MODERATING EFFECT OF TECHNOLOGY ON THE BUSINESS STRATEGY-PERFORMANCE RELATIONSHIP IN MALAYSIAN SMES

ABSTRACT

Past studies that examined the moderating effect of technology on the business strategy-performance relationship have mainly concentrated on big firms. The review of the small business literature reveals limited research has attempted to investigate the moderating effect of technology in small and medium-sized enterprises (SMEs), particularly in the Malaysian context. This study empirically examined the moderating effect of technology on the relationship between business strategy and performance of 100 SMEs in the Malaysian manufacturing sector. Findings of the study indicate the performance of SME vary with the choice of the business strategies they adopted. Additionally, to a certain degree, the findings of the study suggest technology as measured by technological complexity of process moderates the relationship between business strategy and the performance of SMEs.

INTRODUCTION

Small and medium-sized enterprises (SMEs) represent an important part of the economies of both developed and developing countries. More specifically, in Malaysia, currently SMEs made up of more than 90 percent of the total number of firms and at the same time, export about 20 percent of their total output. Apart from their large numbers and contribution to generating income through exporting, Malaysian SMEs are also known to provide new job opportunities, introduce innovations, stimulate competition, and assist big companies (Hashim and Wafa, 2002).

Despite the significant role of SMEs in the Malaysian economy, research involving small businesses still appears to be not only neglected, but also limited in their scope. The review of the small business literature in Malaysia reveals that SMEs have received limited empirical attention as a field of study. Although in recent years there has been an increasing number of research on SMEs, these studies have limited focus and as such do not seem to be able to increase as well as improve our knowledge in this area of study (Hashim and Abdullah, 2000; Sim and Yap, 1997; and Sim, 1991).

Given the importance of SMEs and the limited scope of past studies, more focused research is needed in this field of study. One such significant area of research is to address the issue of technology in influencing the business strategy-performance relationship in SMEs. The review of the small business literature indicates that very few studies have adequately addressed this research issue (Prescott, 1986; and Li and Simerly,

1998). Previous empirical research on the relationships between business strategy, technology, and performance have largely emphasized on large enterprises (Hofer and Schendel, 1978, Wood and Laforge, 1979; Kotha and Nair, 1995).

Moreover, with the effects of globalisation, the prospects of stiffer competition, maturing markets, and limited local market opportunities, the importance of business strategy and technology for Malaysian SMEs are obvious. Based on the contingency framework, the present study seeks to determine whether technology moderate the relationship between business strategy and performance in Malaysian SMEs.

LITERATURE REVIEW

Technology

The concept of technology has been defined in terms of information and hardware, activities and cause/effect knowledge and the variability of materials and the nature of search processes. According to Rousseau and Cooke (1984), technology involved knowledge and capabilities (such as those found in organizational members and machines), the techniques and procedures available for transforming inputs into outputs, and the processes or activities associated with the application of these technologies.

In a similar way, Robbins (1996) defined technology as how an organization transform its inputs (such as materials and information) into outputs (products and services), and is considered as one of the internal contingency variable that also influenced the structure of an organization.

The earlier study by Woodward (1965) indicated that distinct relationships existed between the three basic forms of technology (unit production or batch technology, mass or large batch, and process production or continuous process technology) and the subsequent structure of manufacturing firms. The author also found that the effectiveness of manufacturing firms was related to the fit between technology and structure.

In reviewing the empirical technology-structure research from 1965 through 1980, Kantrow (1980) and Fry (1982) found that with some exceptions, many of the studies suggested strong support for the existence of the technology-structure and performance relationships. In addition, the research reviews carried out by Kantrow (1980) revealed that managers expressed the need to place technological decisions in the context of management.

In another study that examined firms that used technology as part of their competitive strategies, Frohman (1982 and 1985) reported that a strategy that emphasized technology is not necessary the best. Regardless of their organizational size, Frohman concluded that if a firm decides to exploit technology as a competitive weapon, it must also fulfill the following three conditions: a) have top management orientation; b) have project selection criteria; and c) have appropriate systems and structure.

Morone (1989) noted that technology provides a firm the opportunity of a source of competitive advantage. As such, the author proposed that strategic management in firms should respond to this technological opportunity and integrate technology with their business strategy.

Molloy and Schwenk's study (1995) of the effects of technology on the strategic making decision process suggested that information technology improved decision making efficiency and effectiveness at each stage of the strategic decision process.

The study conducted by Schroeder, Congden, and Gopinath (1995) found the linkages between strategy, technology and performance in small manufacturing firms. The authors concluded that failure to adopt an appropriate new technology or the failure to realign a firm's strategy to the new technology weakened the firm's competitive position as well as affects its performance.

Another study carried out by Ackroyd (1995) discovered that although information technology firms lack structure (lack hierarchy), these firms are highly successful in terms of sales turnover and value-added due to their adoption of high technology.

Hitt, Ireland and Hoskisson (2003), Wheelen and Hunger (2002), David (2001), Price (1996) stressed that technology forms one of the forces that can drive strategic change in organizations. These authors emphasized the important relationships that exist between technology, strategy, structure and organizational performance. The authors also claimed that superior utilization of technology is one the most important ingredient of economic success.

Business Strategy

Over the years, the importance of business strategy in both large and small firms have been continuously emphasized in the strategic management literature (David, 2001; Wheelen and Hunger, 2002; and Rue and Holland, 1989). According to the literature, firms adopt business strategy to outline the fundamental steps they need to follow in order to accomplish their organizational objectives. The literature further indicates that organizations can have a single strategy or many strategies, and that these strategies are likely to exist at three levels: corporate level strategies; business level strategies; and functional level strategies. Although the literature suggests that strategies are developed at the three different levels, theoretical and empirical studies of the relationship between strategy and organizational performance have mainly emphasized on business strategy (Lee, 1987).

Past empirical research on the relationship between strategy and performance has mainly concentrated on large firms. These studies provide strong evidence that suggests business strategies are associated with the performance of large firms (Hofer and Schendel, 1978, Wood and Laforge, 1979; Lee, 1987; and Kotha and Nair, 1995). Although most of the empirical studies have centered upon large firms, findings of an increasing number of studies have suggested that business strategy also influenced the performance of smaller firms.

Giglierano (1987) noted that effective business strategies in smaller firms depended on the type of business as well as the products they developed. Giglierano found that SMEs that adopted particular business strategies seem to achieve better performance. Forrest (1990) observed that small firms have to develop new strategies to react to the changing nature of business as reflected in such factors as increasing competition, both national and international, the increasing internationalization of markets, and new global competitors.

Earlier on Porter (1980 and 1986) pointed out that a firm can gain its competitive advantage by producing value to its customers. The author emphasized that a firm can gain its competitive advantage by performing the chain of strategically important activities (such as production, marketing, sales, service, human resource management, technology development, procurement activities) cheaply or better than its competitors. Based on these activities, Porter developed the following three generic business strategies; low cost, differentiation and focus (niche). In a low cost strategy, the firm attempts to reduce cost and increase profit as well as sales by using economies of scale, scope and technology. In a differentiation strategy, the firm emphasizes on developing ways to make products appear unique and different. Finally, in a niche (focus) strategy, the firm focuses on product development and marketing efforts in a particular market segment that the firm has a cost or differentiation advantage.

Using the Porter's three generic competitive strategies (low cost, differentiation and focus), Schroeder, Congden and Gopinath (1995) indicated the linkage between the generic strategies and manufacturing technology. In addition, Mosakowski (1993) found that entrepreneurial firms that adopted focus and differentiation strategies performed better than firms that do not use these strategies.

In developing six business strategies (harvest, build, cashout, niche, climber and continuity) for businesses in consumer markets and four (low commitment, growth, maintenance and niche) in industrial markets, Galbraith and Schendel (1983) concluded that only the build strategy type (consumer), growth (industrial) and niche (both) appear appropriate.

Although the literature suggests firms adopt various business strategies, several of these can be defined in terms of Porter's or Galbraith and Schendel's dimensions. Despite the relevance of the generic business strategies developed by Porter, and Galbraith and Schendel, few studies have examined them in the context of SMEs. Accordingly, this study adopts the following six common types of competitive strategies: three of Porter's generic strategies (low cost, differentiation and focus); growth and harvest strategy of Galbraith and Schendel (1983); and vertical integration strategy of David (2001).

Performance

Although, many studies have found that different companies in different countries tend to emphasize on different performance measurement, the literature suggests financial profitability and growth to be the most common measures of organizational performance. Nash (1993) claimed that profitability is the best indicator to identify whether an organization is doing things right and hence profitability can be used as the primary

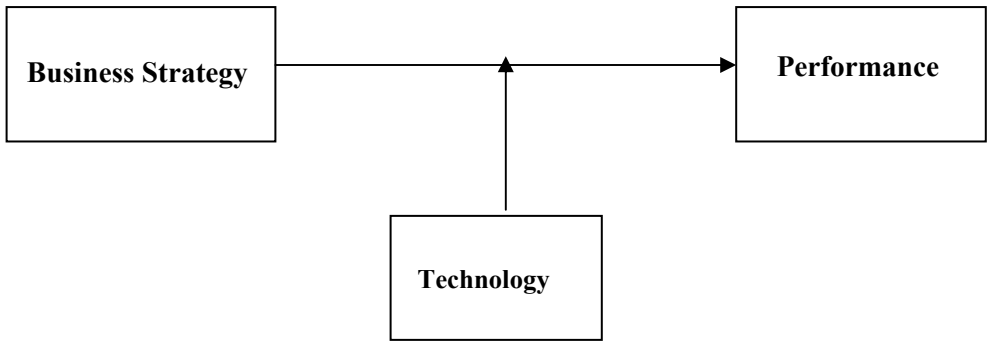
measure of organization success. Furthermore, Doyle (1994) pointed profitability as the most common measure of performance in western companies. Profit margin, return on assets, return on equity, return on sales are considered to be the common measures of financial profitability (Robinson, 1982; Galbraith and Schendel, 1983). Abu Kassim et. al (1989) found sales, sales growth, net profit and gross profit were among the financial measures preferred by the Malaysian manufacturing firms.

The Contingency Framework

According to the contingency framework, technology is considered as an important contingency variable. This framework viewed technology as source of competitive advantage for a firm. However, a firm will need to align its technology to its strategy. The contingency theory suggests that firms that adapt their technology to their business strategies tend to improve their performance.

From the contingency viewpoint, different types of firms operating in different situations require different technological complexity. Mass production technology or more complex technology is normally effective for manufacturing firms involve in high volume products. Likewise, unit product or less complex technology is more suited for firms involve with the production of customised products. The following Figure 1 presents the research model of the present study.

Figure 1: The Research Model



In order to test the proposed relationships between business strategy, technology, and performance, this study developed the following hypotheses.

1. The performance of SMEs will vary with the choice of business strategy adopted.
2. The technological complexity of product will moderate the relationship between business strategy and the performance of SMEs.
3. The technological complexity of process will moderate the relationship between business strategy and the performance of SMEs.

METHODOLOGY

Procedure and Sample

The sample consisted of 748 small and medium-sized enterprises operating in northern Malaysia that were registered with the Malaysian Labour Department. All of the firms were contacted by telephone and their participation was requested from their owners/managers. Of the total of 748 firms contacted, 100 firms confirmed their participation. Using a structured questionnaire, the data for the study were collected through personal face-to-face interviews with the owners and managers of the selected SMEs.

Measurement

Business Strategy

Low cost strategy, product differentiation strategy, and niche strategy (Porter, 1980), growth and harvest strategies (Galbraith and Schendel, 1983), and vertical integration strategy (David, 1999) were adopted in the study. The literature indicates most of these business strategies have been widely used in previous studies. Structured questions containing brief descriptions of each the six business strategies were used to measure the business strategies in this study. By using a five-point numerical scale response mode ranging from "least applicable" to "most applicable", respondents were requested to indicate one of the six business strategies that was most applicable to their firm. Each respondent was instructed to choose only one of the descriptions that best describe the business strategy the firm was adopting.

Technology

Technology in this study was operationalised by measuring the level of technological complexity of product and the level of technological complexity of process (Katz, Brockhaus and Hill, 1993) found in the SMEs. On a five-point numerical scale that ranged from "low" to "high", the owner-managers were requested to indicate the scores that best described the level of the technological complexity of their products and processes of production.

Performance

Performance was measured by using the actual figures of dollar sales volume, the amount of assets, the amount of equity, the number of employees, return on investment (ROI), return on sales (ROS) and return on assets (ROA) over a five-year period. The ROI, ROS and ROA were computed as follows:

a. ROI = net profit/total equity
b. ROS = net profit/total sales
c. ROA = net profit/total assets

The average performance measures were derived by adding the annual figures of (dollar sales volume, the amount of assets, the amount of equity, the number of employees, ROI, ROS and ROA) for over a three to five year period and divided by three or five.

The growth (average rate) performance measures were computed by taking the average percentage change in the performance measures (sales volume, the amount of assets, the amount of equity, and the number of employees, ROI, ROS and ROA) for over a five year period. The rate of change of each of the performance measures was computed by taking the difference between two years and divided by the earlier year, resulting in each performance measure having four figures. The average rate of growth of each of the measures was derived by dividing the total growth rate by four. Additionally, this study used the business performance composite index (BPCI) as the mean values of ROI, ROS and ROA (Lee, 1987). The computation of BPCI was done as follows:

BPCI = (ROI + ROS + ROA/3)

Background of the Sample Firms

The small and medium-sized enterprises in the study represented 14 industries. However, about 50% of the total firms were from the food, textile, and the furniture industries. About 90% of the firms have more than one owner, and 83% were registered as Private Limited companies. The mean number of employees was 61 workers with a standard deviation of 65.72. The mean age of the firms was 13 years and the mean number of products made was six. Capitalization ranged from $1000.00 to $11 million. The mean dollar value of sales for 1996 was $4,967,610 million.

Of the 100 firms in this study, 30 firms (30%) adopted the differentiation strategy, 26 firms (26%) adopted the low cost strategy, 17 firms (17%) adopted the growth strategy, 18 firms (18%) adopted the niche strategy, six (6%)firms adopted the harvest strategy, and the remaining three (3%) firms adopted the vertical integration strategy.

RESULTS

Testing of Hypothesis 1

Hypothesis 1 was tested by using the ANOVA. The results of the ANOVAs summarized in Tables 1, 2, and 3 suggest statistically significant differences in the performance (BPCI, growth in ROI and ROA) of the SMEs that adopted the different types of business strategies. However, the results of the ANOVAs for the other performance indicators were not statistically significant.

The results in Table 1indicate that at .04 significant level, the F-value for the business performance composite index (BPCI) is 2.96, providing support for Hypothesis 1. This result suggests that there are significant differences in the mean BPCI between the different strategy types adopted by the SMEs surveyed. The Duncan Multiple Range test indicates that the means for niche strategy (mean=0.11) and differentiation strategy (mean=0.26) are the ones that are low on BPCI and are significantly different.

Table 1: One-Way ANOVA of Business Strategy By BPCI

Variable:	Mean	F Ratio	Sign. F	Duncan
Business Strategy		2.96	0.0370	0.5
Niche	0.1106			
Differentiation	0.2625			
Growth	0.4960			
Low Cost	1.0225			

The results of the ANOVA analysis between the business strategies and the growth of ROI are presented in Table 2. At .04 significant level, the F-value for growth in ROI is 2.93, providing support for Hypothesis 1. This result suggests significant differences in the mean growth in ROI among the SMEs that adopted the different business strategies. The Duncan Multiple Range test indicates that the mean for differentiation strategy (0.20) is the one that is low on growth in ROI and is significantly different.

Table 2: One-Way ANOVA of Business Strategy By ROI Growth

Variable:	Mean	F Ratio	Sign. F	Duncan
Business Strategy		2.9297	0.0437	0.5
Niche	-0.835			
Differentiation	0.2028			
Growth	2.31			
Low Cost	2.5942			

The results in the Table 3 also indicate that the ANOVA between the business strategies and the growth in ROA are statistically significant. At .03 significant level, the F-value for growth in ROA is 3.193. This result provides support for Hypothesis 1. This result suggests significant differences in the mean growth in ROA among the SMEs that adopted the different business strategies. The Duncan Multiple Range test indicates that the means for differentiation strategy (0.49), niche strategy (1.1) and low cost strategy (1.67) are the ones that are low on growth in ROA and are significantly different.

Table 3: One-Way ANOVA of Business Strategy By ROA Growth

Variable:	Mean	F Ratio	Sign. F	Duncan
Strategy Types:		3.1933	0.0292	0.5
Differentiation	0.4908			
Niche	1.0985			
Low cost	1.6654			
Growth	5.9710			

Testing of Hypotheses 2

Hypothesis 2 was tested by using the multiple regression with interaction term. The method is used to yield a conservative estimate of the moderating effect technology has

on the relationship between business strategy and the performance of SMEs. The equation for the moderated regression model is as follows:

Y = A + B+ Z + CBZ, where

Y = the dependent variable (average and growth performance and BPCI)

X = the independent variable (business strategy)

Z = the moderator variable (technology)

BZ = the interaction term

The purpose of the moderated analyses is to determine if adding the interaction term increases the explanation of variance (R^2) significantly. The change in R^2 from the restricted regression model (without moderator variable) to the full regression model (with moderator variable) is statistically significant at $p<0.05$ for some of the performance measures (as assets, ROS, growth ROS, growth ROA and growth ROI). The changes in R^2 for the other performance measures are not statistically significant. The results of the R^2 that are statistically significant provide some support for Hypothesis 3.

The results of the moderated regression analysis for technological complexity of product are presented in Table 4. As shown, the change in R^2 from the restricted regression model (without moderator variable) to the full regression model (with moderator) is not statistically significant, providing not support for Hypothesis 2. The results suggest that the relationship between business strategy and performance does not varies with the technological complexity of product found in the SMEs surveyed.

Table 4: Technological Complexity of Product as Moderator

Dependent Variable	Without Moderator (R^2)	Sig F	With Moderator ($\hat{R}^2$)	Sig F
a. Average:				
Sales	0.07	0.51	0.15	0.61
Assets	0.04	0.84	0.26	0.13
Employment	0.03	0.89	0.17	0.47
Equity	0.08	0.34	0.11	0.83
Gross Profit	0.06	0.57	0.13	0.78
ROS	0.02	0.95	0.24	0.21
ROA	0.06	0.68	0.07	0.98
ROI	0.06	0.68	0.07	0.98
b. Growth:				
Sales	0.09	0.29	0.19	0.39
Assets	0.05	0.67	0.10	0.90
Employment	0.03	0.89	0.22	0.21
Equity	0.09	0.28	0.18	0.41
Gross Profit	0.02	0.85	0.09	0.76
ROS	0.18	0.03*	0.26	0.12
ROA	0.23	0.04*	0.30	0.20
ROI	0.20	0.03*	0.25	0.18
c. BPCI	0.02	0.91	0.16	0.54

Table 5 presents the results of the moderated regression analysis for technological complexity of process. The change in R^2 from the restricted regression model (without moderator variable) to the full regression model (with moderator) is statistically significant for assets, ROS, growth ROS, growth ROA and growth ROI. These results provide some support for Hypothesis 3. These results suggest that the relationship between strategy types and performance (as for assets, ROS, growth ROS, growth ROA and growth ROI) varies with the technological complexity of process found the SMEs studied.

Table 5: Technological Complexity of Process as Moderator

Dependent Variable	Without Moderator (R2)	Sig F	With Moderator (^R2)	Sig F
a. Average:				
Sales	0.07	0.51	0.14	0.66
Assets	0.04	0.84	0.35	0.01*
Employment	0.03	0.89	0.25	0.11
Equity	0.08	0.34	0.12	0.81
Gross Profit	0.06	0.57	0.20	0.29
ROS	0.02	0.95	0.40	0.00*
ROA	0.06	0.68	0.09	0.95
ROI	0.06	0.68	0.09	0.95
b. Growth:				
Sales	0.09	0.29	0.25	0.11
Assets	0.05	0.67	0.15	0.68
Employment	0.03	0.89	0.21	0.26
Equity	0.09	0.28	0.23	0.15
Gross Profit	0.02	0.85	0.16	0.27
ROS	0.18	0.03*	0.37	0.00*
ROA	0.23	0.04*	0.36	0.01*
ROI	0.20	0.03*	0.37	0.01*
c. BPCI	0.02	0.91	0.25	0.11

DICUSSION AND CONCLUSION

The findings of the study seem to indicate that the three generic strategies (low cost, differentiation, and niche) developed by Porter are not only relevant to large firms, but also to SMEs. These findings appear to concur with studies conducted by Dess and Davis (1984) and Robinson and Pearce (1983). Both these studies found empirical evidence that suggest SMEs adopted different strategies. In addition, the studies discovered that SMEs that adopted certain business strategies were more viable for certain industrial environments.

This study hypothesized that the moderating effect for technology might occur on the business strategy-performance relationship. Contrary to expectation, the results of the moderated regression analyses on technological complexity of product are not significant.

However, the results of the study indicated some support in the expected direction for technological complexity of process with regard to the average and growth performance measures (average assets, ROS, growth ROS, growth ROA and growth ROI).

For the average performance measures, the results indicate that assets is significant at $p<0.01$ (R^2 from 0.04 to 0.35 percent) and ROS at $p<0.00$ (R^2 from 0.02 to 0.40). The results for the other average performance measures are not significant.

The results of the moderated regression analyses for technological complexity of process is significant for growth ROS (R^2 from 0.18 to 0.37 percent, at $p<0.00$), growth ROA (R^2 from 0.23 to 0.36, at $p<0.010$) and growth ROI (R^2 from 0.03 to 0.37 percent, at $p<0.01$). These findings suggest that technological complexity of process has some moderating effect on the strategy types-performance relationship.

These findings point out that business strategy may lead to better performance under condition of greater technology complexity of process, but not technological complexity of product. These findings that suggest technological complexity of process moderates the relationship between business strategy and performance is consistent with the contingency theory. The contingency theorists viewed technological process as an important moderating variable that can influence a firm's performance.

Furthermore, strategy theorists such as Kentrow (1980), Frohman (1982 and 1985), Hitt, Ireland and Palia (1982), Morone (1989) and Price (1996) have long acknowledged the connection between strategy type and technology. These theorists argued that competitive advantage can come from any technological process. According to the theorists, firms should therefore incorporate their technological process in formulating and implementing their business strategies. The strategy theorists are of the view that the matching of business strategy with the technological process should significantly improve a firm's performance.

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