

ENHANCING MANUFACTURING FLEXIBILITY FOR FINANCIAL PERFORMANCE: THE MEDIATING ROLE OF CULTURAL COMPATIBILITY

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ABSTRACT

Manufacturing flexibility (MF) becomes an important requirement for an effective response to market uncertainty. However, the outcomes of this relationship on financial performance often show mixed results. Identifying factors facilitating this relationship is crucial for maintaining financial performance. Drawing from social cognitive capital and uncertainty reduction theories, this study argues that cultural compatibility (CC) can mediate this relationship. A structural equation analysis of 150 Vietnamese manufacturers strongly supports this hypothesis. This study showed that a strong association exists between a manufacturing firm's CC and its MF and financial performances. Besides, CC acts as a mediator to enhance MF on financial performance. Manufacturers can leverage MF to capture more market share and profits when developing a good working culture with their supply chain partners. For supply chain managers, these findings indicate that a strategy for achieving supply chain-based performance requires a dual-pronged approach that aligns manufacturers' operations with extensive organizational capabilities with external partners.

Keywords: Flexibility, Culture, Compatibility, Supply chain management, Manufacturing

1. INTRODUCTION

In a highly competitive and globally reached environment, managers need to develop manufacturing flexibility (MF) that emphasize on flexible volume, variety of products and accelerated response times (Chan, Ngai, & Moon, 2017; Wei, Song, & Wang, 2017; Yang, 2014). However, the bottom line measures such as financial performance reflecting market share, profits have mixed results (Chan et al, 2017). In a complex network of supply chain members, the differences in partners' business vision and cultures can affect the extent and quality of the collaboration (Hu, Zhu, Wang, & Koren, 2008), thus impact on performance. However, previous

literature has much interest in dissimilarities among members, but far less has been discussed what compatibility can bring to the whole network. Cultural compatibility reflects organizational alignment, learning and adaptation (Kim, Suresh, & Kocabasoglu-Hillmer, 2013) that may offer important opportunities for the supply chain members to be flexible in dealing with the complexity of environmental changes. Volkswagen Brazil created compatible cultural platforms with their suppliers (e.g. from joint workshops on quality to unified working uniforms). With higher proximities to and similar cultural practices with their suppliers, the car manufacturer enhance delivery flexibility and overall costs were down 15 – 25% (Marx, Zilbovicius, & Sergio Salerno, 1997).

Vietnam becomes an additional manufacturing hub next to China due to USA-China trade conflicts (Pencea, 2019). More than 10,000 foreign companies, including big global players such as Samsung, Microsoft, Intel, and LG (Shira, 2018). A deeper understanding of the financial outcomes associated with MF allows managers to better decide when, how much, and where to invest resources to enhance competitiveness, especially for SMEs in developing countries (Meirovich, 2015; Nguyen & Aoyama, 2015). The findings of this study make contributions to the on-going theoretical and practical debates on manufacturing flexibility by taking cultural perspectives and manufacturing flexibility. The paper is set out as follows. The first section provides a theoretical background from cultural alignment and MF literature. Next, the study provides the development of the research model and hypotheses. The study design section describes methods and findings. The last section offers interpretations, contributions and limitations.

2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Manufacturing Flexibility (MF) and Financial Performance (FIN)

Literature in manufacturing flexibility (Chan et al., 2017; Thomé, Scavarda, Pires, Ceryno, & Klingebiel, 2014; Williams, Roh, Tokar, & Swink, 2013) indicated several flexibility measurements, including new product flexibility, volume flexibility, variety flexibility, and product modification. Many researchers show that inter-organizational linkage is an important factor influencing a firm's flexibility and over-all performance (Sáenz, Knoppen, & Tachizawa, 2018; Wei et al., 2017). MF also links to marketing and operations strategy when dealing with growth strategies such as venturing into new markets. MF facilitates introducing a new product flexibility (Fantazy & Salem, 2016) interacts with a marketing strategy in which it enables an organization to respond effectively and efficiently to change product mix, customization of product and introducing new products. Companies increase their market shares by gaining new customers to develop a competitive advantage. The new product flexibility and volume flexibility should be taken into consideration, as the need for a firm to meet the customers' expectations, since they are continuing to change at an increasing rate (Wei et al., 2017). This study proposes:

H1. A manufacturer's MF exerts a direct positive effect on the financial performance

2.2 Cultural Compatibility and MF

Cultural compatibility, under social capital theory, is defined by shared languages and a joint understanding of basic concepts and assumptions (Bolino, Turnley, & Bloodgood, 2002). It thus facilitates joint understanding (Tsai & Ghoshal, 1998), free communication and exchange of resources based on common objectives and interests. On the other hand, MF is dependent on the way information is shared, the collaboration, coordinated flows and joint activities (Bowersox, Closs, & Cooper, 2002). Congruence theory contributes to the understanding of how firms can

promote MF to enhance adaptation, alignment, integration and performance of partnering organizations. Congruency refers to “the degree to which the needs, demands, goals, objectives, and/or structure of one component are consistent with the demands, goals, objectives, and/or structure of another component” (Nadler & Tushman, 1980). Without a common understanding between these partners (e.g. quality and technological concepts), or lack of business vision and top management support, MF may not deliver the expected results. Thus, this study proposes:

H2: MF is positively related to the Cultural compatibility

2.3 Mediating roles of CC between MF and Financial Performance

This study argues that the effect of MF on FIN will be greater where CC can be emphasized. This indirect effect exists due to collaboration, reduced complexity, uncertainty and knowledge exchange that captures from different partners to facilitate MF. Indeed, when supply chain members can enhance the cultural compatibility, opportunism mitigation created reduces the transaction costs in negotiating, monitoring, and safeguarding involved different parties (Meirovich, 2015; Rajaguru & Matanda, 2013). The uncertainty reduction theory (URT) highlights that similarities between persons reduce uncertainty (Berger, 2015). Relationships with high comparability are more likely to reach relationship objectives due to social capital created, which reduces conflict in the relationship by parties finding ways to resolve issues. At the same time, this enables collaboration by reducing complexity in the relationship (Adamides, Karacapilidis, Pylarinou, & Koumanakos, 2008). When opportunistic behavior is restrained through a compatible and flexible supply chain, coordination cost and uncertainty between exchange parties are also reduced (Joshi & Stump, 2015), which results in improved manufacturers’ performance. The MF demands significant interaction within suppliers and buyers to reconfigure their internal manufacturing processes.

H3: The positive relationship between MF and FIN will be stronger when firms develop higher level of CC

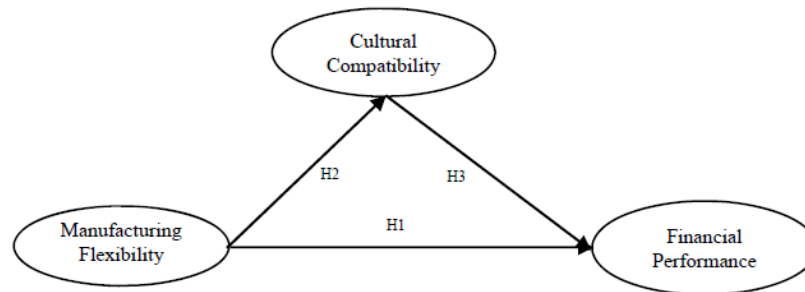


Figure 1. Research model- manufacturing flexibility

3. RESEARCH METHODOLOGY

3.1 The study designs

This questionnaire was developed through the Global Manufacturing Research Group (GMRG) project conducted in 2014. The plant is chosen as the unit of analysis to avoid problems related to business units with multiple plants operating in different ways. The initial population sample consisted of 825 firms, which were drawn from databases provided by Dun & Bradstreet and the Vietnam supply chain association. A rigorous process of translation and back-translation was employed to ensure the consistent use of the scales. A pilot study was conducted with seven executives in the annual meeting of the Vietnam supply chain association in 2014. The study has made initial phone calls to around 450 companies to identify informants and their direct contact, email addresses. On average, the research team used 3 phone calls per company to complete a questionnaire. Overall 150 complete and useable responses were received, which represent a response rate of 13%. The sample consists primarily of small and medium-sized companies (80%). Included in the survey are more than eighteen manufacturing industries, which represent food processing, garment and textile, chemical, furniture, metal products, semiconductor, electrical machinery, precision instrument, automotive, and other transport industries.

3.2 Construct development and reliability, convergent validity and discriminant validity tests

The items used to measure this study's variables are derived from a thorough literature review. The model includes MF construct, which focuses on firms' ability to add product variety without sacrificing quality and cost, capability for responding quickly to customization requirements, the high volume of products (Wu, Choi, & Rungtusanatham, 2010). The concept CC represents the extent this plant and its major external partners have a common understanding about what activities are best for our relationship, shared objectives and visions, common language and codes and similar behavioral rules and norms (Choi, Wu, Ellram, & Koka, 2002; Ketokivi & Jokinen, 2006). Financial performance measures the market share, revenue and profit (Choi et al., 2002). Responses were measured in a seven-point Likert Scale, where a value of 1 indicates "to no extent" or "unimportant" and a value of 7 indicates "completely" or "very important".

First, the internal consistency reliability test revealed that Cronbach's alphas ranged from 0.712 (Manufacturing complexity) to 0.812 (Financial performance), which exceeds the threshold value 0.60 (Hair, Black, Babin, & Anderson, 2010). Table 1 provides constructs' mean of measurement items, standard deviation, loading and p values. Second, the CFA measurement models confirmed the presence of five unique constructs, their CFA details are presented in Table 2. The model fit indices were $\chi^2/df = 1.89$, which fell in the recommended range of 1 to 3. Further, the RMSEA value of 0.04 suggests a good model fit. The results in Table 2 showed that all of the AVE square root values were higher than the correlations, again indicating acceptable discriminant validity. Besides, both MSV and ASV values are smaller than AVE (Hair et al., 2010).

Table 1. Constructs means and measures

Research construct's measurements	Estimate	Mean	SD
Manufacturing flexibility ($\alpha=0.781$)			
We can add product variety without sacrificing quality	0.768	5.17	1.34
We can easily add significant product variety without increasing cost	0.713	4.64	1.33
Our capability for responding quickly to customization requirements is very high	0.749	5.18	1.22
Our plant produces a high volume of products	0.614	4.96	1.48
Cultural compatibility ($\alpha=0.812$)			
This plant and its major external partners have ...			
common understanding about what activities are best for our relationship	0.768	5.09	1.18
shared objectives and visions	0.757	4.85	1.21
common language and codes (e.g. special vocabulary, abbreviation, and technical)	0.724	4.89	1.25
similar behavioral rules and norms	0.614	4.89	1.05
Financial performance ($\alpha=0.827$)			
Total sales	0.825	4.61	1.60
Profitability	0.890	4.33	1.38
Market share	0.724	4.53	1.21

$\chi^2 = 294.261$; $df = 155$; $\chi^2/df = 1.89$; CFI = 0.979; NFI = 0.957; RFI = 0.941; RMSEA = 0.04. Note: RMSEA=Root Mean Square Error of Approximation, GFI=Goodness-of-fit Index, CFI=Comparative Fit Index. BOM = Bill of Materials;

Table 2. Correlation matrix and construct measures

Research constructs	CR	AVE	MSV	ASV	[1]	[2]	[3]
[1] Cultural compatibility (CC)	0.809	0.516	0.489	0.224	0.718		
[2] Manufacturing flexibility (MF)	0.805	0.509	0.489	0.201	0.699**	0.713	
[3] Financial performance (FIN)	0.856	0.666	0.314	0.188	0.563**	0.357**	0.816

Note: Diagonal elements in **bold** are the square root of the average variance extracted (AVE) between the constructs and their measures. Off diagonal elements are correlations between constructs. MSV – Max shared variance and ASV – Average shared variance. For discriminate validity, AVE should be greater than off-diagonal elements. *** Correlation is significant at 0.001. ** at 0.01. * at 0.05

3.3 Hypothesis testing

A structural equation model was used to test the hypotheses. Table 3 shows the fit indices and displays the directions and significances of the hypothesized relationships among the constructs. The results rejected H1, which confirmed the negative impacts of MF on FIN. The results supported H2, confirming the strong relationships between MF, CC and FIN. This study tested for such mediation effects using a structural equation model with bootstrapping procedures (Mallinckrodt, Abraham, Wei, & Russell, 2006). Table 4 indicated the outcomes, which show the direct effects with and without a mediator. The test of the indirect effects between MF $\rightarrow$ CC $\rightarrow$ FIN was significant. Thus, H3 was accepted with full mediation effect of CC on MF and FIN.

Table 3. Results of the hypothesis testing

Research impacts	Estimate	S.E.	C.R.	P	Hypotheses
MF ---> FIN	-0.185	0.193	-0.959	0.338	H1-Rejected
MF ---> CC	0.685	0.109	6.305	***	H2-Accepted
CC ---> FIN	0.870	0.222	3.920	***	H3-Accepted

Note: $\chi^2 = 183.17$; $df = 108$; $\chi^2/df = 1.69$; CFI = 0.932; NFI = 0.854; IFI = 0.934; RMSEA = 0.079. *** Correlation is significant at 0.001.

Table 4 Results of the mediating effects of CC

Mediator - Cultural compatibility	Direct with mediator	Indirect	Mediation
Manufacturing flexibility to Financial perf.	-0.185(n/s)	0.164(0.001)	Full

Note: p value in brackets.

4. DISCUSSION AND IMPLICATION

This study examined the linkages between MF and FIN, which has been studied with mixed results. Drawing upon the social cognitive capital and uncertainty reduction view, this study confirmed that cultural compatibility (CC), exerted a mediating to enhance financial performance. MF has a strong relationship with CC, where collaborative process alignment between customers and manufacturers can reconfigure the existing processes to capture more market share and profits.

In H1, this study argued that a positive impact of MF on the FIN. Interestingly, the results indicate that MF does not directly impact on financial performance. This might be due to several reasons. Firstly, the flexibility strategy often requires more complicated decisions (Dreyer, 2004). Su, Yang, and Yang (2012) suggested that the interaction between flexibility strategy and power distance hurts performance. That could be relevant as this study refers to the Vietnamese context, where consultative decision-making is not always a better choice (Nguyen & Aoyama, 2013). Secondly, previous literature also indicated cases, where the marketing function did not take advantage of the resulting flexibility opportunities, thus may result in manufacturing flexibility having a limited impact on a firm's performance (Anderson, Cleveland, & Schroeder, 1989). In the Vietnamese context, these manufacturers (mainly SMEs about 75%) had a low marketing capability (Lee & Linda, 2016) or lack of strong connection between business and operations strategies. Thirdly, these manufacturers may pursue a defensive strategy, thus they tend to seek very little manufacturing flexibility. Majority of Vietnamese manufacturers follow export-led growth strategy (Marco & Antonio, 2015), where dependence on a foreign order leads to a reactive strategy tends to be reactive and emphasize the implementation of cost reduction and efficiency improvement methods.

This study also investigated a facilitating factor, the CC, to MF that can help improve the effects of MF on performance. The findings from this current study show that CC can serve as facilitators to enhance manufacturing flexibility that can deliver financial performance. The results theoretically explain and empirically demonstrate how inter-organizational compatibility can be aligned with manufacturing flexibility to enhance performance. Previous studies (He, Lai, Sun, & Chen, 2014; Thomé et al, 2014) suggest that, in general, effective deployment of organizational changes into supply chains is associated with improved flexibility and performance. Besides, CC promotes shared business visions and cultures, which can be associated with a higher level of supply chain visibility and integration (Wei et al, 2017; Williams et al, 2013). Previous studies confirmed positive relationships between visibility, supply chain flexibility and performance (Sáenz et al, 2018; Williams et al, 2013). The results extend these by explaining why some firms are successful at such alignment whereas others are not. CC provides an effective foundation for supply chain partners to exchange their business visions, share a common language and culture. In return, these compatible organizations can respond quickly to customer and market requirements, such as volume flexibility (Chu, Chang, & Huang, 2012), production variety flexibility (Patel, Terjesen, & Li, 2012), delivery flexibility (Chang & Huang, 2012) and to enhance financial positioning.

Given difference in cultural practices between the investors, the manufacturers, local suppliers in this emerging manufacturing industry, the findings of this study make contributions to the on-going theoretical and practical debates on manufacturing flexibility and financial performance by taking cultural perspectives. The findings confirmed that the process of cultural alignments among supply chain members exerts a mediating effect to enhance financial performance, such as revenue and market share. These enhanced collaborative processes between customers and manufacturers can reconfigure the existing processes to capture more market share and profits. This is important findings, as supply chains become more complex reflecting the highly dynamic market demands of consumers, and the realities of competing in a global economy.

5. LIMITATIONS AND FUTURE RESEARCH

The results of this study are subject to several limitations. First, the study collected the data from a variety of industries, the generalizability of this study's findings to other types of organizations is still limited. Hence, future researchers may replicate and extend this study to sectors other than manufacturing or to comparing between several industries/sectors. Second, the bottom-line results from MF can be extended to social and environmental measures (Wiengarten, Ahmed, Longoni, Pagell, & Fynes, 2017) to enhance sustainable performance.

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