

Consumer perception of mass customized furniture

Torsten Lihra¹ and Urs Buehlmann²

1. FPInnovations-Forintek, Québec, Canada

2. Virginia Tech, VA, USA

Abstract

The North American furniture industry is facing critical challenges to stay competitive. Product differentiation through mass customization has been identified as a potentially profitable strategy. A survey has been conducted in the North-Eastern U.S. to assess the importance consumers assign to seven ways to customize their furniture. Results showed that customization is important to certain consumer segments and colour choice was the most highly ranked option when purchasing bedroom furniture.

Introduction

Globalization has an important impact on manufacturing industries everywhere and the North American household furniture sector in particular (Schuler and Buehlmann, 2003; Ince et al., 2007). Over the last 10 years (1997 to 2007) household furniture imports in the U.S. increased by nearly 300% to reach a market share over 60%. Over the same time span, China increased its household furniture exports to the U.S. by over 800% and accounted for 50% of U.S. household furniture imports in 2007 (U.S. Department of Commerce, 2008). Numerous U.S. furniture plants shut down, unable to compete in this new economic environment (Champine and Krishnan, 2004; Gazo and Quesada, 2005). Others developed new competitive strategies to gain profitability. Product differentiation and adding real or perceived value for consumers have been identified as potential means to increase market shares for manufacturers located in countries not having access to a low cost labour force (Huyett and Viguerie, 2005; Grant Thornton LLP, 2006; Wan and Bullard, 2008). Thus, numerous furniture manufacturers in North America decided that offering a higher degree of product customization should be part of their new competitive strategy (Lihra et al., 2008).

The production of customized goods on an industrial scale is known under the term “mass customization”. After decades of efforts to standardize products in order to minimize costs – Henry Ford being the synonym for it – manufacturers started to realize in the 1960’s that satisfying individual consumer preferences may be a business opportunity. Toffler (1970) started to conceptualize the approach and Davis (1987) coined the term “mass customization” (MC) that was later popularized by Pine (1993). Numerous authors described the MC concept (Alford et al., 2000; Duray, 2002; Piller, 2003; Rudberg and Wikner, 2004) but for the purpose of the present study, the definition introduced by Kodzi et al. (2007) may be the most suited: MC is viewed as “... the fulfillment of customized orders for defined segments of mass markets, at costs and lead times that communicate value rather than an associated penalty for personalization or order size”. This definition highlights two parameters that are directly affected by a MC strategy: costs and lead times.

Today’s market conditions are such that MC products are more expensive than their mass produced counterparts. That is mainly due to an added complexity to the production system (Hart, 1995; Huffmann and Kahn, 1998, Boucher and Barnett, 2008). Customizing furniture means that the point of consumer involvement (also called the decoupling point) lies at an earlier state of the production process. Many authors consider that point as an indicator of the degree or type of customization provided (Lee et al., 2000; Tseng and Piller, 2003; Piller et al., 2004). Having access to a great variety of standard products may satisfy many consumers and could substitute customization because consumers are more likely to find the product they are looking for with no need for customization (Jacoby et al., 1974; Duray et al., 2000).

However, MC may be considered as a particular type of co-production where the consumer plays an active role in the value-creation process (Liechty et al., 2001; Addis and Holbrook, 2001; Bendapudi and Leone, 2003). This is in line with consumers' use of goods to express uniqueness (Snyder, 1992; Tian et al., 2001). As a result, MC would have a positive impact on consumer furniture purchasing choices when its perceived benefits are more important than the sacrifices related to it. The objective of the present study was to shed light on consumer perceptions of different types of furniture customization.

Method

Using a quantitative method (WEB survey) a cross-sectional study was conducted using a questionnaire to collect data, an approach outlined by Malhorta (2004). Likert type scales are used to measure importance using a scale of one to seven. This scale is balanced and offers a point of indifference (point 4). Before the survey, a preliminary test was conducted in order to verify the measurement techniques and determine the time needed to complete the questionnaire online. The questionnaire consisted of a question about the importance of different levels of customization in the context of a master bedroom purchase, and several socio-demographic questions.

Cossette Communication (2008) was hired to collect the data. The firm administrates an online panel of more than 8.5 million Americans. From this panel a randomly selected sample of 349 people in the north-eastern U.S. (U.S. Census Bureau, 2000) was drawn. Seven levels of furniture customization were submitted to consumers for evaluation using example furniture set-ups for each level. These customization levels were based on a mass customization model presented by Lihra et al. in 2008. The terms used to represent the levels of customization are presented in Table 1.

The first four levels (Colours, Accessories, Configuration and Dimensions) offers pre-purchase customization of the furniture. The following three levels (Decoration, Adjustment and Rent& Exchange) consist of post-purchase customization options.

The questionnaire asked respondents to rate the importance of these seven levels of customization on a scale from 1 = not at all important to 7 = very important. ANOVA and t-test statistics were used to measure the impact of socio-demographic variables on the importance of levels of customization. A two stage cluster analysis (Punj and Steward, 1983) was performed using non-standardized data to

Table 1 Terms used to represent seven levels of furniture customization

Terms	Description
Colours	a selection of 30 colours is offered
Accessories	a choice of hardware that goes along with the furniture is offered (handles hinges etc.)
Configuration	furniture may be configured by the consumer (eg, a chest can have doors or drawers or shelves)
Dimensions	consumers may choose the overall dimension of the furniture (length, width, height)
Decoration	an interior decoration service is offered when purchasing the furniture
Adjustement	furniture may be adapted to future needs of the consumer (eg. a baby crib may be conversed into a double bed)
Rent & Exchange	furniture is rented and may be exchanged against new furniture after 2 years

detect the presence of groups of respondents who answered the questionnaire in a similar way. The Ward method with squared Euclidean distance was used for hierarchical cluster analysis. An agglomeration table was used to determine the number of clusters to consider.

Results

The survey generated 349 usable responses from the north-eastern United States (U.S. Census Bureau, 2000). The socio-demographic characteristics of the sample are presented in Table 2. Table 3 shows the importance that respondents associated with the level of customization in descending order of means.

Table 2 Sample Characteristics

Variable	Category	n	%
Gender	Male	144	41.3
	Female	205	58.7
Age (years)	25-34	72	20.6
	35-44	70	20.1
	45-54	75	21.5
	55-64	73	20.8
	65-74	48	13.8
	75 and over	11	3.2
Family income (US\$)	19,999 and less	59	16.9
	20,000 – 39,999	83	23.8
	40,000 – 59,999	79	22.6
	60,000 – 79,999	49	14.0
	80,000 – 99,999	35	10.1
	100,000 and more	44	12.6

Table 3 Importance of seven levels of furniture customization

Level of customization	Mean*	Std. Dev.
Colours	6.0	1.6
Dimensions	5.5	1.7
Accessories	5.2	1.7
Configuration	4.9	1.8
Adjustment	4.0	2.0
Decoration	4.0	2.2
Rent & Exchange	2.7	2.0

* On a scale of 1 = not at all important to 7 = very important

Student tests for paired samples showed significant differences ($\alpha = 0.05$) between mean levels of customization with the exception of the "Adjustment" and

"Decoration" levels. The four levels of pre-purchase customization are on the first four ranks followed by the three levels of post-purchase customization. The preferred level of customization is the choice of colours with an average of six on a scale of one to seven. Having obtained a rating of 5.5, the choice of the dimensions of the furniture is also considered important. The offer of accessories comes in third with a score of 5.2. Configuration falls below five on the Lickert scale with a rating of 4.9. This level can be regarded as less important. The order of importance consumers assign to these four levels was also mentioned by furniture manufacturers prior to the study. Manufacturers have demonstrated a good knowledge of the needs of consumers despite the limited information they receive in this regard mainly through their interaction with retailers. The last three positions are occupied by the Adjustment (4.0), Decorating (4.0) and Rent & Exchange (2.7) options. The latter has raised minor interest.

ANOVA was used to assess the impact of socio-demographic variables on the importance of levels of customization. Only significant effects ($\alpha = 0.05$) are presented in the following paragraph.

Gender had a significant impact on the importance of a choice of colours, a choice of accessories and adjustment of furniture to future needs. In all three cases, women assigned greater importance than men to those levels. Indeed, with an average of 6.3 women considered the choice of colours very important. Men gave a score of 5.6 at this level of customization. The importance of accessories was estimated at 5.4 by women and 4.9 by men. The adjustment option had received a rating of 4.2 by women and 3.7 by men. Age and family income did not have a significant impact ($\alpha = 0.05$) on the importance of levels of customization.

The hierarchical cluster analysis indicated the presence of two distinct clusters. K-means clustering was then used to classify respondents in both clusters. Ranking of the customization levels by the two clusters is presented at table 4.

Table 4 Customization level importance by cluster

Level of customization	Cluster 1 (n=200) « Customization fans »		Cluster 2 (n=149) « Standard product buyers »	
	Mean*	Std. Dev.	Mean*	Std. Dev.
Colours	6.8	0.8	5.3	0.7
Dimensions	6.0	0.9	5.0	0.9
Accessories	6.1	1.0	4.4	0.8
Configuration	5.4	1.0	4.1	1.0
Adjustement	5.2	1.3	3.1	1.1
Decoration	5.1	1.3	2.2	1.2
Rent & Exchange	3.1	0.9	2.0	0.8

* On a scale of 1 = not at all important to 7 = very important

The first cluster can be called "customization fans" (n = 200). This cluster is characterized by a common taste for all levels of customization. In particular, the choice of colours, accessories and dimensions have been considered very important by this group (mean scores of 6.8, 6.1 and 6.0 respectively). The configuration, adjustment and decoration options came in on rank three four and five with ratings of 5.4, 5.2 and 5.1. The location & exchange obtained a score of 3.1 putting this option on the last position. This cluster is composed of 65% women and 35% men. Age and family income does not characterize the profile of the group.

The second cluster is called "buyers of standard products" (n = 149). This cluster is characterized by a low interest in customized furniture. The choice of colours and dimensions got the highest rating with a score of 5.3 and 5.0 respectively. The choice of accessories and configuration follow with a rating of 4.4 and 4.1. The adjustment, decoration and rental & exchange options took the last rows with ratings of 3.1, 2.2 and 2.0 respectively. The cluster consists of 50% men and 50% women. Socio-demographic variables had no impact on the profile of this cluster.

Conclusion

This study had as objective to measure the importance that consumers assign to seven

levels of bedroom furniture customization. To do this, a survey of 349 respondents in the north-eastern United States was conducted using a WEB panel. The results showed a preference for the four levels of pre-purchase bedroom furniture customization. The three levels of customization after purchase raised less interest. The choice of colours was considered by all respondents as the most important level of furniture customization followed by a choice of dimensions, accessories, and configuration of the product. The option to adjust furniture to future consumer needs, Decoration and Rent & Exchange levels raised less interest with the latter being not attractive to consumers. A significant difference ($\alpha = 0.05$) between the perception of men and women was observed. Indeed, women assigned more importance to bedroom furniture customization than men, especially in regard to a choice of colours. A cluster analysis allowed establishing two clusters: "customization fans" and "buyers of standard products." The first group is characterized by a high importance for all levels of customization. This group is predominantly female. The group of "buyers of standard products" was characterized by a greater indifference to all levels of customization. This group consists of 50% women and 50% men. Age and family income does not characterize the profile of both groups.

Results of this study show that bedroom furniture customization is of importance to certain consumers. The cluster analysis pointed out that a major segment of respondents considered pre-purchase customization, especially colour choice, as an important factor when purchasing bedroom furniture. For the marketing of customized furniture, women should be the target group.

The study has assessed the importance of different levels of customization without constraints (eg.: price, shipping delay). The absence of a price premium for higher customization levels can explain the fact that family income had no impact on the importance of levels of customization. The survey used a relatively small sample of 349 respondents and was limited to the north eastern region of the USA. These limitations have to be kept in mind when interpreting the results of the study. To further analyse consumer buying behaviour in regard to customized furniture, price and delay constraints have to be considered.

Literature Cited

- Addis, M. and M.B. Holbrook.** 2001. On the conceptual link between mass customization: An explosion of subjectivity. *Journal of Consumer Behaviour*. 1(1): 50-66.
- Alford, D.P. Sackett and G. Nelder.** 2000. Mass customization: An automotive perspective. *International Journal of Production Economics* 65(1): 91-110.
- Bendapudi, N. and R.P. Leone.** 2003. Psychological implications of customer participation in co-production. *Journal of Marketing* 1(67): 14-28.
- Boucher, M. and R. Barnett.** 2008. Tailoring products to customer preferences: Configuring profits to order. Aberdeen Group. Boston. MA. 166 pp.
- Champine, L.A. and A. Krishnan.** 2004. Asia's impact on the residential furniture industry. Morgan Keegan & Company. Inc. New York. NY. 36 pp.
- Cossette Communication.** 2008. www.impactrecherche.com. Québec. QC.
- Davis, S.** 1987. *Future perfect*. Addison-Wesley Publishing Company. Reading. MA. 354 pp.
- Duray, R.** 2002. Mass customization origins: Mass or custom manufacturing? *International Journal of Operations and Production Management* 22(3): 314-328
- Duray, R., P.T. War, G.W. Milligan, and L.B. William.** 2000. Approaches to mass customization: Configurations an empirical validation. *Journal of Operations Management*. 18: 605-625.
- Gazo, R. and H. Quesada.** 2005. A Review of Competitive Strategies of Furniture Manufacturers. *Business Strategies Review. Forest Products Journal* 55(10): 4-11.
- Grant Thornton LLP.** 2006. Survey of U.S. business leaders. 12th Edition. Grant Thornton International. Chicago. IL. 126 pp.
- Hart, C.W.L.** 1995. Mass customization: Conceptual underpinnings, opportunities and limits. *International Journal of Service Industry Management* 6(2): 36-45.
- Huffmann, C. and B. Kahn.** 1998. Variety for sale: Mass customization or mass confusion. *Journal of Retailing* 74(4): 491-513.
- Huyett, W. I. and S.P. Viguerie.** 2005. Extreme competition. *The McKinsey Quarterly* Number 1: 46-57
- Ince, P., A. Schuler, H. Spelter and W. Luppold.** 2007. Globalization and structural change in the U.S. forest sector: An evolving context for sustainable forest management. United States Department of Agriculture. Forest Service. Forest Products Laboratory. General Technical Report FPL-GTR-170. Madison. WI. 26 pp.
- Jacoby, J., D.E. Speller and C.K. Berning.** 1974. Brand choice behaviour as a function of information load: Replication and extension. *Journal of Consumer Research* 18(1): 33-42.
- Kodzi, E. T., T. Lihra and R. Gazo.** 2007. Process transformation mandates for manufacturing customized furniture. *Journal of Forest Products Business Research* 4(8): 1-21.
- Lee, C.-H.S., A. Barua, and A.B. Winston.** 2000. The complementarity of mass customization and electronic commerce. *Economics of Innovation and New Technology* 9(2): 81-109.

- Liechty, J., R. Venkatram and S.H. Cohen.** 2001. Choice menus for mass customization: An experimental approach for analysing customer demand with application to a web-based information service. *Journal of Marketing research* 38 (May): 283-196.
- Lihra, T., U. Buehlmann and R. Beauregard.** 2008. Mass customization of wood furniture as a competitive strategy. *International Journal of Mass Customization* 2 (3/4): 200-215.
- Malhotra, N.K.** 2004. *Marketing research: An applied orientation.* Pearson Education inc.. Saddle River. New Jersey. 713 pp.
- Piller, F.T.** 2003. What is Mass customization? A focused view on the term. *Mass Customization News* 6(1):. 2-5.
- Piller, F.T., K. Moeslein and C.M Stotko.** 2004. Does mass customization pay? An economic approach to evaluate customer integration. *Production Planning & Control* 15(4): 435-444.
- Pine, J.B.** 1993. *Mass customization: The new frontier in business competition.* Harvard Business School Press. Boston. MA. 364 pp.
- Punj, G. and D.W. Steward.** 1983. Cluster analysis in marketing research: Review and suggestions for application. *Journal of Marketing Research* 20 (May): 134-148.
- Rudberg, M. and J. Wikner.** 2004. Mass customization in terms of customer order decoupling point. *Production Planning & Control* 15(4): 445-458.
- Schuler, A. and U. Buehlmann.** 2003. Identifying future competitive business strategies for the U.S. residential wood furniture industry: Benchmarking and paradigm shifts. United States Department of Agriculture. Forest Service. Northeastern Research Station. General Technical Report NE-304. Delaware. OH. 16 pp.
- Snyder C.R.** 1992. Product scarcity by need for uniqueness interaction: A consumer catch-22 carousel? *Basic and Applied Social Psychology* 13(1): 9-24.
- Tian, K.T., W.O. Bearden and G.L Hunter.** 2001. Consumers' need for uniqueness: Scale development and validation. *Journal of Consumer Research* 28(1): 50-66.
- Toffler, A.** 1970. *Future shock.* Bantam Books. New York. NY. 223 pp.
- Tseng, M.M. and F.T. Piller.** 2003. *The customer centric enterprise - advances in mass customization and personalization.* Springer Verlag. New York. NY. 285 pp.
- U.S. Census Bureau.** 2006. www.census.gov/econ/census02/guide/INDRPT31.htm.
- U.S. Department of Commerce. International Trade Administration.** 2008. U.S. Imports for Consumption: Top 25 Import Destinations by Industry, available at: www.ita.doc.gov/td/ocg/imptab.htm.
- Wan, Z. and S.H Bullard.** 2008. Firm size and competitive advantage in the U.S. upholstered wood household furniture industry. *Forest Products Journal* 58(1/2): 91-96.