



Increasing trust in mobile commerce through design aesthetics

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ABSTRACT

The growth of mobile commerce (m-commerce) has motivated a better understanding of how trust can be built on a mobile device. Researchers have previously examined design aesthetics (or visual aesthetics) of mobile website and incorporated a hedonic component of enjoyment in m-commerce domain, but the relationship between design aesthetics of mobile website design and customer trust in m-commerce has been rarely investigated. In this study, design aesthetics was enhanced to include a website characteristics component as important to trust development on the mobile Internet. This model was examined through an empirical study involving 200 subjects using structural equation modeling techniques. Our research found that design aesthetics did significantly impact website characteristics component, especially customization, perceived usefulness and ease of use, all of which were ultimately shown to have significant explanatory power in affecting customer trust.

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1. Introduction

For e-vendors, the concept of building trust in electronic commerce (e-commerce) to ensure customer confidence and long-term relationships has been recognized, practiced and researched (Doney & Cannon, 1997; Jarvenpaa, Tractinsky, & Vitale, 2000; Selnes, 1998). The high level of trust not only smoothes the transaction but also eliminates the uncertainty as well as perceived risks. As a result, a website with a greater level of trust is often associated with a higher degree of purchase intentions and higher customer retention rate (Siau & Shen, 2003; Van der Heijden, Verhagen, & Creemers, 2003).

Over time, as more and more customers use their mobile device to conduct business activities, building trust for vendors in mobile commerce (m-commerce) is equally important. However, gaining trust for m-vendors is seriously challenged by the interface design (e.g., small screen) (Lee & Benbasat, 2003) and its network capabilities (e.g., connection speed) (Siau & Shen, 2003). Customers are constrained by these factors when making business transactions. As such, this puts mobile vendors (m-vendors) in a disadvantageous position. For m-vendors, the process of building trust is complex and transitional, but it can be done.

Gaining trust from mobile customers relies on well-designed websites. Recent research examined a variety of topics, including impact of interface design on trust development in m-commerce (Lee & Benbasat, 2003; Liu, Marchewka, Lu, & Yu, 2005; Siau, Sheng, & Nah, 2003), factors affecting the adoption of m-commerce

(Yang, 2005) and extended business applications for mobility (Perry, O'Hara, Sellen, Harper, & Brown, 2001; Schrott & Gluckler, 2004). Of these relevance to this study, Koufaris and Hampton-Sosa (2004) found that a customer perceptions about the website is a key determinant of gaining initial trust, followed by a development of buyer–seller relationship.

On the other hand, website's design aesthetics or visual aesthetics were found to be important for gaining trust from customers (Karvonen, 2000). Elements of design aesthetics include color, photographs, font style and layout. Studies showed that design aesthetics affect perceived usefulness and ease of use of a website (Schultz, 2005; Tractinsky, 2004). Hence, we believed that a thorough examination of the factors mentioned above that promote trust in mobility context is critical and may have implications on the trust development for m-vendors.

2. Research background

2.1. Context for m-commerce

The research in m-commerce is growing. Mobile applications in different industry were extensively studied. Jung, Perez-Mira, and Wiley-Patton (2009) considered TAM, content and cognitive concentration in a mobile TV service for the potential users who intend to use and suggested cognitive concentration having critical impacts on consumer's intention to subscribe the mobile TV service. Luarn and Lin (2005) extended TAM with other variables (i.e., credibility, self-efficiency and financial cost) and examined consumer's behavioral intention to use mobile banking. Consistent with Wang, Wang, Lin, and Tang's (2003), they found credibility having a

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significant relationship with behavioral intention to use. Li and Yeh (2009) identified factors affecting quality of service in mobile commerce context and pointed out the impact of these factors on behavioral intention to use 3G services through the improved level of satisfaction. There are other studies associated with m-commerce. For example, Choi, Seol, Lee, Cho, and Park (2008) studied m-loyalty with contribution from design aesthetics and Kuo and Yen (2009) investigated behavioral intention to use 3G mobile value-added services.

2.2. Trust in mobility

Over time, increased attention focused on the development of trust in m-commerce. Trust becomes a critical topic for research because it plays a role in creating satisfied and expected outcome as a result of transaction (Gefen & Straub, 2003; Pavlou, 2003). Also, as noted by prior work (Salam, Rao, & Pegels, 2003), trust can be developed by the trustee (the party being trusted) to positively create trustor (the party placing trust) perception that the trustee possesses characteristics that would benefit the trustor. Such perception is important to reduce the uncertainty and risks of transaction that exist for the trustor about a potential or existing relationship-business, social, or otherwise (Doney & Cannon, 1997; Kee & Knox, 1970; Mayer, Davis, & Schoorman, 1995). According to Mayer et al. (1995), trust is not taking risk per se, but rather it is a willingness to take a risk. McKnight, Choudhury, and Kacmar (2002) further defined trust in terms of ability, integrity and benevolence. Ability is related to skills and competencies of the trustee in a specific context. Integrity concerns if the trustee follows moral and ethical principles that are deemed acceptable by the trustor. Benevolence concerns the degree to which the trustee has goodwill or empathy towards the trustor. Perceptions of these elements will affect the trustor to have trust towards the trustee. Trust that we concentrate on in this study is in alignment with these previous definitions.

According to Siau and Shen (2003), trust in m-commerce (m-trust) can be divided into two categories: trust in mobile technology and trust in mobile vendors. Moreover, Katerattanakul and Siau (2003) pinpointed the importance of website design of store image and provided the guidelines for creating a favorable store image. With the aid of information technology, a virtual shopping environment may be effective in prompting the transactions and thus has implications of building trust. However, both Lee and Benbasat (2003) and Chae and Kim (2003) agreed that limited system resources (e.g., smaller screens and lower multimedia processing capabilities) can hinder the development of trust in m-commerce.

2.3. Design aesthetics

Design aesthetics is an important tool to develop trust as effective website design attracts customers and gain their attentions (Agarwal & Venkatesh, 2002; Cyr, Kindra, & Dash, 2008). The virtual experience of the website can determine whether a customer stays and purchases (Jiang & Benbasat, 2003; Rosen & Purinton, 2004). Following Cyr, Head, and Ivanov (2006), design aesthetics in m-commerce was defined as the balance, emotional appeal, or aesthetic of a website and it may be expressed through the elements of colors, shapes, language, music or animation. A proper presentation of these elements with an image header, decorative font, and colorful graphical buttons can positively affect user's positive impression of the site (Schultz, 2005). While it is recognized that trust is a multi-dimensional construct, some studies like this one treated trust as a single construct (Gefen & Straub, 2003) and

showed that a combination of these elements has a relationship with trust (Karvonen, 2000). Moreover, how to effectively display these elements on a mobile device can be a research issue in m-commerce (Dillon, Richardson, & Mcknight, 1990; Duchnick & Kolers, 1983). Although small graphical displays do not permit a better examination of the vendor website's aesthetics via a mobile device, Sarker and Well's work (2003) implied that physical limitations of the device to hinder trust development can be overcome by the beauty of website's aesthetics. This implication is consistent with Venkatesh and Ramesh (2002).

We drew on research on aesthetics in association with different situation. We took one step further by applying design aesthetics in m-trust context. We expected that the perceived visual aesthetics of the mobile website would influence the customer's trusting belief towards the m-vendors. Thus, we hypothesized:

H1. Higher level of design aesthetics of a mobile website will result in higher m-trust.

2.4. Design aesthetics and website design

Websites are the communication bridge between m-vendors and customers. Without physical appearances or direct contact between buyers and sellers, it makes business transactions difficult to complete. This concern gives a reason for m-vendors to rely heavily on their storefront to attract potential customers and to be able to communicate with them. Therefore, applying website design elements of m-commerce can be the most effective method of developing m-trust.

There are studies referring design aesthetics to various website design issues (Tractinsky & Lavie, 2003; Zettl, 1999). Zettl argued that visual aesthetics need to interact with website design to produce the final message. Zettl further stated that it is important to correctly apply visual aesthetics. They should be aimed to support the messages that are intended to deliver to the customers. Misuse of design aesthetics can result in an ineffective communication and thus become a disadvantage. Related to this, Tractinsky and Lavie stated that design aesthetics should work with website design elements (e.g., usability, customization and interactivity) as a whole to produce an aesthetic experience rather than being viewed as isolated elements. Finally, such an experience will be greatly influenced by design aesthetics (Zettl, 1999).

We predicted that design aesthetics along with three website characteristics of usefulness, ease of use and customization would result in m-trust. Fig. 1 showed the model. Usefulness and ease-of-use are the two vital elements in technology acceptance model (TAM) (Davis, 1989). In TAM, behavioral intention to use is jointly influenced by attitude and usefulness, where the latter affects the former directly. Moreover, ease-of-use directly influences usefulness and attitude. In general, TAM functions to explain and predict the technology adoption.

Although the derived results were not based on a mobile device, Schultz (2005) demonstrated that an enhanced version of web page (e.g., a web page with an image header, decorative font, colors and graphical design), as compared to a simple page layout, can positively affect user's impression of the site, including perceived usefulness. Tractinsky (2004) suggested that users perceive and evaluate attributes of the system such as ease of use, usefulness and aesthetics when being involved in the interactive systems. Most importantly, Kuroso and Kashimura (1995) and Tractinsky examined the layout of objects on an ATM machine and found support for the relationship between machine's "beauty" and ease of use. Moreover, Van der Heijden et al. (2003) related design aesthetics to perceived attractiveness, which was defined as the degree to which a person believes that the website is aesthetically pleasing

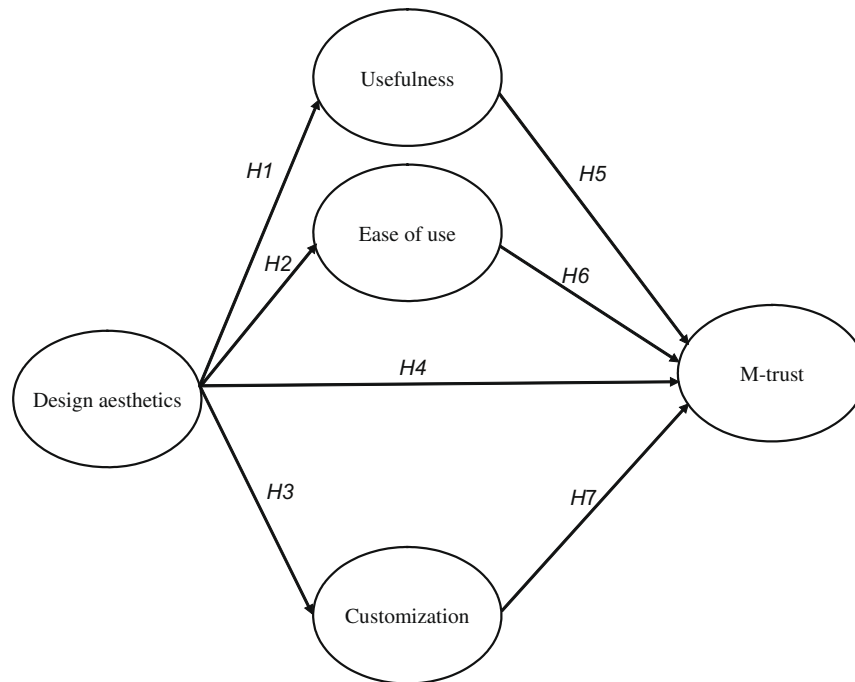


Fig. 1. A model for m-trust development.

to the eye. Van der Heijden et al. (2003) found support for the relationship between usefulness, ease of use, customization and perceived attractiveness.

In our investigation, we researched on design aesthetics in various situations and applied the proposed framework to the specific context of website in m-commerce. It is expected that perceived visual aesthetics of the mobile website would influence customer perception of usefulness, ease of use and customization. Thus, we formulated the following hypotheses:

H2. Higher level of design aesthetics of a mobile website will result in higher perceived usefulness of the mobile website.

H3. Higher level of design aesthetics of a mobile website will result in higher perceived ease of use of the mobile website.

H4. Higher level of design aesthetics of a mobile website will have a higher impact on the customization of the mobile website.

2.5. Website design and m-trust

Various predictors of e-trust have been identified. Previous literature suggested some predictors of e-trust: perceived site quality (McKnight, Kacmar, & Choudhury, 2004; Wakefield, Stocks, & Wilder, 2004), website quality (Kim, Xu, & Koh, 2004) and perceptions about the website (Koufaris & Hampton-Sosa, 2004). Further, the original TAM was used to explain the technology adoption (Davis, 1989). Recently, TAM was extended with additions of utilitarian and hedonic factors in the context of online retail shopping. In their work, Moon and Kim (2001) suggested online vendors have both utilitarian and hedonic dimensions. Later, Cyr et al. (2006) suggested these dimensions can be created aesthetically rich for consumers to enjoy. Childers, Carr, Peck, and Carson (2001) pointed out that an interactive shopping experience was expected to result in perceived usefulness and ease of use of the website. Koufaris and Hampton-Sosa (2004) included variables of perceived usefulness, ease of use and security control as precursors of initial trust. These relationships being supported, their use and application in m-commerce were still not fully understood. However, since m-vendor's website is also an example of a type of technology, it was

expected that two TAM belief variables: perceived usefulness and perceived ease of use of technology, will also impact on m-trust in m-commerce.

Some antecedents of m-trust have been researched, including website characteristics. Five such characteristics were website design, customization of the website, ease of input and navigation, readability of the display, accuracy of information and richness of information. These characteristics were shown to influence the customer trusting belief towards the m-vendors. Kuo and Yen (2009) included personal innovativeness and perceived cost along with perceived usefulness and perceived ease of use as precursors to the behavioral intention to use value-added mobile service. Zhu, Nah, and Zhao (2003) suggested perceived usefulness and perceived ease of use be the antecedents of m-trust, which further impact on the intention to use a mobile device, albeit without formal empirical validations. Venkatesh, Ramesh, and Massey (2003) addressed customization's impact which can be extended to improve mobile usability. Siau et al. (2003) suggested personalization of website can enhance m-trust. Finally, Cyr et al. (2006) served as an important catalyst to our study. They, motivated by Bruner and Kumar (2003) who found strong effects of usefulness, ease of use and fun on the devices of desktop PC, a wireless phone simulation and a PDA, tested user perceptions for loyalty via design aesthetics on a mobile phone. Specifically, an attractive website was created for empirical test. They found that an aesthetically designed website can influence loyalty in mobile service domain.

In alignment with Bruner and Kumar (2003), we used a wireless phone simulation on a desktop PC to examine specific elements of website's customization, perceived usefulness and perceived ease of use as antecedents of trust towards m-vendors. This resulted in the following hypotheses:

H5. Higher perceived usefulness of a mobile website will result in higher level of m-trust.

H6. Higher perceived ease of use of a mobile website will result in higher level of m-trust.

H7. Higher customization of a mobile website will result in higher level of m-trust.

Table 1
Descriptive statistics.

Measure	Items	Frequency	Percentage (%)
Gender	Male	97	48.5
	Female	103	51.5
Total		200	100
Age	19–23	98	49.0
	24–28	63	31.5
	29–35	29	14.5
	>35	10	5.0
Total		200	100
Education	University	102	51.0
	Graduate	98	49.0
Total		200	100
Numbers of experiences	1	70	32.5
	2	58	28.0
	>2	84	39.5
Total		200	100
Wireless handheld equipment type	Cell phone	95	44.0
	PDA phone	72	36.0
	Smart phone	45	20.0
Total		200	100

3. Research methodology

3.1. Participants

Taiwan's mobile phone penetration rate has exceeded 102.97% in 2007 (FIND, 2007), of which 24% of all are 3G phone users. For those 3G users, approximately 54.2% are aged 21–30 years old (FIND, 2006). According to Kuo and Yen (2009), the users in this age range are studying college or graduate school and are distributed across the whole island. To exhaust the limited research resources, data collection process took place in two large cities in the northern part of Taiwan. Three universities were chosen to reduce the sampling bias. Participants were solicited through a poster or university bulletin board to participate the online mobile phone simulation experiment, followed by the questionnaire. Participants were limited by the phone use requirement. They must at least have experience of using their mobile device for one year. Participants were also required to have conducted business transactions in m-commerce at least once. A total of 200 responses were collected after all. Even though the majority of subjects were aged 19–28 years old, this demographic pattern did not affect the result. As we used Casaló, Flavián, and Guinalú's approach (2007) to justify the sample representation by comparing socio-demographic characteristics (e.g., ages, education level and number of times of m-commerce experiences) with other m-commerce studies using Taiwanese-speaking population as samples (Kuo & Yen, 2009; Lin & Wang, 2006), similar results demonstrated that more than 50% of subjects were aged 21–30 years old, more than 60% of subjects had university degrees and more than 70% of subjects had at least one-time m-commerce experience. It thus showed that this age range represented the Taiwanese-speaking m-commerce customers and can be processed for further statistical analysis.

The questionnaire comprised two parts. The first part was intended to measure potential m-commerce customer perception of each construct in the model. The second part recorded potential customers' demographic data and their mobile phone use's background. Table 1 recorded this information.

3.2. Experimental site

Since m-commerce websites in Taiwan are mostly with text-based and mono-color design, to highlight design aesthetics, an

attractive mobile website was provided to differentiate itself from the current mobile websites. For example, the website featured a colored storefront as well as product photographs and icons. Screenshots of all pages were listed in Appendix A. A mobile phone emulator in Appendix B was enabled to run these web pages on a desktop PC. When participants were seated in front of the computer, they can scroll, view and click these web pages on their mobile phone emulator. The web pages were already downloaded into the mobile phone emulator and were made available to the participants before they were set to the computer. Also, considering the purpose of this study is to understand mobile customer's perception of an aesthetically-treated website, a survey is an appropriate tool to measure customer's perception.

3.3. Experimental tasks

A pilot study was conducted to pre-test the potential tasks (e.g., survey items) and to check the experimental protocol (e.g., procedures that were needed to guide participants to use the system). Fifty subjects were selected from one of three previously selected universities in the northern part of Taiwan to ensure the clarity of content and appropriateness of aspects. Later, these subjects were asked to perform an information retrieval tasks. Following Flavián, Guinalú, and Gurra (2006), Roberts, Varki, and Brodie (2003) and Casaló, Flavián, and Guinalú (2008)'s recommendations, subjects needed to select the website to analyze since the objective of this work was to understand customer behavior instead of investigating a particular type of product or service being distributed. Three types of virtual m-vendor services were provided, each with simplified snapshots presented to subjects: buying digital cameras, renting a car for travel from a rental car agency and booking a hotel. A supplementary illustration of booking a hotel was in Appendix C. Only one type of services was allowed to be chosen and the chosen one was used in the full study. The camera task was preferred and it was also suitable for further refinement in terms of visual design. For this task, an interior design of the storefront and numerous camera photographs were both created and provided.

When the full study began, each participant performed the experiment under supervision of an instructor. The session began with a brief introduction and purpose of the study, followed by a 10-min familiarization time with Google G1 mobile device. The real G1 mobile device allows users to touch the screen and select the desired function. Similar to this, participants use the mouse to perform the selected movement by clicking on the screen. Once it was determined that participants were fully aware of the procedures, they were read the following information:

"Image that you are about to buy a digital camera, but currently you do not know how to make your purchase decision. One day on your way to the school by bus, you unintentionally use your 3G-enabled mobile device to find a m-vendor and the provided information was intended to facilitate your decision making. Spend as much time you need browsing through the featured listings for this virtual m-vendor. No need to write down any information.

Once browsing is finished, please also complete the questionnaire. When finishing, please click FINISH on your screen".

The mobile website featured the rankings of digital cameras (e.g., 5 at most in the screen) based on the popularity of purchase from the customers. There are several well-known brands included such as Canon, Nikon, Sony and Olympus. Most participants took no more than 10 min to complete this phone simulation task. Participants took additional 10 min to complete the questionnaire. Finally, participants were told that they will receive a movie ticket as an incentive after all the tasks completed.

3.4. Content validity and construct validity

Content validity examines if the items included are representative and comprehensive, and it is verified by examining the process by which the construct were generated (Straub, 1989). In accordance of this guideline, survey items were adapted from previously validated studies on design aesthetics (Cyr, Bonanni, Bowes, & Ilsever, 2005; Cyr, Bonanni, & Ilsever 2004; Cyr et al., 2006), customization (Ribbink, van Riel, Liljander, & Streukens, 2004), trust (Lin & Wang, 2006; Ribbink et al., 2004; Van der Heijden et al., 2003), perceived usefulness and perceived ease of use (Cyr et al., 2006; Davis, 1989; Lin, 2007). All items that were included in Appendix D were measured on a five-point Likert scale, ranging from “strongly disagree” (1) to “strongly agree” (5). The Cronbach's alpha value of 0.7 was used to assess the initial reliability of the scales (Cronbach, 1970; Nunnally, 1978). The values ranged from 0.78 (perceived ease of use) to 0.90 (trust), which were all above the standard threshold. Results were included in the Table 2.

Construct validity examines the extent to which a construct measures the variable of interest. To assess the convergent validity, a principle components factor analysis with varimax rotation (as recommended by Straub, 1989) was performed on 5 latent variables that correspond to 7 hypotheses. Factor extraction was based on the existence of eigenvalues higher than 1. All loadings were well above 0.5 (convergent validity), as recommended by Hair, Anderson, Tatham, and Black (1998). Complete results of the principle component analysis with varimax rotation on the 15 items (outlined in Appendix C) were included in Table 2. Another way to examine convergent validity is to evaluate the factors loadings. Following Hair et al. (1998), the factor loadings in our model were all above the recommended value of 0.7. Results were shown in Table 2. Moreover, to further verify discriminant validity, we compared the squared correlations between constructs and variance extracted for a construct (Fornell & Larcker, 1981). As shown in Table 3, the square correlations for each construct is less than the average variance extracted (AVE) by the indicators measuring that construct.

Although the Cronbach's alpha value is the often seen assessment tool for reliability, Smith (1974) considered it an underestimated measure. Consequently, the use of composite reliability has been suggested (Jöreskog, 1971). The coefficient of composite reliability is similar to the Cronbach's alpha except the former va-

lue takes the actual factor loadings into account, rather than assuming that each item is equally weighted in the composite load determination (Lin & Wang, 2006). The results that were included in Table 3 were still satisfactory. Finally, our model demonstrated an adequate content, convergent and discriminant validity.

4. Results

To test the proposed hypotheses, a structural equation modeling (SEM) approach was used, a second-generation multivariate technique that combine multiple regression with confirmatory factor analysis to estimate simultaneously a series of interrelated dependence relationships. SEM has received its popularity in several fields, including marketing, psychology, social science and information systems (Hull, Lehn, & Tedlie, 1991; Methlie & Nysveen, 1999; Seibert, Kraimer, & Liden, 2001).

Seven model-fit measures were employed to assess the model's overall goodness of fit: the ratio of X^2 to degrees-of-freedom (df), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), comparative fit index (CFI), norm fit index (NFI), root mean square error of approximation (RMSEA) and root mean square residual (RMR). Results of these measures were given in Table 4. The overall model was considered accepted since all the model-fit indices exceeded the respective common acceptance level suggested by previous research.

Fig. 2 showed the result of the structural model analysis, including R^2 and standardized path loadings for all hypothesized relationships. The effect design aesthetics on the dimensions of website characteristics was significant. The coefficients for perceived usefulness, ease of use and customization were 0.41 ($p < 0.01$), 0.16 ($p < 0.01$) and 0.41 ($p < 0.01$), respectively. Thus, Hypotheses 1, 2 and 3 were supported. As expected, design aesthetics also significantly impacted m-trust ($B = 0.25$, $p < 0.01$). Therefore, Hypothesis 4 was supported. Moreover, perceived usefulness ($B = 0.19$, $p < 0.01$), ease of use ($B = 0.28$, $p < 0.01$) and customization ($B = 0.29$, $p < 0.01$) were found to significantly impact m-trust, thus supporting Hypotheses 5, 6 and 7. All together, design aesthetics, perceived usefulness, perceived ease of use and customization accounted for 37% of the variance in m-trust, with customization exerting a stronger effect on m-trust than design aesthetics and perceived usefulness and ease of use. The results of path coefficients and all hypotheses can be found in Table 5.

5. Discussion and conclusion

Recent studies in mobile services have made the research in m-commerce more completed. However, there is a lack of understanding of how visual aesthetics can influence the mobile customer's experience and consequently affects his or her trust towards the m-vendors.

Being one of few works to discuss m-trust building in m-commerce, our study investigated gaps in the literature and applied website characteristics (e.g., perceived usefulness, ease of use, and customization) and design aesthetics to the mobile services context. Compared to prior studies, for a mobile website to successfully gain customer trust, its layout must be personalizable, easily operated, and aesthetically designed, as they are required to meet customers' need for enjoyment and arousal. Corresponding to these, a strong influence of design aesthetics, perceived usefulness, ease of use and customization on m-trust was noticed, indicating that the constructs chosen were appropriate determinants of m-trust, suggesting that a blend of customizable, useful, and appealing elements in mobile website can communicate with customers and gain their trust. In our results, both perceived

Table 2
Construct validity.

Items	Factor loadings	Trust	Perceived usefulness	Customization	Design aesthetics	Perceived ease of use
T-1	0.87	0.89				
T-2	0.93	0.86				
T3	0.82	0.82				
U-1	0.86		0.90			
U-2	0.86		0.87			
U-3	0.81		0.84			
C-1	0.70			0.89		
C-2	0.89			0.88		
C-3	0.91			0.78		
DA-1	0.78				0.86	
DA-2	0.85				0.85	
DA-3	0.79				0.75	
EOU-1	0.71					0.84
EOU-2	0.76					0.82
EOU-3	0.75					0.79
Cronbach's alpha		0.90	0.88	0.86	0.85	0.78
Mean		3.47	3.47	3.36	3.42	3.37
SD		0.88	0.93	0.74	0.93	0.69

Table 3
Discriminant validity.

Construct	CR	(1)	(2)	(3)	(4)	(5)
(1) Trust	0.91	0.78				
(2) Perceived usefulness	0.87	0.34	0.70			
(3) Customization	0.91	0.38	0.10	0.77		
(4) Design aesthetics	0.84	0.48	0.33	0.44	0.64	
(5) Perceived ease of use	0.85	0.32	0.14	0.27	0.17	0.65

Diagonal elements represent average variance extracted, while the others represent inter-construct correlations.

Table 4
Fit indices for the measurement.

	Recommended criteria	Measurement model	Structural model	Suggested by authors
χ^2/df	<3.0	1.64	1.74	Hair et al. (1998)
GFI	>0.9	0.92	0.91	Gefen, Straub and Boudreau (2000)
AGFI	>0.8	0.88	0.87	Gefen, Straub and Boudreau (2000)
CFI	>0.9	0.97	0.96	Bagozzi and Yi (1988)
NFI	>0.9	0.93	0.92	Bentler and Bonett (1980)
RMSEA	<0.08	0.057	0.061	Bagozzi and Yi (1988)
RMR	<0.05	0.048	0.05	Gefen, Straub and Boudreau (2000)

usefulness and ease-of-use were demonstrated to have significant impact on m-trust with similar explanatory power ($b = 0.20$ and $b = 0.19$ for perceived usefulness and ease-of-use, respectively). Even though the explanatory power for perceived usefulness was significant, the strength, as compared to prior research, was not as strong. For example, in Koufaris's study (2002), the strength of perceived usefulness in online purchasing context was stronger

($b = 0.42$; $p < 0.01$). Similarly, in Cyr et al.'s m-loyalty study (2006), the strength of perceived usefulness was also stronger ($b = 0.37$; $p < 0.001$). However, the strength of perceived ease-of-use in our study was relatively stronger, as compared to Jung et al.'s mobile TV study (2009) ($b = 0.17$; $p < 0.05$). Finally, in the same m-commerce context, design aesthetics in our study ($b = 0.24$; $p < 0.01$) exerted similar influence on perceived ease-of-use ($b = 0.23$; $p < 0.05$) (Cyr et al. (2006)).

Another differentiation from our work to other m-commerce studies is that dependent variables in recent studies have been attitude (Teo, Oh, Liu, & Wei, 2003), behavior changes (Ahn, Ryu, & Han, 2004; Gefen, Karahanna, & Straub, 2003; Liu, Marchewka, Lu, & Yu, 2004), satisfaction (Li & Yeh, 2009) and acceptance (Shih, 2004). However, in Cheung, Zhu, Kwong, G., and M. (2003)'s meta-analysis of online consumer analysis (as quoted from Cyr et al. (2006)), they emphasized the scarcity of long-term relationship building in research, as compared to other topics such as intention and adoption. Most importantly, Siau and Shen (2003) suggested customer trust, as one of long-term relationship builders, is crucial for the growth and success of m-commerce as well as transition from initial trust formation to continuous trust development. Thus, being one of few studies to consider m-trust development in mobile services domain, our results validated the antecedents of m-trust; they are, the components of website characteristics and the website design aesthetics. All together, they were shown to be important determinants of m-trust. To investigate further, ease of use and customization showed larger significant paths coefficient to m-trust than usefulness to m-trust. Koufaris and Hampton-Sosa (2004) found similar results in their study of online company. Their results demonstrated the perceptions about the website for an e-vendor affected initial trust development. The website of m-vendor in our study with an emphasis on website functionality contributed to the development of m-trust.

While the proposed model contributed to the theory and extended the generalizability of mobile services, the major contribution of this research is the integrations of design aesthetics with

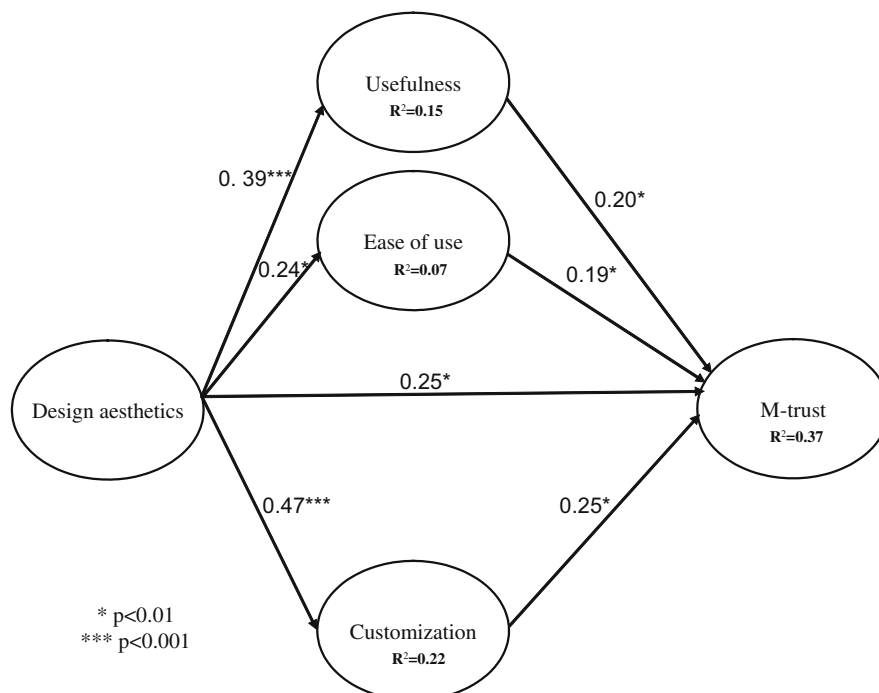
**Fig. 2.** m-Trust standardized structural model.

Table 5
Results of hypotheses testing.

Hypothesis	Causal path	Path coefficient	t-Values	Supported
H1	Design aesthetics → PU	0.39	4.74***	Yes
H2	Design aesthetics → PEOU	0.24	2.78*	Yes
H3	Design aesthetics → Customization	0.47	5.92***	Yes
H4	Design aesthetics → m-trust	0.25	2.80*	Yes
H5	PU → m-trust	0.20	2.76*	Yes
H6	PEOU → m-trust	0.19	2.62*	Yes
H7	Customization → m-trust	0.25	3.19*	Yes

* $p < 0.01$.

*** $p < 0.001$.

other selected constructs into a coherent and parsimonious model that predicts m-trust. As discovered by Karvonen (2000), the beauty of the website affects the feeling of trust in the Internet environment. In Karvonen's study, design elements such as clarity was most frequently mentioned as key to enhancing trust towards the service providers on the Web. Similar to this, for the Sweden users, a "clear" or "clean" design in the Internet environment would make users ready to trust the service providers more easily. Despite the importance of link between interface and website design that have been extensively researched, the importance of aesthetics dimension in mobile services domain has been constantly neglected partly because cultural differences make the interpretation of aesthetics difficult (Karvonen, 2000). Example can be seen from a comparison between Cyr et al. (2006) and ours. Being validated in the western culture in Canada, Cyr et al.'s m-loyalty framework showed that design aesthetics did not exert its influence to the continuant variable, m-loyalty. Even if the direct path between m-loyalty and design aesthetics was added into the model, the path coefficient was not significant ($b = 0.074$; $p > 0.1$) yet the explanatory power did not improve significantly. However, being validated in the eastern culture, our m-trust framework suggested design aesthetics capable of influencing a different type of continuant variable, m-trust. More importantly, not only the path coefficient was significant ($b = 0.25$; $p < 0.05$) but also the explanatory power significantly improved by 5% after the path was added into the model (from 32% to 37%). Therefore, culture difference can be one of influential variables. Other than aesthetics impact created by culture difference, what can be borrowed and extended from these findings is that users in the Internet environment often make intuitive and rather emotional on-the-spot decisions when dealing with online vendors (Karvonen, 2000). Thus, to take advan-

tage of this user behavior lie with design quality that enhances the feelings of trust. Even if the effects of aesthetics may differ across cultures, the brief design into the makings of trust in m-commerce clearly showed the importance of visual pleasantness.

From a theoretical perspective, the work developed the m-trust framework and validated this framework. Based on a solid theoretical foundation, the m-trust framework combined constructs of design aesthetics and website characteristics such as perceived usefulness, ease-of-use, and customization in a new context of mobile services and provided a new way to understand the unrevealed effect created by these m-trust determinants.

From a practitioner perspective, the objective of this work was to demonstrate practical insights of how to establish m-trust among customers of mobile services. For m-vendors, the website characteristics, if perceived productive, easy to use and personalizable by customers, have consequences of building trust. In stationary Internet environment, design aesthetics was shown to enhance the success of website characteristics, which was also stated by Hoffmann and Krauss (2004). Interestingly, it appears that the same is true for mobile settings. Our study highlighted the significant role played by design aesthetics.

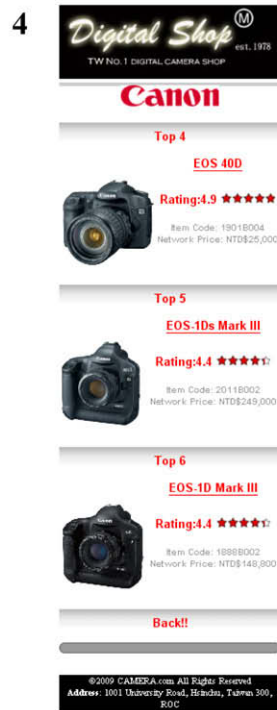
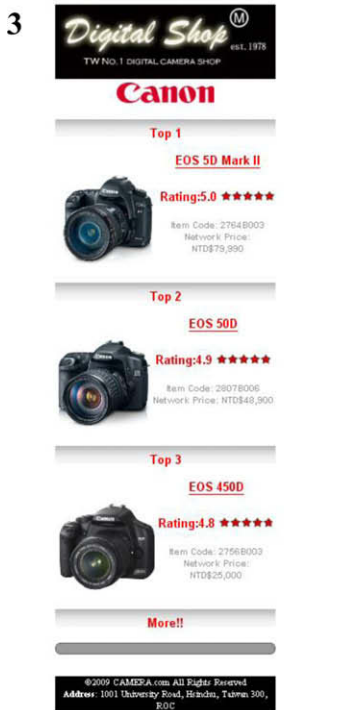
This study had several limitations. First, this study was conducted using a cross-sectional data in Taiwan. Although the selected scales were based on previously validated constructs, one may argue if the results can be generalized to other nations. Second, since this study only considered online digital shop as a m-vendor, it is thus unclear whether the results can be extended to other service types on the mobile Internet. Finally, an experimental site was conducted in our study. Laboratory experiments involve flaws in terms of realism (Cyr et al., 2006). However, since the purpose of our model was to test the proposed model for the design of a website on user affective perceptions, precision was extremely critical for model validation. Thus, a laboratory experiment can be deemed as an appropriate method. Future work may employ other types of m-commerce websites. It is essential to define whether the conclusions obtained in this work may vary with the category of products or services. In the end, we propose a moderation test of consumer types (i.e., utilitarian or hedonic type) to be considered in the future, as the degree of visual design may be affected by different consumer types.

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Appendix A. Screen shots

Numbers indicate different pages:



Appendix B. Google G1 phone illustration



Appendix C. Supplementary screen shots of booking a hotel

Numbers indicate different pages:



- Grand hotel
- Chinatrust hotel
- Brother hotel
- Parkview hotel

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Parkview hotel

- Superior Room
- Deluxe Room
- Seaview Rooms
- Business room
- Backpacking Room

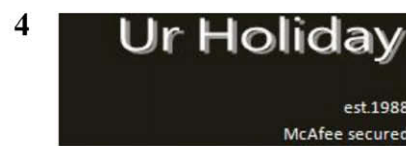
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Parkview hotel-Seaview Rooms

- Luxury sea-view**
 - NTD 3770
 - Housing content:
The Western-style buffet breakfast * 2 passengers
- Aegean Athena Twin**
 - NTD 3900
 - Housing content:
The Western-style buffet breakfast * 2 passengers

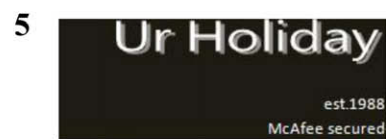
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Parkview hotel-Seaview Rooms

- Aegean Apollo Triple**
 - NTD 5770
 - Housing content:
The Western-style buffet breakfast * 2 passengers
- Moon House Seaview Rooms Liu Renfang**
 - NTD 8800
 - Housing content:
The Western-style buffet breakfast * 2 passengers

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Parkview hotel-Seaview Rooms



- NTD 4970
- Housing content:
Sea of Love outdoor bath
bathing tickets * 2

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Appendix D. M-trust survey

D.1. Trust

- T-1 I trust this store keeps my best interests in mind.
 T-2 The store's behavior meets my expectations.
 T-3 The store is trustworthy.

D.2. Usefulness

- U-1 The service helped me be more effective.
 U-2 The service required the fewest steps to accomplish what I wanted to do with it.
 U-3 The service helped me be more productive.

D.3. Ease of use

- EOU-1 It is easy to get the website to do what I want.
 EOU-2 The interactions with the website are clear and understandable.
 EOU-3 The website is easy to use.

D.4. Customization

- C-1 I feel that my personal needs have been met when using this site.
 C-2 The site provides me with information and products according to my preferences.
 C-3 I feel that the online store has the same norms and values as I have.

D.5. Design aesthetics

- DA-1 The screen design (i.e., colors, boxes, navigation bars, etc.) is attractive.
 DA-2 The site looks professional designed.
 DA-3 The overall look and feel of the site is visually appealing.

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