Product Innovation in High-tech SMEs: A Case Study of Weili Electronics Co., Ltd

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Abstract  Product innovation is an important strategy for high-tech firms, especially for small and medium enterprises. This paper proposes that the technological strategies for SMEs are dynamic and during different phase, there is different innovation strategy which leads to various market performances. In particular, through the case study of Weili Electronics Co., Ltd, we find that organizational learning abilities play a fundamental role in strategic decision. In addition, the frameworks for the determinants of technological strategies in three stages are established to illustrate the evolutionary processes of product innovation in Weili Electronics Co., Ltd.

Key words  product innovation; technological strategy; high-tech SMEs

Scholars argue that product innovation is a critical strategy for the high-tech small and medium enterprises (SMEs). Despite of its potential attractive, the empirical findings on the impact of product innovation strategy on SMEs performance appear inconclusive. In fact, Capon et al. found that empirical results of prior researches have been mixed, with over two-thirds of the studies finding a positive relationship between product innovation strategy and firm performance, and the rest finding a negative relationship or none at all[1]. Although there are many possible explanations for the contradictory empirical results, for instance, Li and Atuahene-Gima suggest moderate factors may set some impacts on the strength of this relationship[2], in this paper, we argue that organization learning ability and its different evolutionary phases may account for this inconsistency, especially for technology-based firms. Given the internal resources and external uncertain environment, a firm may exhibit different relationship between technology innovation strategy and performance during different phases. The lack of studies investigating the effect of firm’s learning ability to this relationship is an important research gap.

Our study will employ resource-based theory, industrial organization theory and contingency perspectives to explain the technological strategy in different life-cycle phase. Taking Weili Electronics Co., Ltd (Weili) as an example, this paper emphasizes the importance of organizational learning in the product innovation. Our findings reveal that the innovation of SMEs mainly depends on the speed of technological learning, which is also associated with the accumulation of the R&D capability. In the following section, we will first introduce the background of Weili and then analyze its evolutionary process of product innovation.

1 The Background of Weili

Weili, located in south of China, was founded in 1984 with about ten employee and the main product was the controller of washing machine. Before 1990, all washing machine made in China were mechanical and their controller was comparatively simple. However, with the entry of foreign company, particular the joint ventures of Japanese, semi-automatic washing machines were gradually appearing in the market. Weili was soon aware of this changing and decided to develop computer controller as soon as possible. To be the first step, they tried to imitate Japanese product. After nearly half year, the product was finished. But the market performance was not satisfied due to the low quality of the imitation controller. Drawing some lessons from this failed experience, the firm decided to develop the automatic computer controller by themselves, especially the core software of the product. This time, the product was very successful and brought high profit to the company. After 2000, with the entry of large number of firms, the competition became stronger and stronger. Facing with this situation, Weili on the one hand had to reduce the cost, on the other hand, extended existing product and actively explored the other related products as well.
2 The Evolutionary Process of Product Innovation

2.1 The First Stage: Imitation Innovation

One of advantages of the SMEs is their prominent sensitivity to market. Although large firms may occupy most of market, there still exist many niches termed by population ecology theory, which may have potential bright future. Through scanning, firms identify early signals of potential changes in the general environment and detect changes that are already under way. Insights from industrial organization perspective provide an approach to assessing the profitable opportunity.

Industrial organization theories focus on the selection of industries and the positioning of firms within that industry to achieve sustained competitive advantage\[^{3-4}\]. This approach originated from the structure-conduct-performance paradigm developed by Mason\[^{5}\] and Bain\[^{6}\], which places more emphasis on structure (context) than on conduct (strategy) and on implications for public policy as opposed to firm strategy\[^{7}\]. Traditionally understood, market conduct or a firm’s strategy merely reflects the environment\[^{8-9}\]. In this formulation, the focus is on the quest for monopoly rents through industry and segment selection and the manipulation of market structure to create market power\[^{10}\]. Industrial organization theories emphasize industry attractiveness as the primary basis for superior profitability and the implication is that strategic management is concerned primarily with seeking favorable industry environment, location attractive segments and strategic group and defining the frontier for a generic strategy\[^{11}\].

![Diagram of the first stage: imitation strategy](image)

As shown in Fig.1, internal limited capability was the major factor contributing to the failure of Weili’s imitation strategy. Therefore, what has happened in Weili electronic company did not support the industrial theory which emphasizes the finding process of high profitable niches. For the high-tech industry, it seems that the technology has a dominant role in the marketing success. Although Weili had found a very attractive niche, it still could not develop corresponding new product due to the limitation of its own R&D capability. The main reason for this failure was the stability of controlling software. On condition that some hardware parts had to be imported, the core software had to be developed by the firm itself not only for cost control but also for the specialized demand of various customers. In summary, the mismatch between external demand and internal capability led the firm to make imitation strategy and the low R&D ability further resulted in the initial failure of the production innovation.

2.2 The Second Stage: Independent Innovation Strategy

Given the unsucces of the imitation strategy, Weili faced with two choices: one was to give up the research and the other was to continue developing computer controller. On the one hand, the automatic washing machine markets were fast growing and attracted more and more new entrants. On the other hand, although the initial endeavor did not get the expected objective, all the participants had learned a
lot from previous research. They accumulated some valuable experiences and got to know the key points of the new product.

Drawing the lessons from the first stage, Weili gradually understood the importance of cultivating its own competitive advantages which may come from its R&D ability. The first stage R&D largely increased the absorptive ability of the firm. Therefore, Weili decided to develop computer controller independently. In addition to the qualities of hardware and software, the match between them was also critical to the stability of new product. Having made up mind to continue research program, the firm invested a large amount of money in reorganizing the project. A senior engineer was hired to be the project manager. After nearly four months, computer controller was finished. This new product was completely developed by the firm itself including controller design, part selection, software written and integration. Owning to the perfect match of the hardware and software, this time, the quality had been largely improved and the market performance is very good. Fig.2 illustrate this decision making process.

What we should mention is that the strong learning ability of Weili. The successful shifts from imitation strategy to independent innovation strategy mainly rely on the fast improvement of firm’s R&D ability, which was directly determined by the organizational learning capability. Contrary to the industrial organization theory, resources-based perspectives emphasize the centrality of distinctive competencies to competitive success. Prahalad and Hameland stress the strategic importance of identifying, managing, and leveraging core competencies rather than focusing only on products and markets in business planning[12]. The resource-based view posits that competitive advantage can be sustained only if the capabilities creating the advantage are supported by resources that are valuable, rare, costly-to-imitate and nonsubstitutable, which have been called the core competencies of a firm. Resources are valuable when they enable a firm to conceive of or implement strategies that improve its efficiency and effectiveness. However, valuable but common capabilities are sources of competitive parity. Costly-to-imitate capabilities are capabilities that other firms cannot easily develop and nonsubstitutable resources refer to the capabilities that do not have strategic equivalents[13]. Capabilities failing to satisfy the four criteria of sustainable competitive advantages are not core competencies, meaning that although every core competence is a capability, not every capability is a core competence[14]. In other words, firms’ resources must raise “barriers to imitation”[15]. Thus resources are basic units of analysis and include physical and financial assets as well as employees’ skills and organizational processes. A firm’s capabilities result from bundles of resources being brought to bear on particular value-added tasks[16].

From resource-based perspective, the main competitive advantage of Weili was their fast learning abilities. But whether this ability is the core competency is concerned about the four criteria proposed by Barney. From dynamic point of view, there is no sustainable competitive advantage per se unless the ability can also be achieved continuously according to the changing environment. Generally, Inimitation and nonsubstitutable resources are comparative and can only be sustained during certain period of time. For Weili, it was the confidence of their learning ability that made them decide to innovate independently. This first-mover advantage led to very good currency. However, we still doubt how long this advantage can be maintained. The potential entrants would try to develop or imitate the first mover, which arise another important question that what indeed the core competency are and whether there exists so called core competency. Having enjoyed high profit for about five years, in 2000, Weili again faced great threats from its competitors.

2.3 The Third Stage: Cost Strategy and Diversification Strategy

The computer controller market was closely associated to the washing machine market. High profits attracted many firms to enter into automatic washing machine industry. The strong competition resulted in the price war and led to the large decrease of the profit. To be the key part and the main cost component of washing machine, computer controller...
was facing with the big challenge of cost reduction. Firms which can provide cheaper product with high quality would eventually survive. This cruel market selection made all the firms try their best to optimize their product. For Weili, how to reduce the controller cost had become a new important issue. With finite capital, the firm must allocate resources either to creating multiple products tailored to individual consumer preferences or to developing efficient processes to produce a few products\cite{17-18}. On the one hand, the environment was changing gradually to hostility, where strong competition in washing machine market was increasing and profit was decreasing. On the other hand, having succeeded in developing computer controller independently, Weili had grasped the related knowledge and abilities to the new product. As we know, the economies of scale and scope are two main ways to reduce the cost, therefore, Weili decided to take advantages of these approaches to extend the breadth of product as well as cost control.

Generally, diversification scatters risk for the sake of production cost. Considering the special feature of computer controller, two strategies were combined to explore new market and to minimize cost at the same time. Weili began to standardize some modules such as part of hardware, CMOS clip and control programs. Given the similar working mechanism to washing machine, the firm tried to develop new computer controller for the air-conditioner. This product variety allowed the firm to better meet the demands of heterogeneous consumers and thus reduce the risk of focusing on a narrow market segment. The success to develop controller for air-conditioner manifested the insights from contingency perspective. Contingency theory regards environmental conditions as a direct cause of variation in organizational forms, so management task is to achieve “good fits” with the environment. The proponents of this approach give primary emphasis to reactive adaptation and discount or ignore the opportunity firms have to influence their environment. Successful adaptation of organization to environment is assumed to be directly dependent on the ability of top management to interpret the conditions facing the firm in an appropriate manner and to adopt relevant courses action. The implication of contingency theory for firm strategy is that firms should achieve fits with changing competitive environments through appropriate organizational forms\cite{19}. For Weili, finding other niche and keeping the advantages in old market through cost control have until now been proven to be an efficient ways for the hostile environment.

3 Conclusions

Taking Weili as an example, this paper discusses the technological strategies of high-tech SMEs. Through the case study of Weili’s product innovation strategies under different situation, we notice that the uncertain environment is an important determinant to the strategy decision of firms, particularly for small and medium firms that have finite resources. From the initial imitation to independent innovation, and then to diversification, the evolutionary process of Weili technological strategies partly reflects the locus of high-tech SMEs’ product strategies. Lack of research capabilities, the firm had to adopt imitation innovation or even copy existing products. However, this approach is not as easy as most of firms’ expectations. Weili provides a fail case for this strategy. Of course, the earlier failure of Weili does not mean that this is a bad choice for SMEs, on the contrary, it is proven that if there were no the previous failure, the firm could not accumulated necessary knowledge and the later success would not be achieved. The most important is the organizational learning abilities, which are generally viewed as the advantages of SMEs. Due to the simple internal organization structures and their strong survival pressures, SMEs are always sensitive to the demand changes and try their best to adapt it quickly. The different technological strategies using in various stages display their adaptation to the turbulent environment. Therefore, we can hardly expect that one theory can explain the behavior of high-tech SMEs, instead different theories are needed to illuminate their dynamic processes.

References


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