

LINKING MARKET ORIENTATION TO MASS CUSTOMIZATION CAPABILITY: AN ORGANIZATIONAL LEARNING PERSPECTIVE

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ABSTRACT

Mass customization (MC) capability enables firms to provide large volumes of customized products within short periods and at reasonably low costs comparable to mass production. Different from mass producers, manufacturers that customize their products may face a more complex and dynamic market environment and thus need to be consistently responsive to customer needs, competition and market dynamics. However, the existing literature offers little insights regarding the influence of market orientation on the development of MC capability. This study empirically tests and substantiates the effects of the three components of market orientation, namely customer orientation, competitor orientation and inter-functional coordination, on MC capability, through the organizational learning initiatives (including customer knowledge utilization and multifunctional employee training) as intervening factors.

Key words: Mass customization capability; Market orientation; Organizational learning

INTRODUCTION

The increasing demand for product variety and customization has attracted firms to pursue a fascinating production and/or marketing strategy, mass customization [20][37]. Mass customization (MC) involves both customization issues and cost issues since customized

products must be designed to customer specifications in a cost-effective manner [8][15]. MC brings firms two challenges, the ability to design a system capable of collecting and processing highly uncertain and varied product information and the ability to transform and assemble materials to produce a corresponding range of product variety [28]. Different from mass producers, manufacturers that customize their products may face a more complex and dynamic market environment and thus need to be consistently responsive to customer needs, competition and market dynamics. MC has been seen as a systemic idea involving all aspects of a full-circle including product sale, development, production and delivery [7].

From a marketing perspective, firms need to understand MC from the view of the market and that of the customer, as the market demand for customization and customers' willingness to pay for the extra benefits will determine firms' gains through MC [36]. From an operations management perspective, to realize mass customization firms need to provide large volumes of customized products or services within short periods and at reasonably low costs comparable to mass production [24]. In other words, the marketing scholars are more concerned with how to collect and process the highly varied and uncertain information of market demand and customer requirements for customization, whereas the operations management scholars are more concerned with how to accommodate customer requirements effectively through the operations process.

Market orientation is a concept proposed and operationalized by marketing scholars [19][33], which focuses on the market and customer information acquisition and dissemination and the coordinated efforts of customer value creation. For manufacturers that customize their products, market orientation may enable them to understand customer needs and market demand for customization and share the customer and market knowledge among different functional units and organizational layers. However, the existing literature offers little insights regarding the influence of market orientation proposed by marketing scholars on the development of MC capability proposed by operations management scholars. In addition to market orientation, organizational learning activities are also suggested as a prerequisite for the development of MC capability [15][37]. Knowledge and learning have played an important role in enabling manufacturers to adapt to a changing environment [30].

This study attempts to investigate the joint effect of market orientation activities and organizational learning activities on MC capability. Specifically, we will try to understand the influences of the three components of market orientation (i.e., customer orientation, competitor orientation and inter-functional coordination) on MC capability, through the organizational learning initiatives (including customer knowledge utilization and training) as intervening factors. We conduct this research using data collected from 204 Chinese manufacturers. This study will enrich our understanding of MC by providing an actionable set of practices which help firms to build up MC capability through the market orientation-organizational learning-MC capability chain.

In the rest of this paper, we will review the literature on market orientation, organizational learning and MC capability, and propose the conceptual model and hypotheses in Section 2. Section 3 and Section 4 present research methods, analyses and results. Section 5 discusses the results and their managerial implications.

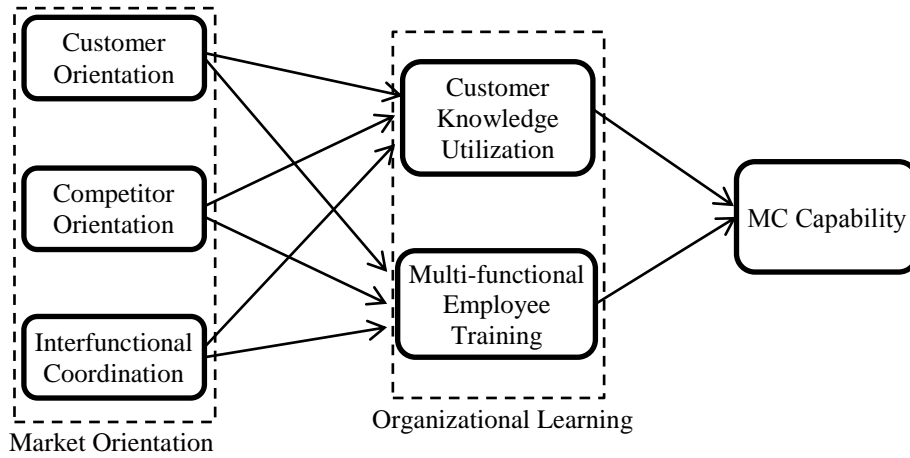
CONCEPTUAL MODEL AND HYPOTHESES

The market concept dates back to 1950s and represents the philosophical foundation of a market orientation [16]. Kohli and Jaworski [19] conceptualized market orientation as the organizational-wide generation, dissemination, and responsiveness to market intelligence. In Narver and Slater's [33] framework, market orientation was conceptualized and operationalized as consisting of three behavioral components, namely customer orientation, competitor orientation, and inter-functional coordination. The first two components focus on acquiring information about the customers and competitors and the third one focuses on the coordination of efforts in creating superior value for the target customers. Berthon et al. [4] suggested that the notion of market orientation is to always put the customers first. Matear et al. [26] suggested that market orientation contributes to cost advantages, relational advantages including satisfaction and loyalty. Atuahene-Gima [2] found that market orientation significantly contributes to innovation projects' performance. For manufacturers that wish to customize their products, market orientation may enable them to understand customer needs and market demand for customization and share the customer and market knowledge among different functional units and organizational layers.

Organizational learning activities/routines are also suggested as a prerequisite for the development of MC capability [15][37]. Huang, Kristal and Schroeder [15] suggested that both internal learning (training of multifunctional employees and incorporation of employee suggestions) and external learning (inter-organizational learning through problem solving) can lead to MC capability. Organizational routines are defined as "organizational processes that utilize clusters of resources to achieve desired outcomes" [35], and they are deemed as the foundations for firms' capability building [9][13][39] and the key to competitive advantage [6][14]. We have proposed two learning initiatives as organizational routines that may facilitate the processing of the information acquired to build up firms' MC capability, customer knowledge utilization (CKU) and multi-functional employee training (MET). CKU represents a firm's explicit effort to learn continuously and to capture past experience [46], while MET represents a cross-training routine that aims to increase the common knowledge among individual employees [13] and to help employees assimilate new ideas [41].

Based on the above theory and literature, we propose a conceptual model to investigate the effects of market orientation and organizational learning initiatives on MC capability (see FIGURE 1).

FIGURE 1. Conceptual Model



Hypotheses

Customer orientation is the sufficient understanding of the target customers to be able to create value for them continuously [33]. In order to respond to customer needs, firms need the information about the needs and preferences of customers, and they will also take customer needs and requirements into consideration when designing new products. Customer-oriented firms will always put the customers first [4], hence the knowledge learned about customers when they engage in understanding and fulfilling customer needs will be more likely to be utilized in operations and shared among different departments.

Further, a customer orientation requires that a firm to understand the customer's entire value chain, not only as it is today but also as it will evolve over time [1][33]. But this is often a difficult task which may require the employees of the firm to be knowledgeable about the operations in many aspects of the entire value chain. Given each employee has his/her own expertise and cannot be an expert in everything, multi-functional training would be necessary as it helps increase the common knowledge among individual employees [13] and helps employees assimilate new ideas.

Therefore, we hypothesize that

H1: Customer orientation is positively related to customer knowledge utilization.

H2: Customer orientation is positively related to multi-functional employee training.

Competitor orientation means that “a seller understands the short-term strength and weaknesses and long-term capabilities and strategies of both the key current and the key potential competitors” [33] and it mainly focuses on acquiring information about competitors. Similar as customer orientation, the focus on competitor may increase the utilization of customer knowledge as much information about competitors is related with their products and customers' preferences towards them. The focus on competitors will also influence multi-functional employee training when it is the routine of the competitors, but this effect may vary across

different industries or contexts. In general, we expect that there is a positive relationship between competitor orientation and multi-functional employee training.

Therefore, we hypothesize that

H3: Competitor orientation is positively related to customer knowledge utilization.

H4: Competitor orientation is positively related to multi-functional employee training.

The above two components of market orientation focus on acquiring information from outside of the firm whereas the third component, interfunctional coordination, internally focuses on the coordination of company resources in creating superior value for the target customers [33]. Interfunctional coordination fosters communication, collaboration, cohesiveness, trust, and commitment between different functional areas [3]. Both the company-wide utilization of customer knowledge and multi-functional employee training will be facilitated by the coordinated efforts of different functional departments. Therefore, we hypothesize that

H5: Interfunctional coordination is positively related to customer knowledge utilization.

H6: Interfunctional coordination is positively related to multi-functional employee training.

From an organizational learning perspective, CKU and MET can represent a firm's efforts in external and internal learning separately. CKU enables firms to apply knowledge learned from fulfilling customer needs, whereas MET enables individual employees to have multiple functional skills [15]. These two action-based learning routines can have significant impacts on the firm's capability [17].

CKU is essential for capability building for MC because companies can acquire, assimilate and apply the knowledge derived directly from past customer orders. The use of past customer knowledge can help in increasing the flexibility and agility in responding to the customer needs. In addition, the costs incurred in searching for new knowledge can be greatly reduced by extending the customer knowledge to other product lines. Pine, Victor and Boynton [38] argued that learning is a prerequisite for the development of MC capability. MET, as a major internal learning routine, has been also found an positive effect on the building of MC capability [15].

Therefore, we hypothesize that

H7: Customer knowledge utilization is positively related to MC capability.

H8: Multi-functional employee training is positively related to MC capability.

METHODOLOGY

Sample and Data Collection

The unit of analysis was the manufacturing company. We surveyed Chinese manufacturers in the Pearl River Delta (PRD) area of China, which started in 1978 as the first region to be developed following China's new "open-door policy". It then quickly became a major destination for foreign investment. The PRD has become one of the main drivers of the Chinese economy and a

platform for international trade. Its geographic closeness and historical connection with Hong Kong initially helped integrate the PRD with the global economy.

As Li, Rao, Ragu-Nathan and Ragu-Nathan [21] pointed out, most management executives were not willing to take part in such a survey due to lack of time and/or interest. In order to obtain a sufficiently large sample and response rate to guarantee the quality of our research, we implemented some of Frohlich [12] tactics, such as the leverage method, i.e. to ask other professors or institutes with many social connections for help in distributing and collecting the questionnaires. Sample firms were selected because of their connections with the Industrial Research Institute of the university attended by one of the authors. To increase the response rate, we first contacted the companies by phone and invited them to participate in the research project. The questionnaire was distributed either by mail or in electronic form, as requested by the informant during the preliminary phone contact. As concluded by Boyer, Olson, Calantone and Jackson [5], as long as the questionnaire was developed properly, both methods of distribution should have similar reliability and internal consistency.

A total of 745 questionnaires were distributed during the two-month survey period at the end of 2009, and 250 questionnaires were returned, of which 204 were usable. The final response rate was 27.4%. That exceeded the minimum requirement of 20% defined by Malhotra and Grover [25] to guarantee the quality of empirical research. Such sample numbers also met MacCallum et al.'s [23] requirement for the statistical power of 0.80. About 88% of the informants had the title of general manager or functional manager. The remaining 12% of respondents were in charge of the daily operations in design, marketing, or manufacturing. From the pilot study of more than 10 manufacturers in PRD, we were confident that this group of informants was competent to provide the information requested in the survey. The profile of company respondents is presented in TABLE 1. It indicates that the respondents represent a variety of industries.

TABLE 1 Profile of Respondents

Industry	N	%	Industry	N	%
Appliances	26	12.7%	Food & Beverage	12	5.9%
Nonmetallic mineral products	26	12.7%	Rubber & Plastics	10	4.9%
Fabricated metal products	23	11.3%	Textiles & Apparel	8	3.9%
Automotive or parts	20	9.8%	Papers & Printing	4	2.0%
Chemicals	20	9.9%	Pharmaceutical	4	2.0%
Industrial machinery and equipments	19	9.3%	Toys	3	1.5%
Computer & Electronics	17	8.3%	Miscellaneous	12	5.9%

We carried out t-tests to assess response bias between tradition mailing and electronic form and between early and late responses. They showed no significant differences. Therefore, we combined the responses collected by different means for further analysis.

Since there was a single respondent for each company, the common method bias was assessed by the means of a confirmatory factor analysis to Harman's Single-factor Model [10][22]. The model's fit indices were worse ($\chi^2=1071.45$, d.f.=230, $\chi^2/\text{d.f.}=4.66$, SRMR=0.093, RMSEA=0.134, CFI=0.669, NNFI=0.636). Such indices suggested that a single factor model was not acceptable, thus the common method bias was small and should not be a serious concern. Based on the above bias analysis, we were confident to proceed with these samples.

Measures

Similar to previous studies in operations management [15][42], all the measures in this study were perceptual measures. According to Ketokivi and Schroeder [18], perceptual measure is viable, providing rigorous examinations of validity are performed. This research employed a seven-point Likert scale to items to capture the perceptions of participants toward their firms, with the higher value indicating stronger effect or better performance.

Some scales in this study were drawn from earlier English language literature. In order to distribute our survey in mainland China, all such scales were translated into Chinese. The translation was verified following the steps advised by Flynn, Huo and Zhao [10], i.e. the Chinese translation was initially reviewed by an operations management professor, and then the Chinese translation was translated back into English to check against the original English version for language discrepancy. The translation was finally confirmed when the results showed the translation was acceptable.

Both the independent variables and the dependent variable have been measured by previous studies. To measure the dependent variable, MC Capability, we adopted the scales in Tu, Vonderembse and Ragu-Nathan [40], whose reliability and validity had been confirmed by other researchers [15][42]. The measurement items for the independent variables, namely the three components of market orientation, were adapted from Narver and Slater [33], Jaworski and Kohli [16], and Matsuno and Mentzer [27]. Due to language difference, slight modifications were made to the wording in the Chinese translation. Such modifications were carefully evaluated with academics and practitioners during the development of the questionnaire, and no ambiguity was found.

Two organizational learning routines have been included, CKU and MET. Researchers have defined knowledge utilization in different ways. Menon and Varadarajan [29] defined knowledge utilization as having three facets: to guide behavior, to help decision-making and to cause change in psychological areas. Customer knowledge was one important kind of market information which embedded the customer preference, which could improve the compatibility of new products to meet the customer needs and generate competitive advantage [43][45]. Drawing on existing literature, we developed four items to measure CKU. The items were developed to measure the extent to which the firm utilized the knowledge gained from the customer to customize the product, and the impact that such utilization had on the firm in terms of the product and the whole organization. The training of multiple functional employees has been suggested a major internal learning initiative [15] and the measurements items for MET were borrowed from their study.

All the items were measured on a seven-point Likert scale and respondents were asked to indicate the degree to which they agree to the statements, with a 1 indicating strongly disagree and a 7 for indicating strongly agree.

ANALYSIS AND RESULTS

Reliability and Validity Tests

Content validity had been established through the literature search and review, and through careful and critical evaluation of constructs with academics and practitioners when we were developing the questionnaire.

Reliability was verified by inspecting the internal consistency of constructs. We measured the internal consistency of constructs using composite reliability, resulting in 0.91 for MC Capability, 0.84 for customer orientation, 0.74 for competitor orientation, 0.82 for interfunctional coordination, 0.85 for CKU and 0.82 for MET. Such results indicated that internal consistency values for all constructs were good.

Convergent validity were evaluated by confirmatory factor analysis (CFA), using the measurement model, as suggested by O'Leary-Kelly and Vokurka [34]. The covariance among the constructs was estimated freely. The CFA results are shown in TABLE 2. The model's fit indices meet all respective criteria ($\chi^2=400.15$, d.f.=215, $\chi^2/\text{d.f.}=1.86$, SRMR=0.067, RMSEA=0.065, CFI=0.927, NNFI=0.914). These indices indicated the measurement model was acceptable. Furthermore, all loading of items was at least 0.57 and significant at 0.001 level, indicating good convergent validity.

We assessed discriminant validity by comparing squared root of average variance extracted (AVE) of each construct to its correlations with other constructs, and Table 3 shows that no correlation was greater than squared root of AVE, indicating discriminant validity of each construct.

TABLE 2 Measurement Model

Construct/Measurement Items		Factor Loading
Mass Customization Capability		
MC1	We can customize products on a large scale.	0.758
MC2	We can add product variety without increasing cost.	0.744
MC3	We can set up for a different product at low cost.	0.714
MC4	We can customize products while maintaining a large volume.	0.867
MC5	We can add product variety without sacrificing product quality.	0.860
MC6	We can respond to customization requirements quickly.	0.786
Customer Orientation		
CuO1	We regularly seek to understand customer needs and requirements	0.788
CuO2	We systematically analyze customer needs when designing new products	0.864
CuO3	Information about customer orders will be updated and accessed easily.	0.722
Competitor Orientation		

CoO1	We actively analyze and discuss about the strengths and weaknesses of competitors' products	0.827
CoO2	We respond quickly to competitors' strategies	0.692
CoO3	We may hire senior employees from competitors and promote them to important positions	0.574

Interfunctional Coordination

IC1	Our management board recognizes all suggestions for product and process improvement	0.792
IC2	Many useful suggestions are implemented in our company.	0.818
IC3	Multiple functions/departments are often involved in joint meetings to discuss about improvements on products or processes.	0.746
IC4	Our company maintains close communication with our customers, including exchange of visits.	0.565

Customer Knowledge Utilization

KU1	The knowledge we learned from customization has had a beneficial impact on subsequent orders.	0.698
KU2	The knowledge we learned in fulfilling customization has become a valuable resource for the whole organization.	0.874
KU3	Our R&D team has been successful in disseminating the “lessons learned” from fulfilling customization.	0.883
KU4	The results from each customization will have far-reaching effects throughout the organization.	0.553

Multi-functional Employee Training

PI1	Employees are cross-trained at this plant so that they can fill in for others if necessary.	0.735
PI2	Employees receive training to perform multiple tasks.	0.877
PI3	We often arrange internal workshops for employees.	0.702

TABLE 3 Correlations and Construct Validity

	CuO	CoO	IC	CKU	MET	MCC
CuO	0.63 ^a (0.79) ^b					
CoO	0.51 ^c	0.50 (0.71)				
IC	0.65	0.53	0.54 (0.74)			
CKU	0.65	0.54	0.60	0.58 (0.76)		
MET	0.52	0.44	0.59	0.46	0.60 (0.78)	
MCC	0.64	0.49	0.57	0.61	0.49	0.62 (0.79)

Note: CuO - Customer Orientation; CoO - Competitor Orientation; IC- Interfunctional Coordination; CKU - Customer Knowledge Utilization; MET - Multifunctional Employee Training; MCC- Mass customization Capability

^a Average variance extracted (AVE) is on the diagonal.

^b Squared root of AVE is on the diagonal in parentheses.

^c Correlation

Hypothesis Test Using Structural Equation Modeling (SEM)

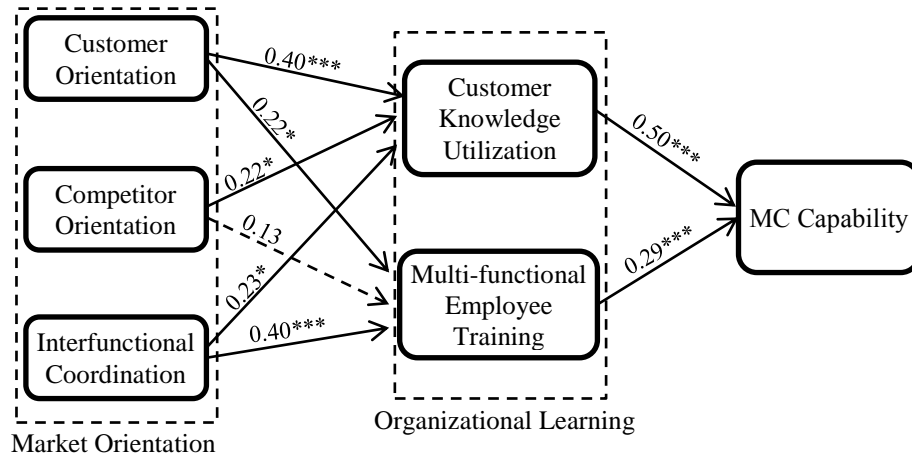
We tested the hypotheses using SEM. SEM estimates were generated using AMOS 20 with the maximum likelihood estimation method. The fit indices for our model are: Chi-square = 417.22 with Degrees of Freedom = 219, RMSEA = 0.067, NNFI = 0.910, CFI = 0.922, Standardized RMR = 0.074, which are better than the commonly accepted threshold values. The results of hypotheses tests are shown in TABLE 4 and summarized in FIGURE 2.

TABLE 4 Results of Hypothesis Testing

Path in the structural model	Path coefficient	Outcome
Customer Orientation → CKU (H1)	0.40***	Supported
Customer Orientation → MET (H2)	0.22*	Supported
Competitor Orientation → CKU (H3)	0.22*	Supported
Competitor Orientation → MET (H4)	0.13	Rejected
Interfunctional Coordination → CKU (H5)	0.23*	Supported
Interfunctional Coordination → MET (H6)	0.40***	Supported
CKU → Delivery performance (H7)	0.50***	Supported
MET → Financial performance (H8)	0.29***	Supported

Note: * $p < .05$, ** $p < .01$, *** $p < .001$.

FIGURE 2 Conceptual Model



*** $p < 0.001$ ** $p < 0.01$ * $p < 0.05$.

DISCUSSION AND IMPLICATIONS

The key objective of this study was to examine how market orientation contributes to the achievement of mass customization capability with respect to customer knowledge utilization and multi-functional employee training as the key functions. Specifically, this study provides empirical evidence that the three components of market orientation facilitate customer knowledge utilization, which in turn positively influences mass customization capability. Empirical evidence also supports that both customer orientation and interfunctional coordination will facilitate multi-functional employee training, which also positively influences mass

customization capability. The proposed positive relationship between competitor orientation and multi-functional employee training (H4) was not supported. This might be due to that the information acquired about competitors is more likely to be related to the external and tangible aspects such as product features, technologies, or marketing strategies, yet less likely to be related to internal and intangible aspects such as employee training and other internal organizational routines.

Given the findings, this study offers three key contributions. First, this study extends the current understanding of MC capability by employing the capability building theory to identify the relationships among practices, routines, and capabilities [11][35][44]. The existing literature offers little insights regarding the influence of market orientation on the development of MC capability. This study contributes to both MC literature and MC literature by linking them together through a practices-routines-capabilities chain, and the marketing orientation practices have been found positively related to organizational routines (CKU and MET), which in turn help to build up MC capability.

Second, the findings of this study indicate the effectiveness of combining the marketing perspective and operations management perspective in the context of MC. The marketing perspective suggests firms need to understand MC from the view of the market and customer whereas the operations management perspective contends that the realization of MC requires firms to focus on processes and routines which enable them to provide large volumes of customized products within short periods and at reasonably low costs. Hence, by employing the marketing practices to acquire information about the customer need and market environment and then processing and assimilating the information with organizational routines, a firm will enhance its MC capability, which enables it to manufacture on demand and thus reduce the distribution inventories, gain flexibility, and get access to stick information [36].

Third, the findings indicate that the practices and routines included in this study are not equally influential in building up MC capability. Specifically, this study provides empirical evidence that all three components of market orientation facilitate customer knowledge utilization, but only customer orientation and interfunctional coordination will facilitate multi-functional employee training. Our further analyses also indicated that the differences of the respective weights were significant.

Although this research has addressed the need to advance the existing literature by exploring the antecedents to MC capability [15] and made contributions to the implementation of MC, there are some limitations in this study that provide opportunities for future work. First of all, this paper uses a cross-sectional design to investigate the relationship between market orientation, organizational learning initiatives, and MC capability. However, the capability building should be a process that develops over time, thus a longitudinal design would be an area of fruitful research. Second, this paper only focuses on the popular marketing practices and learning routines, but manufacturers that customize their products may face a situation with many complexities and dynamics, which means future studies could explore other antecedents to MC capability and study the joint effects of those factors as well as their contingencies. Finally, this paper presents some interesting findings about the antecedents of MC capability based on the a sample from manufacturing firms, it would be interesting to see future research using data from

some service industries, which may have different characteristics of offerings in the context of mass customization.

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