

Competitive Strategies for Small-sized Manufacturing Firms in High-technology Industries

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Abstract

This study explored competitive strategy employed by small-sized firms in high-technology industries. Basically three types of strategy, i.e., low cost leadership, service differentiation and innovative differentiation, were identified. Findings of this study also indicated unique characteristics of strategies followed by small-sized companies. Existence of a large number of small-sized companies without clear competitive strategies ("stuck in the middle") and somewhat lower performance of innovative firms indicated hardship experienced by small-sized firms in prospering in high-technology industries.

Competitive strategy has become an important topic in the strategic management field during the last decades. A number of strategic typologies or "generic" strategies have been proposed and well-received in the academic and business communities. Examples of popular topologies are Porter's (1980) generic strategies, i.e., low cost leadership, differentiation and focus, and Miles and Snow's (1978) typology, i.e., prospector, analyzer and defender. A strategic typology is a broad categorization of firms' strategic behaviors into a few types. It is often called "generic" because it is considered applicable and viable to any firm in any environment. As a result, many empirical studies have tested the topologies or applied them to firms without taking into account firm size and environmental differences.

Several studies, however, have found or contend-

ed that firm size and the type of environment (or contingency) have strong impacts on choice as well as effectiveness of strategies (e.g., Wan and Bullard, 2008; Hambrick, 1983b; Wright, 1987). Only a few studies have investigated competitive strategies employed by small-sized companies (e.g., Beal, 2000; Barth, 2003; Davig, 1986; Dandridge, 1979; Sexton and Van Auken, 1982; Welsh and White, 1981), very few of which have focused on specific types of environment. Executives of small-sized firms, therefore, have few guidelines and frameworks for formulating and implementing effective strategies for competition in their markets.

The present study is an initial attempt to address these gaps by exploring competitive strategy pursued by small-sized firms in a specific environment, i.e., high-technology industries. This research study applies Porter's (1980) generic strategies to small-sized firms competing in the semiconductor industry. Specifically, this study attempts to answer the following questions.

- (1) What types of competitive strategy are followed by small-sized manufacturing firms for competition in high-technology industries?
- (2) What types of competitive strategy are instrumental in providing small-sized firms with competitive advantages in high-technology markets, thereby leading to higher performance?

In the next section, a review of previous literature relating to competitive strategy will be presented, followed by an explanation of survey design of the study. Then, results of the survey, and implications for small-sized firms and future research will be dis-

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cussed.

I Competitive Strategy

The recent trend in strategic management research has been to identify types or typologies of strategies employed by firms within an industry. These studies are based on the recognition that strategies differ along firms within the same industry, and that subgroups of firms (or strategic groups) employ different mixes of methods to compete in the industry (Hatten, 1979). Companies operating in the same or similar environment may compete by using different competitive methods due to dissimilar strategic orientation of their management and other internal distinctive competence. Strategic group analysis investigates strategies and operating similarities and differences among firms within the industry, thereby providing a useful intermediate frame of reference between viewing the industry as a whole and considering each firm separately (Proff, 2000; Harrigan, 1985).

Several strategic topologies have been proposed. As mentioned earlier, Porter's (1980) generic strategies, and Miles and Snow's (1978) typology have been well-received by the academic and business communities. Other examples are Glueck's (1980) typology including growth, stability and retrenchment, and Herbert and Deresky's (1987) typology consisting of develop and stabilize types. All of them are to explain strategic behaviors of firms and categorize them onto a few types.

These topologies are not completely incompatible with each other. Strategy is a complex phenomenon, including many dimensions. Each typology, however, fills on one or two strategy dimensions for classification purposes. For example, Porter's generic strategies use the competitive strategy dimension, i.e., low cost leadership and differentiation, as a major classification variable. The major classification dimension of Miles and Snow's (1978) typology, for another, is a product-market scope change, i.e., rapid changes in products and markets versus little changes (Hambrick, 1983b). Still other topologies developed by Glueck (1980) and Herbert

and Deresky (1987) classify firms based on growth direction dimension, rapid or slow growth. Unfortunately, relationships along these strategy dimensions as well as those along these topologies are not clear. As an initial attempt to explore strategies employed by small-sized firms in high-technology industries, Porter's (1980) framework, which focuses on competitive strategy, is applied in this study.

Porter has developed a typology which includes three strategic types, i.e., low cost leadership, differentiation and focus. A low cost leadership strategy emphasizes creating competitive advantage through generating and maintaining low cost positions relative to competitors. A differentiation strategy requires firms to create something, either products or services, that are recognized industrywide as unique. A focus strategy describes firms following either differentiation or low cost leadership but focusing on a particular group of customers, geographic markets, or product line segments. In other words, a focus strategy is not a major dimension of competitive strategy but that of product-market scope, i.e., wide or narrow scope (White, 1986). This study, therefore, focuses on competitive strategy dimension, i.e., low cost leadership and differentiation, in identifying types of competitive strategy used by small-sized firms.

Several empirical studies that have tested the Porter's generic strategies have confirmed that firms oriented toward one of the strategies outperformed those which did not (e.g., Colin, 2000; Koo, Koh and Nam, 2004; Dess and Davis, 1984; Galbraith and Schendel, 1983; Hambrick, 1983a; White, 1986). The latter group of firms is referred to as "stuck in the middle" (Tallon, 2008).

There have been considerable refinements of the generic strategies during the last decades (e.g., Parnell, 2006; Yiannis and Spyros, 2001; Roy and Vezina, 2001). For example, Karnani (1984) contends that a firm pursue both differentiation and low cost leadership strategies and can outperform in an industry, which has been confirmed Dess and Davis' (1984) and White (1986) studies. It has also been found that there are many means to differentiate from competitors, e.g., product innovation, creative marketing techniques and customer service. Miller

(1986) has suggested that the following two major distinct forms of differentiation strategy, i.e., marketing differentiation which emphasizes brand identification development, advertising and other marketing techniques, and innovative differentiation that stresses new product development and introduction. In other words, the recent development of Porter's generic strategies has been to identify major subtypes within a strategy type and a combination of strata types.

The claim by Porter that any of the three generic strategies can be viable to any type of firms operating in any environment has been challenged by Wright. Wright (1987) has proposed that small-sized firms have a choice of selecting only focus strategy (either low cost or differentiation strategy), while larger companies have the option of low cost leadership, differentiation, or focus (i.e., differentiation) strategy. The restriction on strategy choices stems primarily from the size of the firm and its access to resources (Wright, 1987).

II Research Design

A questionnaire was mailed to each executive (president or Chief Executive Officer) of 356 semiconductor companies (SIC code: 3674), listed in various company directories. A single industry was chosen in order to control for industry differences. 106 useable responses were received (about 29 percent response rate). Of the 106 responding, 49 companies (about 46 percent of the sample) were larger fixed (employed more than 250 employees) and thus were dropped from the study. The remaining 57 responses were used for analysis. Assuming that the size distributions of responding and non-responding firms did not differ significantly, the response rate of 29 percent can be considered fair for mail surveys. Also, given the exploratory nature of the study and resource constraints, the final sample size is considered adequate, and not a major barrier in interpreting the results. However, a somewhat larger sample would obviously permit firmer conclusions to be drawn from the statistical analysis.

Each respondent was asked to rate the degree of

emphasis on ten competitive methods (e.g., customer service, brand identification and new product development) used in competing in his/her market, based on a seven-point scale, with 1 being least emphasized and with 7 being most emphasized. The questionnaire items concerning competitive methods were derived from an extensive literature review. A review of Porter's book, *Competitive strategy* (1980), and articles by Dess and Davis (1984), Galbraith and Schendel (1983), Hambrick (1983a), Koo, Koh and Nam (2004), Beal (2000), and Jusoh and Parnell (2008) was undertaken. Care was taken to include many competitive methods for differentiation, since it was argued that the strategy has several dimensions including marketing, innovation, and customer service.

Organizational performance was assessed using a subjective self-report instrument developed and validated by Dess and Robinson (1984). Three measures of organizational performance, i.e., sale growth, after tax refrain on total assets and overall firm performance, were used in this study. Growth in sales reflects how well a company aligns itself to its environment (Hofer and Schendel, 1978: 4) by successfully expanding its product-market scope (Ansoff, 1965). Another measure, after tax return on total assets (ROA), is usually considered a measure of the efficiency of a firm with regard to the profitable use of its total asset base (Ansoff, 1965; Bourgeois, 1980). For each measure of performance, respondents were asked to identify whether their firm, relative to other firms of similar sales volume in the industry or region, was in the top 20 percent of the distribution of firms (scale = 5), upper 20-40 percent of the distribution of firms (scale = 4) and so on. The questionnaire was tested prior to mailing to the sample firms.

Data was analyzed in three steps. First, factor analysis was used to identify prevalent patterns of competitive strategy. Factor Analysis has the ability to analyze complex relationships between and among variables and identify meaningful patterns among a set of variables. Second, factor scores produced by factor analysis for each sample were used as input to a cluster analysis, in order to classify them into distinct strategy types. This procedure

has been employed in several strategic management and marketing studies (Amoako-Gyampah and Acquah, 2008; Acquah, Adjei and Mensa-Bonsu, 2008; Jusoh and Parnell, 2008; Dess and Davis, 1984; Frank and Green, 1968; Galbraith and Schendel, 1983; Green, Frank and Robinson, 1967; Robinson and Pearce, 1988). While it results in some loss of information, it has the advantage of generating orthogonal (i.e., unrelated) patterns for subsequent analysis, thus reducing the potential problem of “noise” due to interdependence among strategy variables. Finally, a one way analysis of variance test was used to determine whether the different strategy types were associated with different levels of performance.

III Results

1 Patterns of competitive Strategy

Three distinct patterns of competitive strategy were found by factor analysis to be used by small-sized, high-technology companies (see Table 1). One pattern of strategy was to compete through differentiation by emphasizing new product development, advertising, competitive pricing and creative marketing techniques. The most important competitive method in this pattern of strategy was new product development, while the least important one was competitive pricing. Therefore, this strategy pattern can be interpreted as innovative differentiation strategy, with some emphasis on marketing programs and competitive pricing.

Second prevalent pattern of competitive strategy was low cost leadership, emphasizing operating ef-

iciency and economies of scale in manufacturing. It also stressed broad range of products. It can thus be labeled as broad-line low cost leadership strategy.

Pattern three emphasized production of specialty products for customers, product quality and customer service. This pattern can be interpreted as a focus strategy because of its focus on a particular group of customers who require customization of products. However, a focus strategy should take the form of either differentiation or low cost leadership. This strategy did not manifest either one of the two strategy orientations. Also, a study of Dess and Davis (1984) did not find clear strategy orientation of a focus strategy. Because of the emphasis on customer service and customization of products to customers’ special needs, this pattern can thus be interpreted as differentiation basis on superior services (service differentiation).

It should be noted that the principal factor solution with the varimax rotation was used for the analysis. The three revealed factors were significant, i.e., eigenvalues > 1. All the ten competitive methods exhibited factor loadings greater than or equal to ± .50 on at least one factor. The reliability and validity of the factor analytic results can be supported by a relatively high ratio of samples ($n = 57$) to measures ($n = 10$). The ratio of 5.7 exceeds the desirable ratio of four or five to one recommended by Hair, Anderson, Tatham and Grablovsky (1979).

2 Competitive Strategy Types and Performance

Cluster analysis was performed on the sample firms, and revealed four clusters of companies following similar competitive strategies (see Table 2). Sample firms were switched from one cluster to another until each cluster consist of companies with similar strategy orientation and differed sibilantly from other clusters . The scores generated by factor analysis was used as input a clustering algorithm (FASTCLUS procedure in SAS).

Companies in cluster one primarily pursued a low cost leadership strategy, and strongly deemphasized innovative differentiation. Nine companies were classified into cluster two. These companies stressed only customer service but not innovative

**Table 1 Factor Analysis Results
Three Patterns of Competitive Strategy**

Factor	Prevalent competitive methods
1	New product development Creative marketing techniques and methods Advertising Competitive pricing
2	Economies of scale in manufacturing Operating efficiency Broad product range
3	Superior service Product quality control Capability to manufacture specialty products

Table 2 Cluster Analysis Results
Four Clusters of Small-Sized Companies, Competitive Strategy, and
Organizational Performance

	Innovative Diff.	Low cost Leader	Focus	Sales Growth ^a	ROA	Overall Perf.
1 (<i>n</i> = 9)	-- ^b	H		3.6	3.9	3.8
2 (<i>n</i> = 9)	-		H	2.6	3.4	3.1
3 (<i>n</i> = 19)	-	-	--	2.5	2.7	2.7
4 (<i>n</i> = 20)	H		L	3.3	2.9	3.2

Notes: ^a One way analysis of variance results for the four clusters: Sales growth, *F*-value = 2.78, *p* < .05; After tax ROA, *F*-value = 2.89, *p* < .04; Overall performance, *F*-value = 3.57, *p* < .02.

^b Executives consider the degree of importance of the competitive strategy: "H", high; "L", low; blank, average; -, not important, and --, not important at all.

differentiation and low cost leadership.

Cluster three companies were found not to emphasize any of the three competitive patterns. These companies thus were labeled "stuck in the middle." Firms in cluster four emphasized innovative differentiation with some emphasis on service.

As shown in Table 2, there were significant differences in organizational performance among the four clusters of companies. For sales growth, a measure of match between organizations and environments, companies in cluster one (low cost leaders) achieved higher performance than others, especially those in clusters 2 and 3 (service oriented companies and those "stuck in the middle"). For after tax return on assets, an efficiency measure, cluster one companies again achieved higher performance than others. In terms of overall performance, firms in cluster one outperformed others, especially those "stuck in the middle."

IV Implications for Small Business in High-technology Industries

Several distinct attributes of strategies employed by small-sized firms were identified in this study. Characteristics of competitive strategy patterns identified by factor analysis revealed some differences from those of generic strategies described by Porter (1980), indicating fairly distinct strategy attributes of small-sized companies. First, marketing differentiation strategy alone was not used by small-sized companies in high-technology industries, the semiconductor industry. The strategy was to devel-

op brand identification (consumer or customer loyalty) thrills strong marketing programs such as advertising and creative marketing techniques. It was employed in combination with innovative differentiation strategy—promoting new products to the markets. Small-sized companies, perhaps due to resource constraints, could not support large marketing expenditures in building brand identification. Moreover, probably because of rapid changes in technologies and customer needs, they may not be able to achieve sustainable brand loyalty along customers through extensive marketing programs.

Second, a product innovation oriented strategy (innovative differentiation) encompasses an emphasis on competitive pricing. It means that small-sized companies tend to competitively price their new products. This tendency may reflect the greater bargaining power of the buyers, as well as the competitive nature of the markets.

Types of competitive strategy employed by small-sized companies in high-technology industries also exhibited several unique characteristics. First, a disproportionately large number of small-sized companies (more than one third of the sample) pursued innovative differentiation strategy with some emphasis on marketing programs and customer service. The multiplicity of their strategic orientation indicated that small-sized companies could not achieve competitive advantage through new product development alone.

Second, innovative differentiation strategy, which has usually when considered viable and effective

for small-sized companies, was found in this study to attain only about average performance. In a rapidly changing high-technology industry, limited organizational resources due to small firm size might have led to limited performance potential. Also, high levels of risk associated with product innovation might have lowered average performance levels among companies in this group.

Third, it was surprising to find that more than a third of small-sized companies (cluster three) in the sample were “stuck in the middle.” Note that they placed about average emphasis on innovative differentiation and deemphasized log cost leadership and customer service. It appeared that these companies did not emphasize enough product innovation to achieve competitive advantage. In line with Porter’s contention that those “stuck in the middle” are guaranteed low profitability, they scored lowest in all the measures of performance. Also, as organization theory research literature suggests, poor performance tends to lower product innovation capabilities (e.g., Cameron, Whetten and Kim, 1987). Since these companies have relatively higher levels of competence in product innovation, compared to those using the other two competitive strategies (i.e., low cost leadership and service differentiation), they need to stress more product innovation in order to survive, probably by obtaining external financing or raising capital internally. This finding of a large number of small-sized companies in the “stuck in the middle” category urgently calls for more research on unsuccessful companies’ operations and strategies.

Fourth, it was also surprising to find that only a few small-sized companies (about 16 percent of the sample) pursued a low cost leadership and that these low cost leaders consistently outperformed others in all three measures of performance. These companies deemphasized new product development and thus produced and marketed established products. It appeared that the small number of low cost leaders captured growing niches that demand established products. Wright (1987) suggested that the low cost leadership strategy in a given industry may be available only to a limited number of companies. Companies that have greater cumulative vol-

ume of operational capabilities or better access to low cost inputs (i.e., labor, energy, freight, raw materials and semi-finished goods) can achieve lowest cost positions relative to competitors.

Lastly, differentiation strategy through superior customer service and customization of products to customers’ needs, without product innovation and low cost positions, was found to provide only about average overall performance and low sales growth performance.

Some limitations of the present study should be noted. First, the use of privately owned firms as a sample precluded the independent verification of the respondents’ statements pertaining to organizational performance. Second, competitive strategy may include other essential competitive methods not covered in this study. However, given the exploratory nature of the study and resource constraints, the limitation is not considered a major barrier in interpreting the results. Third, although the final sample size is considered adequate, a somewhat larger sample would obviously permit firmer conclusions to be drawn from the statistical analysis results.

Future research should investigate competitive strategy employed by small-sized firms operating in other types of environment, e.g., mature industries. The relative importance of the competitive methods might vary across different environments. As discussed previously, this study focused on one dimension of strategy—competitive strategy. Future research should investigate other dimensions of strategies such as product-market scope change and growth direction. It should also attempt to explore the nature of relationships among strategy dimensions. The ultimate goal is to develop a comprehensive, contingent framework specifically for small-sized companies, which integrates complex dimensions of strategy.

This study explored competitive strategy employed by small-sized firms in high-technology industries. Basically three types of strategy, i.e., low cost leadership, service differentiation and innovative differentiation, were identified. Findings of this study also indicated unique characteristics of strategies followed by small-sized companies. Existence

of a large number of small-sized companies without clear competitive strategies ("stuck in the middle") and somewhat lower performance of innovative first indicated hardship experienced by small-sized firms in prospering in high-technology industries. More research is needed to further understanding of strategies employed by small-sized companies.

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