Investigating Consumer Attitudes and Behavioral Intention Toward Online Mass Customization: An Empirical Test of Extended TAM

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Abstract

The trend of “design-it-yourself” or customization is growing at a rapid rate owing to consumers’ growing interest in expressing individuality. With increasing popularity of internet, digital technology, and flexible manufacturing systems, mass customization makes it possible to offer personalization of goods and services for individual customers at a mass production price. In response, the concept of mass customization (MC) has got increasing attention to great academic concern in recent years. Some researches in this field have confirmed that self design delivers superior customer value by measuring the user's willingness to pay (WTP). Some other studies just focused on interface technologies and concluded that different types of toolkits with more modules can achieve higher product utility for customers. Overall, scholars in this stream have tried to figure out why and when do MC generate value for customers. However, the present study then intends to complement the research gap by proposing and analyzing a theoretical framework to explain how individual characteristics, customer knowledge, and technology interface affect consumers’ attitudes toward the co-design system of mass customization.

1. INTRODUCTION

The trend of “design-it-yourself” or customization is growing at a rapid rate owing to consumers’ growing interest in expressing individuality. The core idea of mass customization (MC) is to provide a web-based user toolkit that allows customers to design their own products which fit their individual preferences. The increasing popularity of internet and digital technology facilitate the emergence of MC and enable companies to develop and implement such a MC system in response to each customer's individual preferences. In addition, flexible manufacturing systems have empowered companies to provide individual products with mass production efficiency via make-to-order concept (Pine, Victor, and Boyton 1993). Thanks to new technology. Traditionally, customization and low cost have been mutually exclusive. But, mass customization makes it possible to offer personalization of goods and services for individual customers at a at a mass production price.

Stan Davis was the first person to coin the term “mass customization” in his best seller *Future Perfect* in 1987. Tseng and Jiao (2001) defined mass customization as "producing goods and services to meet individual customer's needs with near mass production efficiency". Further, Chase, Jacobs and Aquilano (2006) stated that mass customization is the method of "effectively postponing the task of differentiating a product for a specific customer until the latest possible point in the supply network." Also, some eempirical studies have confirmed that the user’s willingness to pay (WTP) for self-designed products is much higher than for standard products (Kamali & Loker, 2002; Franke and Piller, 2004; Schreier, 2006; Franke et al. 2010). That is, mass customization would help companies possess economic scale and flexibility, at the same time offer product value for each individual customer.
Company like Longchamp, a French luxury brand, has got in on the act and allows customers to design their own handbag. Also, sneaker giant Converse (Design your own) provides customers to design their own sneakers. And at Mojamix.com, consumers can make their own custom-mixed breakfast cereal. Specifically, Wildemasche is one of the leading wage knitters in Germany, offering customers many customized options like colors, sizes, modules, and shapes to design self-owned scarves, blanket and etc. In addition, companies like Land Rover, Dell, Gateway, Adidas, Lands’ End, Hallmark (You create, we print), Kleenex (Let your own creativity) and Nike (Customize with NikeID) all have applied the concept of online co-design process. It looks like the era of the one-size-fits-all product has come to an end. Consumers are now allowed to interact with a company for providing their special needs and further designing the unique product they really want to buy.

In response, the concept of mass customization (MC) has got increasing attention and leads to great academic concern in recent years (e.g., Brunel, Mugge, & Schoormans 2010, Dellaert and Stremersch 2005, Franke and Schreier 2010,Lee and Chang 2011, Randall, Terwiesch, and Ulrich 2007, Simonson 2005). In one line of research, scholars (Kamali & Loker, 2002; Franke and Piller, 2004; Schreier, 2006; Franke et al. 2010) have confirmed that self design delivers superior customer value by measuring the user's willingness to pay (WTP). Another line of research focuses on how different interface

technologies can drive and support this trend of mass customization. Scholar like Randall, Terwiesch, and Ulrich (2007) analyzed what attributes of MC toolkits generating the most value for customers. They concluded that parameter-based toolkits fit expert users whereas needs-based toolkits offer a better fit for novice users. Moreover, Dellaert and Stremersch (2005) analyze different types of toolkits and found that more modules and module levels can achieve higher product utility for customers.

From the third perspective, scholars tried to figure out why and when do MC generate value for customers. Some scholars (Addis and Holbrook 2001, Broekhuizen and Alsem 2002, Dellaert and Stremersch 2005, Franke and Schreier 2008, Franke and von Hippel 2003, Randall, Terwiesch, and Ulrich 2007, Williams 2004) emphasized product-related benefits like functional and aesthetic fit as a source of value for self-designed products. Other scholars analyze and identify some individual characteristics prone to using MC toolkits. Fiore, Lee, and Kunz (2004) found that the personality trait of "optimum stimulation level" appears to be an important predictor toward willingness to design by their own. Further, Simonson (2005) proposes that customers who have clear and stable preferences might prefer self -designed products.

On the basis of the above review and discussion, it is very clear there is still no one theoretical framework to explain how individual characteristics, customer knowledge, and technology interface affect consumers' attitudes toward the co-design system of mass customization (Piller et. al., 2005). The present study then intends to complement the research gap by analyzing personal traits prone to using MC toolkits, customer knowledge of web skill and product familiarity and some particular toolkit characteristics to affect consumer attitudes toward mass customization. Further, this study proposes a hypothesized MC model and provides testable hypotheses by intensively reviewing prior MC research and consumer behavior theories. An integrated model of TAM (Technology Acceptance Model) and TPB (Theory of Planned Behavior) will be adapted as the framework for this study.

2. THEORY AND HYPOTHESES DEVELOPMENT

2.1 Three Models Predicting Behavioral Intention (BI)

In the social psychology setting, there are three popular models predicting the behavioral intention for consumers. The theory of reasoned action (TRA) proposed by Fishbein and Ajzen (1975) is generally recognized as the best starting point for studying the determinants of individuals' behavioral intentions (Sheppard, Hartwick, and Warshaw, 1988). TRA assumes a person's behavioral intention depends on the person's attitude toward the behavior and subjective norms ($BI = A + SN$) (see Figure 1). Attitude toward behavior refers to the degree in which a buyer has a favorable or unfavorable reaction toward a given behavior. Subjective norm is seen as "the person's perception that most people who are important to him or her think he should or should not perform the behavior in question" (Ajzen and Fishbein, 1975).

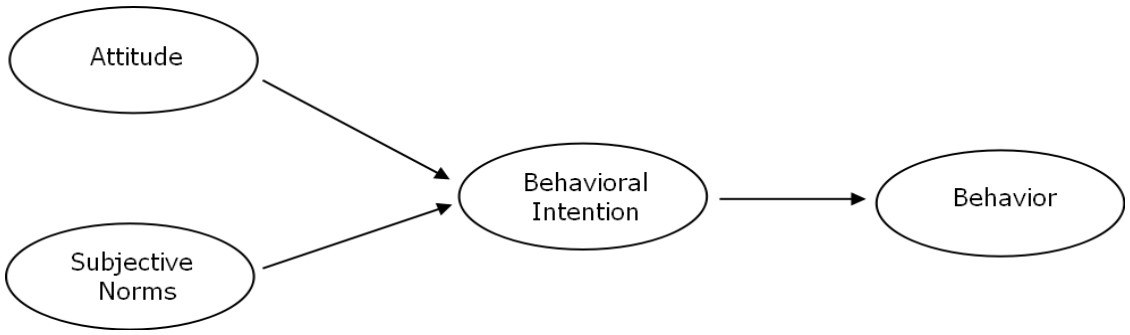

Figure 1- The Theory of Reasoned Action (TRA)

(Source: Fishbein and Ajzen ,1975)

The TRA theory has been revised by Ajzen (1991) into the theory of planned behavior (TPB).TPB assumes three independent predictors of behavioral intention: attitude toward behavior, subjective norm, and perceived behavioral control (see Figure 2). This extension involves the addition of one major predictor, perceived behavioral control, to the model. The addition of perceived behavior control is the key difference between the TPB and the TRA. Perceived behavioral control refers to a person's perception of the ease or difficulty of performing a given behavior and is measured in terms of resources and opportunities possessed by the individual.

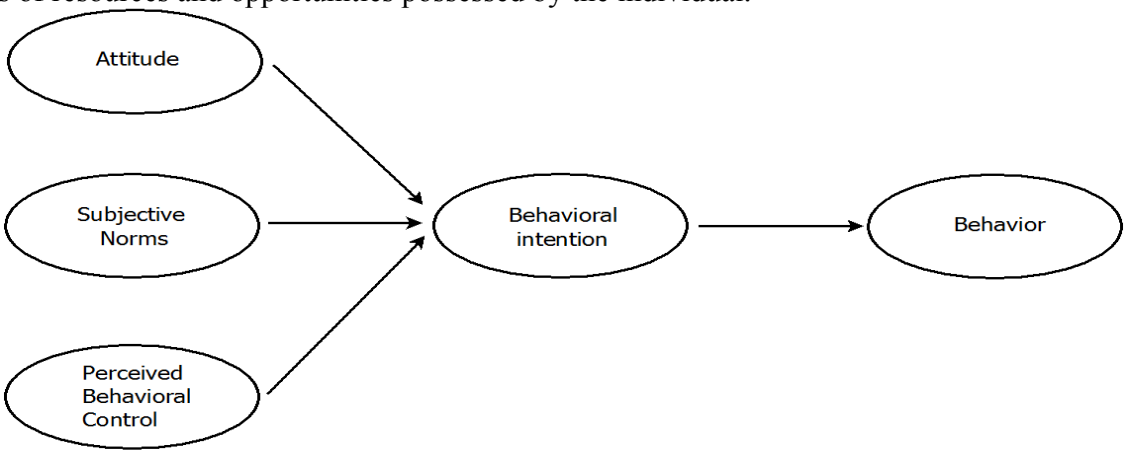

Figure2- the theory of planned behavior (TPB)

(Source: Ajzen ,1985, 1991)

Like the TPB, the technology acceptance model (TAM) is one of the most influential extensions of TRA. It was developed by Davis, Bagozzi, and Warshaw (1989, 1992). Davis (1989) defined perceived usefulness (PU) as "the degree to which a person believes that using a particular system would enhance his or her job performance" and perceived ease-of-use (PEOU) as "the degree to which a person believes that using a particular system would be free from effort".

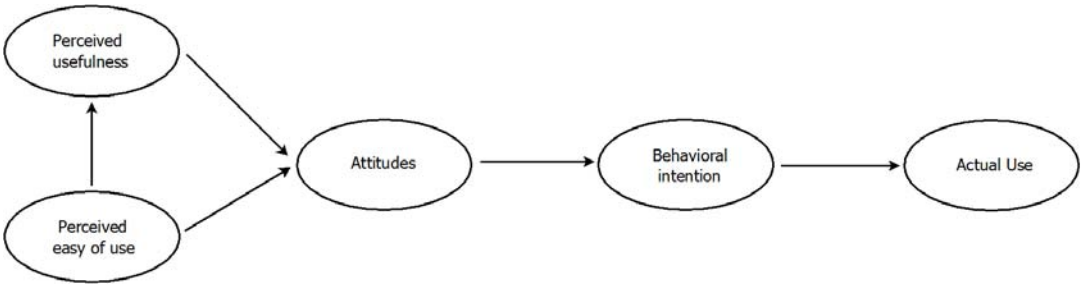

Figure3- The Technology Acceptance Model (TAM)

(Source: Davis et. al., 1989)

TAM was designed to help explain and predict user behavior by tracing the impact of external factors on internal attitudes and intentions. The TAM model has been widely applied well to examine users' acceptance attitude and behavior in various fields of technology related to MC, like system used by online retailers (Kim & Forsythe, 2007; Lee, et al., 2006), web site use (Moon & Kim 2001) and online shopping (Barkhi and Wallace, 2007; Chen & Tan, 2004; Koufaris, 2002; Liu et al., 2003; Vijayasarathy, 2004). Thus, the present study proposes a hypothesized MC framework by adapting an integrated TAM model appears to be justified.

2.2 Perceived Ease of Use (EOU)

Perceived ease of use in TAM is "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989). Perceived ease of use captures the buyer's expectation about the effort required to use MC toolkits in the co-design process. Perceived ease of use is a direct determinant of perceived usefulness in TAM (Davis, 1989; 1993). Afterwards, some research has concluded the significant positive effects of perceived ease of use on attitude/intention in the online retail context (Chen & Tan, 2004; O'Cass & Fenech, 2003; Vijayasarathy, 2004). However, some research shown that perceived ease of use is significantly related to attitudes/intention through perceived usefulness (Gefen, Karahanna, and Straub, 2003; Venkatesh and Davis, 2000; Venkatesh, Speier, and Morris, 2002). That is, customers would think the system is pretty much useful when their perception about this system is free of effort. The study then proposes the following hypotheses:

H1: Perceived ease of use of the MC online system will positively affect customers' attitude toward the online mass customization practice.

2.3 Perceived Usefulness (U)

Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989). Perceived usefulness captures the buyer's perception that MC toolkits will enhance his/her self-designed products and willingness to design by their own. Perceived usefulness as a construct of TAM has been empirically examined and concluded to have a significant

impact on attitudes toward online retailers (Chen and Tan, 2004; Childers et al., 2001; Kim & Forsythe, 2007; Koufaris, 2002; Lee et al., 2006; O'Cass and Fenech, 2003; Vijayasarathy, 2004). Therefore, we propose:

H2: Perceived usefulness of the MC online system will positively affect customers' attitude toward the online mass customization practice.

2.4 Perceived Enjoyment

Davis, Bagozzi, and Warshaw (1992) found that perceived enjoyment was the significant determinant in the adoption of a technology. Thus, they extended the model by including the enjoyment concept along with two initial constructs of perceived usefulness and ease of use. The perceived enjoyment construct was defined as "the extent to which the activity of using the computer is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated". In line with the extended TAM model, some research suggested there is a strong and positive relationship between the perceived enjoyment and attitudes toward online retailers (Childers et al., 2001; Heijden & Verhagen, 2004; Lee et al., 2006). For example, Childers et al. (2001) examined the extended TAM model in an online grocery shopping setting. In addition, Lee et al. (2006) applied the concept of enjoyment with two initial variables of TAM in an online apparel retailer context. Consequently, both studies empirically supported the strong and positive effects of perceived enjoyment on attitudes. In short, previous research revealed the importance of perceived enjoyment in the shopping context, but little is known about applying the concept of perceived enjoyment to the mass customization context. This study thus hypothesizes:

H3: Perceived enjoyment of the MC online system will positively affect customers' attitude toward the online mass customization practice.

2.5 Perceived Behavioral Control (PBC)

The theory of planned behavior (TPB) assumes three independent predictors of behavioral intention: attitude toward behavior, subjective norm, and perceived behavioral control (see Figure 2). The addition of perceived behavior control is the key difference between the TPB and the TRA. However, TAM has neglected the effect of perceived behavioral control in the framework (Mathieson, 1991; Venkatesh, 2000). Mathieson (1991) compared the TPB to TAM and found that the construct of perceived behavioral control was as much a significant determinant of consumers' attitudes as perceived usefulness and perceived ease of use in TAM.

Perceived behavioral control refers to a person's perception of the ease or difficulty of carrying out a given behavior and is measured in terms of resources and opportunities possessed by the individual. Perceived control has previously been used to investigate people's control over specific action or environment (Ajzen, 1985; Novak et al., 2000). In addition, prior research has supported the positive impact of people's ability to perform

that behavior on their behavioral intention (Koufaris 2001; Godek et al., 2004; Piller, 2003).

The online MC toolkits help consumers to select the pre-defined options available on the Web site and the customer becomes the co-producer. Co-design is used as a way to meet customer needs for mass customization and thus co-design cannot take place without consumers' participation (Duray et al., 2000; Piller, et al., 2005). However, some consumers feel frustration in the co-design process as they lacked the confidence to complete the mass customization (Anderson-Connell et al. 2002; Piller 2003). That is, not every consumer is comfortable with this process as the perception of inability to control the situation. In short, this perceived inability to control over the situation might discourage the use of mass customization (Piller et al., 2005). Therefore, understanding how consumers perceive their ability in the co-design process is needed in order to predict the behavioral intention toward the mass customized product. Therefore, the present study proposes:

H4: Customers' perceived behavioral control over the MC online system context will positively affect their behavioral intention toward the mass customized product.

2.6 Consumer Knowledge (Ability to Express Their Preference)

Although TAM has been widely used to predict individual's acceptance and usage of new technology, many scholars noted that emphasis of individual-level factors has been neglected (Kwon & Chidambaram, 2000; Lee et al., 2006; Venkatesh & Davis, 2000). The present study then adds consumer knowledge and individual characteristics into our research framework.

Familiarity and expertise are two critical elements of consumer knowledge (Alba and Hutchinson 1987; Chiou and Droge 2006; Jacoby et al., 1986) Familiarity is defined as "the number of product-related experiences that have been accumulated by the consumer". Whereas, expertise is defined as "the ability to perform product-related tasks successfully". This study then adopts the above concept and proposes "PC expertise" and "product familiarity" to represent as the construct of "Consumer Knowledge".

The central concept of mass customization (MC) is to provide a web-based user toolkit that allows customers to design their own products which fit their individual preferences. That is, in the context of on line mass customization, co-design process allows consumers to specify their preference by selecting the fabric, color, style, detail, and size options (Duray et al., 2000). Therefore, consumers' ability to use a PC interface by selecting different options provided by companies to finalize their customized products would be a important factor to predict consumers' attitude and usage toward the online mass customization. It does make sense that the MC on line system should be easier for consumers with PC expertise than those without PC skill. Also, Koufaris (2002) concluded that consumers who believed that they had greater web skill perceived more control and enjoyment with online shopping. Thus, we generate the following hypotheses:

H5: The level of customers' PC expertise will positively affect their perceived ease of use of the MC online system.

H6: The level of customers' PC expertise will positively affect their perceived enjoyment of the MC online system.

H7: The level of customers' PC expertise will positively affect their perceived behavioral control over the MC online system context.

This study defines "product familiarity" as "the number of product-related experiences that has been accumulated by the consumer" (Chiou and Droge 2006). Based on individual interests, consumers might have different experiences/ knowledge with this co-design product in terms of brands, features, services, and other product-related purchase information. Thus, in addition to different level of PC expertise, the present study would explore if different level of individual interests, experiences and knowledge about the co-design product will affect consumers' perceived usefulness, enjoyment, and control. The online co-design process provides individuals with various options to select and customize their desired unique products. Therefore, consumers with high level of "product familiarity" would perceive more usefulness, enjoyment, and control toward the MC online system. Thus, we proposed the following hypotheses:

H8: The level of customers' product familiarity will positively affect their perceived usefulness of the MC online system.

H9: The level of customers' product familiarity will positively affect their perceived enjoyment of the MC online system.

H10: The level of customers' product familiarity will positively affect their perceived behavioral control over the MC online system context.

2.7 Desire for Uniqueness

Frank and Piller (2003) suggested that personal characteristics like creativity, innovativeness, and uniqueness, have a significant influence on user's satisfaction with a MC toolkit system. However, after intensive review the research in the field of mass customization, *uniqueness* seemed to have the most important relation with the co-design process. Uniqueness is then selected to be included in the model of the current study. The concept of consumer's need for uniqueness was initiated by Snyder and Fromkin (1970) in the social psychology setting. Customers' need for uniqueness is defined as "the trait of pursuing differentness relative to others through the acquisition, utilization, and disposition of consumer goods for the purpose of developing and enhancing one's self-image and social image" (Tepper-Tian, Bearden, and Hunter,2001). That is, consumers with strong need for uniqueness tend to desire high levels of dissimilarity to others. The present study will then adapt the concept of the desire for unique consumer products to represent the factor of uniqueness. Thus, the uniqueness will be measured as the extent to which consumers' needs for possession of consumer goods, services, and experiences that

are different from the majority of others (Lynn and Harris, 1997).

Fiore et al. (2004) investigated why customers want to use the MC co-design system and found that to create a unique product and assert their individuality is one of the major reasons. Mass customization helps to create value by tailoring each product for each customer (Goldsmith & Freiden, 2004; Piller, 2003).That is, to acquire some unique products for consumers is a good way to express their differentness, not being similar to others. Therefore, the uniqueness of personal trait should have a positive influence for consumers' perception on the enjoyment and usefulness toward the MC toolkits system. This study therefore proposes the following hypotheses:

H11: Customers' desire for unique consumer products will positively affect their perceived usefulness of the MC online system.

H12: Customers' desire for unique consumer products will positively affect their perceived enjoyment of the MC online system.

2.8 The Effects of Attitude to Behavioral Intention

Researchers have created a belief-attitude-intention relationship model and argued that positive attitude toward a technology system is an antecedent to behavioral intention (Davis, 1993; Liker and Sindi, 1997; Mathieson, Peacock, and Chinn, 2001). These behavioral intentions of consumers include intention to buy, intention to return to the online store, and intention to recommend products to others (Korzaan, 2003; Yoh, Damhorst, Sapp, and Lazniak, 2003). Moreover, in the setting of online shopping, researchers has also found that attitudes positively influence consumers' behavioral intentions empirically (Chen & Tan, 2004; Heijden & Verhagen 2004; Moon & Kim, 2001; O'Cass & Fenech, 2003). That is, consumers who perceived the benefit of the customization were willing to spend money to purchase a customized product (Piller & Muller, 2004). The present study then would like to examine consumers' attitudes and its effects on their behavioral intention toward mass customized products. Therefore, this study proposes:

H13: Attitudes towards the online mass customization practice will positively affect behavioral intention toward mass customized products.

3. CONCEPTUAL MODEL AND HYPOTHESES

Based on the evidence grounded in prior literature as discussed in the last section, this study then develops and proposes the following conceptual model (Figure 4). The following conceptual model depicts the research purpose and testable hypotheses that will be examined in the present study. This conceptual model is also like a roadmap offering guidelines for data analysis.

3.1 Conceptual Model

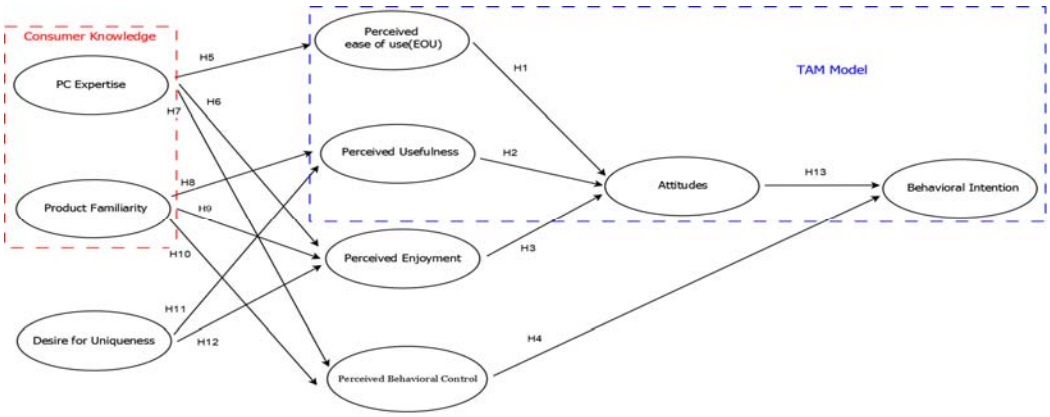

Figure 4 – Research Conceptual Model

3.2 Hypotheses Summary

H1: Perceived ease of use of the MC online system will positively affect customers' attitude toward the online mass customization practice.

H2: Perceived usefulness of the MC online system will positively affect customers' attitude toward the online mass customization practice.

H3: Perceived enjoyment of the MC online system will positively affect customers' attitude toward the online mass customization practice.

H4: Customers' perceived behavioral control over the MC online system context will positively affect their behavioral intention.

H5: The level of customers' PC expertise will positively affect their perceived ease of use of the MC online system.

H6: The level of customers' PC expertise will positively affect their perceived enjoyment of the MC online system.

H7: The level of customers' PC expertise will positively affect their perceived behavioral control over the MC online system context.

H8: The level of customers' product familiarity will positively affect their perceived usefulness of the MC online system.

H9: The level of customers' product familiarity will positively affect their perceived enjoyment of the MC online system.

H10: The level of customers' product familiarity will positively affect their perceived behavioral control over the MC online system context.

H11: Customers' desire for unique consumer products will positively affect their perceived usefulness of the MC online system.

H12: Customers' desire for unique consumer products will positively affect their perceived enjoyment of the MC online system.

H13: Attitudes towards the online mass customization practice will positively affect behavioral intention.

4. RESEARCH METHOD AND DESIGN

Most of the prior MC research has been conducted by using qualitative experiments approach. However, this study is designed as quantitative research by utilizing survey methodology. While a questionnaire survey lacks the detail of a case study, it does give a better representation of the whole sector and therefore expects to generalize the result. Thus, the research design will involve questionnaire surveys to three universities' business major students. A reliable measure will then be developed from well-established scales with demonstrated reliability and validity. Multiple scale items will be employed to operate variables depicted in Figure 4. The survey instrument consisted of a 44-item questionnaire (Appendix A) piloted and refined with a small expert group, and later implemented across a broader population. Further, a path analysis by using structural equations modeling (SEM) will be performed to test the hypotheses through an analysis of the proposed structural model.

4.1 Overview of Procedure and Sample

For the purposes of this study, we will prepare several PCs to allow subjects to design their own footwear by using a real online MC toolkit without time constraints. Each subject will be randomly assigned to one MC toolkit, either Converse (http://www.converse.com) or Nike (http://nikeid.nike.com), and asked to design a product virtually based on his/her individual preferences. As our participants will be university students, the present study then selected the footwear product typical to suit for young students. In addition, the setting room will offer free beverages and snacks with soft music to create a relax and natural environment similar to the online shopping setting in reality. Following the self-design process, the participant will be asked to fill out a physical questionnaire regarding the MC toolkit system for which they just used to design their own products. Lastly, the customized product design will be saved and printed as a gift to the participant.

4.2 Survey Instrument and Measures

Multi-item scales will be developed to measure the relevant constructs in the framework. All items will be drawn from existing scales with satisfactory validity and reliability. Some of the survey questions will be slightly modified to reflect the study setting. The questionnaire contains 9 scales and several demographic questions profiling the respondent on factors such as age, gender, university/college studying program, study

major, experience for online shopping, studying years at the college university, and the amount of daily time spent with web. In addition, the survey will include a brief cover note that explains the purpose of the research, identified the researcher and the qualification of respondents, and ensures the confidentiality of responses. In addition, a translation of the measure from English into Chinese will be carried out, including translation-back translation technique (Brislin, 1970), pilot review and pretest. Thus, it will be necessary to find a bilingual and native English translator to discuss with him/her during the back-translation review (final language into source language).

To measure the TAM constructs of perceived usefulness and ease of use will adapt from varied scales with satisfactory reliability and validity (Childers et al., 2001; Davis, 1989; Davis et al., 1992; Yi and Davis, 2001). The scale will consist of four items for the usefulness construct and four items for the ease of use construct. To assess attitudes toward online mass customization, the study will use four items from Bruner and Hensel (1996), Lee and Chang (2011) and Todd (1995). To measure behavioral intention, there are six statements including intention to buy, intention to return to the online store, and intention to recommend MC products and this site to others (Davis, 1989; Engel, Blackwell, and Miniard, 1995; Lee and Chang, 2011; Taylor and Todd, 1995; Uncles and Lee 2006).

To assess the perceived behavioral control, this study will use five question items adapted from Taylor and Todd (1995) and Koufaris (2002). To measure perceived enjoyment, this study will use four statements adapted from varied scales developed by Childers et al. (2001), Davis et al. (1992) and Lee and Chang (2011). The present study measures consumers' desire for uniqueness by using five question items adapted from Franke and Schreier (2008) and Lynn and Harris (1997). To measures participants' expertise on computer technology, subjects are asked to indicate how familiar they are with computer technology. Based on Koufaris(2002) and Lee and Chang (2011), there are totally five items will be used for this study to assess subjects' PC expertise. To assess product familiarity, the present study modifies some scales developed by Coupey, Irwin, and Payne (1998), Garbarino and Johnson (1999), and Grewal et al. (1998) respectively. There are totally seven items to investigate subjects' prior experience, knowledge, and brand with the product category.

All of the items will be measured on a 7-point Likert-type scale. Subjects indicated their level of perception with each of these aspects by responding on a seven point rating scale ranging from 7 (strongly agree), through 4 (neither agree nor disagree), to 1 (strongly disagree). To ensure desired balance, some items will be worded with proper negation. These items are reversed questions and will need to restate in the following data entry process. The following Tabe-1 is a summary of all scales used in this study. Therefore, there will have totally 9 constructs and 44 item questions adopted in the present study as listed at Appendix A.

Table-1 Generation of Variables from Multi-item Scales

Construct (abbreviation) # items	Reference Research for Scale Used
Perceived usefulness (PU) #4	Childers et al. (2001), Davis et al. (1992) and Lee and Chang (2011)
Perceived ease of use (PEOU) #4	
Perceived enjoyment (PE) #4	Childers et al. (2001), Davis et al. (1992) and Lee and Chang (2011)
Perceived behavioral control (PBC) #5	Taylor and Todd (1995) and Koufaris(2002)
Desire for uniqueness (DU) #5	Franke and Schreier (2008) and Lynn and Harris (1997)
PC expertise (PC) #5	Lee and Chang (2011) and Koufaris(2002)
Product familiarity (PF) #7	Coupey, Irwin, and Payne (1998), Garbarino and Johnson (1999), and Grewal et al. (1998)
Attitudes (ATT) #4	Bruner and Hensel (1996), Lee and Chang (2011) and Todd (1995)
Behavioral intention (BI) #6	Davis (1989), Engel, Blackwell, And Miniard (1995), Lee and Chag 2011), Taylor and Todd(1995), Uncles and Lee (2006)
Total: 9 constructs	44 items

5. RESULTS

5.1 Model Testing

The conceptual model consists of nine latent variables (PCE: PC Expertise, PF: Product Familiarity, DFU: Desire for Uniqueness, EOU: Perceived Ease of Use, PU: Perceived Usefulness, PE: Perceived Enjoyment, PBC: Perceived Behavioral Control, ATT: Attitudes, BI: Behavioral Intention). Descriptive statistics, Cronbach's *alpha, and* causal model analyses were conducted respectively.

5.2 Measurement Model

The below Table summarizes the results of the measurement model, including the Cronbach's *alpha*, standardized factor loadings, *t*-values, and composite reliability. To check reliability of multi-item scales, we estimated Cronbach's *alpha* and composite reliability. Cronbach's *alpha* for all multi-item scales ranged from .75 through .94. Composite reliability for all constructs was calculated and the values of all constructs

ranged from .83 to .96.All figures were greater than .70 and thus recommended as a reliable measure (Hair, Anderson, Tatham, & Black, 1998). In addition, the confirmatory factor loading values for model constructs ranged from .65 through .97. In short, confirmatory factor analysis of the measurement model showed that factor loadings of indicators for each construct were statistically significant and sufficiently high for structural model testing.

Table 2 – Measurement Model Results

Constructs	Standardized Factor Loadings (λ)	*t*-Values
PCE(α: .75, CR: .83, AVE: .55)		
PCE1	0.71	18.19
PCE2	0.85	22.89
PCE3	0.78	20.66
PCE4	0.60	14.66
PF(α: .85, CR: .86, AVE: .61)		
PF1	0.89	25.69
PF2	0.93	27.90
PF3	0.64	16.44
PF4	0.62	15.79
DFU(α: .91, CR: .94, AVE: .79)		
DFU1	0.81	23.04
DFU2	0.90	27.08
DFU3	0.90	27.28
DFU4	0.93	28.47
EOU(α: .89, CR: .91, AVE: .84)		
EOU1	0.88	24.58
EOU2	0.95	27.62
PU(α: .78, CR: .83, AVE: .71)		
PU1	0.85	22.86
PU2	0.84	22.72
PE(α: .94, CR: .96, AVE: .83)		
PE1	0.91	28.14
PE2	0.92	28.68
PE3	0.96	30.82
PE4	0.95	30.44
PE5	0.80	22.64
PBC(α: .86, CR: .90, AVE: .74)		
PBC1	0.81	22.58
PBC2	0.94	28.31
PBC3	0.83	23.22
ATT(α: .91, CR: .93, AVE: .70)		
ATT1	0.70	19.00
ATT2	0.68	18.03
ATT3	0.94	29.77
ATT4	0.97	31.61
ATT5	0.96	30.72
ATT6	0.65	17.23
BI(α: .93, CR: .95, AVE: .76)		
BI1	0.77	21.32
BI2	0.87	25.62
BI3	0.91	28.06
BI4	0.87	26.02
BI5	0.89	26.01
BI6	0.90	27.07

1. PCE: PC Expertise, PF: Product Familiarity, DFU: Desire for Uniqueness, EOU: Perceived Ease of Use , PU: Perceived Usefulness, PE: Perceived Enjoyment, PBC: Perceived Behavioral Control, ATT: Attitudes , BI: Behavioral Intention.BI(α: .93, CR: .95, AVE: .76)

2.α: Cronbach's alpha, CR: composite reliability, and AVE: average variance extracted

5.3 Model Fitting

To assess the goodness of model fit, some indicators like nonnormed fit index(NNFI); the comparative fit index (CFI), and the root mean squared approximation of error (RMSEA) are commonly suggested to evaluate (Garver and Mentzer,1999). Therefore, these indices were measured. In addition, for the statistical significance of parameter estimates, *t*-values were used.

The results of SEM obtained for the proposed conceptual model revealed a chi-square of 3671.73 (*df* = 558; *p* < .001), goodness-of-fit index comparative fit index (CFI) of .95, nonnormed fit index(NNFI) of .94, and chi-square/*df* of 6.58. In general, fit statistics greater than or equal to .90 for CFI and NNFI shows a good model fit (Bagozzi & Yi, 1988; Bentler& Bonett,1980, Hair, et al., 1998). The ratio of $\chi 2$ statistic ($\chi 2$/ d.f) should be less than 3 (Hayduk,1987).Also, root mean square error of approximation (RMSEA) values less than .08 are acceptable (Browne and Cudeck ,1993; Hair, Black, Babin, Anderson, and Tatham,2006; Jarpentaa et al.,2000).

However, the value of RMSEA of the model (RMSEA = *.10*) and $\chi 2$ statistic (chi-square/*df* = 6.5) conclude there is a relatively weak fit between an hypothesized model and observed data. In conclusion, the initial model provided an unacceptable fit to the data and the model should be further improved and adjusted following an examination of the modification indices.

Table 3 – Fit Indices of a Hypothesized Model

Model	d.f.	X^2	NNFI	CFI	IFI	RMSEA
Hypothesized model	558	3671.73	0.94	0.95	0.95	0.10

5.4 Hypothesis Testing

The following Figure shows the results of the causal model testing with structural path coefficients and t-values for each hypothesized relationship. All hypotheses were statistically supported except hypothesis 10 (H10: .09; t = 1.86), the path from perceived familiarity to perceived behavioral control. The hypothesis from perceived ease of use to attitudes (H1: .30; t = 8.76), the path from perceived usefulness to attitudes (H2: .35; t = 8.83) and the path from perceived enjoyment to attitudes (H3: .48; t =12.26) received positive statistical support. Also, the path from perceived behavioral control to behavioral intention (H4: -.18; t =-5.20) showed negatively significant. As this study hypothesized, the path from PC expertise to perceived easy of use (H5: .26; t=5.34), perceived enjoyment ((H6: .19; t =4.04)), and perceived behavioral control (H7: .27; t =5.28) were positively significant. As for the path from product familiarity to perceived usefulness (H8: .23; t =4.73), perceived enjoyment(H9: .22; t =4.99), and perceived behavioral control (H10: .09; t =1.86)showed positively significant. In addition, the path from desire for uniqueness to perceived usefulness (H11:.34; t =6.99) and perceived enjoyment(H12: .24; t =5.28) received significant supports. Lastly, consumer attitudes toward online mass customization positively affected willingness to purchase mass customized products (H13: .68; t = 13.3).

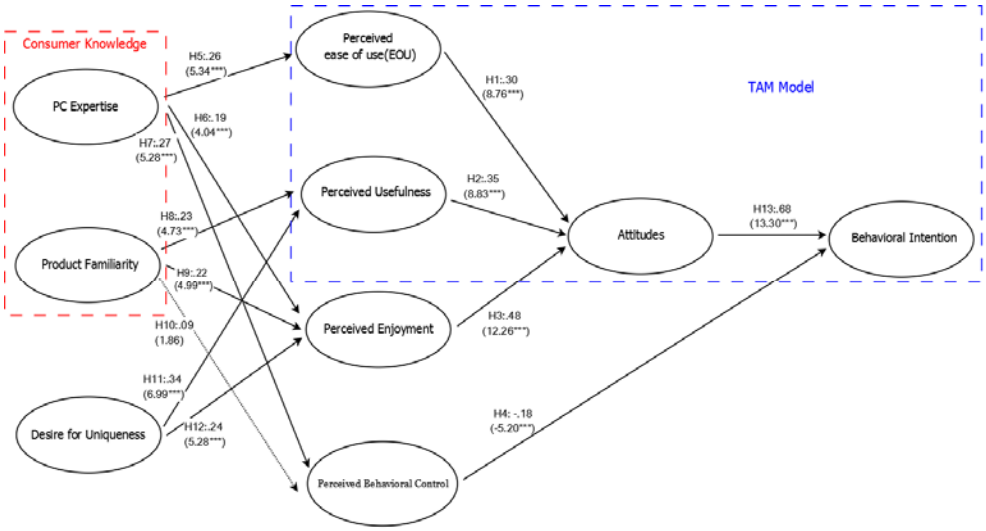

Figure 5 – The Results of the Causal Model Testing

Appendix A: Questions items used in this study In red-reversed items)

Perceived Usefulness

1. PU1 Using MC toolkit technology would improve my performance in this self-design product.
2. PU2 Using MC toolkit technology would not save me time in this self-design product. (-)
3. PU3 Using MC toolkit technology can make my online self-design products easier.
4. PU4 I would find MC toolkit technology not useful for my Online self-design products. (-)

Perceived Ease of Use

1. PEOU1 Learning to operate MC toolkit technology would not be easy for me. (-)
2. PEOU2 I would find it easy to get MC toolkit technology to do what I need it to do for my self-design products.
3. PEOU3 It is easy for me to become skillful at using MC toolkit Technology
4. PEOU4 I find MC toolkit technology not easy to use. (-)

Attitudes:

1. ATT1-Using MC toolkit technology for me to self-design a product is a good idea
2. ATT2-Using MC toolkit technology for me to self-design a product is unpleasant. (-)
3. ATT3-Using MC toolkit technology is beneficial for me to online self-design a product
4. ATT4- Using MC toolkit technology is interesting for me to online self-design a product

Behavioral Intention

1. I am willing to purchase mass customized products
2. I am willing to recommend for friends to purchase mass customized products from online retailer
3. It is very likely that I will return to this site
4. I will return to this site the next time I need footwear.
5. I would recommend this website to someone who seeks my advice
6. I would say positive things about this website to other people

Perceived Behavioral Control (PBC)

1. PBC1-I would have the ability to use MC toolkit technology.
2. PBC2 I would not have the knowledge to make use of MC toolkit technology to help on my online design products. (-)
3. PBC3- Using MC toolkit technology would be entirely within my control
4. PBC4-I anticipate having problems using a MC toolkit system on my online design products. (-)
5. PBC5- I would have the resources (including ask others) to make use of a MC toolkit system.

Perceived Enjoyment

1. I have fun using MC toolkit to design my own footwear
2. I think it is boring by using the MC toolkit system to design my own footwear (-)
3. Using the MC toolkit system to design my own footwear is pleasant
4. I find using the MC toolkit system to design my own footwear is quite enjoyable.

Desire for Uniqueness

1. I am generally more likely to buy a product if it is rare.
2. In general, I love having things that others do not have.
3. I enjoy having items different than others have.
4. I am more likely to buy a product if it is scarce.
5. I enjoy shopping at stores that carry merchandise which is different and unusual.

PC Expertise

1. I am not very skilled at using the PC. (-)
2. I know how to find what I want on the Web.
3. Others know more than me about how to use the PC. (-)
4. I am good at using a PC to get the information what I need via the Web. .
5. I am capable of using a PC for online shopping.

Product Familiarity

1. I have experience in designing footwear.
2. I am well familiar with the footwear products.
3. I am not familiar with Nike. (-)
4. I am knowledgeable about varied footwear brand name.
5. I don't have any idea about how to choose footwear I need. (-)
6. I am familiar with Converse.
7. I am familiar with the processes of purchasing a MC product on the Internet.

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