# The Impact of Strategy on Performance of Firms in Strategic Alliance : The Case of the New Materials Industry

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< Abstract >

Although the issue of alliances among competitors has received increasing attention in the literature (Harrigan, 1985, 1986, 1988; Kogut, 1988; Nielsen, 1988; Burgers et al., 1993), there has been a lack of theoretical development regarding the overall configuration of alliance activity within an industry (Porter and Fuller, 1986; Walker, 1988; Nohria and Garcia-Pont, 1991). Much of the empirical research on alliances has looked at alliance formation across industries (Pfeffer and Nowak, 1976). There has been very little empirical research focusing upon the configuration of alliance activity among competitors within an industry (exceptions being Nohria and Garcia-Pong, 1991; Walker, 1988). This research examines the relationship between strategy and performance of firms of the following types of strategic alliance in the new materials industry : joint venture and non-joint venture.

The results show that capacity utilization, marketing expenditure, and production efficiency in joint venture and non-joint venture group are not significantly related to profit. However, acquisition of new technology and capital intensity showed mixed results. Acquisition of new technology of non-joint venture and capital intensity of joint venture are significantly and positively related to profit. This implies that an increase of acquisition of new technology and capital intensity of new technology and capital intensity of new technology and capital intensity in those groups may affect on an increase of profit. Meanwhile, acquisition of new technology in joint venture and capital intensity of non-joint venture are not significantly related to profit. This implies that an increase of acquisition of new technology in joint venture and capital intensity of non-joint venture are not significantly related to profit. This implies that an increase of acquisition of new technology and capital intensity of non-joint venture are not significantly related to profit. This implies that an increase of acquisition of new technology and capital intensity of non-joint venture are not significantly related to profit. This implies that an increase of acquisition of new technology and capital intensity in those groups may not affect profit.

#### INTRODUCTION

Although the issue of alliances among competitors has received increasing attention in the literature (Harrigan, 1985, 1986, 1988; Kogut, 1988; Nielsen, 1988; Burgers et al., 1993), there has been a lack of theoretical development regarding the overall configuration of alliance activity within an industry (Porter and Fuller, 1986; Walker, 1988; Nohria and Garcia-Pont, 1991). Much of the empirical research on alliances has looked at alliance formation across industries (Pfeffer and Nowak, 1976). There has been very little empirical research focusing upon the configuration of alliance activity among competitors within an industry (exceptions being Nohria and Garcia-Pong, 1991; Walker, 1988). This research examines the relationship between strategy and performance of firms of the following types of strategic alliance in the new materials industry : joint venture and non-joint venture.

## STRATEGIC ALLIANCE

One of the most striking developments in the last decade regarding the evolution of industrial organization is the surge in the number of alliances between firms that operate in the same business. Indeed, it appears that firms trying to keep up with increasingly rapid and costly technological progress have produced not only a proliferation of upstream/downstream cooperative agreements, but also a growing number of partnerships between firms in the same business cooperation among rivals. This latter phenomenon is more difficult to interpret than agreements between suppliers and buyers but is by

no means a rare or marginal phenomenon. In fact, a recent study of alliances indicates that close to 85% of all alliances are set up between rival, or potentially rival, firms. In an environment marked by the growing importance of technology, more and more firms are developing relational strategies, and engaging in strategic alliances. These new behavior patterns affect the rivalry between partner firms and competition within the industries concerned (Dussuage, 1994).

Recently, several studies have examined the relationship between strategic alliance and performance (Hagedoorn and Schakenraad, 1994; Burgers et al., 1993; Berg et al., 1982). Burgers et al. (1993) investigated whether the number of long-term horizontal alliance agreements a firm enters into will be negatively related to the firm's performance, whether the number of competitors linked to the firm will be negatively related to the level of firm performance, and why firms with high performance will tend to concentrate their alliances with competitors within boundaries of a subnetwork, whereas firms with low performance will not. They found that higher levels of performance are negatively related to the number of alliance agreements that firms enter into, that poor performance caused firms to seek additional cooperation with competitors, and that performance differences did not affect the degree to which firms concentrated cooperation within a single subnetwork.

Hagedoors and Schakenraad (1994) investigated to what extent interfirm strategic technology partnering affects the profitability of companies engaged in such joint efforts. The result does not show a direct impact of strategic alliance on economic performance.

Berg et al.(1982) investigated whether or not corporate performance is related to interfirm cooperation. Their results showed that joint venture activity tends to have a significant negative short-term impact on profitability in chemicals and mechanical engineering industries but insignificant effects in the resource - processing sector. No significant long-term effects of joint venture activity on profitability were found in any industrial sector.

Despite research attention to strategy and performance of strategic alliance individually, little research examines the relationship of those factors and their affects on the whole.

# STRATEGY - PERFORMANCE RELATIONSHIP OF FIRMS IN STRAGEGIC ALLIANCE : THEORY AND MODELING

Technology affects competitive advantage if it has a significant role in determining relative cost position or differentiation. Since technology is embodied in every value activity and is involved in achieving linkages among activities, it can have a powerful effect on both cost and differentiation. Technology will affect cost or differentiation if it influences the cost drivers or drivers of uniqueness of value activities. Because of the power of technological change to influence industry structure and competitive advantage, firm's technology strategy becomes an essential ingredient in its overall competitive strategy. Innovation is one of the principal ways of attacking well-entrenched competitors (Porter, 1985).

While technological change can modify the relative importance of the various key factors for success in a given industry, thereby affecting the structure of competition in the industry, it is also a tool which firms can use to create competitive advantage. Indeed, technology appears to be one of the major elements which help define the two main generic strategies - "cost leadership" and "differentiation". Therefore, the formal hypothesis H1 states that

H1 : Acquisition of new technology will be positively related to profit.

According to Patton (1976), capacity utilization reflects management's ability to accurately project sales volume and the required production capacity. Unused capacity is costly. Hemmasi (1983) described production capacity utilization as follows:

Obviously more efficient use of the facilities and equipment results in lower fixed cost per unit of the products. The impact of this variable is likely to be more dramatic in stagnant and declining markets as well as in capital intensive industries where greater utilization of the capacity gives companies a significant competitive edge over the rivals. Thus, capacity utilization is favorable for profitability. Where a value activity has substantial fixed cost associated with it, the cost of an activity will be affected by capacity utilization. Fixed costs create a penalty for underutilization, and the ratio of fixed to variable cost indicates the sensitivity of a value activity to utilization. Different ways of configuring a value activity will affect its sensitivity.

Changes in the level of capacity utilization will involve costs of expanding or contracting, so that a firm that changes its utilization will have higher costs than one that keeps its utilization constant, though they both have the same average utilization. The pattern of utilization reflects such changes, and is thus the appropriate cost driver rather than the average level of utilization. The pattern of capacity utilization of an activity is partly determined by environmental conditions and competitor behavior, particularly competitor investment behavior, and is partly under a firm's control through its policy choices in areas such as marketing and product selection (Porter, 1985).

Capacity expansion is one of the most significant strategic decisions faced by firms, measured both in terms of the amount of capital involved and the complexity of the decision-making problem. It is probably the central aspect of strategy in commodity-type businesses. Because capacity additions can involve lead times measured in years and capacity is often long-lasting, capacity decisions require the firm to commit resources based on expectations about conditions far into the future. The strategic issue in capacity expansion is how to add capacity to further the objectives of the firm, in the hope of improving its competitive position or market share, while avoiding industry overcapacity (Porter, 1980). Ravenscraft (1983), and Buzzell and Gale (1987) investigated the relationship between capacity utilization and profit. They found the relationship to be significantly positive. The formal hypothesis :

#### H2 : Capacity utilization will be positively related to profit.

Most executives think of capital intensity as the amount of capital invested relative to the flow of output produced. Capital-intensive businesses employ a great deal of invested capital to generate each dollar of sales. The heavy capital burden they shoulder tends to drag down their profitability. High labor productivity can offset some of this drag, but for most businesses, productivity doesn't improve enough to pay for the heavier investment. Although there is a great deal of evidence to document the troubles caused by capital intensity, many executives continue to feel a sense of discomfort, and even surprise, when confronted with this finding. Intuitively they feel it ought to be otherwise (Buzzell and Gale, 1987).

Woo (1987) pointed out that capital-intensive processes impose high fixed costs which cannot be deferred during business down turns. Many researchers have investigated the relationship between capital intensity and profit and found it to be significantly negative (Martin 1983; Buzzell and Gale, 1987; and Patton, 1976). We thus hypothesize that:

## H3 : Capital intensity will be negatively related to profit.

Marketing effort by marketing expenditure including advertising acts as a barrier to entry and is a form of non-price competition (Marshall, 1987). It influences brand selection and loyalty (Patton, 1976). Product differentiation created and maintained by marketing expenditure is a major barrier to entry. To an extent, the increased barrier to entry created by marketing expenditure is a price we have to pay for providing consumers with information. But when heavy marketing expenditure and other promotional expenditures create durable preferences going beyond the relative superiority of the product, resistant to anything but major countervailing promotional campaigns, we may well question whether the price has not become too high. If heavy marketing expenditures thus serve to raise the barriers to entry, the adverse competitive consequences are important not only because new firms are kept out, but also because frequently it is the prospect of new entry which serves as a major competitive restraint upon the actions of existing firms. Entry will be made more difficult as a result of the barriers created through extensive marketing expenditure. To the extent that consumers are unable to evaluate the relative merits of competing products, the established products may have a considerable advantage. High entry barriers interfere with the normal process through which increases in demand are met at least in part by new firms (FTC, 1969). Buzzell and Gale (1987) and Marshall (1987) examined the relationship between marketing expenditure and profit and found it to be significantly positive. Therefore, we have the following hypothesis:

H4 : Marketing expenditure will be positively related to profit.

Lack of production efficiency has been a key factor in the failure of many firms while increased efficiency has been a key success factor for many firms. Efficient firms can maintain a relatively stable price level and profit margins (Patton, 1976). The effectiveness of operations influences profit (Buzzell and Gale, 1987). We therefore hypothesize:

H5 : Production efficiency will be positively related to profit.

While the economic interpretation of alliances and partnership provides an analytical framework for assessing situations which are favorable or unfavorable to such collaborative behavior, it is limited in scope. To gain a fuller picture of such a relationship, it is crucial to analyze the strategic orientations of the participating firms, which all have specific resources, capabilities and objectives.

The interpretation of the competitive situation created by alliances remains ambiguous. Are alliances durable alternatives to classical head-to-head competition? Are they formed by firms as a means of calling a provisional truce to rebuild their strengths or are they used rather to attack another competitor? Are they a means of digesting and incorporating a rival's capabilities where one of the partners progressively takes over the other in a sort of treacherous embrace? The nature and extent of the firm's involvement in alliances will differ according to how these questions are answered and how the phenomenon is interpreted (Dussuage, 1994). As earlier mentioned in taxonomic approach, the impact of strategy on performance is context-specific according to sample groups. We therefore hypothesize:

H6 : The relationship between strategic variables and performance of firms will be context-specific according to type of strategic alliance.

#### METHODOLOGY

To examine the hypotheses, regression analysis will be used. The statistical analysis will be performed by SPSS package. After collecting 62 samples via telephone interview of executives of firms in the new materials industry in 1998, 49 samples were finally selected to examine the hypotheses. The Appendix includes the instruments used to measure strategic variables and performance variable. The sample is composed of three groups - joint venture, technology exchange, and joint development. This research will designate the technology exchange and joint development groups together as the non-joint venture category, and will be simply referred to as non-joint venture in the remainder of the article. The sample size of each group is as follows :

| Type of Strategic Alliance | Sample Size |
|----------------------------|-------------|
| Joint Venture              | 18          |
| Non-Joint Venture          | 31          |
| Total                      | 49          |
|                            |             |
|                            |             |

## RESULTS

Table 1 shows the regression results between strategic variables and profit of joint venture and non-joint venture alliances. Capacity utilization, marketing expenditure, and production efficiency in those two groups are not significantly related to profit. However, acquisition of new technology and capital intensity showed mixed results. Acquisition of new technology of non-joint venture and capital intensity of joint venture are significantly and positively related to profit. This implies that an increase of acquisition of new technology and capital intensity in those groups may affect an increase of profit.

Meanwhile, acquisition of new technology in joint venture and capital intensity of non-joint venture are not significantly related to profit. This implies that an increase of acquisition of new technology and capital intensity in those groups may not affect profit.

| Join    |             |             | 0 11      |             | D 1 4      | DA  |
|---------|-------------|-------------|-----------|-------------|------------|-----|
|         | Acquisition | Capacity    | Capital   | Marketing   | Production | R2  |
|         | of New      | Utilization | Intensity | Expenditure | Efficiency |     |
|         | Technology  |             |           |             |            |     |
|         |             |             |           |             |            |     |
| Total   | .427**      | 264*        | .324*     | .231        | 133        | .25 |
|         | (2.772)     | (-1.740)    | (2.134)   | (1.612)     | (832)      |     |
|         |             |             | . ,       |             |            |     |
| Jont    | .000        | .153        | .852*     | .172        | 389        | .58 |
| Venture | (.001)      | (.650)      | (3.265)   | (.855)      | (-1.573)   |     |
|         | · · ·       |             |           |             |            |     |
| Non-    | .567*       | 228         | .105      | .180        | 195        | .26 |
| Joint   | (2.514)     | (-1.040)    | (597)     | (.904)      | (811)      |     |
| Venture |             | . ,         |           |             |            |     |
|         |             |             |           |             |            |     |
|         |             |             |           |             |            |     |

Table 1. Regression results between strategic variables and profit of

Value in Parentheses are T-Value. \*: p < .10 \*\*: p < .01

In two of the three sample groups : non-joint venture and total, acquisition of new technology is significantly and positively related to profit, whereas in joint venture group, it is not significantly related to profit. This implies that the acquisition of new technology in the total and non-joint venture group may contribute to an increase of profit. The acquisition of new technology creates entry barriers, which results in profit. The acquisition of new technology is crucial to the creation of new products and improvement of existing processes. It enables a business to better maintain or achieve production efficiency resulting in lower costs which provides a competitive advantage. In the total sample and nonjoint venture it may provide a competitive advantage resulting in profit, while in joint venture it is not likely to provide any competitive advantage.

Capacity utilization in the total sample is significantly and negatively related to profit, while in joint venture and non-joint venture group it is not significantly related to profit. This means that an increase of inefficient capacity utilization in the total sample is likely to result in a decrease of profit. Capacity utilization reflects management's ability to accurately project sales volume and required production capacity. Unused capacity is costly in the new materials industry. Lower fixed cost per unit resulted in more efficient use of the facilities and also generated a reduction in price, which is favorable for profit (Ghorab, 1982; Patton, 1976). A significant negative relationship in the total sample implies that unused capacity of strategic alliance firms is costly, which can cause decrease of profit.

Capital intensity in the total sample and joint venture is significantly and positively related to profit, while in non-joint venture it is not significantly related to profit. This indicates that an increase of capital intensity in joint venture and the total group may result in an increase of profit. The significant positive relationships in the total sample and joint venture are opposed to findings of Woo (1987) and Buzzell and Gale (1987).

Woo (1987) pointed out that capital - intensive processes impose high fixed costs which cannot be deferred during business downturns. According to Buzzell and Gale (1987), most executives think of capital intensity as the amount of capital invested relative to the flow of output produced. Many researchers have investigated the relationship between capital intensity and profit and found it to be significantly negative (Martin, 1983; Buzzell and Gale, 1987; and Patton, 1976). In particular, Buzzell and Gale explained the four main causes from which the relationship stems :

- 1. Capital intensity leads to aggressive and often destructive competition.
- 2. Heavy capital investment often acts as a barrier to exit from an unprofitable business.
- 3. Management sometimes sets a normal profit to sales target for business that have a

higher than normal investment to sales ratio.

4. Capital intensive businesses may be less efficient in using fixed or working capital than competitors.

The result of the significantly positive relationship between capital intensity and profit in joint venture and the total group shows that capital investment in those groups acts as a barrier to entry, which provides profit.

Marketing expenditure in all three groups - total sample, joint venture, and non-joint venture, is not significantly related to profit. This means that its increase in any type of strategic alliance has no effect on profit increase.

Firms may be over-allocating resources to marketing expenditures in an attempt to achieve sales growth. As Marshall (1987) pointed out, marketing expenditure acts as a barrier to entry. This is favorable for profitability. They examined the relationship between marketing expenditure and profit and found it to be significantly positive. The insignificant relationships between marketing expenditure and profit in all groups in this study are opposed to the findings of Marshall (1987) and Buzzell and Gale (1987). However, marketing expenditure in strategic alliance is likely not to create product differentiation and in turn, not to act as barrier to entry. Thus, marketing expenditure may not affect profit in strategic alliances.

Also, production efficiency in all three groups - the total sample, joint venture, and non-joint venture is not significantly related to profit. This implies that increase of production efficiency in those groups may not affect profit.

Lack of production efficiency has been a key factor in the failure of many firms, while increased efficiency has been a key success factor for many firms. Efficient firms can maintain a relatively stable price level and profit margins in the face of rapidly increasing material costs (Greer, 1971). The insignificant relationships in all three categories are opposed to the result of Patton (1976). An unexpected result of the relationship in this research shows it is likely that an increase of production efficiency in strategic alliance may not affect profit.

### CONCLUSION

Much of the empirical research on alliances has looked at alliance formation across industries. There has been very little empirical research focusing upon the configuration of alliance activity among competitors within an industry. The research examines the relationship between strategy and performance according to two types of strategic alliance in the new materials industry : joint venture and non-joint venture.

The results show that capacity utilization, marketing expenditure, and production efficiency in joint venture and non-joint venture group are not significantly related to profit. However, acquisition of new technology and capital intensity showed mixed results. Acquisition of new technology of non-joint venture and capital intensity of joint venture are significantly and positively related to profit. This implies that an increase of acquisition of new technology and capital intensity of new technology and capital intensity of new technology and capital intensity in those groups may affect on an increase of profit. Meanwhile, acquisition of new technology in joint venture and capital intensity of non-joint venture are not significantly related to profit. This implies that an increase of acquisition of new technology in joint venture and capital intensity of non-joint venture are not significantly related to profit. This implies that an increase of acquisition of new technology and capital intensity of non-joint venture are not significantly related to profit. This implies that an increase of acquisition of new technology and capital intensity of non-joint venture are not significantly related to profit. This implies that an increase of acquisition of new technology and capital intensity in those groups may not affect profit.

This research examines only five strategic variables to examine the relationship between strategy and performance in the strategic alliance. More strategic variables must be explored to investigate the impact of strategies on performance. Environmental variables must also be investigated to examine their impact on performance. This enables explanation of the strategy - environment - performance relationship of firms in strategic alliance of an industry developed by Porter (1982). Also, further research of this relationship in other industries should be conducted. The research examined only two types of strategic alliance - joint venture and non-joint venture. Further research of the relationship between strategy, environment, and performance in other group of strategic alliance such a licensing can be developed. This information might be helpful to management and academic research to better understand strategic alliance.

# APPENDIX

The following are the instruments used in measuring 5 strategic variables and 1 performance variable.

**Strategic variables**. Executives were asked, To what extent has your firm been competitive in your product-market in the past three years(1995-1997) : for acquisition of new technology, capacity utilization, capital intensity, marketing expenditure, and production efficiency (5 - point scale, with 1 = not at all to 5 = a great deal).

**Performance variable**. In addition, we asked them to what extent their firms have achieved an increase of profit in their product-market in the past three years (5 - point scale, with 1 = not at all to 5 = a great deal).