The Mediating Role of Intention between Antecedents of Mass Customization and Co-Design

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ABSTRACT

Mass customization has received great interest among researchers and became an established business for many of the leading brands. Although much of the research has been conducted by other authors from different angles, the role of intention to customize products has not been covered to a satisfactory extent. This article is focusing on how intention leads to co-design the products. Specifically, this article investigates the mediating role of intention between antecedents of mass customization and the co-design of the products. Set of hypotheses regarding these influences were developed and subsequently evaluated, and to achieve in-depth empirical study the cosmetics and painting industries in Sudan were chosen. Purposive sampling method was used to collect the data from respondents through personal questionnaire; data from 100 respondents were used for the purpose of this study.

The results revealed that there is a significant relation between the independent variables attitude, self-confidence, product aesthetics and intention, relation between intention and co- design, and also confirms the mediating role of the intention. Therefore, it is necessary for marketers to consider these factors in implementing Mass Customization strategy. However, certain variables that did not show any significant relationship should not be isolated or ignored.

Keywords: Mass Customization; Customer Intention, Co- Design

INTRODUCTION

Mass customization was first proposed by Toffler in 1970 and then defined by Davis in 1987 in the book Future Perfect. “Any customer can have a car painted any color that he wants so long as it is black”. The famous quote by Henry Ford, the founder of Ford Motor Company, nicely illustrates how individual customer requirements have been respected in the mass production age. But as times have changed, so has the role of customers and suppliers in a globalized economy.

This paper focuses on the concept of mass customization, which in the recent years has gained popularity across companies, industries, and continents. As defined by (Kaplan and Haenlein, 2006) mass customization means the production of products which have been customized by the customer, at production costs similar to those of mass produced products. Although the concept is not new, we observe that many companies which today run professional mass customization businesses have undergone a process of continuous improvement and change.

The objective of mass customization is to produce goods and services meeting individual customer’s needs with near mass production efficiency (Tseng & Jiao, 2001). Mass customization is a hybrid manufacturing concept existing to provide highly value added products. It is about delivering the desired product after the needs of an individual customer have been expressed (Piller, 2004). A standard product that bears certain flexibility, so that

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the retail or customers themselves can customize it, can be regarded as a mass customized product. In addition, providing a set of individual value added services around a standard product could also be regarded as a form of mass customization.

Several empirical studies evaluate the influence of MC on a variety of factors. However, to the best of our knowledge, few and limited studies pointed out the importance of Co-design in mass customization (HIRACHO, 2007). This article investigates the influence of a customer's intention to purchase mass customized products

The remainder of this article is structured as follows. The first section provides an overview of relevant literature in the area of mass customization, which supports the development of the competing hypotheses stated already. The statistical methods applied- as well as the results generated are then explained. The article concludes with a discussion of results as well as managerial and theoretical implications.

LITERATURE REVIEW& RESEARCH HYPOTHESIS

Definition and Concept of Mass Customization

Mass customization can be defined as "Customer co-design process of products and services, which meet the needs of each individual customer with regard to certain product features. All operations are performed within a fixed solution space, characterized by stable but still flexible and responsive processes. As a result, the costs associated with customization allow for a price level that does not imply a switch in an upper market segment" (Piller 2005). This definition shows clearly that the customer is completely involved in the design process to get the product that meets his needs. And that leads us to the main objective of our research that customized products lead to customer satisfaction.

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Again, as our research is measuring customer intention to co-design customized products. It was found that understanding intentions is foundational because it provides the interpretive matrix for deciding precisely what it is that someone is doing in the first place. When we talk about intention; we talk mainly about two theories: the theory of the planned behavior (Ajzen, 1985, 1991) which is the base on which our frame work was built. This theory is an extension of the theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). As a general rule, the stronger the intention to engage in a behavior, the more likely should be its performance. It should be clear, however, that a behavioral intention can be expressed in behavior only if the behavior in question is under volitional control, i.e., if the person can decide at will to perform or not perform the behavior.

Attitude with Intention and Co-Design

According to (Ajzen and Fishbein's model, 1977) attitude has direct impact on purchase intention. Davis (1993) suggests that an individual's attitude toward using a new system leads to the individual's behavioral intention to use that system. Moreover, the theory of diffusion of innovations (Rogers, 1962) indicates that the positive or negative attitude toward the innovation would result in the more permanent adoption or rejection of the innovation. Therefore, based on the existing literature about attitudes toward a brand or product, attitudes toward intention the following hypothesis is proposed:

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H1.1: Attitude has a positive effect on the customer intention.

H1.2: Attitude has a positive effect on co- design customized products.

Self-Confidence with Intention and Co-Design

Bearden et al. (2001) introduced consumer self-confidence, defined as the extent to which a consumer feels capable and assured with respect to his or her marketplace decisions and behaviors. Self-confidence reflects two dimensions. One decision-making, self-confidence is a consumer's perception of her or his ability to obtain and use information and to make good purchasing decisions. Another reflects a consumer's perceived ability to protect her or him from being deceived or unfairly treated in a marketplace and is referred to as consumer protection. Before purchasing customized product, consumers undertake detailed analyses of their needs and translate into specific solutions without vendors' assistance. Tang, Jianghong Luo, Juan Xiao, 2011 found positive effect of self-confidence on consumer intention, while this relation is already supported in TPB. Extending from the research in self-confidence, we can argue that:

H2.1: Self-confidence has positive effect on customer's intention.

H2.2: Self-confidence has positive effect on co- design customized products

Product Aesthetics with Intention and Co-Design

Aesthetics is defined as the level of significance that visual aesthetics hold for a particular consumer in his or her relationships with products. Mass customized goods allow consumers to specify the configuration of product attributes that ultimately shape both the performance-related utilitarian benefits and appearance-related symbolic benefits of a product. Bloch, Brunel, and Arnold (2003) suggest that consumers differ in the degree to which visual product aesthetics are important and that those differences influence product category attitudes. These differences are captured in the concept of centrality of visual product aesthetics (CVPA). Based on the above we argue that:

H3.1: Products aesthetics has positive effect on customer's intention

H3.2: Products aesthetics has positive effect on co- design customized products

Customer Intention with Co-Design

Customer intention is considered as the main element that concern. Intention precedes action, and is itself preceded by emotions and motivations. It is defined as an individual's readiness to perform a certain action. Intention directly precedes behavior. The intention incorporates attitude toward behavior, subjective norm, and perceived behavioral control (Ajzen, 1985, 1991, 2002). As mentioned before, our research frame work is built on the theory of the planned behavior which is an extension of the theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). Theory of planned behavior is the individual's intention to perform a given behavior. Intentions are assumed to capture the motivational factors that influence a behavior; they are indications of how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behavior. As a general rule, the stronger the intention to engage in a behavior, the more likely should be its performance. It should be clear, however, that a behavioral intention can find expression in behavior only if the behavior in question is under volitional control, i.e., if the person can decide at will to perform or not perform the behavior.

Based on the above and to the theory of the planned behavior which says that the intention performs the behavior; the following hypothesis can be formulated:

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H4: Customer intention influences the co- design of the customized products.

Mediating Role of Intention

To the best of our knowledge; most of the previous researches have not been extended further to the intention itself i.e. Soheila Khoddami et al, 2011. So, our contribution in this study will be covering the behavior conducted after the customer intention relying on the TPB. The intention is leading to a certain behavior which we refer here to the co- design. Based on this we hypothesize:

H5: Intention mediates the relation between antecedents of mass customization and the co-design

METHODOLOGY

Research Design

The questionnaire survey method technique was used to collect data. For the purpose of this study, purposive sampling method had been used to select the sample from Sudanese individuals (painting and cosmetics users). One hundred and twenty questionnaires were sent to individuals. One hundred usable questionnaires were returned, which represents 83% of response rate which is quite perfect.

Data and Procedures

To analyze the data and test the hypotheses, several statistical tools were employed. Statistical Package for Social Science (SPSS) Version 16.0 was used with the following techniques:

Factor analysis utilized to insure data goodness of the measurement, Cronbach alpha for consistence and reliability of the measurement, descriptive analysis to test the characteristics of the respondents, correlation to test the relationships between variable and multiple regression to analyze the hypothesis.

Measurement of Variables

Since most of the respondents did not have a good command of English, the questionnaire was administered in Arabic. The measurements of the study variables were adapted from previous studies. The measurement of Attitude (11 questions) from (Moon & Kim, 2001; Robinson, et al., 2005), the measurement of perceived usefulness (10 questions) (Davis,1989; Gefen et al., 2003) Self Confidence (7 questions) from Ajzen, 1991; Ajzen & Fishbein, 1980, Product Aesthetics (10 questions) from Bloch, Brunel, and Arnold's (2003), Intention (8 questions) from Venkatesh et al., 2002; Wang et al., 2006,and Co- Design (7 questions) were developed from (Noelin, 1999; Shim et al., 1989; Summers et al., 2006). All the questions were elicited on a five-point Likert-scale, ranging from strongly agree to strongly disagree.

DATA ANALYSIS AND RESULTS

Profile of Respondents

To evaluate the profile of the respondent, we used descriptive analysis data (frequency and percentage) as shown in below table 1. (a) 72% of the respondents were female and 28% were male, in marital status majority are single 67%, 22% are married, 9% divorced while 2% are widow.

Respondents with average income majority are average income (1000 SDG) per month they represent 58%, low income (less than 500SDG) was 33% while high income respondents was 9% which gain more than 1000SDG per month.

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Around 42% of respondents live in Khartoum, 30% in Khartoum North while 28% of respondents live in Umu-Durman region.

Table 1. Demographic Profile

Demographic Profile		*Frequency*	*Percent*
Sex	Male	28	28
	Female	72	72
	Total	100	100.0
Marital Status	Single	67	67
	Married	22	22
	Widow	2	2
	Divorced	9	9
	Total	100	100.0
Income	Low (Less than 500 SDG)	33	33
	Average (1000 SDG)	58	58
	High (Above 1000 SDG)	9	9
	Total	100	100.0
Area	Khartoum	42	42
	Omdurman	28	28
	Khartoum North	30	30
	Total	100	100.0

Descriptive Analysis

Descriptive statistics was used to investigate the range of possible values, means and standard deviation of the variables in this study and are presented in Table 2 below.

Table 2. Descriptive Statistics (N=100)

Variables	*Min*	*Max*	*Mean*	*Std. Deviation*	*Interpretation*
Attitude	1.00	5.00	1.73	1.07	Strongly Agree
Self- Confidence	1.00	5.00	2.058	1.095	Agree
Product Aesthetics	1.00	5.00	3.924	0.851	Disagree
Intention	1.00	5.00	1.62	0.090	Strongly Agree
Co- Design	1.00	5.00	1.38	0.725	Strongly Agree

The respondents surveyed score above the overall mean (Mean=1.73, SD=1.07) that they plan to buy a customized book product at some point, next time I shop for any product, I will

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look for a customized one and The additional effort required to buy a Customized product seems not worth it.

The respondents agrees (Mean=2.058, SD=1.095) that they have self-confidence with owning a customized product and product that has a really great design, they strong agreed both intention (Mean=1.62, SD=1.090) and co-design items (Mean=1.38, SD=0.725) while the respondents surveyed disagreed the product aesthetics(Mean=3.924, SD=0.851).

Factor and Reliability Analysis

To assess the amount of variance explained and to evaluate the goodness of measurements, exploratory factor analysis and reliability analysis were conducted for all variables. Principal component and varimax rotation were used; the varimax rotation shows some high cross loading and some items that are not stable to establish a separate factor, and as a result, 7 items were deleted.

Table 3. Shows the result of the factor analysis on the independent variables, dependent and mediating variable; the selected variables have merged into five factors (Continued ....)

Variables		*Component*						
Factors	*Items*	*1*	*2*	*3*	*4*	*5*	*Eigen Value*	*Alpha (α)*
Factor one: *Attitude*	attit1	.751						
	attit2	.803						
	attit7	.783						
	attit8	.753						
	attit9	.799						
	attit10	.785					3.648	.868
Factor two: Product Aesthetics	Product Aest5		.886					
	Product Aest4		.881					
	Product Aest6		.849					
	Product Aest2		.835					
	Product Aest8		.826					
	Product Aest7		.824					
	Product Aest9		.813					
	Product Aest3		.810				42.728	.960
Factor three: Self confidence	Self Con3			.826				
	Self Con6			.650				
	Self Con2			.597			3.863	.654
Factor four: Co-design	Co-design2				.800			
	Co-design4				.784			
	Co-design6				.706			
	Co-design5				.687			
	Co-design3				.682			
	Co-design1				.635		10.986	.879

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Table 3. Shows the result of the factor analysis on the independent variables, dependent and mediating variable; the selected variables have merged into five factors (...continued)

Variables		*Component*						
Factors	*Items*	*1*	*2*	*3*	*4*	*5*	*Eigen Value*	*Alpha (α)*
	Intention3					.825		
Factor five: Intention	Intention2					.646		
	Intention 1					.631		
	Self Con5					.551	5.816	.778
Variance explained each factor %		60.743	22.881	69.723	38.502	62.197		

Correlation Analysis

Table 4 presents the results of the inter-correlation among the variables. The correlation analysis was conducted to see the initial picture of the inter-relationships among the variables under the study. The importance of conducting correlation analysis is to identify any potential problems associated with multi-Colinearity. The result shows that self-confidence is positively correlated with attitude (r = 0.308, p-value < 0.05), product aesthetics (r = 0.348, p-value < 0.05), intention (r = 0.565, p-value < 0.05), and co-design (r = 0.596, p-value < 0.05). Product aesthetics is negative correlated with attitude and self-confidence(r= -0.348 and -0.409 respectively, p-value < 0.05). Intention is positively correlated with attitude and self-confidence, while negatively correlated to product aesthetics (r= 0.565, 0.538, and -0.517 respectively, p- value < 0.05). Co-design is positively correlated with attitude, self-confidence, and intention (r= 0.596, 0.412 and 0.576 respectively, p- value < 0.05) while negative correlated with product aesthetics (r=- 0.459).

Table 4. Spearman correlation of variables

	Attitude	*Self-Confidence*	*Product Aesthetics*	*Intention*	*Co- Design*
Attitude	*1*				
Self- Confidence	.308**	*1*			
Product Aesthetics	-.348**	-.409**	*1*		
Intention	.565**	.538**	-.517**	*1*	
Co- Design	.596**	.412**	-.459**	.576**	*1*

Hypotheses Testing

Antecedents with Intention

Table 5 shows the results of the hierarchic regression equation testing the influence of the Antecedents on the intention. The result indicates that the three variables cumulatively explained 35% of the observed variation in intention. The result indicated that attitude, self-confidence, and product aesthetics flow significantly influenced intention. The regression coefficient in the table 5 indicated that among these independent variables, product aesthetics was the most important influencing the intention (β = -.316), followed by product self-confidence (β = .257) then Attitude (β = 0.253). However the attitude and self-confidence has positive significant effect on customer intention therefore we accept hypothesis (H1.1 and

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H2.1) while product aesthetics has negative effect on customer intention so we rejected the hypothesis (H3.1)

Table 5. Antecedents on the intention

Predictors	*B*	*T*	*Sig*	*Co linearity Statistics*	
				Tolerance	*VIF*
Attitude	.253	2.770	.007	.780	1.283
Product Aesthetics	-.316	-3.643	.000	.867	1.153
Self-Confidence	.257	2.913	.004	.837	1.195

R=.612, R^2= .375, R^2 adjusted= .355, p<005

Antecedents with Co-Design

Table 6 shows the results of the hierarchic regression equation testing the influence of the antecedents on co- design. The result indicates that antecedents explained 44% of the observed variation in co- design. The result indicated that attitude has positive significantly influencing reliability of co- design (*β*=.469*)then (H1.2)accepted*, while product aesthetics is significantly negative influencing reliability of co-design (*β*=-.283*.) then (H3.2) was rejected* Where, self- confidence is not significantly influencing reliability of co- design (*β*=.080*) thus (H2.2) was rejected.*

Table 6. Regression of Antecedents with Co-design

Predictors	*B*	*T*	*Sig*	*Co linearity Statistics*	
				Tolerance	*VIF*
Attitude	.469	5.409	.000	.780	1.283
Product Aesthetics	-.283	-3.446	.001	.867	1.153
Self-Confidence	.080	.960	.339	.837	1.195

R=.662, R^2= .438, R^2 adjusted= .421

Customer Intention with Co-Design

As shown in table 7 below; the result of regression analysis testing the influence customer intention on with co- design; the result indicated that customer intention explained 29% of the criterion variable variation in co- design.

Customer intention has positive influence on co-design (*β=0.538, t=6.325, Sig=0.000) thus hypothesis (H4) accepted.*

Table 7. Customer intention with Co- Design

Model		*Unstandardized Coefficients*		*Standardized Coefficients*	*t*	*Sig.*	*Collinearity Statistics*	
		B	*Std. Error*	*Beta*			*Tolerance*	*VIF*
1	(Constant)	.647	.126		5.139	.000		
	Intention	.459	.073	.538	6.325	.000	1.000	1.000

R=.538, R2= .290, R^2 adjusted= .283.

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Table 8 shows the mediation test in which self- confidence was excluded as it didn't meet the mediation conditions. Model 1 is showing significance for attitude 0.000 β=*0.497*, and product aesthetics 0.001 β=-0.292. While in Model 2 it is showing that significance of attitude is 0.000 β=*0.382*, but in product aesthetics 0.017β=-0.205. Which indicates that intention is partially mediating the relation between product aesthetics and co- design and also mediating the relation between attitude and co- design thus the hypothesis (H5) partially accepted.

Table 8. Mediation Test

Model	Unstandardized Coefficients		Standardized Coefficients	*T*	*Sig.*	R^2	*Adjusted* R^2
	B	*Std. Error*	*Beta*				
1 (Constant)	1.676	.335		4.867	.000		
Attitude	.049	.008	.497	6.090	.000	*0.427*	*0.466*
Product Aesthetics	-.217	.060	-.292	-3.585	.001		
2 (Constant)	1.156	.372		2.868	.005		
Attitude	.030	.008	. *382*	3.848	.000	*0.477*	*0.460*
Product Aesthetics	-.152	.063	-.205	-2.420	.017		
Intention	.216	.076	.254	2.835	.006		

DISCUSSIONS

Hence, the behavioral intention to adopt a mass-customized product can be analyzed using the TPB Model as done by some previous studies. Using this model as a starting point, for the present study a set of competing hypotheses was developed regarding the influence of antecedents of mass customization on the intention and the influence of intention on the co-design. These hypotheses were subsequently tested building on a sample of approximately 100 customers surveyed regarding their intention to adopt an individualized product (cosmetics). The statistical analysis resulted in the following findings:

1. Mass customization value from a consumer point of view is polymorphous. Also, the value derived from the experience of co-design can have a positive influence on the overall value of mass customization.
2. There is a significant positive relation between attitude, self-confidence with intention in which we agree with the TPB and research done by *Zhongjun Tang et al. 2011* about *antecedents of intention to purchase mass customized products.*
3. There is negative relation between product aesthetics and intention in which we disagree with a research done by *Soheila Khoddami et al. 2011* about *the impact of the three dimensions of the value of the mass customized product on the overall perceived value of MC and the purchase intention***.**
4. This study has showed significant positive relation between intention and co- design.

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5. The results also indicated that intention is not mediating the relation between self-confidence and co- design. While in the mediation test; it was obvious that intention is partially mediating the relation between Attitude and Product aesthetics with co-design.
6. From the results; and the mediation role of the intention, it was found that there is positive relation between antecedents of mass customization and the co- design.

CONCLUSION

The research provides an interesting insight understanding of mass customization and the antecedents of intention to purchase customized products. The study supports the variables of attitude, self-confidence and products aesthetics and the significant relationship of attitude, product aesthetics with co- design.

The result of this study should stimulate managers to concentrate on mass customization strategy especially to benefit from customer involvement in the design process. Mass customization can also be understood as a valuable source for collecting need information from the customers, which for non-customized products can only be obtained by using classical market research instruments. By designing their individual product, customers automatically provide information with regards to their preference for certain designs and design attributes.

This research focused on some factors influencing intention to purchase customized products and their effect levels, further factors will definitely add value. Second, this research focused on investigation of three specific product category, and data collection was limited to one country. It may therefore be possible that findings are idiosyncratic and not fully generalizablity to either other product categories or other countries. It is necessary to test the results in multiple areas with multiple products.

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