

Effects of Organizational Culture and Learning on Manufacturing Strategy Selection: An Empirical Study

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The literature has focused on manufacturing strategy issues from diverse perspectives, most of which are concentrated on hard issues such as marketing and R&D activities. However, relatively few articles have explored manufacturing strategy with soft issues, particularly organizational factors. This study attempts to clarify how firms select their manufacturing strategies based on their organization cultures and organization learning. Based on the related literature, this study infers hypotheses regarding the relationship between organizational cultures, organizational learning, and manufacturing strategies. This study conducts a survey by sampling firms of representative industries to examine the hypotheses. The empirical evidence from 103 respondents confirms the impact of organizational culture and learning on manufacturing strategies. This study provides a new insight on manufacturing strategy issues.

1. Introduction

The business and economic environment has dramatically changed more so than ever before, forcing firms to innovate in the ways they operate the business and to learn more or to fail. Innovation and innovativeness have become the critical factors for firms to survive. Studies in the literature tend to examine innovation-related issues by linking them with “hard” subjects, such as the relationships between marketing activities, R&D, and a firm’s manufacturing strategy selection. Relatively few of them have examined links with “soft” subjects.

Recent studies have started to clarify innovation issues from organizational perspectives. Senge (1990), for instance, argues that building up a learning-based organization with continuous learning and improvement is one of the best ways to create competitive advantages. He further argues that organizational learning influences many aspects of an organization including manufacturing activities. Adam and Swamidass (1989) relate some organizational factors, such as scale, organizational structure, and member of organizations, to manufacturing strategy. Nonaka (1994) selects some world-level firms, such as 3M and Xerox, to explore how an organization creates its knowledge for manufacturing and innovation purposes. Studying manufacturing from the organizational issue side is a new and alternative direction in the near future.

Given that previous research on the above issues is limited and the results of these studies seem inconclusive, this study attempts to explore the effects of organizational factors -specifically, organizational cultures and organizational learning - on the

innovation strategy of manufacturing activities. The study provides a new insight toward manufacturing functions and improving the knowledge on manufacturing innovation. This study not only infers the relationship between the above issues, but also provides some suggestions for empirical research and practical utilization.

2. Literature Review

2.1 Manufacturing Strategy Studies

Since Skinner (1969), manufacturing strategy issues have received attention in the production/operations and strategic management fields. Schroeder, Anderson, and Cleveland (1986) defined manufacturing strategy as a long-term program of manufacturing functions to match the overall strategy of the firm. Some studies explored manufacturing strategy from the diversified perspectives of strategic planning. Sweeney (1991) treated manufacturing strategy as a specific field of strategic management. Cerwin (1993) summarized diversified disciplines and defined manufacturing strategy as a decision-making procedure whereby a firm leads its manufacturing activities based on a strategic perspective. Thus, manufacturing strategy has become a new topic in the field of strategic management.

It is quite appropriate to divide previous studies on manufacturing strategy into two categories; content perspective and process perspective. The former explores the context of manufacturing strategies, and the latter studies how manufacturing strategies are analyzed and formed. This study focuses on the content perspective

The literature on the content perspective of manufacturing strategy suggests that manufacturing strategies are determined by four manufacturing competitive priorities: (1) cost, (2) quality, (3) flexibility, and (4) reliability. Table 1 lists some most recent articles and their constructs of manufacturing strategy content. The literature review seems to indicate that most studies in the previous literature tend to treat the four competitive priorities as the key elements of manufacturing strategy. Adam and Swamidass (1989) classified manufacturing strategy as four types: (1) Marketer (focusing on customers' needs), (2) Caretaker (devoting their efforts to decreasing the manufacturing cost), (3) Reorganizer (rethinking how to fit their manufacturing strategy with the environment), and (4) Innovator (improving their technological capability to innovate their products).

Although the previous literature has identified the relationships between a firm's manufacturing capability, marketing activities, R&D orientations, and its selection of manufacturing strategy, relatively few of them have paid attention to the interrelations among organizational culture, organizational learning, and manufacturing strategy. The next paragraphs introduce two possible antecedents to explaining manufacturing strategy, i.e., organizational cultures and organizational learning.

2.2 Cultural Impacts on Manufacturing Strategy Selection

Studies in the literature have explored the antecedents of manufacturing strategy with

Table 1. The Definition of Manufacturing Strategy Content in Literature

Literature	Cost	Quality	Reliability	Flexibility
Underback & Abernathy (1975)				√
Skinner (1978)	√	√	√	√
Wheelwright (1978)	√	√	√	√
Buffa (1980)	√	√	√	√
Swamidass (1980)	√	√	√	
Wheelwright (1981)		√		
Wheelwright (1984)		√		
Fine & Hax (1985)	√	√	√	√
Hill (1985)	√		√	√
Richardson et al. (1985)	√	√	√	√
Ferdows et al. (1986)	√	√		√
Schoeder et al (1986)	√	√	√	√
Swamidass (1986)	√	√	√	√
De Meyer & Ferdows (1987)				√
Ferdows & Lindberg (1987)				√
Horte et al. (1987)		√		
Lindberg et al. (1988)			√	
Miller & Roth (1988)	√	√	√	√
De Meyer et al (1989)	√	√		
Shroeder et al. (1989)				√
Ferdows & De Meyer (1990)	√	√	√	
Galbraith (1990)				√
Lindberg (1990)				√
Maruchek (1990)	√			
Reitsperger & Daneil (1990)		√		
Tunalv (1990)	√	√	√	√
DeMeyer & Ferdows (1991)	√	√		
Horte et al. (1991)				
Lindberg & Trygg (1991)			√	
Hum & Leow (1992)	√	√	√	√
Tunalv (1992)	√	√	√	√
Corbeet & Wassenhove (1993)	√	√	√	
Garvin (1993)		√		
Fry et al. (1994)	√	√		
Neely et al. (1994)	√	√	√	√
Sweeney (1994)	√	√	√	√
Williams et al. (1995)		√	√	√

very diversified perspectives, while relative few have focused on cultural issues. For instance, Leong and Wrad (1994) proposed “6Ps” to effectively influence manufacturing strategy decision-makings, i.e., planning, proactiveness, pattern of actions, portfolio of manufacturing capabilities, programs of improvement, and performance measurement. When they mentioned “planning,” they emphasized that the cultural consensus, including the setting-up of organizational cultures, the interactions of top-down communications, and the fit of business vision and mission, is the foundation for creating manufacturing advantages. Wheelwright (1981) argued that patterns of business operations and organizational cultures are two of the factors that are essential to create manufacturing advantages for Japanese firms. Reitsperger and Daniel (1990) compared the manufacturing strategy of U.S. and Japanese manufacturers. They contended that employer involvement, which is an element of organizational cultures, is a critical reason that makes Japanese firms more competitive. Swink and Way (1995) and Tunalv (1990) broadly discussed the effects of business goals, organizational structures, corporate cultures, and resource availabilities on manufacturing strategy.

It is possible to examine the literature that studies manufacturing strategy. Minor et al. (1994) reviewed 27 manufacturing strategy-related studies in the literature and detected 16 of which were published in production/operation management journals, while relatively few were represented in managerial journals. Maruchek (1990) also mentioned this situation. The effects of culture on manufacturing strategy seem to be neglected in earlier years.

Some studies have started to pay attention to this. Wacker (1989) clearly described how organizational cultures impact manufacturing performance. Sarkis (1995) investigated how firms adopt significant manufacturing strategies comparing American- and Japanese-owned firms. Bates (1995) employed canonical correlation analysis and confirmed the relationship of organizational culture and manufacturing strategy. The empirical results seem to indicate firms might adopt different manufacturing strategies depending on corporate cultures, management philosophies, and organizational climates.

Generally speaking, a few studies in the literature have begun to examine how cultural factors explain manufacturing strategy. These articles develop some principles or basic descriptions, but they still fail to relate clear propositions/hypotheses with empirical evidence. An empirical study to clarify the relationship between cultural factors and manufacturing strategy is necessary.

Hofstede's (1980) national culture has led to a lot of follow-up studies. He constructed nation-based cultures by four benchmarking elements: power distance, risk avoidance, individualism, and masculinity. The constructs have been used in many disciplines, including management, sociology, marketing, et al. Recently, related research studies have linked the construct of national cultures with new product development (NPD) and have proposed some directions for empirical research. For instance, the initiation step of NPD should be processed in low-power distance, low-risk avoidance, high individualism, and high masculinity cultures. Although this connection seems to be

reasonable, relatively few studies have integrated Hofstede's construct with manufacturing strategy studies.

Based this review, four propositions can be inferred, the following.

Proposition 1: Organizational cultures influences the extent to which a firm works to reduce its manufacturing costs.

Proposition 2: Organizational cultures influences the extent to which a firm works to improve its manufacturing quality.

Proposition 3: Organizational cultures influences the extent to which a firm works to raise its manufacturing flexibility.

Proposition 4: Organizational cultures influences the extent to which a firm works to increase its manufacturing reliability.

2.3 Organizational Learning and Manufacturing Strategy Selection

After Senge's (1990) *The Fifth Discipline*, organizational learning has become a new important issue in management research. Originating from Cyert, March, and Starbuck (1961), organizational learning studies have examined how members in organizations respond to the environment and change their perceptions/cognition mode, feelings, and behaviors (Whyte, 1967; Kol, 1987). Kao and Lee (1996) reviewed the organizational learning-related literature and concluded that managerial academicians consider organizational learning as an effective mechanism to create and sustain organizational competitiveness and to improve efficiency and innovation. He also employed organizational learning to investigate how organizations respond to environment changes. Thus, although few studies have integrated organizational learning to strategic management, it is reasonable to investigate the interrelationships between organizational learning and manufacturing strategy.

Senge (1990) examined organizational learning by five factors: (1) personal mastery, (2) mental models, (3) shared vision, (4) team learning, and (5) system thinking. Although there is very few available studies in the literature linking organizational learning and manufacturing strategy, some possible relationships could be inferred, as the following.

Proposition 5: The degree of organizational learning influences the extent to which a firm works to reduce manufacturing costs.

Proposition 6: The degree of organizational learning influences the extent to which a firm works to improve manufacturing quality.

Proposition 7: The degree of organizational learning influences the extent to which a firm works to raise manufacturing flexibility.

Proposition 8: The degree of organizational learning influences the extent to which a firm works to increase manufacturing reliability.

3. Methodology and the Empirical Results

3.1 Framework

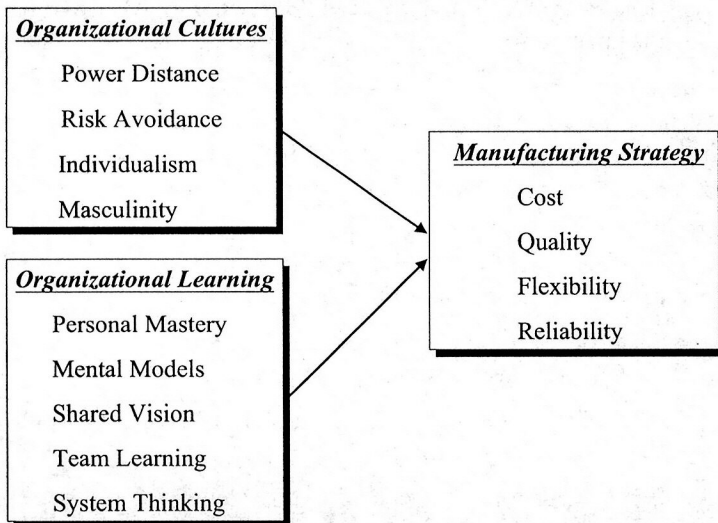
Figure 1 illustrates the scope and framework of this study. The primary construct of the study is manufacturing strategy, including four competitive priorities: cost, quality, flexibility, and reliability. Two organizational issues, organizational cultures and organizational learning, are taken as the antecedents of manufacturing strategy. Organizational cultures and organizational learning are measured by Hofstede (1980) and Senge (1990), respectively.

3.2 Measures and Statistical Techniques

To conduct a larger sample empirical study, it is usually necessary to employ the questionnaire survey technique to collect data. The three constructs are measured as follows:

1. *Manufacturing Strategy.* Manufacturing competitive priority is the major and critical construct to measure MS. The survey employs Cerwin’s (1993) 11-item measures for this. The descriptors are designed as “How important are the following items to your company when making manufacturing decisions,” and the items are measured with a 5-point Likert scale (1=never considered, 5=very important).
2. *Organizational Cultures.* Hofstede’s (1980) construct provides a very robust scale to measure OC. Although his original job was to study nation-level culture issues, many studies have followed Hofstede’s construct to measure organization-level culture. Following Hofstede’s scale, the survey employs 11 items for this construct. The items are measured by a 5-point Likert scale (1=very disagree, 5= very agree).

Figure 1. Framework of the Study



3. *Organizational Learning*. Of the three constructs, organizational learning has the fewest empirical studies and it seems to be not well established yet. Thus, this study constructs its own 15-item scale for the measurement. The items are measured by the 5-point Likert scale as well (1=very disagree, 5= very agree). This study employs factor analysis, Cronbach's coefficient, and multiple regressions as the primary statistical techniques. Multiple (hierarchical) regression, in particular, play the major role when analyzing the impact of organizational cultures and learning on manufacturing strategy selection.

3.3 Sampling and the Samples

To raise sample validity, this study samples both traditional and high-tech industries for comparison. Steel and machinery makers are selected as traditional industries, while electronics and electrical products makers represent high-tech industries. Since organizational cultures, organizational learning, and manufacturing strategy are high-level strategic activities in an ordinary organizational context, the survey targets CEO or senior/high-level managers of the sampled firms. 103 effective respondents were sampled.

3.4 Results

The empirical results from the 103-respondent sample are listed in Table 2. The statistical evidence indicates that organizational cultures, organizational learning, and the interaction of organizational cultures and organizational learning are significant antecedents to explain manufacturing strategy. The four elements of manufacturing strategy, i.e., cost, quality, flexibility, and reliability, are partially correlated with these two constructs. Of the four organizational cultural and five organizational learning variables, power distance, individualism, and shared version are the critical predictors of manufacturing strategy priorities. The empirical evidence partly supports the hypotheses.

4. Conclusions

Although many studies have examined manufacturing strategy issues from diversified perspectives, only a relatively few of them have paid attention to the relationships between organizational issues and manufacturing strategy. This study employs Senge's organizational learning and Hofstede's cultural concepts to link organizational learning and organizational cultures to manufacturing strategy and to explore how organizational cultures and organizational learning influence manufacturing strategy. The results from the evidence partly support the hypotheses and confirm the impact of organizational learning and culture on manufacturing strategy selection.

This study is helpful to manufacturing practitioners for the following reasons. First, the empirical survey indicates a new concept of manufacturing competitiveness: firms that wish to raise their manufacturing quality and capability should not only

Table 2. The Effects of Organizational Learning and Cultures on Manufacturing Strategic Priority

Dependent Variable	Cost			Quality			Flexibility			Reliability		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Predictors	0.220	0.213	0.256	0.256	0.245	0.270	0.270	0.265				
Power Distance		0.241										
Risk Avoidance			0.463									
Individualism				0.463	0.238	0.514		0.416	0.299	0.299		0.145
Masculinity	0.329								0.369			0.229
Personal Mastery		0.305	0.193									
Mental Models										0.342		0.145
Shared Vision				0.487	0.356			0.154				
Team Learning							0.395			0.346		0.237
System Thinking												
R-square	0.150	0.093	0.179	0.240	0.237	0.289	0.289	0.156	0.304	0.388	0.392	0.436
F	79.12	0.939	6.463	14.19	28.24	18.34	18.34	16.85	12.96	28.56	29.04	16.98
p	0.001	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001

Note: All the coefficients in the tables are statistically significant at the $p < 0.05$ level.

emphasize hardware, but also have a need to be concerned about the software issues such as those organizational factors. The literature has found that some software, such as organizational structure, decision models, and managerial styles, are critical important factors for firms to become competitive. This study further finds that organizational learning and cultures might be alternative factors that need to be targeted. Firms need to create an organizational climate with a strong corporate culture of continuous learning and innovation. For instance, managers should share their visions with their subordinates and train their employees to adapt to changing environments.

For future academic efforts, three ideas might be useful. First, the results of this study suggest that organizational issues. Organizational cultures and organizational learning - with some related constructs, such as TQM-relating topics, and strategic vision of the top-, middle-, and low-level status of the organizations - may be of interest for future studies.

Second, manufacturing strategy issues cover many things, but this study only focuses on manufacturing priority. Further studies can expand the scope of this study to other particular strategic elements, such as how organizational cultures and organizational learning influence the process and formulation of manufacturing strategy.

Finally, organizational learning and cultures have divergent definitions and constructs, which disagreements on the definition of constructs may result in confusions over empirical findings. It is hoped that further research on organizational culture and organizational learning could improve the reliability and validity of the constructs.

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