

The Effect of Mass Customization on Competitive Strategy

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Abstract

The frequent change of customers' needs and wants is bringing different challenges for manufacturing firms. As a result, mass customization as a production strategy has drawn attention from scholars in various fields. In an attempt to contribute to the existing stock of knowledge, this study investigated the effect of mass customization strategy on competitive strategy. In view of this four major mass customization strategies were considered: collaborative mass customization, adaptive mass customization, transparent mass customization & cosmetic mass customization to measure the effect of same on competitive strategy. A cross-sectional study with mixed research approach as well as a self-constructed ordered response questionnaire was used to collect data from 127 professional workers of the companies under study. Descriptive statistics and ordinal logistic regression model were used to analyze the results. The result showed negative effect of mass customization strategy on competitive strategy except for transparent mass customization which positively affected both cost leadership and differentiation strategies. The positive effect is stronger between transparent mass customization strategy and cost leadership strategy than between transparent mass customization strategy and differentiation strategy.

Keywords: Collaborative mass customization, Adaptive mass customization, Transparent mass customization, Cosmetic mass customization, Competitive strategy

I. Introduction

Davis, who coined the phrase mass customization in 1987 conceptualize it as "reaching same large number of customers in mass markets of the industrial economy, and simultaneously treating them individually as in the customized markets of pre-industrial economies" (Davis, 1987: 169). Pine (1993a) popularized this concept further and defined it as "providing tremendous variety and individual customization, at prices comparable to standard goods and services" to enable the production of products and service "with enough variety and customization that nearly everyone finds exactly what they want." Tseng and Jiao (2001) introduced a pragmatic but precise definition. Mass customization corresponds to "the technologies and systems to deliver goods and services that meet individual customers' needs with near mass production efficiency." But beyond these understandings, the term is used today for all kind of strategies connected with high variety, personalization, and flexible production (Piller, 2003b). From above we can understand lack of consensus on the conceptualization of mass customization and mass customization has become a buzzword. This is a major part of the problem as no clear definition and common understanding of the term have evolved. "Extant literature has not established good conceptual boundaries for mass customization", state Duray et al. (2000: 606) after an extensive literature review. However, there is an agreement on its definition mass customization will neither be an academic discipline nor a broad strategic concept. The field must not suffer from a definition debate. It needs a definition that can capture the uniqueness of mass customization with its own distinctive properties. There is of course a need to delimit the domain. Not all flexible manufacturing strategies or customer-orientated product design methodologies can be considered as mass customization.

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There is still more work needed to describe mass customization as a domain whose objectives, processes, performance, and governance are unique in respect to a firm's resource allocation approaches (Sheth and Parvatiyar, 2002). On the other hand, whenever we think about producing customized products the issue of cost to be incurred to achieve same and the extent of differentiation to meet customer needs and wants must be analyzed. We have to know cost as it is one of the factors that shape profit. The same is true in the application of mass customization strategy. The issue of differentiation should also take attention because to share substantial portion of market from competitors we have to have something unique with which we approach customers and lure them from other competitors. This study has investigated the effect of mass customization strategy on the competitive strategy (cost leadership and differentiation). As introduced by Gilmore and Pine (1997), there are four major mass customization strategies defined from the perspective of customer involvement in the manufacturing process. These are: collaborative mass customization, transparent mass customization, adaptive mass customization and cosmetic mass customization. Collaborative mass customization implies the early involvement of customers in the production process to specify product or service features according to customers' needs and wants. Transparent mass customization is producing products in accordance with customers needs after deep customer research without direct contact with customers or end users. Adaptive mass customization is when customers buy a standard product but they can modify it by themselves based on their needs. Cosmetic mass customization is when companies produce a standard product but present it differently to different customers. Moreover, today's business environment is characterized with extremely tight competition between companies, countries and even entire continents. Companies are forced to constantly reduce costs and outperform. Efficiency and cost-based competition has been highlighted and production is increasingly transferred to countries with low labour cost. At the same time, customers are becoming increasingly demanding placing pressure for better customer service. Competing only with price is risky if switching costs are low. To retain customer loyalty companies should serve customers by offering customized products and services at a reasonable price (Pine 1993). Companies are expected to pursue both efficiency and effectiveness at the same time. Combining these two aspects is difficult at best and requires reasonable trade-off between cost control and adding customer value. Mass customization, as 'ability to use of flexible processes and organizational structures to produce varied and often individually customized products and services at the price of standardized, mass-produced alternatives' (Hart 1996), is seen as a solution in this inconsistent situation.

A study on theory of mass customization, by Silveira et al. (2001) reveals, while there is little debate on theoretical aspects of concepts and objectives, there are several pending issues regarding its practical implementation. In contrast, Piller(2004) quotes a team of scholars - Duray et al. (2000: 606): "Extant literature has not established good conceptual boundaries for mass customization" – and argues that unless a common understanding is established, mass customization will become neither an academic discipline nor a broad strategic concept recognized by managers. Moreover, there are number of studies showing clear relationship between mass customization and manufacturing priorities such as cost and differentiation. Most of the existing research papers on mass customization are limited to providing an understanding of the content of mass customization strategies (such as organizational structures, process technologies, etc., that are best in a particular environment) and the process of mass customization strategies including the sub-strategy that an enterprise should select and how they can be implemented. In addition to the breadth & context gap with the previous studies there is also methodological problem. While conducting investigations by using categorical data, previous researchers have used methodologies which are appropriate for continuous data such as linear regression and spearman correlation while methods such as logistic regression were more appropriate to be used for categorical variable. To fill the methodological gap, the current study has used ordinal logistic regression model to analyze data. Brian S. et al (2006) investigated the impact of mass customization on the manufacturing trade- offs in U.K and the results indicate relationship between antecedent and the outcome variables remains confusing, underscoring the need for robust study. Therefore, this study investigated the effect of mass customization strategy on the competitive strategy with a robust methodology.

II. Research Approach and Methodology

Research Approach and Design

The research followed mixed research approach used cross-sectional and explanatory design as it enjoys the strength of both quantitative and qualitative approaches.

Sample Design

The area of interest for this study was leather industry. Addis Ababa Tannery S.C and Tikur Abay Shoe S.C were purposely selected companies for the study. Addis Ababa Tannery S.C. is the pioneer private owned company in the tanning sector of the country, Ethiopia. While Tikur Abay Shoe S.C is one of the highly competing shoe manufacturers both in domestic and international markets. The target population for this study is professional workers in these two companies. From these two companies the samples of professional workers from different departments were purposely drawn. The researcher has used professional workers as a sample frame in order to gather reliable data. Out of 400 total employees, Addis Ababa Tannery S.C has about 51 professional employees as of June, 2013 and all of them were selected. While out of 558 total employees, TikurAbay Shoe S.C has 76 total numbers of professional employees again as the data gained in June, 2013 shows. All of these employees were included in the sample since their number was manageable. In general, the total number of respondents for the research was 127 professional employees. All of them have responded to the questionnaire and returned to the researcher so that there is no missing value on the sample size. In general, non-probability sampling which is purposive sampling was used to draw the sample out of total population. The data was summarized, coded and analyzed using SPSS. Both descriptive and inferential statistics were used in the analysis.

Variables in the Study

In this research mass customization strategy was independent variable and it was decomposed into four major functional components; collaborative mass customization, adaptive mass customization, transparent mass customization and cosmetic mass customization. On the other hand, competitive strategy was taken as dependent variable and was operationalized as cost leadership and differentiation strategies.

III. Results and Discussions

Data gained through questionnaire and interview were analyzed and using both descriptive and inferential statistics.

Reliability Analysis

The summary of Cronbach's alpha measure of constructs used in this research is given in the following table (Table 3.2). Results of Table 1 indicate that all alpha values are greater than 0.70, meeting the minimum standard to claim data is reliable to be used for analysis.

Table 1: Reliability Statistics

S.NO	Constructs	Cronbach's alpha
1	Adaptive mass customization strategy	0.736
2	Cosmetic mass customization strategy	0.739
3	Collaborative mass customization strategy	0.847
4	Transparent mass customization strategy	0.718
5	Cost leadership strategy	0.704
6	Differentiation strategy	0.811

Descriptive Statistics

Regarding cost leadership, differentiation, adaptive mass customization and collaborative mass customization, respondents are neutral in their response. In case of cosmetic and transparent mass customizations respondents agree on their relevance to their context.

Table 2: Data Summary Statistics

	Cost Leadership	Differentiation	Adaptive mass customization	Cosmetic mass customization	Collaborative mass customization	Transparent mass customization
N Valid	127	127	127	127	127	127
Missing	0	0	0	0	0	0
Mean	2.99	2.88	3.24	3.58	3.26	3.61
Std. Deviation	.988	.981	1.029	1.224	.994	1.107

The responses given to each variable is summarized as follows by using bar chart:

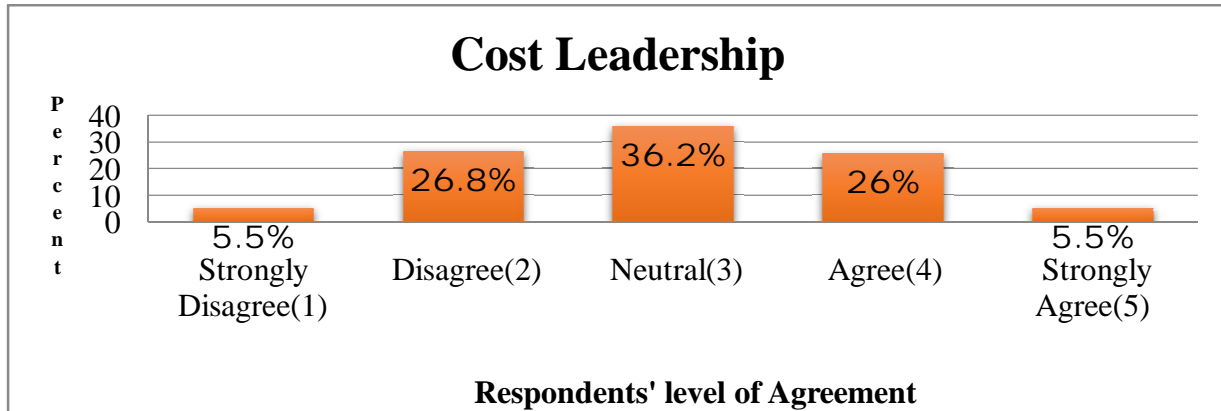


Figure 1: Responses for Cost Leadership Strategy

From Figure 1 it can be noted that 32% of respondents responded disagree with the application of cost leadership strategy in their company while about 32% of them agree. Therefore, we can say they have a divided view on the appropriateness of cost leadership strategy.

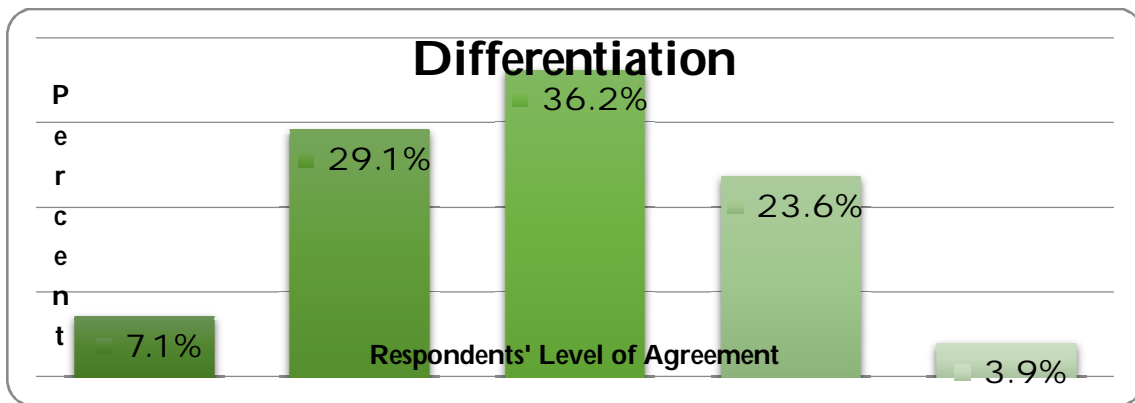


Figure 2: Responses for Differentiation Strategy

Figure 2 indicates 37% of respondents disagree on the practice of differentiation strategy while about 27% of them agree. Thus, given the results in Figure 1 and Figure 2 we can infer that differentiation strategy a relatively accepted strategy in the organizations under study.

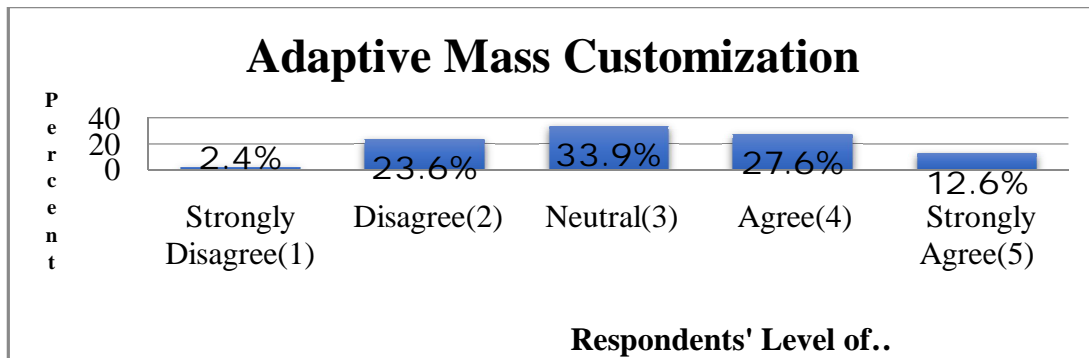


Figure 3: Responses for Adaptive Mass Customization

The figure above 26% reveals that 26% of disagree the use of adaptive mass customization as production and marketing strategy while about 40.2% of do. Therefore, it follows that adaptive mass customization is quite applied in the organization under study.

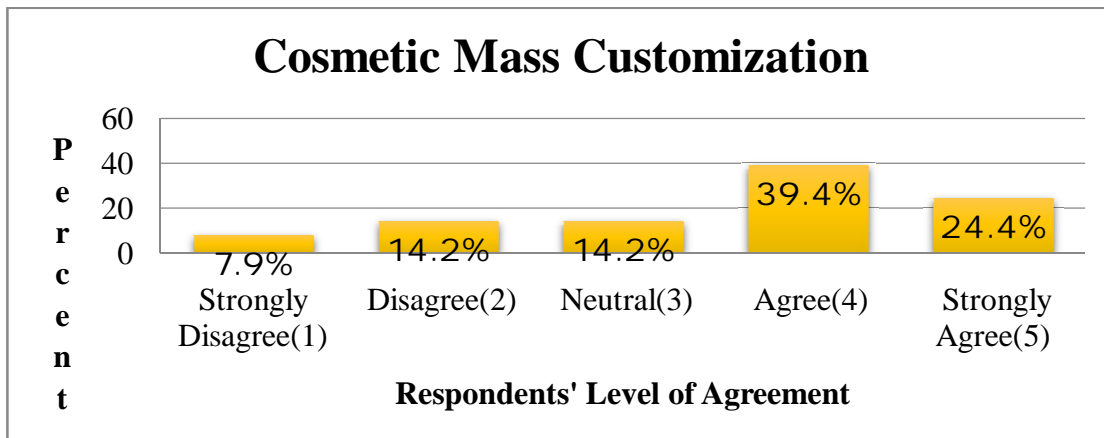


Figure 4: Responses given for Cosmetic Mass Customization

Figure 4 interestingly shows the wide application of cosmetic mass customization with nearly 64% endorsement while unlike the 40% approval for collaborative mass customization as indicated in Figure 5.

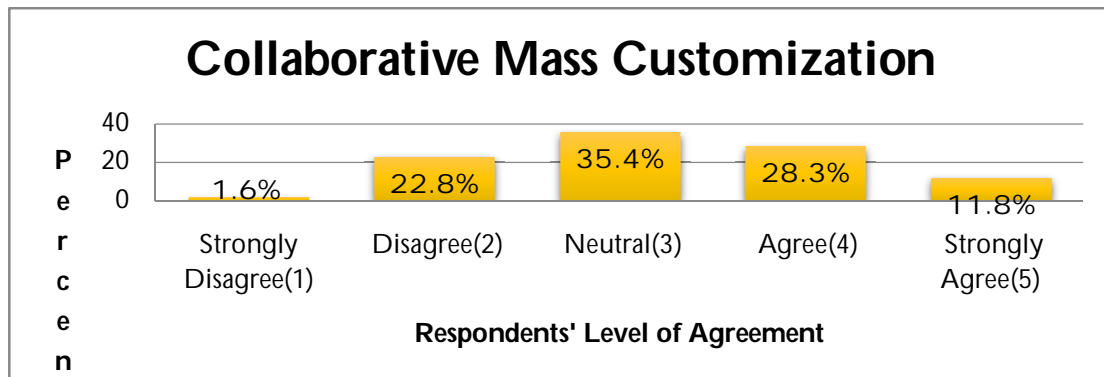


Figure 5: Responses Given for Collaborative Mass Customization

As presented in Figure 6, transparent mass customization is widely practiced with nearly 65% of respondent approval.

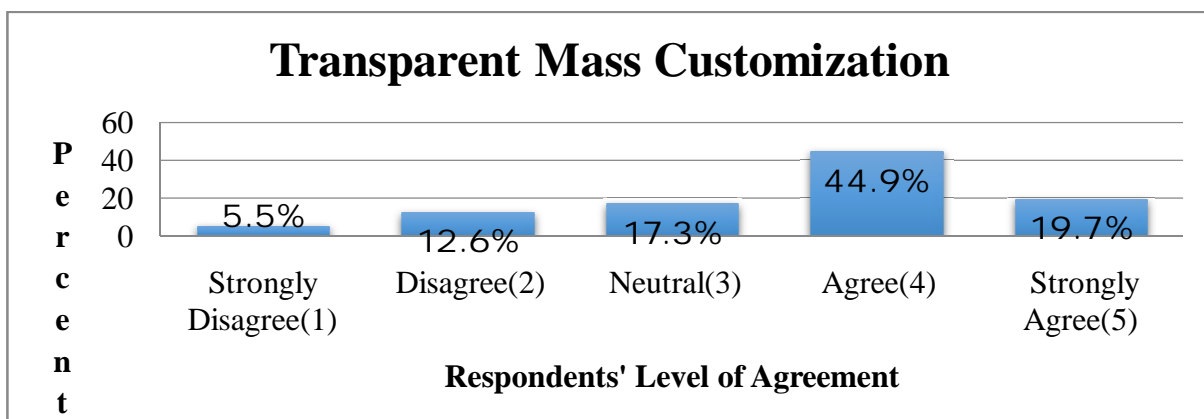


Figure 6: Responses given for Transparent Mass Customization

Inferential Statistics

Mass Customization Strategy and cost Leadership Strategy

Table 3: Parameter Estimates: Ordinal Logistic Regression (Model I)

		Estimate	Std. Error	Wald	df	Sig.	Odds Ratio
Threshold	[Cost leadership = 1]	-5.179	.949	29.790	1	.000	.
	[Cost leadership = 2]	-2.722	.839	10.533	1	.001	.
	[Cost leadership = 3]	-.981	.810	1.465	1	.226	.
	[Cost leadership = 4]	1.207	.843	2.051	1	.152	.
Location	[Adaptive MC=1]	-4.919	1.408	12.209	1	.000	0.007
	[Adaptive MC=2]	-1.420	.647	4.824	1	.028	0.242
	[Adaptive MC=3]	-1.651	.602	7.516	1	.006	0.192
	[Adaptive MC=4]	-1.987	.611	10.572	1	.001	0.137
	[Adaptive MC=5]	0 ^a	.	.	0	.	.
	[Cosmetic MC=1]	-1.390	.710	9.302	1	.003	0.249
	[Cosmetic MC=2]	-.302	.575	.277	1	.099*	0.739
	[Cosmetic MC=3]	-1.611	.582	10.102	1	.004	0.200
	[Cosmetic MC=4]	0.266	.441	8.364	1	.006	1.305
	[Cosmetic MC=5]	0 ^a	.	.	0	.	.
	[Collaborative MC=1]	-.009	1.461	.000	1	.995*	0.991
	[Collaborative MC=2]	-.518	.660	4.615	1	.033	0.596
	[Collaborative MC=3]	-.424	.665	.405	1	.054*	0.654
	[Collaborative MC=4]	-.202	.635	13.101	1	.000	0.817
	[Collaborative MC=5]	0 ^a	.	.	0	.	.
	[Transparent MC=1]	-.680	.843	.651	1	.420*	0.507
	[Transparent MC=2]	-1.210	.659	3.373	1	.006	0.298
[Transparent MC=3]	.239	.565	9.178	1	.003	1.270	
[Transparent MC=4]	.358	.464	11.593	1	.001	1.430	
[Transparent MC=5]	0 ^a	.	.	0	.	.	

Link function: Logit.

a. This parameter is set to zero because it is redundant.

* The ordinal value is statistically insignificant.

There is negative relationship between adaptive mass customization strategy and cost leadership strategy. All categorical outcomes of adaptive mass customization strategy are negatively related to the higher ordinal category of cost leadership strategy. A unit increase in the first category of adaptive mass customization strategy results in 0.993 (0.007 decrease) in the odds of being in the higher category of the ordinal outcome. In the same manner, a unit increase in the second category of adaptive mass customization strategy results in 0.758 (0.242 decrease) in the odds of being in the higher category of the ordinal outcome. On the other hand, a unit increase in the third category of adaptive mass customization strategy results in 0.808 (0.192 decrease) in the odds of being in the higher category of the ordinal outcome. Lastly, a unit increase in the fourth category of adaptive mass customization strategy results in 0.863 (0.137 decrease) in the odds of being in the higher category of the ordinal outcome. With regard to cosmetic mass customization strategy the first and third categories are negatively related to the higher ordinal category of cost leadership strategy while the fourth category is positively related and the second category is statistically insignificant predictor. Accordingly, a unit increase in the first category of cosmetic mass customization strategy results in 0.751 (0.249 decrease) in the odds of being in the higher category of the ordinal outcome. As well, a unit increase in the third category of cosmetic mass customization strategy results in 0.800 (0.200 decrease) in the odds of being in the higher category of the ordinal outcome. Finally, a unit increase in the fourth category of cosmetic mass customization strategy results in 0.305 (1.305 increase) in the odds of being in the higher category of the ordinal outcome. The second and fourth categories are negatively related to the higher ordinal category of cost leadership strategy while the first and third categories are statistically insignificant.

As shown in the table, a unit increase in the second category of collaborative mass customization strategy results in 0.404 (0.596 decrease) in the odds of being in the higher category of the ordinal outcome. On the other hand, a unit increase in the fourth category of collaborative mass customization strategy results in 0.183 (0.817 decrease) in the odds of being in the higher category of the ordinal outcome. Finally, the first category of transparent mass customization strategy is statistically insignificant while the rest are significant. The second category is negatively related to the higher ordinal category of cost leadership strategy while the third and fourth categories are positively related. As indicated, a unit increase in the second category of transparent mass customization strategy results in 0.702 (0.298 decrease) in the odds of being in the higher category of the ordinal outcome while a unit increase in the third category of transparent mass customization strategy results in 0.270 (1.270 increase) in the odds of being in the higher category of the ordinal outcome. Lastly, a unit increase in the fourth category of transparent mass customization strategy results in 0.430 (1.430 increase) in the odds of being in the higher category of the ordinal outcome.

Table 4: Goodness of Fit Test

	Chi-Square	Df	Sig.
Pearson	314.66	344	.87
Deviance	339.39	344	.56

Link function: Logit.

The check the fit of the model we can use goodness of fit test. And the popular measures for ordinal data are Pearson and Deviance measure and both of them follows chi-square distribution. The model is fit if p-value (sig.) is > 0.05. As we can see from Table 4 the p-values for both Pearson and Deviance are > 0.05 confirming the model is fit.

The Effect of Mass Customization Strategy on Differentiation Strategy

Table 5: Parameter Estimates: Ordinal Logistic Regression (Model II)

		Estimate	Std. Error	Wald	df	Sig.	Odds Ratio
Threshold	[Differentiation = 1]	-4.247	.907	21.907	1	.000	.
	[Differentiation = 2]	-1.992	.820	5.896	1	.015	.
	[Differentiation = 3]	-.217	.801	.074	1	.786	.
	[Differentiation = 4]	2.214	.903	6.016	1	.014	.
	[Differentiation = 5]	.217	.801	.074	1	.786	.
Location	[Adaptive MC=1]	.772	1.346	.329	1	.566*	2.165
	[Adaptive MC=2]	-.588	.636	9.853	1	.006	0.555
	[Adaptive MC=3]	-1.182	.593	3.971	1	.046	0.307
	[Adaptive MC=4]	-.566	.589	6.924	1	.007	0.568
	[Adaptive MC=5]	0 ^a	.	.	0	.	.
	[Cosmetic MC=1]	-.768	.711	11.168	1	.000	0.464
	[Cosmetic MC=2]	-1.046	.585	13.197	1	.004	0.351
	[Cosmetic MC=3]	-.330	.579	10.326	1	.008	0.719
	[Cosmetic MC=4]	.217	.442	12.242	1	.003	1.242
	[Cosmetic MC=5]	0 ^a	.	.	0	.	.
	[Collaborative MC=1]	.136	1.462	.009	1	.926*	1.146
	[Collaborative MC=2]	.313	.658	.226	1	.634*	3.717
	[Collaborative MC=3]	-.746	.666	12.255	1	.003	0.474
	[Collaborative MC=4]	-.494	.635	10.605	1	.007	0.610
	[Collaborative MC=5]	0 ^a	.	.	0	.	.
	[Transparent MC=1]	-.161	.834	11.037	1	.007	0.851
	[Transparent MC=2]	-1.484	.663	5.012	1	.025	0.227
	[Transparent MC=3]	.021	.566	20.001	1	.000	1.021
	[Transparent MC=4]	.059	.464	9.016	1	.009	1.061
	[Transparent MC=5]	0 ^a	.	.	0	.	.

Link function: Logit.

a. This parameter is set to zero because it is redundant.

* The ordinal value is statistically insignificant.

In the second model except for the first category other categories of adaptive mass customization strategy are negatively related to the higher ordinal category of differentiation strategy. As presented a unit increase in the second category of adaptive mass customization strategy results in 0.445 (0.555 decrease) in the odds of being in the higher category of the ordinal outcome while a unit increase in the third category of adaptive mass customization strategy results in 0.693 (0.307 decrease) in the odds of being in the higher category of the ordinal outcome. Finally, a unit increase in the fourth category of adaptive mass customization strategy results in 0.432 (0.568 decrease) in the odds of being in the higher category of the ordinal outcome. With regard to cosmetic mass customization strategy except for the fourth category, all other categories are negatively related to the higher ordinal category of differentiation strategy. the results show a unit increase in the first category of cosmetic mass customization strategy results in 0.536 (0.464 decrease) in the odds of being in the higher category of the ordinal outcome while a unit increase in the second category of cosmetic mass customization strategy results in 0.649 (0.351 decrease) in the odds of being in the higher category of the ordinal outcome. Moreover, a unit increase in the third category of cosmetic mass customization strategy results in 0.281 (0.719 decrease) in the odds of being in the higher category of the ordinal outcome. Finally, a unit increase in the fourth category of cosmetic mass customization strategy results in 0.242 (1.242 increase) in the odds of being in the higher category of the ordinal outcome. Referring the same table, the first two categories of collaborative mass customization strategy are statistically insignificant predictors while others are significant. As shown a unit increase in the third category of collaborative mass customization strategy results in 0.526 (0.474 decrease) in the odds of being in the higher category of the ordinal outcome. Similarly, a unit increase in the fourth category of collaborative mass customization strategy results in 0.390 (0.610 decrease) in the odds of being in the higher category of the ordinal outcome. In a similar fashion, the first two categories of transparent mass customization strategy are negatively related to the higher ordinal category of differentiation strategy while others are positively related. As it can be read from the odds ratio section, a unit increase in the first category of transparent mass customization strategy results in 0.149 (0.851 decrease) in the odds of being in the higher category of the ordinal outcome while a unit increase in the second category of transparent mass customization strategy results in 0.773 (0.227 decrease) in the odds of being in the higher category of the ordinal outcome. Moreover, a unit increase in the transparent mass customization strategy results in 0.021(1.021 increase) in the odds of being in the higher category of the ordinal outcome. Lastly, a unit increase in the fourth category of transparent mass customization strategy results in 0.061 (1.061 increase) in the odds of being in the higher category of the ordinal outcome.

The data gained through interview conducted with production managers from both companies has also strongly supported the above finding. The managers' response to the question about the type of mass customization strategy they use in their company was mostly related to transparent mass customization. The managers responded that their company is trying to use transparent mass customization together with competitive strategies such as cost leadership and differentiation. They have also argued that cost leadership is the dominant competitive strategy in their respective company. Generally, except the case for transparent mass customization strategy, almost for all other mass customization strategies, the result of this study showed the negative relationship between mass customization strategy and competitive strategy. In case of transparent mass customization strategy, the result showed positive link between the higher ordinal categories and the higher ordinal category of the response variables. This shows that as the agreement with the existence of transparent mass customization strategy increases the probability that it falls in the higher ordinal category of competitive strategy also increases. So with this exception, the finding on the current study contradicts with the finding of the research done in China by Qi, Yanan, et al (2008) that concluded the positive relationship between mass customization and competitive strategy. This may be due the difference in the methodology used and the context in which the research has been done. In case of methodology, the research done in China by Qi, Yanan, et al (2008) used a simultaneous equation econometric model while the current study used the ordinal logistic regression model given the nature of data collected. In addition to this, the variables used to operationalize mass customization are also different in the two studies. This difference in methodology may pose its own impact on the findings. The other important issue is the difference research context. Obviously, there is big economic and technology gap between China and Ethiopia. China is categorized under one of the developed countries having fast growing economy and infrastructure unlike Ethiopia a developing country with a small economy and slow technological development. As it is already discussed in the literature part of this paper, mass customization is the newly emerging production and marketing technology. Having this, the implementation of this technology in Ethiopia compared to developed countries such as China is obviously low.

This means, developing countries such as Ethiopia face more difficulty than developed countries in breaking the paradox between competitive strategy (cost leadership and differentiation) and mass customization. This could be the major reason why the findings in the two studies are different.

IV. Conclusion and Recommendation

Conclusion

This paper has analyzed the effect of mass customization strategy on competitive strategy in the case of Addis Ababa Tannery S.C. and Tikur Abay Shoe S.C. by using Ordinal logistic regression model. Depending on the findings of the study, the following conclusions have been reached.

- There is negative relationship between adaptive mass customization strategy and cost leadership strategy. This means that when the categorical outcome of adaptive mass customization strategy increases the probability that it falls in the higher ordinal category of response variable is very less.
- Except the fourth ordinal category, all other ordinal categories of cosmetic mass customization strategy are negatively related to cost leadership strategy. As the ordinal category of cosmetic mass customization increases the probability that it falls in the higher ordinal category of the response variable is less compared to the probability that it will not.
- Collaborative mass customization strategy is negatively related to cost leadership strategy. It is less probable that as collaborative mass customization strategy increases it will fall in the higher ordinal category of response variable.
- Except the second ordinal category, it can be concluded that as the ordinal category of transparent mass customization strategy increases it is more probable that it will fall in the higher category of cost leadership strategy (response variable).
- There is negative relationship between adaptive mass customization strategy and differentiation strategy. This means, as the ordinal category of adaptive mass customization increases it is less probable that it falls in the higher ordinal category of the response variable.
- Except the fourth category, for all other ordinal categories as the ordinal category of cosmetic mass customization strategy increases the probability that it falls in higher category of differentiation strategy decreases. All in all, it is concluded that, as the ordinal category of cosmetic mass customization strategy increases the probability that it falls in the higher category of response variable is less compared to that it will not.
- Looking into the significant predictors, collaborative mass customization strategy is negatively related to differentiation strategy. That means, an increase in the collaborative mass customization strategy results in less probability that it falls in the higher ordinal category of response variable.
- There is positive relationship between the higher ordinal categories of transparent mass customization strategy and differentiation strategy. Except for the second category, as the ordinal category of transparent mass customization strategy increases the probability that it falls in the higher ordinal category of differentiation strategy also increases. It can be therefore concluded that, an increase in transparent mass customization strategy results in more probability that it will fall in the higher ordinal category of differentiation strategy.
- Finally, even though the linkage between most of mass customization strategies and competitive strategies is negative, the existing positive linkage is stronger between transparent mass customization strategy and cost leadership strategy than between transparent mass customization strategy and differentiation strategy.

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