06
Normed Fit Index (NFI)	>0.9	Bentler & Bonett [1980]	0.92
Comparative Fit Index (CFI)	>0.9	Bagozzi & Yi [1988]	0.94
Standardized RMR	<0.08	Hu & Bentler [1998]	0.05

Note. The goodness-of-fit index and adjusted goodness-of-fit index are affected by sample size. The current consensus is not to use these measures [Sharma, Mukherjee, Kumar, & Dillon 2005].

Figure 2 shows the three personality traits related to acceptance of the QR code service. CNS made the largest contributions to the model. H3a and H3c were supported. Although the relationship between DUAS and acceptance of the QR code service was negative and significant, the contribution of its coefficient was very low ($\beta = -0.11$). Therefore, H3b was rejected. This implies that the effects of DUAS may vary across consumer groups. With regard to attitudes toward innovation, participants who were more in favor of innovative products were more prone to seek out novelty (H1) and to have a greater desire for uniqueness based on DUGC (H2a).
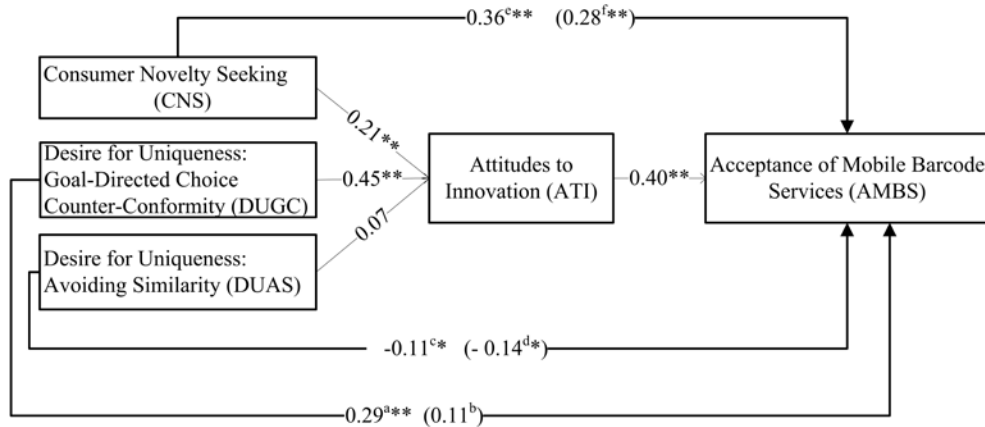
Note.
** $p < .01$; * $p < .05$
a. DUAS predicted ATI
b. The influence of the DUAS on AMBS when controlling for the effect of ATI
c. DUGC predicted ATI
d. The influence of the DUGC on AMBS when controlling for the effect of ATI
e. CNS predicted ATI
f. The influence of the CNS on AMBS when controlling for the effect of ATI
$\chi^2 = 1955.64$, df = 517, $p < .001$, SRMR = 0.054, CFI = 0.94, RMSEA = 0.06, NFI = 0.92

Figure 2: Mediation Model

In addition, attitudes toward innovation were positively related to acceptance of the QR code service (H4). However, according to the TPB [Ajzen 1985, 1991], attitudes toward a specific behavior are influenced by background factors such as personality traits. This can explain differences in people's preferences for QR code services. Thus, we next examined the mediation effects. Figure 2 indicates that attitudes toward innovation did partially mediate the influence of the three personality traits (i.e., CNS, DUGC, DUAS) on acceptance of the QR code service. Although H5 was supported, the mediation, though significant, was not especially strong, especially for DUAS. This modest mediation in the group as a whole may be the result of negligible mediation among consumers unlikely to take up innovative consumer products and may have partially cancelled out much higher levels of mediation among those more likely to take up such services. In other words, the degree of mediation varied across consumer groups (H6).

To test H6, we divided participants into four groups by categorizing them in a way akin to that used by Rogers [2003] to create his classification. Participants were assigned to these categories by using cutoffs of ±1 *SD* and ±2 *SD* from the mean score on the attitude scale. In this way (and following Rogers's terminology), participants were

divided into five types: laggards (M < 3.01), late majority consumers (3.01 ≤ M < 3.61), early majority consumers (3.61 ≤ M < 4.21), early adopters (4.21 ≤ M < 4.81), and innovators (M ≥ 4.81). Then we combined early adopters and innovators into a single adopter category. We used four rather than five categories because this classification eliminates the problem of sample size, reduce complications of the comparison model, and more accurately reflect reality.

Product acceptance items were scored on a 5-point scale (i.e., 1 = strongly disagree, 2 = disagree, 3 = moderate, 4 = agree, 5 = strongly agree). Thus, participants with a mean score less than 2 tended to resist the innovative service, whereas those with a mean score greater than 4 were willing to try it. Again, participants were classified according to their thoughts about the acceptance of the QR code service by assigning them to one of four categories using cutoffs that were ±1 *SD* and ±2 *SD* away from the mean score (3.9): resistant (M ≤ 2.58), indecisive (2.58 < M ≤ 3.9), trying to adopt (3.9 < M ≤ 4.56), and accepting (M > 4.56).

Figure 3 shows that the majority of participants who resisted adopting the new service content were in the laggard group (46.4%) and the late majority group (40.2%). By contrast, about 69.9% of participants who favored adopting the content belonged to the early majority (33.6%) and adopters (36.3%) groups. Approximately 42.7% of the participants belonging to the late majority group were classified as indecisive, and nearly 72% of the participants who were in the majority group (i.e., early and late) were classified as those who would try to adopt the service (χ^2 = 139.67, $p < .001$). Thus, not only did adopters and laggards differ in their decisions about acceptance of the QR code service, but so did late majority and early majority consumers. This result confirmed that consumers' attitudes toward an innovation may serve as an extrinsic cue on which they base their decisions. For example, if individuals respond negatively to the QR code service, they must alter their attitude before accepting the innovation. Researchers have suggested that such resistance to an innovation can be explained by not trying the innovation and can be described by three distinct types of consumer behavior: rejection, postponement, and opposition [Ram & Sheth 1989; Szmigin & Foxall 1998].
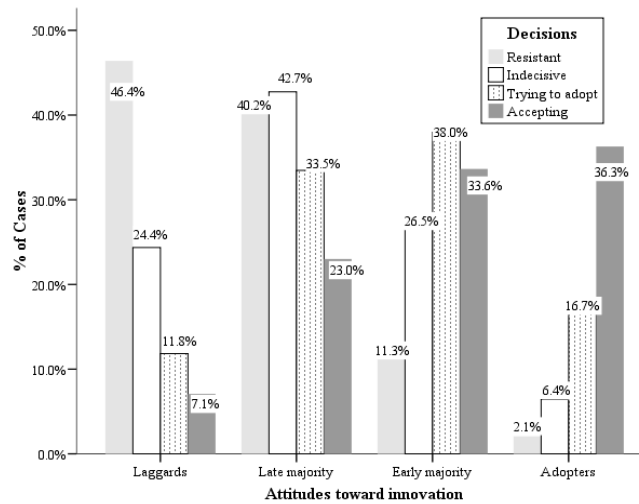

Figure 3: Distribution of Consumer Categories and Adoption Decisions

As can be seen in Figure 3, individuals' attitude to innovations should have an influence on their *resistance*. Therefore, the four-way classification of participants in terms of their attitudes toward innovation was used to examine whether the degree of mediation of the effects of personality on service acceptance was the same in each of the four groups. Considering the effect of the small sample size, hierarchical linear regression models were used to estimate our models. For a discussion of this analytic technique, please see Baron and Kenny [1986] and Kenny, Korchmaros, and Bolger [2003]. To identify the degree of mediation, we first regressed the variable of acceptance of mobile barcode service (AMBS) onto the three personality traits (i.e., CNS, DUGC, DUAS), then we regressed the variable ATI onto those personality traits, and finally we regressed the variable AMBS onto both ATI and the three personality traits. The extent to which the influence of the three personality traits on AMBS was reduced when ATI was included in the regression expressed the degree to which the effect of the personality variables on AMBS was mediated by ATI. The variance inflation factor (VIF) is used as an indicator of multicollinearity. A value of 10 is recommended as the maximum VIF [Hair et al. 2010]. The four models all met the required criterion (i.e., VIF = 1.28–2.93). Results of the separate mediation analyses for each of the four innovation types are depicted in Figure 4.

The laggard and late majority groups (Models 2 and 4) showed no significant mediation effect: the relation between DUAS and acceptance of the QR code service was not mediated by consumers' attitudes toward innovation. Attitudes toward innovation completely mediated the relationship between DUGC and acceptance of the QR code service. For the other groups, mediation did occur. This implies that people who pursue uniqueness in self-distinctiveness have less resistance to innovation even if their attitude toward innovation is unfavorable (laggard) or hesitant (late majority). Thus, H6 was supported. This means that the earlier finding that mediation was fairly modest could be largely attributed to the inclusion of the laggard and late majority groups in the original analysis.

In addition, the original analysis showed a negative relationship between DUAS and acceptance of the QR code service (H3b) and revealed a nonsignificant relationship between DUAS and ATI (H2b; Figure 2). Figure 4 indicates that this phenomenon only affects the laggard and late majority groups (Models 2 and 4). As mentioned earlier, if individuals possess a high need for DUAS, this implies that they will devalue and avoid purchasing products or services perceived as commonplace [Tian et al. 2001]. In contrast, the laggard and late majority groups are prone to accepting a technology service when this service is ubiquitous. Thus, for Models 2 and 4, the negative relationship between DUAS and acceptance of the QR code service (H3b) is reasonable. Given the same rationale, the rest of the models (Models 1 and 3) showed that adopters and early majority consumers, who tend to seek uniqueness based on avoiding similarity, were more willing to choose a QR code service than those who do not tend to seek uniqueness. They were also prone to having more positive attitudes toward innovation than their counterparts. For Models 1 and 3, H2b and H3b were accepted (Figure 4). The findings also support our expectation that the effects of DUAS vary across consumer groups. Apart from the effects of different degrees of DUAS, consumers' acceptance of the QR code service can also be reinforced by different ATI clusters. This reinforcement characteristic similarly appears in the factor of DUGC (H6).
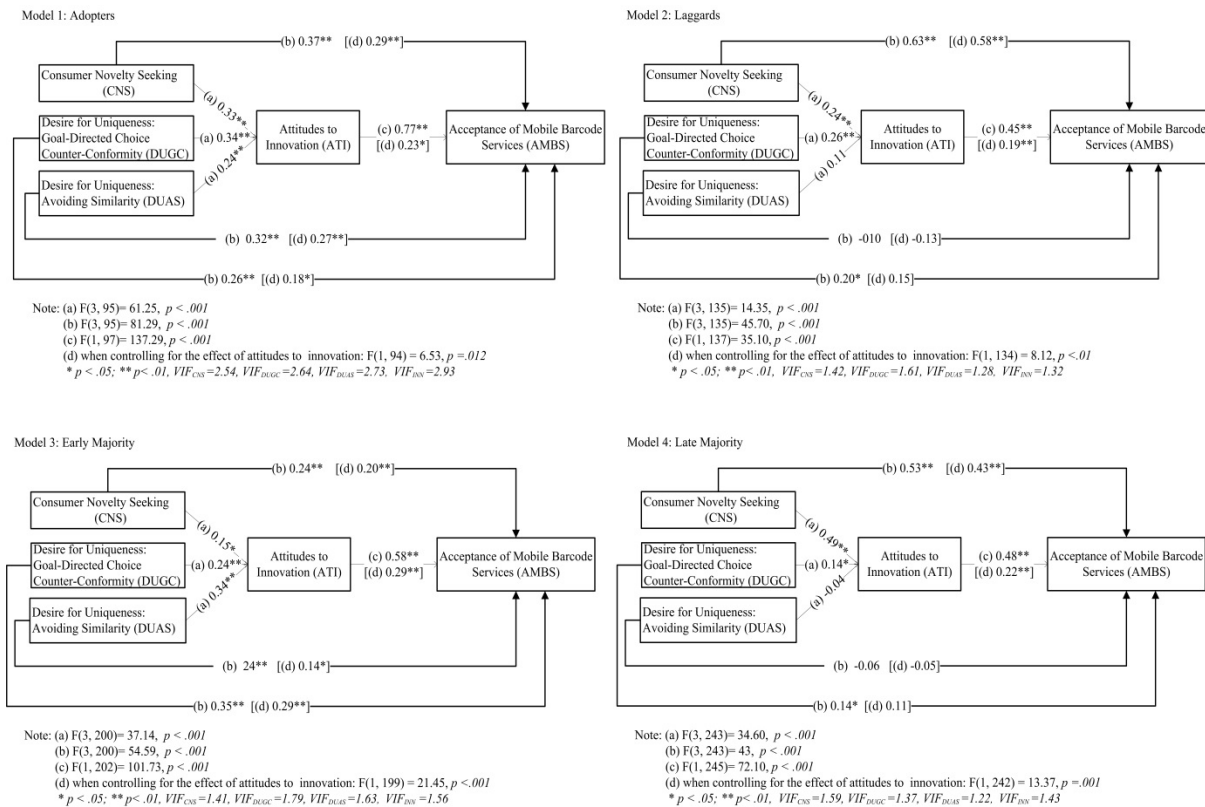
Model 1: Adopters

(b) 0.37** [(d) 0.29**]
Consumer Novelty Seeking (CNS)
(a) 0.33**
Desire for Uniqueness: Goal-Directed Choice Counter-Conformity (DUGC) — (a) 0.34**
(a) 0.24**
Attitudes to Innovation (ATI) — (c) 0.77** [(d) 0.23*] — Acceptance of Mobile Barcode Services (AMBS)
Desire for Uniqueness: Avoiding Similarity (DUAS)
(b) 0.32** [(d) 0.27**]
(b) 0.26** [(d) 0.18*]

Note: (a) F(3, 95)= 61.25, p < .001
(b) F(3, 95)= 81.29, p < .001
(c) F(1, 97)= 137.29, p < .001
(d) when controlling for the effect of attitudes to innovation: F(1, 94) = 6.53, p =.012
* p < .05; ** p< .01, VIF_CNS =2.54, VIF_DUGC =2.64, VIF_DUAS =2.73, VIF_INN =2.93

Model 2: Laggards

(b) 0.63** [(d) 0.58**]
Consumer Novelty Seeking (CNS)
(a) 0.24**
Desire for Uniqueness: Goal-Directed Choice Counter-Conformity (DUGC) — (a) 0.26**
(a) 0.11
Attitudes to Innovation (ATI) — (c) 0.45** [(d) 0.19**] — Acceptance of Mobile Barcode Services (AMBS)
Desire for Uniqueness: Avoiding Similarity (DUAS)
(b) -010 [(d) -.13]
(b) 0.20* [(d) 0.15]

Note: (a) F(3, 135)= 14.35, p < .001
(b) F(3, 135)= 45.70, p < .001
(c) F(1, 137)= 35.10, p < .001
(d) when controlling for the effect of attitudes to innovation: F(1, 134) = 8.12, p <.01
* p < .05; ** p< .01, VIF_CNS =1.42, VIF_DUGC =1.61, VIF_DUAS =1.28, VIF_INN =1.32

Model 3: Early Majority

(b) 0.24** [(d) 0.20**]
Consumer Novelty Seeking (CNS)
(a) 0.15*
Desire for Uniqueness: Goal-Directed Choice Counter-Conformity (DUGC) — (a) 0.24**
(a) 0.34**
Attitudes to Innovation (ATI) — (c) 0.58** [(d) 0.29**] — Acceptance of Mobile Barcode Services (AMBS)
Desire for Uniqueness: Avoiding Similarity (DUAS)
(b) 24** [(d) 0.14*]
(b) 0.35** [(d) 0.29**]

Note: (a) F(3, 200)= 37.14, p < .001
(b) F(3, 200)= 54.59, p < .001
(c) F(1, 202)= 101.73, p < .001
(d) when controlling for the effect of attitudes to innovation: F(1, 199) = 21.45, p <.001
* p < .05; ** p< .01, VIF_CNS =1.41, VIF_DUGC =1.79, VIF_DUAS =1.63, VIF_INN =1.56

Model 4: Late Majority

(b) 0.53** [(d) 0.43**]
Consumer Novelty Seeking (CNS)
(a) 0.49**
Desire for Uniqueness: Goal-Directed Choice Counter-Conformity (DUGC) — (a) 0.14*
(a) -0.04
Attitudes to Innovation (ATI) — (c) 0.48** [(d) 0.22**] — Acceptance of Mobile Barcode Services (AMBS)
Desire for Uniqueness: Avoiding Similarity (DUAS)
(b) -0.06 [(d) -0.05]
(b) 0.14* [(d) 0.11]

Note: (a) F(3, 243)= 34.60, p < .001
(b) F(3, 243)= 43, p < .001
(c) F(1, 245)= 72.10, p < .001
(d) when controlling for the effect of attitudes to innovation: F(1, 242) = 13.37, p =.001
* p < .05; ** p< .01, VIF_CNS =1.59, VIF_DUGC =1.37, VIF_DUAS =1.22, VIF_INN =1.43

Figure 4: Mediation Models for Each Consumer Category

5. Discussion and Future Research

The study of factors that affect consumer acceptance of a QR code service can help improve marketing strategies. The present study investigated the influence of various personality traits on attitudes toward innovation, and whether this would have an impact on consumer acceptance of a QR code service. The original findings did not confirm all of the hypotheses, especially for the trait of desire for uniqueness. Upon further analysis, the comparison

models revealed that laggards and late majority consumers held unfavorable attitudes toward innovation and were less willing to adopt the QR code service. However, if the QR code becomes ubiquitous, laggards and late majority consumers will be more willing to use this service. This phenomenon appears distinctly in the trait of DUAS. This goes against what was hypothesized and does not lend support to previous investigations conducted by Lynn and Harris [1997] on the consumer desire for uniqueness. For consumers with DUAS traits, innovativeness had no mediation effect. This implies that attitudes toward innovation do not enhance the likelihood of acceptance if consumers pursue common traits (e.g., laggard and late majority consumers). This also negates the hypothesis and the majority of research that claims that innovativeness is the best predictor of acceptance [Agarwal & Prasad 1998; Chang & Tung 2008].

There are several possible reasons for these findings. First, Lynn and Harris's [1997] scale focuses primarily on the pursuit of uniqueness through the consumption of scarce or rare goods. Yet the current study used a combined scale [Lynn & Harris 1977; Tian et al. 2001] that identified two main facets of the desire for uniqueness: DUGC and DUAS. The use of this multidimensional scale may have resulted in findings that went against our hypotheses and did not support the findings of Lynn and Harris [1977]. Second, the four-way classification of participants in terms of their ATI generated four models, and the comparison model showed that the effects of DUAS and the degree of mediation (i.e. ATI) vary across consumer groups. Although this classification resulted in findings for some groups (the laggard and late majority groups) that were different from the results of past studies [Agarwal & Prasad 1998; Chang & Tung 2008], our findings provide new insight into explanations of *resistance*. Our Models 2 and 4 (i.e., those for the laggard and late majority groups) provide a conceptual tool to structure how consumers think about resistance and how personality traits (e.g., CNS, DUGC) can reverse resistance. Our findings also suggest that personality traits (e.g., CNS, DUGC) play a key role in decreasing consumer resistance to innovation, even among laggard or late majority groups (in terms of ATI). In contrast, the personality traits of adopters and early majority consumers (i.e., CNS, DUAS, DUGC) influenced acceptance of the QR code service because they led to positive attitudes toward the service. This outcome is consistent with the previous literature [Ajzen 1991; Lynn & Harris 1997; Amaldoss & Jain 2005; Agarwal & Prasad 1998; Chang & Tung 2008]. Overall, these findings suggest that the degree of mediation of the effects of personality traits on service acceptance by attitudes toward innovation varies across categories of consumers.

Although this study provides information regarding specific variables that increase the probability of accepting a QR code service, there is still a need for further investigation to be able to generalize and extend these findings. For example, participants with unfavorable attitudes toward innovation (i.e., laggard and late majority consumers) were the exception to the theory. They did not show the same pattern of mediation. Even though their personality traits (i.e., DUAS) affected how acceptable they judged an innovation to be, the influence of these traits was not mediated by the participants' attitude toward innovation. Their influence may, however, have been mediated by other factors. For instance, unadventurous consumers may feel that they do not have the time, energy, or money to spend acquiring information via mobile QR code services (lack of perceived control). Alternatively, they may be part of social circles in which it is not acceptable to use such services (different subjective norm). These are testable hypotheses that could be examined in future studies.

6.   Implications for Marketing

The QR code application is one example of technological evolution in media. Consumers may be conscious of this technology trend. For example, a two-dimensional barcode appears on many consumer receipts. This barcode may contain information about discounts, calorie content, and so forth. Even today, free/paid QR readers seem to be available on every 3G mobile device, but many users may perceive barriers to using them. These barriers may stem from either technical problems or the consumer's acceptance of the service. According to the findings of this study, laggard and late majority individuals may be alarmed by such dynamic markets. Their perceptions may differ considerably from those of consumers who tend to adopt new things. However, our findings suggest that after the QR code service becomes popular, the laggards and late majority consumers will be more willing to use it. Thus, knowing about individuals' attitudes toward innovative products/services as well as their personality characteristics is likely to assist in evaluating new media services. In addition, studies of innovation have crucial implications for individuals and organizations trying to market novel products. Given today's ever-growing consumer society, technological markets that are rapidly changing, and harsher global competition, more emphasis needs to be put on the consumer. The present results suggest that knowing what influences a consumer's likelihood of accepting a product is extremely valuable for the successful promotion and implementation of the product. Even assessing a single trait variable is likely to be worthwhile.

REFERENCES

Agarwal, R. and J. Prasad, "A Conceptual and Operational Definition of Personal Innovativeness in the Domain of Information Technology," *Information Systems Research*, Vol. 9, No. 2: 204-215, 1998.

Ajzen, I., "From Intentions to Actions: A Theory of Planned Behavior," *Action-control: From cognition to behavior*, J Kuhl and J Beckman (eds.), Springer, Heidelberg, pp.11-39, 1985.

Ajzen, I., "The Theory of Planned Behavior," *Organizational Behavior and Human Decision Processes*, Vol. 50, No. 2: 179-211, 1991.

Ajzen, I., Attitudes, Personality and Behavior, Maidenhead, UK: Open University Press, 2005.

Ajzen, I. and M. Fishbein, "The influence of attitudes on behavior," *The Handbook of Attitudes*, InD Albarracin, B. T. Johnson, and M. P. Zanna (eds.), Erlbaum, Mahwah, NJ, pp. 173-221, 2005.

Ajzen, I. and M. Fishbein, "Attitude-behavior relations: A Theoretical Analysis and Review of Empirical Research," *Psychological Bulletin*, Vol. 84, No. 5: 888-918, 1977.

Amaldoss, Wilfred and Sanjay Jain, "Pricing of Conspicuous Goods: A Competitive Analysis of Social Effects," *Journal of Marketing Research*, Vol. 42, No.1: 30-42, 2005.

Allport, Gordon W. Pattern and Growth in Personality, Rinehart & Winston, New York, Holt, 1961.

Al-Jabri, I. M. and M. S. Sohail, "Mobile Banking Adoption: Application of Diffusion of Innovation Theory," *Journal of Electronic Commerce Research*, Vol. 13, No.4: 379-391, 2012.

Ayalla, R., "Unique Like Everybody Else? The Dual Role of Consumers' Need for Uniqueness," *Psychology and Marketing*, Vol. 25, No. 5: 444-464, 2008.

Bacon, L.D., Using Amos for Structural Equation Modeling in Market Research, SPSS, Chicago, IL., 1997

Bagozzi, R. and Y. Yi, "On the Evaluation of Structural Equation Models," *JAMS*, Vol.16, No.1: 74-94, 1988.

Baron, R. M. and D. A. Kenny, " The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic and Statistical Considerations," *Journal of Personality and Social Psychology*, Vol. 51, No.6: 1173-1182, 1986.

Belk, Russell W, Melanie Wallendorf, and John F Sherry Jr, "The Sacred and the Profane in Consumer Behavior: Theodicy on the Odyssey," *Journal of Consumer Research*, Vol. 16, No. 1:1-38, 1989.

Bentler, P. M. and D. G. Bonett, "Significance Tests and Goodness of Fit in the Analysis of Covariance Structures," *Psychological Bulletin*, Vol. 88, No.3: 588-606, 1980.

Birnbaum, M. H. , Psychological Experiments on the Internet. San Diego, CA, US: Academic Press, 2000.

Birnbaum, M. H., "Human Research and Data Collection Via the Internet," *Annual Review of Psychology*, Vol. 55, No.1: 803-832, 2004.

Brock, TC., "Implications of Commodity Theory for Value Change," *Psychological Foundations of Attitudes*, A. G. Greenwald, T. C. Brock, and T. M. Ostrom (eds.) Academic Press, New York, pp. 243-275, 1968.

Burns, D. J., "The Need for Uniqueness and the Adoption Process," *Journal of Midwest Marketing*, Vol. 4: 28-37, 1990.

Burton, R. J. F., "Reconceptualising the Behavioural Approach in Agricultural Studies: a Socio-Psychological Perspective," *Journal of Rural Studies*, Vol. 20, No.3: 359-371, 2004.

Cattell, Raymond B. Personality and Motivation Structure and Measurement. World Book, New York, 1957.

Cattell, Raymond Bernard. The Scientific Use of Factor Analysis in Behavioral and Life Sciences. Plenum Press, New York, 1978.

Çelik, H. E. and V. Yilmaz, "Extending the Technology Acceptance Model for adoption of E-Shopping by Consumers in Turkey," *Journal of Electronic Commerce Research*, Vol. 12, No. 2: 152-164, 2011.

Chang, S. C. and F. C. Tung, "An Empirical Investigation of Students' Behavioural Intentions to Use the Online Learning Course Websites," *British Journal of Educational Technology*, Vol. 39, No.1: 71-83, 2008.

Cloninger, C. R., R. Adofsson, and N. M. Svrakic, "Mapping Genes for Human Personality," *Nature Genetics*, Vo.12: 3-4, 1996.

Cloninger, C. R., D. M. Svrakic, and T. R. Przybeck (1993), "A Psychobiological Model of Temperament and Character," *Archives of General Psychiatry*, Vol. 50: 975-990, 1993.

Davis, F. D., "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," *MIS Quarterly*, Vol. 13: 319-340, 1989.

Davis, F., R. Bagozzi, and P. Warshaw, "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models," *Management Science*, Vol. 35, No.8: 982-1003, 1989.

de Vreede, Triparna, G-J de Vreede, Gregory Ashley, and Roni Reiter-Palmon, "Exploring the Effects of Personality on Collaboration Technology Transition," Paper presented at the System Science (HICSS), the 45th Hawaii International Conference, IEEE, 2012.

De Young, Colin G, Yanna J Weisberg, Lena C Quilty, and Jordan B Peterson, "Unifying the Aspects of the Big Five, the Interpersonal Circumplex, and Trait Affiliation," *Journal of Personality*, February 2013.

Devaraj, Sarv, Robert F Easley, and J Michael Crant, "How Does Personality Matter? Relating the Five-Factor Model to Technology Acceptance and Use," *Information Systems Research*, Vol. 19, No. 1: 93-105, 2008.

Emerson, R. M., "Power-Dependence Relations.," *American Sociological Review*, Vol. 27: 31-41, 1962

Eysenck, Hans Jürgen, and Michael W Eysenck, Personality and Individual Differences. Plenum Press, New York, 1985.

Eysenck, Hans Jurgen, and Sybil Bianca Giuletta Eysenck, Manual of the Eysenck Personality Questionnaire (Junior and Adult). Hodder and Stoughton, 1975.

Fishbein, M. and I. Ajzen, Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research. Addison-Wesley, Reading, MA, 1975

Flavell, J. H., Cognitive Development. Prentice-Hall. Inc., Englewood Cliffs, NJ, 1977.

Fornell, C. and D. F. Larcker, "Evaluation Structural Equation Models with Unobservable Variables and Measurement Error," *Journal of Marketing Research*, Vol.18: 39-50, 1981

Gillooly, C., "Disillusionment, " *Information Week*, Vol. 669: 46-51, 1998.

Goldberg, Lewis R, "The Structure of Phenotypic Personality Traits," *American Psychologist*, Vol. 48, No. 1: 26-34, 1993.

Hair, J. F. Jr., W. C. Black, B. J. Babin, and R. E. Anderson, Multivariate Data Analysis (7th ed.), Pearson, New York, 2010

Hong, S. J. and K. Y. Tam, "Understanding the Adoption of Multipurpose Information Appliances: The Case of Mobile Data Services," *Information Systems Research*, Vol. 17, No. 2: 162-179, 2006.

Hu, Li T. and P. Bentler, "Fit Indices in Covariance Structure Modeling: Sensitivity to Underparameterized Model Misspecification," *Psychological Methods*, Vol. 3, No.4: 424-453, 1998.

Jang, S.C. and R. Feng, "Temporal Destination Revisit Intention: The Effects of Novelty Seeking and Satisfaction," *Tourism Management*, Vol. 28, No. 2: 580-590, 2007.

Katz, Daniel, "The Functional Approach to the Study of Attitudes. *The Public Opinion Quarterly,*" Vol. 24, No.2: 163-204, 1960

Kenny, D. A., J. D. Korchmaros, and N. Bolger, "Lower Level Mediation in Multilevel Models," *Psychological Methods*, Vol. 8, No. 2: 115-28, 2003.

King, R. T., "California DMV's Computer Overhaul Ends up as Costly Ride to Junk Heap," *Wall Street Journal Eastern edition*, B5, 1994.

Koenigstorfer, J. and A. Groeppel-Klein, "Consumer Acceptance of the Mobile Internet," *Marketing Letters*, 1-12, 2012.

Kron, J, Home-Psych: The Social Psychology of Home and Decoration. Potter, New York, 1983.

Kwon, T. H. and R. W. Zmud, "Unifying the Fragmented Models of Information Systems Implementation," *Critical Issues in Information Systems Research*, R. J. Boland and R. A. Hirschheim (eds.), Wiley, New York, pp. 227-51, 1987.

Leavitt , C. and J. Walton, The Open Processing Scale: a Predictor of Innovative Cognitive Style, College of Administrative Science, Ohio State University, 1983.

Leavitt, C. and J. Walton, "Development of a Scale for Innovativeness," *Advances in Consumer Research*, Vol. 2, No.1: 545-54, 1975.

Lutz, Richard J., "Changing Brand Attitudes through Modification of Cognitive Structure," *Journal of Consumer Research,* Vol. 1, No. 4: 49-59, 1975

Lutz, Richard J., "A Functional Approach to Consumer Attitude Research," *Advances in Consumer Research,* Vol. 5, No.1: 360-369, 1978

Lynn, M., The Effects of Scarcity on Perceived Value: Investigations of Commodity Theory, Psychology Department, Ohio State University, 1987.

Lynn, M., "Scarcity's Enhancement of Desirability: The Role of Naive Economic Theories," *Basic and Applied Social Psychology*, Vol.13: 6-78, 1992.

Lynn, M. and J. Harris, "The Desire for Unique Consumer Products: A New Individual Differences Scale," *Psychology & Marketing*, Vol. 14, No. 6: 601-616, 1997.

Madden, T. J., P. S. Ellen, and I. Ajzen, "A Comparison of the Theory of Planned Behavior and the Theory of Reasoned Action," *Personality and Social Psychology Bulletin*, Vol. 18, No.1: 3-9, 1992.

Manning, K. C., W. O. Bearden, and T. J. Madden, "Consumer Innovativeness and the Adoption Process," *Journal of Consumer Psychology*, Vol. 4, No. 4: 329-345, 1995.

Maremmani, I., H. S. Akiskal, S. Signoretta, A. Liguori, G. Perugi, and R. Cloninger, "The Relationship of Kraepelian Affective Temperaments (as Measured by TEMPS-I) to the Tridimensional Personality Questionnaire (TPQ)," *Journal of affective disorders*, Vol. 85, No.1-2: 17-27, 2005.

McAlister, Leigh, and Edgar Pessemier, "Variety Seeking Behavior: An Interdisciplinary Review," *Journal of Consumer Research*, Vol.9, No. 3: 311-322, 1982.

McCarroll, T, "What New Age?," *The Time*, Vol. 138, No. 6: 44-46, 1991.

McCrae, Robert R, and Paul T Costa Jr, "Rotation to Maximize the Construct Validity of Factors in the Neo Personality Inventory," *Multivariate Behavioral Research*, Vol. 24, No. 1: 107-124, 1989.

McCrae, Robert R, and Oliver P John, "An Introduction to the Five-Factor Model and Its Applications," *Journal of Personality*, Vol. 60, No. 2: 175-215, 1992.

Miettunen, J., E. Lauronen, L. Kantojarvi, J. Veijola, and M. Joukamaa, "Inter-Correlations between Cloninger's Temperament Dimensions -- A Meta-Analysis," *Psychiatry research*, Vol. 160, No.1: 106-114, 2008.

Naghavi, H. R., J. Lind, L. G. r. Nilsson, R. Adolfsson, and L. Nyberg, "Personality Traits Predict Response to Novel and Familiar Stimuli in the Hippocampal Region," *Psychiatry Research: Neuroimaging*, Vol. 173, No. 2: 94-99, 2009.

Nysveen, H., Per E. Pedersen, and H. Thorbjornsen, "Intentions to Use Mobile Services: Antecedents and Cross-Service Comparisons," *JAMS*, Vol. 33, No. 3: 330-346, 2005.

Oliveira, Rodrigo De, Mauro Cherubini, and Nuria Oliver, "Influence of Personality on Satisfaction with Mobile Phone Services," *ACM Transactions on Computer-Human Interaction (TOCHI)*, Vol. 20, No. 2: 1-23, 2013.

Ram, Sundaresan, and Jagdish N Sheth, "Consumer Resistance to Innovations: The Marketing Problem and Its Solutions," *Journal of Consumer Marketing*, Vol. 6, No. 2: 5-14, 1989.

Reips, U. D., "Standards for Internet-Based Experimenting," *Experimental Psychology*, Vol. 49, No. 4: 243-256, 2002.

Rogers, E. M., Diffusion of Innovations, Free Press, New York, 1962.

Rogers, E. M., Diffusion of Innovations, Free Press, New York, 2003.

Schumacker, RE and RG. Lomax, *A Beginner's Guide to Structural Equation Modeling*. Lawrence Erlbaum Associates, Mahwah, NJ, 2004.

Sharma, S., S. Mukherjee, A. Kumar, and W. R. Dillon, "A Simulation Study to Investigate the Use of Cutoff Values for Assessing Model fit in Covariance Structure Models," *Journal of Business Research*, Vol. 58, No. 7: 935-943, 2005.

Shuk, Y. H., J. D. Michael, and Y. T. Kar, "Personalization and Choice Behavior: The Role of Personality Traits," *The DATA BASE for Advances in Information Systems*, Vol. 39, No. 4: 31-47, 2008.

Simonson, I. and S. M. Nowlis, "The Role of Explanations and Need for Uniqueness in Consumer Decision Making: Unconventional Choices Based on Reasons," *Journal of Consumer Research*, Vol. 27, No. 1: 49-68, 2000.

Skitka, L. J. and E. G. Sargis, "The Internet as Psychological Laboratory," *Annual Review of Psychology*, Vol. 57, No. 1, 529-555, 2006.

Snyder, C. R., "Product Scarcity by Need for Uniqueness Interaction: A Consumer Catch022 Carousel?," *Basic & Applied Social Psychology*, Vol. 13, No. 1: 9-24, 1992.

Snyder, C.R., and H.L. Fromkin, Uniqueness: The Human Pursuit of Difference. Plenum Press, New York, 1980.

Steiger, J. H., "Understanding the Limitations of Global fit Assessment in Structural Equation Modeling," *Personality and Individual Differences*, Vol. 42, No. 5: 893-898, 2007.

Sultan, F. and L. Chan, "The Adoption of New Technology: The Case of Object-Oriented Computing in Software Companies," *IEEE Transactions on Engineering Management*, Vol. 47, No. 1: 106-126, 2000.

Sun, Y., N. Wang, X. Guo, and Z. Peng, "Understanding the Acceptance of Mobile Health Services: A Comparison and Integration of Alternative Models," *Journal of Electronic Commerce Research*, Vol.14, No.2, 2013.

Svendsen, Gunnvald B, Jan-Are K Johnsen, Live Almås-Sørensen, and Joar Vittersø, "Personality and Technology Acceptance: The Influence of Personality Factors on the Core Constructs of the Technology Acceptance Model," *Behaviour & Information Technology*, Vol. 32, No. 4: 323-334, 2013.

Szmigin, Isabelle, and Gordon Foxall, "Three Forms of Innovation Resistance: The Case of Retail Payment Methods," *Technovation*, Vol.18, No. 6: 459-468, 1998.

Tellegen, Auke, and Niels G Waller, "Exploring Personality through Test Construction: Development of the Multidimensional Personality Questionnaire," *The Sage Handbook of Personality Theory and Assessment*, Gregory J. Boyle, Gerald Matthews and Donald H. Saklofske (eds.), Sage Publications, London, UK, pp261-292, 2008.

Tepper. K., "Categories, Contexts, and Conflicts of Consumers' Nonconformity Experiences," *Research in Consumer Behavior*, R. W. Belk (ed.), JAI Press, pp. 209-245, 1997.

Tian, K. T., W. O. Bearden, and G. L. Hunter, "Consumers' Need for Uniqueness: Scale Development and Validation," *Journal of Consumer Research*, Vol. 28, No. 1: 50-66, 2001.

Tornatzky, L. G. and K. J. Klein, "Innovation Characteristics and Innovation Adoption Implementation: A Meta-Analysis of Findings," *IEEE Transactions on Engineering Management*, Vol. 29, No. 1: 28-44, 1982.

Venkatraman, M. P. and L. L. Price, "Differentiating between Cognitive and Sensory Innovativeness: Concepts, Measurement, and Implications," *Journal of Business Research*, Vol. 20, No. 4: 293-315, 1990.

Verhallen, T. M. M. and H. S. J. Robben, "An Integrative View of How Consumers React to Scarcity," *Integrating views on economic behavior*, G. Antonides and W. F. van Raaij (eds.), IAREP/SABE conference, Rotterdam, pp.1326-1342, 1994.

Yi, M. Y., K. D. Fiedler, and J. S. Park, "Understanding the Role of Individual Innovativeness in the Acceptance of IT-Based Innovations: Comparative Analyses of Models and Measures," *Decision Sciences*, Vol. 37, No. 3: 393-426, 2006.

Zhou, Tao, and Yaobin Lu, "The Effects of Personality Traits on User Acceptance of Mobile Commerce," *Intl. Journal of Human–Computer Interaction*, Vol. 27, No. 6: 545-561, 2011.

APPENDIX 1: FULL VERSION OF QUESTIONNAIRE

Acceptance of Mobile Barcode Service (AMBS)
- After I watch the introduction to scanlife video, I desire to try this new service.
- If the QR code mobile service could enhance my life quality, I am usually willing to adopt it.
- As seen in the video, if the QR code mobile service can enhance the convenience and efficiency of shopping or information, I really interest in using this service.
- With regard to such new service, I usually dare to try it.

Attitude toward Innovation (ATI), Leavitt and Walton [1975, 1988]
- I like to take a chance.
- I would like a job that requires frequent changes from one kind of task to another.
- I like to try new and different things.
- I like to experiment with new ways of doing things.
- Some modern art is stimulating.
- I like to fool around with new ideas even if they turn out later to be a total waste of time.

Consumer Novelty Seeking (CNS), Manning, Bearden, and Madden [1995]
- I often seek out information about new products and brands.
- I like to go to places where I will be exposed to information about new products and brands.
- I like magazine that introduce new brands.
- I frequently look for new products and services.
- I seek out situations in which I will be exposed to new and different sources of product information.
- I am continually seeking new product experiences.
- I take advantage of the first available opportunity to find out about new and different products.

Desire for Uniqueness, Lynn and Harris [1997]; Tian, Bearden, and Hunter [2001]

DUGC (Desire for Uniqueness: Goal-Directed Choice Counter-Conformity)
- I am very attracted to rare objects.
- I am more likely to buy a product if it is scarce.
- I would prefer to have things custom-made than to have them ready-made.
- I enjoy having things that others do not.
- I rarely pass up the opportunity to order custom features on the products I buy.
- I like to try new products and services before others do.
- I enjoy shopping at stores that carry merchandise which is different and unusual.
- I collect unusual products as a way of telling people I'm different
- I often look for one-of-a-kind products or brands so that I create a style that is all my own
- Often when buying merchandise, an important goal is to find something that communicates my uniqueness
- I actively seek to develop my personal uniqueness by buying special products or brands
- The products and brands that I like best are the ones that express my individuality

DUAS (Desire for Uniqueness: Avoiding Similarity)
- When products or brands I like become extremely popular, I lose interest in them
- I avoid products or brands that have already been accepted and purchased by the average consumer
- When a product I own becomes popular among the general population, I begin using it less
- I often try to avoid products or brands that I know are bought by the general population
- The more commonplace a product or brand is among the general population, the less interested I am in buying it