The Patterns of Technology Strategy Formulation: The Case of Korean Firms

Heeseung Yang
Sejong University

Abstract

Understanding the fact that more spending for R&D is merely a necessity, not a factor of success, managing technological development efforts effectively and efficiently for higher R&D productivity and sustainable growth has become an important issue for contemporary firms.

Based on a survey on small- and medium-sized manufacturing firms, this paper explores the relationships of leadership positions, technological contents and acquisition methods of Korean firms.

This paper has identified several findings from Korean manufacturing firms: (1) five different patterns are identified in the technology strategy of medium-sized companies; (2) a significantly positive relationship exists between a firm's leadership position and the aggressiveness in technological contents of their acquisition methods; (3) a significantly positive relationship of some technology acquisition methods to the firms' leadership position exists.

I. Introduction

Recognizing the fact that the key to their future survival and sustainable growth lies in a continuous flow of new and improved products, firms are undertaking research and development (R&D) activities to increase their knowledge base for new products. Accordingly, R&D spending for newer, better, and cheaper products has rapidly increased. However, more spending for R&D is merely a necessity, not a factor of success. Developing new products or bettering existing products cannot be made at random and thus requires a formulation of strategy for the innovation process.

In the technology-driven era, managing technology effectively and efficiently is the core of firm's competitive advantage. Major concern for management in the new era, therefore, is how to develop the technology strategy that can make a difference, by identifying the full range of business opportunities and threats likely to confront the firm, and by incorporating relevant input from all parts of the firm.

As many studies have indicated, cloning foreign products through foreign technology licensing was the major vehicle of Korean firms during the course of their early industrialization period. Korean firms did not require high technological levels and, therefore, indigenous R&D investment was not a necessity in that era. During the 1990s, though, many Korean firms began to recognize the importance of technology and innovation to expedite smooth restructuring from traditional production-based manufacturing to technology-based manufacturing for sustainable growth under the turbulent business environment [3]. Example is the emergence of Chinese power in certain industrial sectors.

This study explores the relationships existing in the course of technology strategy formulation. The three auxiliary questions are: whether any significant relationship exists between strategic patterns and contents of technologies sought; and whether any significant relationship exists between strategic patterns and technology acquisition methods.

II. Organizing Framework

An organizing framework has been created to guide an analysis of survey results. This framework consists of three aspects -- leadership positions sought, development contents required, and technology acquisition methods. Each of these is described in the following [1]; [2]; [4]; [5]; [6]; [7]; [8].

Strategic Position: Reflecting the Korean specific characteristics such as export-orientation as well as the nature of developing economies, five types of technology strategies are available for Korean manufacturing firms as follows:

- Type 1: World Leader Strategy – seeking the leadership position globally by developing new technology for the first time and launching new products first to the market it operates in.
- Type 2: Domestic Leader with In-house Development Strategy – seeking the number one position in the domestic market by developing new or similar products differently in-house after identifying an

opportunity of new technology and a new product developed abroad.

Type 3: Domestic Leader with Buying Strategy – seeking a strong position in the domestic market by introducing a new product through joint venture and/or licensing agreement with a world leader.

Type 4: Imitation Strategy – modifying new products of other firms to fit the needs of certain market segments, based on reverse and/or application engineering capability.

Type 5: Improvement Strategy – seeking product improvement and cost reduction of existing products based on quality assurance and operational efficiency instead of new product development.

Contents of Technologies Sought: There are five development activities available to Korean firms as follows:

Core technological capability build-up.
New product development.
New process technology development.
Product technology improvement.
Process technology upgrading.

Technology Acquisition Methods: There are seven major practices to acquire new technologies for Korean firms as follows.

In-house development.
Contracted research to university or government sponsored research institute.
Reverse/application engineering.
Technical assistance from public research organizations.
Internal venture.
Technology transfer from joint venture with foreign firms.
Technology licensing from foreign firms.

III. Survey and Research Methods

Research Sample

To identify the patterns of a technology strategy in Korean manufacturing firms, questionnaires were sent out to a random sample of 400 companies that applied to and were awarded from the Industry Base Technology Development Program. The program is the oldest government R&D program aiming to develop generic technologies for industrial competitiveness of the manufacturing sector. 110 responses were received, resulting in a response rate of 27.5%.

Survey Questions

The survey comprises seven questions that included such items as stage of product life cycle, and degree of market competition, length of product life cycle, and characteristics of technology strategy sought, focusing areas/contents of development, and technology acquisition methods sought.

Research Methods

This study utilized SPSS. Correlation analysis, multi-way analysis of variance, and $\chi 2$ test were performed to test the relationships of variables.

IV. Analysis

With the five technology strategies proposed, the surveyed firms were asked to indicate the nearest strategy they pursued during the past three years and express the strategy they are planning to pursue for the next three years. Table I shows the distribution of the firms.

Table I Distribution of Patterns of Technology Strategies

Strategic Patterns \ Time	Past 3 years	Next 3 years
World Product Leader	3	39
Domestic Leader with Development	45	34
Domestic Leader with Buying	25	24
Imitation	13	4
Improvement	20	6

Technology Strategy vs Contents of Technologies Developing

Table II shows that firms seeking a world product leadership strategy have a strong positive relationship with core technological capability build-up and advanced product development. This implies that firms with a world leadership strategy tend to place significant efforts on core technological capability upgrading and new product development with new technology.

Table II. Results of Correlation Analysis between Strategic Patterns and Contents of Technologies Sought

Strategic Patterns / Technology Contents	World Product Leader	Domestic Leader with Development	Domestic Leader with Buying	Imitation	Improvement
Core technological capability	.332†*	-.093	-.073	-.206*	-.145
New product/technology	.281**	-.026	-.031	-.154	-.281**
New process technology	.165	-.018	-.157	.088	-.112
Product technology improvement	-.048	.002	-.139	.191*	.125
Process technology upgrading	-.029	-.053	-.087	.191*	.098

†: Spearman's R, Level of significance:*($p<0.05$), **($p<0.01$)

In contrast, firms with an imitation strategy have a fairly strong negative relationship with core technological capability build-up and firms with an improvement strategy also have negative relationship with new product development at significant levels. This indicates that those firms with imitation or improvement strategies tended to place less importance on core technological capability and new product developments.

Technology Strategy vs Technology Acquisition Methods

Table III show the results of correlation analysis between strategic position sought and technology acquisition methods of surveyed firms. It indicates that technology acquisition methods are significantly different by technology strategy. First, most firms are planning to emphasize in-house development in the future regardless of their strategy seeking. Second, firms seeking leadership positions both in world and domestic markets are highly interested in in-house development. Third, firms seeking an imitation strategy are continuously pursuing reverse or application engineering practices. Forth, firms seeking an improvement strategy show pretty high interest in licensing.

The results provide two important implications. First, Korean firms seeking the leadership positions in domestic market, their actual acquisition methods of technologies needed have been different depending on their technological capability and resource availability, and strong consistency exists between strategic position and technology acquisition methods. Second, for Korean firms seeking other strategies, no significant relationship is identified, and no strong

Table III. Results of Correlation Analysis between Strategic Patterns and Technology Acquisition Methods

Strategic Patterns / Acquisition Methods	World Leader	Domestic Leader with Development	Domestic Leader with Buying	Imitation	Improvement
In-house development	.054	.246**	-.253***	.037	-.093
Contracted research	-.049	-.064	.004	-.035	.074
Reverse/application engineering	-.179	-.050	-.007	.091	.084
Internal venture	.051	-.016	-.028	-.108	.041
Technology transfer from JV	.049	.017	-.057	.040	-.011
Technology licensing	-.080	-.238**	.357***	-.116	-.021
Technical assistance	.180	-.126	.022	-.080	.100

†: Spearman's R, Level of significance:* * ($p<0.05$), ***($p<0.01$)

consistency is existed between strategic position and technology acquisition methods.

V. Discussion and Conclusion

Korean manufacturing firms have been heavily engaged in the development of new products to gain competitiveness and achieve sustainable growth in the marketplace. The main phenomena in their effort to enhance technology development activities are the increase of R&D spending and the formalization of technology development activities within the firms.

This study explores the characteristics existing in the course of technology strategy formulation in terms of leadership position, technological contents seeking and technology acquisition methods. The study has found that Korean manufacturing firms have sought different strategic positions depending on their business environment and technological capabilities and resource availabilities, and that their technological contents targeting to acquire and their technology acquisition methods have been consistent with the product strategy they pursue.

Additional findings from this study are that Korean firms are still continuously transforming themselves by placing more emphasis on development rather than improvement, and innovation rather than imitation, and joint work plus outsourcing rather than single-individual effort. These changes seem to be based on the recognition of the new but serious threat emerging from the Chinese market in recent time period.

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