

Drivers to Enhance New Product Development Performance

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Abstract--This study utilizes ordinary least squares (OLS) regression and verifies the framework in the Taiwanese manufacturing industry. The study employed questionnaire survey and collected data from 158 Taiwanese manufacturing companies. The purpose of this study develops an original framework to explore effects of both outward and inward capabilities on corporate competitive advantage through the mediator: new product development performance. Environmental scanning is regarded as the outward capability and locus of planning is regarded as the inward capability. If companies want to increase their new product development performance, they should enhance both environmental scanning and locus of planning capabilities.

I. INTRODUCTION

Competitive advantage is a distinguishing factor that drives a company's to gain sustainable profit. Maintaining competitive advantage helps companies to build up entry barriers to competitors. Porter asserts that sustainable competitive advantage cannot be achieved through operational effectiveness alone. Operational effectiveness means performing similar activities better than their rivals [25]. Effectiveness is important to company operations, but it cannot led to sustainable competitive advantage. Moreover, companies have to develop strategy that being different from everyone else. Sustainable competitive advantage is possible only through performing similar activities in different ways. A company with good business strategy must have clear choices about what it wants to accomplish [5].

Environmental scanning and locus planning are regarded as transformer capabilities converting resources to improve a company's performance. The outward capability (environmental scanning) and inward capability (locus of planning) facilitate companies to develop strategy to obtain competitive advantage. This study develops an original framework to explore effects of both outward and inward capability on competitive advantage through the mediator: new product development performance. Companies' competitive advantages result from the key resources and capabilities [7, 22]. Sustainable competitive advantage drives from not only what assets a company owns but also how the company utilizes and integrates such assets through appropriate capabilities [29]. A company can build up capabilities that transform those resources into competitive advantages by providing superior products to customers [27]. Moreover, this study would like to fill the research gap to explore manufacturing companies about the role of environmental scanning capability and locus of planning.

The structure of this study is as follows. A literature review is discussed in section 2, and five hypotheses are also proposed in this section. In section 3, this study describes the

methodology, the sample and data collection, and the measurements of the constructs. Besides, the descriptive statistics, reliability of the measurement, factor analysis, correlation coefficients between the four constructs, and the results of the measurement and structural models are shown in section 4. In section 5, this study mentions the discussions about the findings, implications, and possible directions for future research.

II. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

A. The positive effect of environmental scanning on new product development performance

According to the study of Aguilar [2], environmental scanning is the acquisition and use of information about events, trends, and relationships in an organization's external environment. Through environmental scanning, companies can adapt external changes and to incorporate new information in strategy formulation to ensure their future survival and growth. Companies attain new knowledge which assists managers in planning the organization's future action [2, 4]. Environmental scanning is as a form of information behavior comprises information needs, information seeking, and information use. Environmental scanning can support managers to make correct decision in turbulent business environment. Environmental scanning also improves the company's ability to react to and implement change in response to external factors [11].

Innovation is critical to company's success and survival. With regards to setting policies and targets for the development of new products, companies acquire knowledge from a variety of sources. Companies obtain customers' opinions to develop new products. For manufacturing companies, successful new product development requires technology input from a variety of external sources to determine how to be designed into new products [9, 10]. Accessing knowledge and information from their partners enables them to provide and to develop valuable products. Obtaining knowledge and information about their suppliers enables companies to choose proper strategic planning. Companies gain information from relevant partners can identify ways to improve the quality and reliability of new products. Through environmental scanning, diversified knowledge allows companies to attain new ideas [33]. Companies obtain creative ideas from environmental scanning to develop innovative products [15]. Environmental scanning has a positive effect on the organization's innovation performance [11]. Therefore, this study proposes the following hypotheses:

H₁: *Environmental scanning capability of a company is positively associated with its new product development performance.*

B. The positive effect of locus of planning on new product development performance

Locus of planning is defined as the depth of employee involvement in a company's strategic planning activities. Companies can be characterized as having either a shallow or a deep locus of planning. A deep locus of planning is regarded as a high level of employee involvement in the planning process, including employees from virtually all hierarchical levels within the company. Conversely, a shallow locus of planning is regarded as a fairly exclusive planning process, typically involving only the top managers of a company [8].

For companies, accessing knowledge and information from their employees enables them to provide and to develop more valuable products. A high level of first line employee involvement in planning brings the managers in the company closest to the market into the planning process. The participation of employee in planning may facilitate opportunity recognition, which is central to the innovation process. Companies involve in sharing knowledge and collaboration can extend their own knowledge base to improve innovation performance. A deep locus of planning enhances the active participation of managers in the planning process. A deep locus of planning can avoid the potential of good ideas being overlooked. Moreover, knowledge acquisition from different sources can build diversified knowledge that allows companies to attain creative ideas [33]. A deep locus of planning also facilitates the innovation process that maximizes the diversity of viewpoints. It would be the introduction of new product lines, or the extension into a new product. The capability enables companies to obtain crucial information and knowledge from different levels of employees for developing new products. Previous study also asserts there is negative relationship between top management team homogeneity and openness to innovation [6, 19]. This kind of problem can be solved by involving a deeper and more diverse mix of employees in the strategic planning process [14]. Hence, this study implies the following hypotheses:

H₂: *Locus of planning of a company is positively associated with its new product development performance.*

C. The positive effect of new product development performance on corporate competitive advantage

Innovation is critical to company's success and survival. In manufacturing companies, technological innovation enables companies to develop new products to meet the market demand [26]. Product innovation is important processes which companies sustain their competitive strength. Successful innovation can create isolation mechanisms which

protect profit margins and allow benefits to be gained [31]. Innovation performance will be outstanding if a company has the ability to make good use of information, and then makes proper strategies to face uncertainty. Innovation enables companies to create and deploy their capabilities that support the long-run business performance [30]. Successful innovation can help companies to make competitors' imitation more difficult and allow companies to sustain their advantages better [16]. Hence, this study implies the following hypotheses:

H₃: *New Product development performance of a company is positively associated with its corporate competitive advantage.*

D. The positive effect of environmental scanning and locus of planning on corporate competitive advantage

According to resource-based view (RBV), competitive advantage results from companies' key capabilities and resources [7, 22]. When a company has strong environmental scanning capability, the company can monitor, evaluate, and disseminate of information from the external and internal environment to key partners within the organization. Sustained competitive advantage emerges from unique combinations of resources that are valuable, rare, difficult to imitate and non-substitutable [7, 17]. Competitive advantage can help companies to build up entry barriers that are unable to replicate by their competitors [23].

In the manufacturing industry, companies can commercialize valuable ideas which come from outside or inside of companies. Environmental scanning can help companies to acquire market-related information from its competitors and suppliers. The company thoroughly observes industrial development trends to face uncertainty. Deep locus of planning can gather diverse opinions from different level of employees in the company. Managers obtain relevant information about events occurring outside the company in order to guide the company's future action. Previous study asserted that the more diverse of opinions are, the higher the managerial performance is [3]. Therefore, both outward (environmental scanning) and inward capability (locus of planning) enhance corporate competitive advantage.

H₄: *Environmental scanning of a company is positively associated with corporate competitive advantage.*

H₅: *Locus planning of a company is positively associated with corporate competitive advantage.*

This study is to verify the framework to explore effects of both outward and inward capability on competitive advantage through the mediator: new product development performance. Environmental scanning is regarded as the outward capability and locus planning is the inward capability. This study also wants to explore new product development performance plays a full or partial mediation role in the conceptual model. This study shows the conceptual model in Fig. 1.

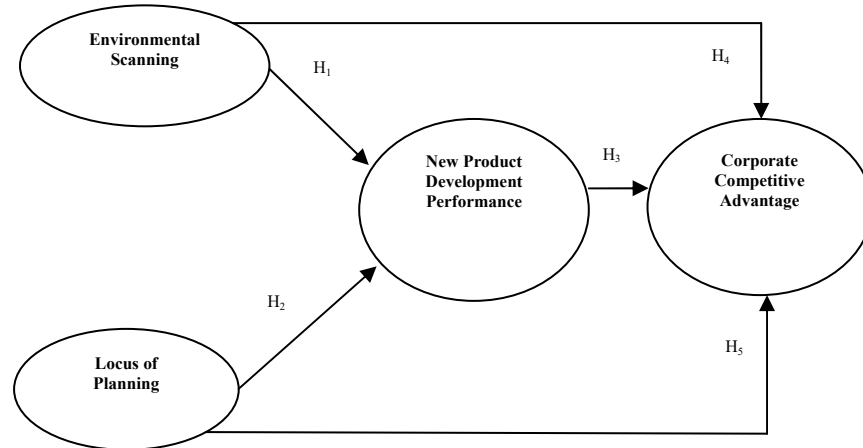


Figure 1. Conceptual model

III. METHODOLOGY AND MEASUREMENT

A. Data collection and the sample

The unit of analysis in this study is the business level and the research object focuses on the manufacturing industry in Taiwan. This study utilizes ordinary least squares (OLS) regression to verify the framework. The sample of this study is randomly selected from the “2013 Business Directory of Taiwan.” Questionnaires are mailed to Taiwanese manufacturing companies including information technology and electronics companies, metal and mechanical companies, electronics engineering companies, chemistry companies, biotechnology companies, and textile companies. Respondents are top managers, CEOs, managers of manufacturing, R&D, marketing, human resource management, finance departments. To increase the survey response rate, research assistants called each company which was sampled, explained the objectives of the study and the questionnaire contents, and confirmed the names and job titles of the respondents prior to questionnaire mailing. The respondents are asked to return the completed questionnaires within two weeks after mailing.

Moreover, to avoid common method variance (CMV), different respondents answer the different constructs in the questionnaire. The respondents of “environmental scanning” are managers of marketing, or R&D departments; those of “locus of planning” are CEOs, top managers, or managers of human resources management departments; those of “new product development performance” are managers of finance or manufacturing departments; those of “competitive advantage” are CEOs, or top managers. This study sent 800 questionnaires to the selected manufacturing companies. There are 158 valid questionnaires of manufacturing companies. The effective response rate is 19.7% in the manufacturing industry.

B. Measurements of variables

The measurement of the questionnaire items in this study is by means of “seven-point Likert scale from 1 to 7” rating

from strongly disagreement to strongly agreement. The measurements of the constructs in this study are described as follows:

Environmental scanning. This study refers to Aguilar [2], Auster and Choo [4], and Cho [12] to measure environmental scanning. The measurement of environmental scanning includes four items: (1) the company tries to acquire market-related information from its competitors; (2) the company exchanges market-related information with its suppliers; (3) the company’s top managers focus on monitoring the environmental changes; (4) the company thoroughly observe industrial development trends.

Locus of planning. This study refers to Barringer and Bluedorn [8] and to measure locus of planning. The scale measures the extent to which employees from different hierarchical levels in a company are involved in their firm’s strategic planning process. The following hierarchical levels in a company were included: top management, middle management, lower-level management, and rank-and-file employees. The measurement of locus of planning capability includes five items: (1) goal formation; (2) the business resources examination; (3) strategy formulation; (4) strategy implementation; (5) evaluation and control. The five items represent the basic steps in the strategic management process. This study determined locus of planning by averaging the scores for middle management, lower-level management, and rank-and-file employees across the five steps in the strategic management process.

New product development performance. This study refers to [32] to measure new product development performance. The measurement of new product development performance includes six items: (1) whether the quality of the new products of the company is better than that of the major competitors; (2) whether the new products of the company can meet the needs of its customers; (3) whether the ratio of the successful new product development projects in the company is more than that of the major competitors; (4) whether the new products of the company attain the goal of expected sales; (5) whether the new products of the company

attain the goal of expected profitability; (6) whether the overall performance of the new products in the company are successful [20,21,28].

Corporate competitive advantage. Previous studies defined the competitive advantage as a company occupies some position where the competitors cannot copy its successful strategy and the company can gain the sustainable benefits from this successful strategy [7, 13, 24]. The measurement of corporate competitive advantage includes three items: (1) whether the company has better managerial capability than other competitors; (2) whether the company has better growth rate than other competitors; (3) whether the company occupies the important position in some fields.

IV. EMPIRICAL RESULTS

Table 1 shows the descriptive statistics of this study. The Cronbach’s α coefficients of the constructs were shown in Table 2. Generally, the minimum requirement of Cronbach’s α coefficient is 0.7 [18]. It can be observed that the Cronbach’s α coefficient of “environmental scanning” is 0.880; that of “locus of planning” is 0.946; and that of “new product development performance” is 0.902; and that of

“corporate competitive advantage” is 0.935. The Cronbach’s α coefficients of all three constructs are more than 0.7. Therefore, the measurement of this study was acceptable in reliability.

Table 3 shows the correlation coefficients among the constructs. There is a significantly positive correlation among the four constructs.

A. The results of regression analysis

The results of the regression analysis in this study are shown in Table 4. In Model I, the results show that environmental scanning and locus planning are positively associated with new product development performance. In Model II, the results show that environmental scanning and locus of planning are positively associated with corporate competitive advantage. Moreover, new product development performance has a positive association with corporate competitive advantage. In addition, this research also verifies new product development performance plays a partial mediation role among environmental scanning, locus of planning and competitive advantage. Table 5 shows all the hypotheses are supported in this study.

TABLE 1. DESCRIPTIVE STATISTICS

Constructs	Mean	Standard Deviation
Environmental Scanning	5.489	0.899
Locus of Planning	4.888	0.893
New Product Development Performance	5.423	0.889
Corporate Competitive Advantage	4.768	1.355

TABLE 2. THE CRONBACH’S α COEFFICIENTS OF THE CONSTRUCTS

Constructs	Number of Items	Cronbach’s α	Remark
Environmental Scanning	4	0.880	acceptable
Locus of Planning	5	0.946	acceptable
New Product Development Performance	6	0.902	acceptable
Corporate Competitive Advantage	3	0.935	acceptable

TABLE 3. CORRELATION COEFFICIENTS BETWEEN THE CONSTRUCTS

	(A)	(B)	(C)
(A) Environmental Scanning			
(B) Locus of Planning	0.470**		
(C) New Product Development Performance	0.497**	0.351**	
(D) Corporate Competitive Advantage	0.354**	0.352**	0.587**

Note: ** $p < 0.01$.

TABLE 4. EMPIRICAL RESULTS OF REGRESSION ANALYSIS

Dependent Variable	Model I	Model II	Model III
	New Product Development Performance	Corporate Competitive Advantage	Corporate Competitive Advantage
Independent Variables			
Environmental Scanning	0.497** (7.151)	0.354** (4.726)	
Locus of Planning	0.351** (4.678)	0.352** (4.704)	
New Product Development Performance			0.587** (9.059)
R ²	0.265	0.170	0.345
Adjusted R ²	0.255	0.159	0.343
N	158	158	158
F	27.877**	15.845**	82.062

Note: The number in the bracket is t value. * $p < 0.05$, ** $p < 0.01$.

TABLE 5. RESULTS OF HYPETHOSES

Results	
H ₁	H ₁ is supported
H ₂	H ₂ is supported
H ₃	H ₃ is supported
H ₄	H ₄ is supported
H ₅	H ₅ is supported

V. CONCLUSION AND IMPLICATIONS

This study verifies the positive effects of environmental scanning and locus planning on corporate competitive advantage in the Taiwanese manufacturing industry via the mediator: new product development performance. The findings in this study highlight inward and outward capability are important to new product development performance and corporate competitive advantage. New product development performance plays the partial mediation role among environmental scanning, locus planning and corporate competitive advantage. If companies want to increase their new product development performance, they should focus on environmental scanning capability and locus of planning.

There are three implications emerging from the study. First, manufacturing companies in Taiwan should focus on both inward and outward capability. Environmental scanning and locus of planning can lead to successful new product development performance. In the manufacturing industry, competitive advantage drives from both inward and outward capability which also enhances new product development performance. By addressing the link among inward capability, outward capability and competitive advantage, this study presents a novel perspective for product innovation.

Second, environmental scanning plays an important role in the manufacturing industry. Product innovation begins by engaging customers, open inquiry about customers' needs. Customers are invited to co-create new products. When a company scanned at a higher frequency in the competitor, customer, and technology sectors, it can make greater use of different sources [1]. Environmental scanning can integrate information among various sources to develop successful product innovation. To develop innovation, companies can learn from their partners, customers and suppliers. Therefore, companies can obtain crucial information and knowledge from their networking members to develop innovation.

There are three limitations of this study. First, the sample companies came from the "2013 Business Directory of Taiwan," including information technology and electronics companies, metal and mechanical companies, electronics engineering companies, chemistry companies, biotechnology companies, food companies, and textile companies. Future research can focus on other industries and compare with this study. This study is conducted in the Taiwanese context. In order to verify whether the hypotheses can be generalized to the rest of the world, future research can select other countries as the research object and compare with this study. It is an interesting issue to test whether the hypotheses are supported in other countries. Second, this study considers

inward and outward capability and selects the two constructs: environmental scanning and locus of planning to verify differences in the Taiwanese manufacturing companies. Future research should focus on other constructs of inward and outward capability, such as relationship learning capability, transformational capability, absorptive capacity, etc. Third, this study suggests that future research could take "timing" related measures into consideration in the measurement of new product development performance. This study verifies hypotheses by use of questionnaire survey, only providing cross-sectional data, so that this study cannot observe the dynamic changes of environmental scanning and locus of planning in the different development stages of the Taiwanese industries through longitudinal data. Therefore, future research can set forth toward the longitudinal study to find out the different research results in the different development stages. Finally, this study hopes the research results are beneficial to managers, researchers, or policy makers in the world, and contribute to relevant and future research as reference.

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