

The Role of Firm Size in Determining Corporate Strategies for New Product Programs

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Abstract

Success in new product development is vital to most industrial firms. In recent decades, a firm's new product strategy is increasingly recognized as an essential component of the total corporate plan in developing countries. In this research, 81 Korean manufacturing firms are examined to identify the relationships between a firm's product innovation strategy and the performance results with special emphasis on firm size in a developing country. First, a total of 8 strategy dimensions were identified, which constitute the specific elements of firms' innovation strategies. Two independent dimensions of performance were also identified and were found to be closely linked to the strategy adopted. Then, a categorization scheme is developed to distinguish firms according to their size, and proves useful in identifying how the impact of the firm's new product strategy on performance results might be altered for different company size. The findings generally suggest that a well-balanced new product program emphasizing both marketing and technological effort appropriately is needed to make the program successful. The different size of the company is found to call for somewhat different strategy dimensions to enhance the performance results.

1. Introduction

In recent decades, many developing countries have made significant progress in industrial and technological development, evolving from agriculture-based traditional societies to industry-dominant modern societies. In the process, the management of technological change and new product development has become increasingly important to most

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industrial firms (Lee et al.,1988). In spite of the importance of new product planning, relatively little empirical research has been undertaken in developing countries to determine the components of a firm's overall new product strategies and their relationships with performance results: that is, how companies directly or indirectly choose new markets and areas of technology, and organize and focus their R&D efforts in different ways. A few exceptions include studies conducted in Latin America (Katz,1980), Taiwan (Gerstenfeld & Wortzel,1977), and Korea (Kim & Kim,1985; Lee & Kim,1986). These studies, however, concentrated on the product itself as the unit of analysis, rather than on the firm's total new product program. Many new product studies performed in advanced countries also have employed individual product as the unit of analysis (Myers & Sweezy,1978; Cooper,1979; Hopkins,1981; Lilien & Yoon,1989).

Concentrating only on the new product rather than the totality of the firm's new product program could result in a myopic focus (Cooper,1985). For example, Myers & Marquis(1969) found that most firm's new products were merely incremental innovations. A recent survey of Booz, Allen & Hamilton(1982) reveals similar conclusion to this. But for a long run and dramatic success, major breakthroughs and significant innovations may be required. Conceivably, what leads to success for individual products may not result in a totally successful new product program in a firm's viewpoint. The purpose of this paper is, first, to identify the basic characteristics and the underlying dimensions that portray a firm's entire new product program and its performance results respectively. A second purpose is to investigate the relationships between a firm's posture on the key strategy dimensions and the performance results of its new product program considering different firm size.

The importance of new products and technological innovation as a route to corporate growth has long been recognized in most technologically advanced countries (Souder,1987). Recently, the strategy a firm elects for its product innovation program is viewed as a critical element of the firm's total corporate strategy (Booz, Allen & Hamilton,1982; McGee & Thomas,1989; Clarke et al.,1989). New product development and technology bear an integral relationship to a company's strategic thinking by helping to define the range of its possibilities (Kantrow,1980; Bitondo & Frohman,1981; Wilkinson,1983; Morton,1983; Liberatore & Titus,1983; Frohman,1984; Scarpello et al.,1986; Shrivastava & Souder,1987; Clark,1989). Additionally, the technological strategy a firm elects and company characteristics such as firm size have showed an intimate relationship in many studies concerning corporate strategy (Gilmore,1971; Hoorn,1979; Cooper,1981; Porter,1985; Shrivastava & Souder,1987), and new product success and failure (Myers & Sweezy,1978; Holt,1988). This study is much indebted to the work undertaken in advanced countries for the delineation of a set of research questions and for the construction of a conceptual framework that helps to provide some initial evidence of the relationships between a firm's entire new product strategies and the performance results in a developing country.

2. Previous Research

The past decade has witnessed a growing emphasis on the need to incorporate technological issues within a firm's strategic decision making. Kantraw(1980) insists that technology has an inner logic that must be considered in a company's strategic planning. He states that "more than 30 books and articles ... express this increasing perception by managers of the need to place technological decisions in the context of overall corporate strategy." And, new product planning is known to be one of the strategies available to top management to maintain, develop or expand the firm's technological base, as required, within the overall corporate strategy (Liberatore & Titus,1983; Cooper,1989; Kortge & Okonkwo,1989). Bitondo & Frohman(1981) also suggest that before corporate objectives and business strategies can be translated into new product projects, a technological strategy must be formulated and made as essential a part of corporate business planning as marketing and finance. It is only a recent phenomenon, however, that researchers have begun to investigate a firm's new product strategy and the performance results of the entire new product program through an empirical basis.

In order to help structure the review framework, the key dimensions of a firm's new product strategy are first identified from normative strategy literature, from previous research on individual new products, and from previous studies of firms' new product strategies. According to Corey(1975), two key dimensions of corporate strategy are market selection and product specification. Crawford(1980) further identified four dimensions of the key target business arenas considered by managers in their product innovation charters. These are product type, end-user activity, type of technology employed, and end-user group. Cooper(1985), recently, has suggested the nature, orientation and level of commitment to the new product process as another key dimension of new product strategy. In this study, we employed types of product, market, technology, and program orientation as 4 major blocks constructing a firm's new product strategy. Table 1 shows the detailed elements of new product strategies presented in previous research. The conceptual framework of the firm's new product strategy in this research was fully developed from these 4 strategy blocks and the elements contained in them.

Measures of the performance of a firm's new product program are a second feature of the review. Collier(1977) reviewed several new product performance criteria, including; financial criteria, the percentage of current company sales generated by new products; and objectives relative to profitability, ability to generate sales or profits and other less quantifiable objectives. Hopkins(1981) suggests other measures of new product performance including the success rates of new products introduced and a global satisfaction score elicited from managers. Recently, Collier et al.(1984) have suggested near and distant criteria of new product performance, where the near criteria include market growth, market share and margin on sales, and the distant criterion refers to the profitability of the business

Table 1. Previous Research on the Key Dimensions and Variables
for New Product Strategy

Elements of New Product Strategy Suggested in Recent Studies	Research Study*
[New Product Features & Focus]	
Degree & nature of the product differential advantage sought	1,2
Level of product innovativeness	1,3,4
Product quality level	1,3,5,6,7
Product concentration vs. diversification	8,9
Product type - e.g. high technology products, technically complex products, low-cost & repeat-buying products	1,3
[Types of Technology Employed]	
Concentrated vs. diversified technologies	8
Technological fit or synergy of new products with the firm	3,7,8,10,11
Maturity of technology - e.g. state-of-the-art (new) vs. old technology	12,13
Patent requirements	7
Technology acquisition	12,23
Isolated vs. synergistic use of technology	8
[Types of New Product Markets Sought]	
Market size, growth and potential	3,7
The competitive situation - either specifically avoiding or confronting particular competitors	3,7,14
The stage of the product life cycle	12
Marketing fit or synergy with the firm	1,3,7,11
Market newness to the firm	1,4,8,9,10,12
[Orientation & Nature of the New Product Development Program]	
Whether the program is proactive or reactive in nature - degree of innovation/imitation	3,7,8,12,28
Sources of new product ideas - internal vs. external	3,8,27,29
Technical vs. market orientation of the program	8,15,16,17,24,25,26
Level of R&D spending	5,6,12,18,19
Whether the R&D effort is pure vs. applied research	12
Risk level of projects	3,7
Speed of the product development program	7
Internal vs. external orientation of R&D	8
Coordination between technological and market or other business activities	20,21,22

*Studies refer to:	1: Cooper 1979	2: Coyne 1986
	3: Crawford 1980	4: Heany 1982
	5: Buzzell et al. 1975	6: Schoeffler 1974
	7: Crawford 1972	8: Nystrom 1979
	9: Corey 1975	10: Roberts & Berry 1985
	11: Morton 1983	12: Bitondo & Frohman 1981
	13: Soukup & Cooper 1983	14: Abel & Hammond 1979
	15: Pilditch 1981	16: Schmitt 1985
	17: Ward 1981	18: Bemelmans 1979
	19: Hull et al. 1984	20: Thomas 1984
	21: Kiel 1984	22: Carroad & Carroad 1982
	23: Ronstadt & Kramer 1983	24: Souder 1989
	25: Holt 1988	26: LaZerte 1989
	27: von Hippel 1989	28: Kane 1989
	29: Foxall 1989	

(Cooper, 1989). A comparison with competitors provides another gauge of performance (Cooper, 1985). These various performance criteria lead to the development of a set of program performance measures for this research, which is outlined in the later section of results.

3. Conceptual Framework and Propositions

The major concern of our research is to identify the basic characteristics of the entire new product program a firm elects and its performance results by investigating the relationships between them in different company situations as small, medium-sized, and large firms. That is, we are interested in the relationship between firm size and the firm's strategic decision making of new products. The underlying propositions are first described in order to help structure the research.

Proposition 1

A firm's overall new product strategy is closely tied to the performance result of the company's new product program.

Proposition 2

The relationships between the firm's new product strategy and the performance results will exhibit different patterns in small, medium-sized, and large companies.

The research reported in this article addresses these propositions; first by measuring and reducing the many possible descriptors of an industrial firm's new product strategies and performance results; and then by determining whether different categories of companies show specific similarities and differences in their strategic decision making of new product and the impact of these on performance results.

4. Method

The data for this study were collected from 81 Korean manufacturing firms of consumer and industrial products such as fabricated metals, machinery, electric and electronic home appliance, cosmetics, and so on. Initially, a convenience sample of 150 firms, which is composed of such firms as producing consumer frequently purchased goods, consumer durable goods, and industrial goods, was selected from a list of manufacturing firms registered in Korea to provide the data base. Forty-one firms, however, were disqualified: Eleven were no longer in business or could not be contacted; Another 30 simply were not active enough in new product development to provide an appropriate new product strategy. Of the remaining sample of 109 firms known to be active in product development, a total of 81 replied to the questionnaire for an effective response rate of 74.3%. Personal visits

to all of the 109 firms and persistent telephone follow-up were largely responsible for the exceptionally high response rate.

The companies include a broad cross section of small- to large-sized firms in Korea. Here, we are faced with the problem of which yardstick to use to express the size of the company. Among some conventional size criteria such as sales, assets, and number of employees, several previous studies undertaken in advanced countries have used the number of employees to describe the strategic decision making and innovation behaviour in different size of firms (Gilmore,1971; Roberts,1976; Myers & Sweezy,1978; Hoorn,1979; Cooper,1981). It appears, however, that in advanced countries such as the U.S., the term 'small and medium-sized companies' may apply to enterprises with 1000 or more employees, which would be considered large companies in our country. Myers & Sweezy(1978), for example, distinguished small companies as having employees under 500, medium-sized companies as from 500 to 2500, and large companies as 2500 plus. Hence, the previous research undertaken in advanced countries is of little use to us for the categorization of firm size. In this research, we demarcate small firms as having employees under 200, medium-sized companies as between 200 and 1000, and large firms as 1000 plus, based on the Korea's Small and Medium Enterprise Basic Law enacted in 1966, and on the Small and Medium Enterprise Promotion Law enacted in 1978.

5. Results

An overview on the strategy-performance relationships in each size of firms, first, show that both marketing- and technology-related factors are important to determine the performance of a firm's new product program. Only marketing-oriented or technology-oriented new product strategy constructed from the corresponding competitive strength of a firm does not guarantee a satisfactory overall performance. Rather, a balanced strategy focusing both the marketing- and technology-related dimensions appropriately is required to obtain a high performance of the entire new product program (LaZerte,1989). One evidence can be resulted from an overall look at Table 5 and Table 6 that marketing-related factors such as the Fitness of New Product to Market and the Market Potential are not significantly related with the first performance dimension, Program Success, as compared with their relationship to the second one. Technology-related factors, on the other hand, are found to have a relatively significant relationship with both performance dimensions, although the degree of significance varies in different size of firms.

Second implication concerns the technological nature of new product development. Our results imply that small firms should employ the proper level of technological sophistication and innovativeness appropriate to them, for the purpose of achieving a rather short-term impact on the performance criteria, the Program Success. If a small firm wants to make highly innovative and technologically sophisticated

Table 2. New Product Behavior in Different Firm Size

Variables	Components	Firm Size (number of employees)			One-way ANOVA Significance Level
		~ 200 (n=18)	201~1000 (n=31)	11001 ~ (n=30)	
sales	company's annual sales in \$ millions*	3.6	24.6	99.0	0.0001
	sales of major products as a % of total company sales	65.8%	52.3%	50.4%	0.05
new product performances in development stages	prototype development/idea generation(%)	46.2	53.5	38.8	0.05
	product launch/prototype development(%)	51.3	66.6	74.5	0.0001
	commercial success/product launch(%)	58.0	60.6	63.4	n.s.**
	commercial failure/product launch(%)	41.9	39.3	36.5	n.s.
investment level	annual R&D expenditure as a % of sales	1.80	1.85	1.40	n.s.
	annual advertising expenditure as a % of sales	1.3	2.7	3.2	0.05
types of new product development (total 100%)	imitative development of local & foreign products(%)	31.9	32.9	32.6	n.s.
	cooperative development with other research organizations(%)	12.5	5.4	5.1	0.05
	technological licensing & technology transfer(%)	9.4	17.5	31.5	0.0001
	joint venture(%)	3.6	9.8	2.1	n.s.
	internal development of technological capability(%)	40.5	34.0	28.3	0.05
	technology/R&D department(%)	18.0	21.1	13.6	n.s.
sources of new product ideas (total 100%)	marketing department - sales, promotion & distribution(%)	4.1	5.7	6.7	n.s.
	top management(%)	30.5	10.3	3.6	0.0001
	competitors(%)	2.2	3.3	3.1	n.s.
	customers(%)	13.0	5.1	15.5	0.05
	technical agents including independent inventors, other firms & labs, consultants, etc.(%)	2.2	2.3	2.8	n.s.
	spinoff ideas and technology transfer(%)	1.3	17.0	24.9	0.0001
commercial follow-ons from government contracts(%)	commercial follow-ons from government contracts(%)	0.27	***	0.40	n.s.
	adopted/no existing products in local mkt.(%)	7.5	5.0	9.5	n.s.
original foreign products(%)	20.2	29.9	19.5	0.05	

* All numbers have % value, except where noted by *. In cases of idea sources and development types, their components add to 100%.

** n.s. denotes not statistically significant under $\alpha = 0.05$.

*** No cases fall in this category.

Table 3. Underlying Dimensions of New Product Strategy

Factor Name* (% Variance)	Variables Loading on Factor**	Variable Loadings
F1. Fitness of New Product to Market *** (31.4%; $\alpha = 0.93$)	Markets involve familiar channels/salesforce to firm	0.858
	Markets involve familiar competitors to firm	0.835
	New products are in same class as existing products	0.825
	Markets involve familiar advertising/promotion to firm	0.809
	New products are closely related to each other	0.779
	Markets involve familiar customers to firm	0.761
	New products are aimed at related markets - focused	0.742
	New product program is a concentrated one	0.737
	New products have similar end-use as existing products	0.708
	New products fit firm's advertising/promotion resources	0.696
	New products fit firm's existing channels/salesforce	0.631
F2. Market Potential (21.0%; $\alpha = 0.87$)	Users' needs quickly change in the market	0.868
	Markets have frequent introductions of new products	0.809
	New product markets are large ones	0.767
	New product markets are rapidly growing	0.746
	New product markets have large potential	0.745
	Markets are price competitive	0.563
F3. Technological Sophistication (12.9%; $\alpha = 0.74$)	Markets have many competitors and intense competition	0.529
	New products offer unique features/designs to customers	0.353
	New products are high technology, technically complex	0.920
	New products employ sophisticated development technology	0.883
	New products employ various different prod./dev. tech.	0.831
	New products employ state-of-the-art prod./dev. tech.	0.780
F4. Product Innovativeness (11.1%; $\alpha = 0.81$)	Products in the market are highly heterogeneous ones	0.623
	New product process is dominated by a technological group	0.585
	New product program is important in corporate strategy	0.328
	New products are higher quality than competitors' prod.	0.740
F5. Proactive Orientation (5.1%; $\alpha = 0.76$)	New products let customers perform a unique task	0.734
	New products are highly innovative ones	0.677
	New product markets are mass markets - many customers	0.663
F6. Technological Synergy (4.0%; $\alpha = 0.77$)	Program is offensive - aimed at market leader	0.754
	Internally-oriented : developed by their own efforts	0.643
	Program is proactive - active to develop innovative ones	0.623
F7. Competitive Dominance (3.8%; $\alpha = 0.89$)	New products fit firm's R&D skills and resources	0.791
	Fit firm's production/engineering skills and resources	0.555
	Employ production/development tech. familiar to firm	0.450
F8. Technologi -cal Competit -iveness (3.3%; $\alpha = 0.79$)	New products fit firm's production facilities	0.431
	Markets have customers satisfied with competitors' prod.	0.786
	Markets have a dominant competitor	0.783
F8. Technologi -cal Competit -iveness (3.3%; $\alpha = 0.79$)	Competitive to acquire raw materials/production equipment	0.617
	Markets are competitive to develop high quality products	0.442
	Competitive to employ production/engineering skills	0.440

* Principal factors with iterations ; Varimax rotation, SPSS routine.
The eight factors had eigenvalues in excess of 1.0 and explained 92.6% of the variance after rotation.

** Both "relative advantage in product price" and "initiation by market-related factors" did not load particularly highly on any factor.

Table 4. Underlying Dimensions of the Performance of New Product Program

Factor Name* (% of Variance Explained;)**	Variables Loading on Factor	Variable Loadings
F1. Program Success	Extent to which profits exceed the costs of new product program	0.802
	Extent to which the new product program met its performance objectives over the last five years	0.740
	Percent of new products failed in last five years***	-0.650
(57.3%; $\alpha = 0.79$)	Percent of new products succeeded in last five years***	0.645
F2. Company-Wide Impact	Program importance in generating sales for the company	0.864
	Percent of company sales by new products introduced in last five years***	0.782
(42.7%; $\alpha = 0.75$)	Overall success rating of new product program	0.531

* Principal factors with iterations ; Varimax rotation, SPSS routine.

** % variance explained by each factor after rotation. α means Cronbach alpha of the variables loading on each factor. The two factors have eigenvalues in excess of 1.0.

*** These are direct/numeric measures and all other items are measured by one-to-seven anchored scales. Since success rate, kill rate and failure rate add to 100%, two variables explained the third, i.e. only two variables are measured.

Results of Canonical Analysis Relating New Product Strategy to Performance Variables

Firm Size	Small Firms (~ 200)	Medium-sized Firms (201 ~ 1000)	Large Firms (1001 ~)
	function I	function I	function I
Coefficients for Canonical Variables*			
Independent Set :			
Fitness of New Product to Market	-0.253	0.262	0.047
Market Potential	-0.014	0.529	-0.132
Technological Sophistication	-0.294	0.592	-0.235
Product Innovativeness	0.401	0.456	0.237
Proactive Orientation	0.761	0.213	-0.625
Technological Synergy	-0.131	-0.200	-0.081
Competitive Dominance	0.335	0.288	-0.030
Technological Competitiveness	0.108	-0.488	-0.526
Dependent Set :			
Program Success	-0.633	0.554	0.844
Company-Wide Impact	0.799	0.758	-0.666
Eigenvalue	0.772	0.723	0.476
Canonical Correlation	0.878	0.850	0.690
Wilk's Lambda	0.112	0.144	0.523
Chi-square	26.18	48.33	16.19
Significance Level	0.05	0.0001	0.05

* The items with coefficients above 0.30 are used to interpret significant relationships between the two sets of variables (Hair et al., 1979).

** In case of medium-sized firms, two significant canonical functions are extracted. The first one is statistically significant ($p < 0.0001$), and the two sets of dimensions are found to have a high degree of association as indicated by the Wilk's lambda (0.144) and canonical correlation (0.850). The second function exhibits a somewhat weak correlation than the first one, but also has a significant ($p < 0.01$) relationship between the two sets of dimensions.

new products, it may cause severe damage to the short-term performance results. And, in case of small firms, long-term success may be very difficult to achieve if they can't make satisfying short-term performance results. This interpretation is not that the proactive orientation is unimportant. In case of small firms, to keep in proactive mind for better new products would be still needed to attain the long-term impact on performance results if they have made some good performance of program success with appropriate technology. This situation, however, does not prevail in large firms. As the firm size becomes large, most firms planning their new product strategy are confronted with the highly innovative and new technologies that have not been tried before. And, large firms would achieve satisfying short-term and long-term performance results of new products when they successfully cope with the new, challenging and high-level technologies in new product development.

6. Summary and Conclusions

The findings have several implications. First, the top management and new product developers in industrial firms should give a careful consideration to the firm's competitive positions because our result shows the importance of firm size in determining the impact of a firm's new product program on performance results. That is, new product developers in developing countries should take a contingency approach to make their new product program successful by employing an appropriate new product strategy in each size of firms.

Second, the research finding that the new product strategies firms elect are indeed closely tied to the performance results achieved, points to the need for a carefully conceived innovation strategy. New product performance is not so much a matter of being in the right industry or simply being lucky; rather new product performance is largely decided by the strategy that top management elects. In developing countries like Korea, managements increasingly recognize the central role that new products will play in their firm's future prosperity. The need to treat product innovation strategy as a central facet of corporate strategy becomes more evident. Ways of conceptualizing and measuring new product performance and strategies leading to alternative types of performance, as uncovered in this research, must be consciously considered as managers go about the development of a product innovation strategy.

Finally, this study employed the strategy dimension as one common domain of the independent variable. Further research needs to focus on the moderating ability of the strategy types or strategy scenarios to yield a more comprehensive analytical scheme for use in examining strategy-performance relationships.