FACTORS INFLUENCING DEVELOPMENT OF MANUFACTURING STRATEGY AND THEIR IMPACT ON FIRM'S PERFORMANCE

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Abstract: *Strongly integrated with a firm's business strategy, manufacturing strategy is considered to be an important component of overall corporate strategy However, none of the existing studies examines the comprehensive set of variables that could influence the development of manufacturing strategy. Also, there is a paucity of research that studies the impact of manufacturing strategy on performance. This study identifies, incorporates and empirically tests all the relevant factors taken into consideration by the firms while developing manufacturing strategy and subsequently examines the impact of influencing factors and manufacturing strategy on firm's performance. This paper presents preliminary findings from a sample of 194 Canadian manufacturing concerns, top executives and managers. It was found that the influencing factors – innovation orientation, environmental dynamism, and manufacturing capability exhibit positive and statistically significant association with manufacturing strategy. The manufacturing strategy positively impacts both financial and non-financial performance. Market orientation and innovation orientation impact only financial performance while manufacturing capability impacts non-financial performance.*

Keywords :
Manufacturing Strategy, Resource Orientation, Market Orientation, Innovation Orientation, Environmental Dynamism, Manufacturing Capability, Organizational Performance

Manufacturing strategy is defined as "the competencies that a firm develops around the operations function" (Amoako-Gyampah, 2003, p 577). These competencies are meant to achieve competitive advantage (Anderson et al., 1989). Skinner (1969) defined manufacturing strategy as the "set of manufacturing system design aspects managers (must) decide on" (Cagliano, Acur, and Boer, 2005).

There has been a steady stream of research in this area focusing mainly on two aspects of manufacturing strategy: content and process (Dangayach and Deshmukh, 2001). The content literature focuses mainly on the significance of the manufacturing function for improving product competitiveness through setting and accomplishing long-term goals in terms of cost, quality, flexibility, delivery, reliability and innovation etc. The process of manufacturing strategy addresses the method used to develop and implement the manufacturing strategy (Hurreeram, 2007). Process relates to the development and implementation of strategic plan (O'Regan and Ghobadian, 2002) or "how these decisions and actions come about" (Pun, 2005).

Skinner (1969) and Hill (1985) emphasize the importance of the process of manufacturing strategy formation and implementation. However, most of manufacturing strategy literature is focused on the content aspects. Dangayach and Deshmukh (2001) conducted an extensive review of the manufacturing strategy literature, a total of 260 articles from 31 refereed international journals and conferences, and divided the entire literature into content and process-related issues. They concluded that process-related

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articles accounted for less than 10 percent of the literature, indicating that research on manufacturing strategy formulation is limited.

This paper addresses this gap in the literature. The objective of this paper is to empirically test a comprehensive list of variables that can influence development of manufacturing strategy and subsequently examine the impact of influencing variables on firm's performance.

LITERATURE REVIEW

This section reviews the literature related to all the variables empirically tested in this study.

Factors Influencing Manufacturing Strategy

There are two opposing views with respect to the development of manufacturing strategy – market-based view and resource-based view. The market-based view, which takes an external perspective, regards manufacturing strategy as a derivative of business strategy and emphasizes the consideration of market requirements at the manufacturing level. Market orientation is defined as "the organizational culture that most effectively and efficiently creates the necessary behaviours for the creation of superior value for buyers and thus, continuous superior performance for the business" (Narver and Slater, 1990, p.21). Market orientation aims to keep the firm close to its competitors. The focus of resource orientation is internal while market orientation is external (Paladino, 2007). The external environment comprising economic, technological, political, environmental and social issues is relevant but the real emphasis is on the industry.

Though the literature points to the increasing use of resource orientation influencing the manufacturing strategy, market orientation is still considered vital, since knowledge of customer requirements and competitors' actions are necessary to compete effectively in today's highly competitive environment where customers are exposed to numerous product choices. It is posited, therefore, that market orientation will also have an impact on the development of manufacturing strategy.

The resource-based view, on the other hand, takes an internal perspective and considers a firm's internal assets, resources and capabilities to be the main determinant of the manufacturing strategy (Thun, 2008). The resource-based view of the firm stresses that its performance is driven by its resources. The objective of the firm is to develop and deploy a bundle of resources which are difficult for the competitors to imitate (Paladino, 2007). Bates et al. (2001) highlight the significance of developing manufacturing resources and capabilities by stating that the "manufacturing process is a result of a firm's long-term commitment to build manufacturing capabilities and resources."

In addition to the market and resource based view, this study posits that there are three other variables that influence the development of manufacturing strategy – manufacturing capability, innovation orientation and environmental dynamism.

The manufacturing strategy literature borrowed the term 'capabilities' from

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The dimensions of manufacturing strategy – cost, quality, flexibility, dependability and so on, are firmly dependent on capabilities of the firm, it is posited that manufacturing capability will have a direct impact on manufacturing strategy.

business strategy literature focused on resource-based view of the firm (Corbett and Claridge, 2002). Manufacturing capability is defined as "the ability of a production system to compete on basic dimensions such as cost, flexibility and time" (Sarmientom et al., 2007, p. 368). Bates et al. (2001) emphasize the role of resources in building manufacturing capability which, aligned with business strategy, serves as a source of competitive advantage. Since the dimensions of manufacturing strategy – cost, quality, flexibility, dependability and so on, are firmly dependent on capabilities of the firm, it is posited that manufacturing capability will have a direct impact on manufacturing strategy.

Innovation is defined as "the search for and the discovery, development, improvement, adoption, and commercialization of new processes, products, organizational structures and procedures" (Dosi, 1988, p. 1122). A number of authors have stated that, in the face of rising competition, investments in innovation are likely to give firms competitive advantage in global and international markets (Brown and Eisenhardt, 1995; Conner, 1991). Akman and Yilmaz (2008) consider innovation as a vital success factor in a highly competitive, global economy. Qian, Qi, and Yu-cheng (2008) also emphasize that an increasingly competitive world and highly demanding customers make it imperative for firms to develop strategies based on innovation. Innovation seems to have a significant impact on a firm's productivity and on the overall performance of the organization (Yamina et al., 1997).

Innovation, for the purpose of this study, is limited to technological innovation. An innovation orientation is a characteristic of the corporate culture and is normally considered as a component of a broader innovation culture. For this study it is defined as "openness to new types of technologies, the ability to search for these technologies proactively, being able to recognize them early on, and reacting to them appropriately, as well as an attempt to use these technologies purposefully for innovation to develop technologically first-class products that are superior to those of the competitors" (Herrmann, Gassmann, and Eisert, 2007).

Management decisions are guided by the overall corporate strategy. It is imperative for firms to continually monitor their environment for changes in buyer preferences, rapid environmental changes, and increased competition. Such changes could make the firm's current positioning outdated and/or offer new growth opportunities. Scanning of the environment provides an effective basis for linking corporate strategy to marketing strategy (Cravens, 1975).

There is no consensus amongst the researchers as to the best way to conceptualize and measure external environment. However, environmental dynamism is one of the most frequently used measures of external environment. It is defined as the "rate of environmental change and unpredictability of that change" (Bierly and Daly, 2007, p. 498). This change can be caused by the entrance of new competitors, changes in customer preferences and variations in the firm's

technological capabilities (Bierly and Daly, 2007).

Manufacturing Strategy Dimensions

Competitive priorities of manufacturing strategy, also called competitive strategy or manufacturing strategy in the literature, are defined as the dimensions on which the firm competes in the marketplace (Hayes and Wheelwright, 1984). A number of studies in the literature propose manufacturing strategy dimensions. Fang and Wang (2006), however, conducted a systematic and extensive review of the literature to develop taxonomy of manufacturing strategy dimensions from the literature. They reviewed thirty-seven studies over a period of twenty years. They found cost, quality, reliability and flexibility to be the most frequently used dimensions. Since their analysis was limited to 1995, the most recent studies, starting from 1996 onward, were scanned to identify the manufacturing strategy dimensions currently being proposed in the literature. Based on extensive literature review the dimensions of manufacturing strategy were classified as quality, cost, flexibility, delivery and innovation.

Organizational Performance

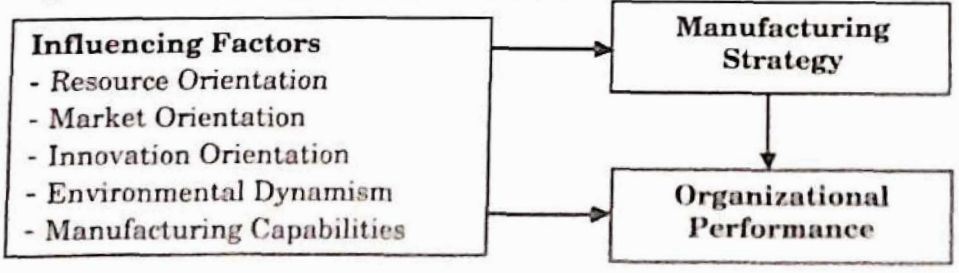
Organizational performance is a widely used construct and a number of studies in varying disciplines measure organizational performance for different objectives. There are two types of measures, objective and subjective, that are used in the literature to capture organizational performance. Objective measures are more tangible but are constrained to financial data only and thus are limited in scope. The standard measures of financial performance - revenue and profitability growth - are used by most of the studies. Subjective measures, on the other hand, are less concrete but provide a different and richer perspective about organizational effectiveness, especially in comparison to the competitors. The subjective measures, however, vary depending upon the precise objective of the study. It is recommended that researchers should consider multiple indicators of the performance to get a more comprehensive assessment of the performance (Allen et al., 2008). The organizational performance measure for this study comprise financial - market share, sales growth, return on investment, overall profit and profit growth and non-financial, customer satisfaction and customer loyalty.

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CONCEPTUAL FRAMEWORK AND HYPOTHESES

The variables discussed in the literature review are posited to have a relationship as depicted in the conceptual framework given below:

Figure 1: Influencing Factors, Manufacturing Strategy and Firm's Performance



The following hypotheses are posited to test the relationship between the variables:

Impact of Influencing Factors on Manufacturing Strategy

H1a: Resource orientation will have an impact on manufacturing strategy.

H1b: Market orientation will have an impact on manufacturing strategy.

H1c: Innovation orientation will have an impact on manufacturing strategy.

H1d: Environmental dynamism will have an impact on manufacturing strategy.

H1e: Manufacturing capability will have an impact on manufacturing strategy.

Impact of Influencing Factors on Organizational Performance

H2a: Resource orientation will have an impact on firm's financial and non-financial performance.

H2b: Market orientation will have an impact on firm's financial and non-financial performance.

H2c: Innovation orientation will have an impact on firm's financial and non-financial performance.

H2d: Environmental dynamism will have an impact on firm's financial and non-financial performance.

H2e: Manufacturing capability will have an impact on firm's financial and non-financial performance. Impact of Manufacturing Strategy on Organizational Performance

H3: Manufacturing strategy will have an impact on firm's financial and non-financial performance.

DATA COLLECTION AND ANALYSIS

The structured questionnaire was sent to 2,500 manufacturing firms in Canada. The data was collected from top decision makers in two sub sectors - NAICS code 334 (Computer and electronic product sub sector) and NAICS Code 335 (Electrical equipment, appliance and component sub sector). The findings of this study are based on 194 usable questionnaires, a response rate of almost 8%.

The data was checked for normality, independence and linearity. Non-response as well as common method bias were tested and do not seem to have any impact on the results. Since measures used in the study were validated in the literature, Principal Component Analysis (PCA) was used as a data reduction technique which resulted in removal of 11 items with loading of less than 0.5. The factor loading ranged from 0.53 to 0.92, comparable to figures obtained in many management studies. In addition the explained variance ranged from 0.68 to .82 which exceeds the 0.5 benchmark (Fornell and Larcker, 1981). The reliability of measures was assessed with Cronbach's Alpha which ranged from 0.60 to 0.93, with most of them well above 0.70. Both convergent and discriminant validity were established along with content validity. The regression analysis was used to test the hypotheses.

TESTS OF HYPOTHESES

The regression analysis with manufacturing strategy as dependent variables and influencing factors as independent variables was used to test the first set of hypotheses. The findings of the analysis are given below:

Table 1: The Impact of Influencing Factors on Manufacturing Strategy

Independent Variables	Dependent Variable Manufacturing Strategy
Resource orientation	0.047
Market orientation	0.043
Innovation Orientation	0.154 **
Environmental Dynamism	0.102 *
Manufacturing Capability	0.559 ***
R Square	0.475
F Statistics	32.814 ***

Standardized regression coefficients are shown

*** p< .01, ** p< .05, * p< .10

Despite vigorous support from theory, both resource and market orientation are not significant predictors of manufacturing strategy. However, all three remaining variables – innovation orientation, environmental dynamism and manufacturing capability are statistically significant predictors of manufacturing strategy development. With a beta coefficient of 0.559 at p value of .01, manufacturing capability is the strongest predictor of manufacturing strategy. Hypotheses H1c, H1d and H1e are fully supported but H1a and H1b are not supported.

The second set of hypotheses was tested with financial and non-financial performance as dependent variable and influencing factors as independent variables. The results are given below in Table 2.

Table 2: The Impact of Influencing Factors on Firm's Performance

Independent Variables	Dependent Variable	
	Financial Performance	Non - Financial Performance
Resource orientation	0.044	0.058
Market orientation	0.204 **	0.123
Innovation Orientation	0.239 ***	0.103
Environmental Dynamism	-0.090	-0.022
Manufacturing Capability	0.015	0.179 **
R Square	0.162	0.119
F Statistics	7.019 ***	7.896 ***

Standardized regression coefficients are shown

*** p< .01, ** p< .05, * p< .10

Despite vigorous support from theory, both resource and market orientation are not significant predictors of manufacturing strategy.development

Market orientation and innovation orientation are the only two variables which have positive and statistically significant impact on financial performance. Manufacturing capability, however, has a positive and statistically significant impact on non-financial performance. Hypotheses H2a and H2d are not supported but hypotheses H1b, H1d and H1e are partially supported.

Another regression analysis was done to test the impact of manufacturing strategy (independent variable) on firm's performance (dependent variable). The findings are given below in Table 3.

Table 3:The Impact of Manufacturing Strategy on Firm's Performance

Independent Variable	Dependent Variables	
	Financial Performance	Non - Financial Performance
Manufacturing Strategy	0.281 ***	.263 ***
R Square	0.079	0.069
F Statistics	16.488 ***	14.282 ***

Standardized regression coefficients are shown
*** p< .01, ** p< .05, * p< .10

Manufacturing capability, however, is a significant predictor of manufacturing strategy in our study. The concept of manufacturing capabilities originates from resource-based orientation of the firm.

Manufacturing strategy has a positive and statistically significant impact on both financial and non-financial performance of the firm thus supporting hypothesis H3.

DISCUSSION

Resource and market orientation have been theoretically posited to influence the development of manufacturing strategy. The debate in the literature, however, clearly favours resource orientation over market orientation as the main premise for the development of manufacturing strategy. We did not find statistical evidence for either of them. Manufacturing capability, however, is a significant predictor of manufacturing strategy in our study. The concept of manufacturing capabilities originates from resource-based orientation of the firm. Therefore, it could be deduced that resource orientation is more likely to impact development of manufacturing strategy than market orientation.

Innovation orientation appears to be an important factor since it has a positively significant impact on manufacturing strategy. We did not find any study in operations management literature which had used innovation orientation as a factor which can influence manufacturing strategy. Thus, this is a very significant finding for manufacturing strategy.

Environmental dynamism, one of the factors of external environment, has been used extensively in business strategy literature. However, its use in the operations management literature has been limited. In our study it was found to have a statistically significant impact on manufacturing strategy.

There are a number of studies in the literature which examine the relationship between environmental dynamism and manufacturing strategy, though findings have been mixed. Ward et al. (1995) collected data from

manufacturing firms in Singapore to investigate relationship between business environment, operations strategy and performance. It was found that environmental dynamism leads to more emphasis on flexibility, delivery and quality. Ward and Duray (2000) conducted a study of manufacturing firms in USA and did not find any impact of environmental dynamism on manufacturing strategy though it was found to influence differentiation business strategy which in turn affected quality, delivery and flexibility dimensions of manufacturing strategy.

In the literature resource and market orientation have empirically been tested in relation to firm's manufacturing performance rather than financial and non-financial performance. For example, Paiva, Roth and Fensterseifer (2008) found that cross functional integration in manufacturing was positively related to resource orientation. Schroeder, Bates and Junttila (2002) found a positive relationship between resources and manufacturing performance. Thun (2008) grouped the plants into high and lower performers based on cluster analysis. The market-based group shows better performance in terms of product mix and volume flexibility while resource-based group shows high performance in inventory turnover and cycle time.

Our study found that resource orientation has no bearing on firm's performance but market orientation and innovation orientation lead to positive financial performance. Manufacturing capability, however, positively impacts non-financial performance. This is also a very significant finding since market orientation does not influence manufacturing strategy directly but overall it has a positive impact on performance, thus highlighting the importance of market orientation.

The importance of developing an appropriate manufacturing strategy is emphasized by the fact that it has a positive and statistically significant impact on both financial and non-financial performance of the firm.

THEORETICAL AND MANAGERIAL IMPLICATIONS

This is the first study which looks at comprehensive set of variables that can influence the development of manufacturing strategy as well as firm's performance. No other study has empirically tested more than two antecedents of manufacturing strategy within a single framework. This study also introduces a new construct, innovation orientation, which has not been previously deliberated in manufacturing strategy literature. Innovation orientation has a significant impact on both manufacturing strategy as well as firm's financial performance.

By identifying the factors taken into consideration by managers while developing manufacturing strategies, it leads to better understanding of what specific factors must by considered be the firms to develop successful manufacturing strategies. It will thus provide practical guidance to companies which wish to implement manufacturing strategies for their firms.

The importance of developing an appropriate manufacturing strategy is emphasized by the fact that it has a positive and statistically significant impact on both financial and non-financial performance of the firm.

LIMITATIONS

Single key informants were used as respondents in this study. Also single-item indicators were used to measure manufacturing strategy. Future studies could use multiple respondents in the firm and develop multi-item scales to measure manufacturing strategy. Since this is the first study to use the constructs of manufacturing capability and manufacturing strategy within the same model, the nature of relationship between the two constructs needs to be further explored with quantitative and qualitative research.

Single key informants were used as respondents in this study. Also single-item indicators were used to measure manufacturing strategy. Future studies could use multiple respondents in the firm and develop multi-item scales to measure manufacturing strategy.

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