Strategic Management Quarterly
September 2015, Vol. 3, No. 3, pp. 73-81
ISSN: 2372-4951 (Print), 2372-496X (Online)

Published by American Research Institute for Policy Development
DOI: 10.15640/smq.v3n3a5
URL: http://dx.doi.org/10.15640/smq.v3n3a5

Dissecting a Company's Innovative Capabilities and Strategic Position in a Knowledge Economy

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Abstract

Innovation is critical to the long-term survival for any company in the knowledge economy. However, while many studies highlight the importance of companies' innovative capabilities, a practical conceptual mapping with valuation measures has not been clearly demonstrated in the literature. Therefore, this paper proposes a formal conceptual model for evaluating a company's innovative capability based on two dimensions that have been proposed in the literature so far. In addition, our multiplicative innovative value model incorporates a third factor that captures the critical internal "knowledge transfer" capability acting as the catalyst between a firm's R&D innovation capacity and a firm's capacity to generate value in the market place. This factor highlights the interaction and inter-connectedness between the two critical dimensions in terms of the success of a company's innovation: invention and commercialization. We provide a practical and useful mapping for locating a firm in terms of its position in strategic innovation. Boards, managers and consultants pursuing a successful innovation strategy can use this map to identify their future strategic innovation trajectory based a firm's current and desired position on this map. Thus we contribute to the literature and practice of both innovation and strategy.

Keywords: Innovation, inventors, leaders, copycats, laggards, commercialization, intellectual property, strategy

Introduction

Globalization of the world economy has introduced both a global market place and an increased level of competition across national boundaries.

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Creating value through innovation has been recognized widely as a critically important corporate activity not only in the immediate success of a firm but also its long-term viability. In a recent McKinsey Survey (2010) of over twenty-two hundred CEOs, two of the key findings were that: 1) just over half of the CEOs considered their firm to be better than their competitors in innovation, a level which has not changed since 2008; and 2) many CEOs cited organizational issues, followed by an innovative climate and success in commercialization, among others, as key problem areas. It is very clear that while firms recognize the critical importance of innovation, they also face and realize the difficulty in forging organizational structures and cultures which are good in translating R&D inventions into commercial success. There is a large body of literature on the importance of innovation to companies in the twenty-first century. Dadfar*et. al.* (2013) emphasizes the fact that innovation is critical for creating competitive advantage for small and medium-sized enterprises (SMEs). Laforet (2011) cites short-product cycles, rapid technological change and intense rivalry as reasons for a difficult operating environment for modern companies. Klewitz and Hansen (2014) make the point that innovation needs to be successfully received whether as a product or as a process to generate value. With respect to internal pathways for inter-organization cooperation-collaboration, there is a substantial literature on network organization. In the literature of network theories, many previous studies looked into internal social relations such as social capital (Coleman, 1988; Fukuyama, 1995, Bourdieu and Wacquant, 1992; Burt, 1997, Adler and Kwon, 2002) or relational edges of organizations (Granovetter, 1973; Freeman, 1977). Ozkan-Canbolat*et. al.* (2014) applies a network model to emphasize the connection between a firm's strategy and its business model, with a particular focus on inter-organization relations. Aarikka-Stenroos and Sandberg (2012) discuss the role of networks in the process from new product development to commercialization.

In this paper we propose a "Multiplicative Innovation Value Model" (MIVM) and apply the model to investigate the strategic innovation positioning of a company based on its R&D capability in generating intellectual property (IP) and the company's capability in successfully commercializing the innovative product and competing in the market place. Based on these two dimensions, we discuss five archetypes of strategic innovation position. This simple but elegant value-creation model provides managers and business strategists with a straightforward framework to analyze a company's current innovation position and capabilities and, more importantly, the direction and roadmap for improving or changing a company's position.

In the following section, Section II, we develop a new basic conceptual model to evaluate a corporate entity under proposal. Section III describes the five archetypes of a partnership/alliance and analyzes the valuation implications of these basic types of combinations. Section IV considers strategic implications and then concludes.

I. A Multiplicative Model of Innovation Value (Mivm)

We define the realized value of a new innovation project X, $\boldsymbol{V_X}$, as:

Equation (1): $\boldsymbol{V_X} = (\alpha_X * \boldsymbol{V_{IP}^X}) + \boldsymbol{V_C^X}$, and

Equation (2): $\boldsymbol{V_C^X} = (\alpha_{IP}^X * \boldsymbol{V_{IP}^X}) * \tau * \beta_C^X$, where

$\boldsymbol{V_{IP}^X}$ is the market value of the new invention X as an intellectual property and α_X is a company's ability, as bargaining power, in extracting value from the sale of the intellectual property X. This value captures, for example, revenue generated from royalties or generated from the sales of invention X as an IP product.

$\boldsymbol{V_C^X}$ is the realized market value of the commercialized product X and the coefficient β_X measures a company's ability to get extra value from the commercialized product X in the market place where X competes for market share in product X's product category. This value-measure captures the value of innovation X as a successfully commercialized product, in contrast merely to an IP product.

β_C^X, the commercialization co-efficient, captures a company's capability in generating a commercially successful product based on the new invention X. In a catch-all sense, this coefficient captures a company's competitive position in the relevant market segment as well as other business capabilities such as efficient cost structure, operational efficiency, management know-how and low financing cost, namely other factoring that together provides the overall commercial success of a new innovation. We conceive β_C^X as a multiplier on the basic IP value of the new invention X, thus $0.0 < \beta_C^X < N^{Max}$, where 0.0 means either no commercialization (new invention X is only sold as an IP for royalty), or a complete failure as a commercial product, and at N^{Max} the company is able to extract the maximum value from a highly successful commercialization of new invention X.Most importantly, the coefficient τ is the internal knowledge transfer coefficient which measures a company's ability to

transfer intellectual knowledge into becoming a commercialized product and generate value for the company from its successful commercialization.

We note that forthe purpose of structuring a parsimonious valuation model, we represent the commercialized value of innovation X via $\boldsymbol{V}_{IP}^{X}$, the IP value of invention X, through the effect of the 2 multipliers τ and β_C^X. This formulation provides us a clear and straightforward pathway to isolate two important dimensions of a company's ability in generating value from innovation, namely its capacity to internally transfer IP knowledge into a commercialized product and its ability to compete in the product market place.

We next further refine our valuation model by combining Equations (1) and (2) into a third equation:

Equation (3):
$$\boldsymbol{V}_X = (\alpha_{IP}^{X} * \boldsymbol{V}_{IP}^{X}) + (\alpha_{IP}^{X} * \boldsymbol{V}_{IP}^{X}) * \tau * \beta_C^X$$
$$= (\alpha_{IP}^{X} * \boldsymbol{V}_{IP}^{X}) * (1 + \tau * \beta_C^X)$$

This straightforward and parsimonious MIVM model provides us with an insightful way of segregating the different value-chain activities in relation to value creation from new product development. We provide an analytical discussion of a firm's strategic innovation position in the following section.

II. The Five Archetypes Of Strategic Innovation Positions

In this section we discuss the five archetypes of a firm's strategic innovation position based on (1) a company's two capabilities in generating value from a new innovation product, and (2) a company's capability in internal knowledge transfer. Figure 1 provides a graphical presentation of the 5 strategic innovation positions, where the commercialization dimension includes the multiplicative product of ($\tau * \beta_C^X$) in Equation (3).The two dimensions measure two distinct but equally critical sides of a company's capability in generating commercial success from innovations. The two dimensions also define a company's direction in creating value for the firm, ranging from collecting royalties via intellectual products to copy-catting by either following innovation generated by innovative leaders or, more prevalently, paying royalty to use other companies' innovations but compete effectively in the marketplace by successful commercialization based such outside innovation. Below we provide brief discussion of the five strategic innovation positions.

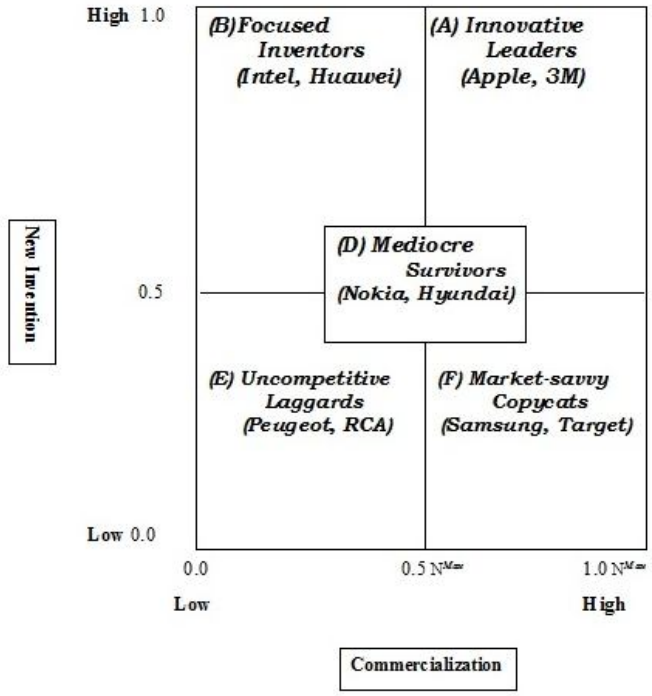
(A) Innovative Leaders

Innovative leaders are characterized by strong R&D capability in generating high value IP (invention with high V_{IP}^{X}), strong capability in extracting royalties from IP (high α_{IP}^{X}), high capability in internal knowledge transfer (high τ) and last but not a least strong commercialization capability (high β_C^{X}). In an ideal case, $\alpha_{IP}^{X}=\tau = 1.0$ and $\beta_C^{X} = N^{Max}$.

Applying Equation (4), we have:

$$= (\alpha_{IP}^{X} * V_{IP}^{X}) + (\alpha_{IP}^{X} * V_{IP}^{X}) * \tau * \beta_C^{X}$$
$$= (\alpha_{IP}^{X} * V_{IP}^{X}) * (1 + \tau * \beta_C^{X}) = (1 + N^{Max}) * V_{IP}^{X} = V_X^{Max}$$

Figure 1. Capability map of innovative firms



This is the optimal situation for profit where the company fully extracts both the IP royalty value and the realizable product value from the company's maximum market share in the particular product segment.

Such companies are both innovative leaders in generating new invention, but are also able to successfully commercialize a product and extract maximum market value.

(B) Focused Inventors

For young technology firms and certain firms focusing on particular segments of science and technology, research and development of new inventions is their strongest capability. Some such firms are not even characterized by business/management know-how or operational and production resources and capacities. For these firms, focusing on generating new invention and profit from royalty is often a natural strategy. These firms would generate high IP value (high

V_{IP}^{X}), possibly high capability to generate extra royalty (high α_{IP}^{X}), but at the same time low or very low internal knowledge transfer capability and commercialization capability (τ and β_C^X low, in the worst case = 0.0).

Applying Equation (3), we have:

$$V_X = (\alpha_{IP}^{X} * V_{IP}^{X}) + (\alpha_{IP}^{X} * V_{IP}^{X}) * \tau * \beta_C^X$$
$$= (\alpha_{IP}^{X} * V_{IP}^{X}) * (1 + \tau * \beta_C^X) \qquad = V_{IP}^{X\text{-}Max}$$

The company is able to realize maximum IP value from a new invention X, but fails or simply chooses to forsake the potential value from commercialization. It is important to note that, given capacity constraint, this may often be an optimal strategy.

(C) Market-savvy Copycats

Many companies take the opposite approach to archetype B firms. Recognizing a company's own limitations in generating successful new inventions, some companies focus on enhancing their capabilities in generating commercial success based on other inventive companies' intellectual properties. A darker side of this is the case of reverse engineering other firms' new invention. For these companies, the knowledge transfer coefficient needs to be high and the commercialization coefficient in particular would be high, as that is the strength of such firms.

Applying equation (3), with τ close to 1.0 and β_C^X close to N^{Max}, assuming α_{IP}^{X} = -1 for the first term in Equation (3) (where the firm pays the maximum value for the IP value) and α_{IP}^{X} = +1 for the second term in Equation (3) (where the firm generates a high multiple of the value of the commercialized innovation X), we have:

$$V_X = (\alpha_{IP}^{X} * V_{IP}^{X}) + (\alpha_{IP}^{X} * V_{IP}^{X}) * \tau * \beta_C^X$$
$$= (-1 * V_{IP}^{X}) + (1 * V_{IP}^{X}) * \tau * \beta_C^X$$
$$= (N^{Max}-1) * V_{IP}^{X} = V_X^{Max} - V_{IP}^{X}$$

In other words, in the ideal case, a highly successful copycat would capture the maximum value of the commercial success of innovation X by paying the

maximum cost for the IP value of invention X. As in archetype B, given capability constraint (here is a company's capability in R&D), this may be an optimal strategy for firms who are market-savvy and strong in commercialization but weak in generating leading-edge inventions.

(D) Mediocre Survivors

In a middle-of-the-road situation, this group of firms are generating new inventions which lag behind the industry leaders. In the commercialization front, they also are less successful in extracting value in the market place.Applying equation (3), with α_{IP}^{X} around 0.5, low τ and 0.0 $<\beta_C^X<N^{Max}$(likely in the mid-range), these companies survive but do not thrive, and would certainly be uncompetitive in the long run (being pushed further to the left-bottom quadrant over time). We have:

$$\begin{aligned} V_X &= (\alpha_{IP}^{X} * V_{IP}^{X}) + (\alpha_{IP}^{X} * V_{IP}^{X}) * \tau * \beta_C^X \\ &= (0.5 * V_{IP}^{X}) + (0.5 * V_{IP}^{X}) * 0.5 * (0.5N^{Max}) \\ &= (0.5 + 0.125) * V_{IP}^{X} \\ &<< (1 + N^{Max}) * V_{IP}^{X} = V_X^{Max} \end{aligned}$$

Depending on how weak the R&D capability and commercialization capability of the company, a mediocre survivor would realize only a small fraction of the maximum value of an innovation X (V_X^{Max}), which the innovative leader would generate.

(E) Uncompetitive Laggards

In recent years, given the fast-pace of changing technology, this un-enviable position has in fact become a frequent occurrence. We can cite textbook cases of the spectacular decline in once leading companies such as Blackberry, AOL, Dell, as well as an older generation of failing firms such as Kodak, Digital and Xerox, among others. In the strategy literature, the issue often lies in the over-adherence of such firms to existing technologies or business models, which while generating most of the revenue and/or profit, were experiencing fast decline in both the value as an intellectual property and ability to generate value in the market place.Applying Equation (3), with V_{IP}^{X} and β_C^X declining at extreme fast pace ($\rightarrow$0.0), the value of

company's product X will also drop sharply, exemplifying the kind of process which Blackberry and similar firms went through, we have:

$$\boldsymbol{V_X} = (\alpha_{IP}^{X} * \boldsymbol{V_{IP}}^{X}) + (\alpha_{IP}^{X} * \boldsymbol{V_{IP}}^{X}) * \tau * \beta_C^{X} = (\alpha_{IP}^{X} * \boldsymbol{V_{IP}}^{X}) * (1 + \tau * \beta_C^{X}) \quad \rightarrow 0.0$$

Uncompetitive laggards will quickly approach an uncompetitive non-viable situation and probably result in bankruptcy or dissolution. One interesting outcome or potential solution which certain modern businesses take is for the company to be taken privately by either a small group of managers or large shareholders. After having been taken privately, these companies might better be able to effect drastic strategic change and move their position to the other corners of the strategic innovation map.

III. Conclusions and Strategic Implications

While many companies strive to improve their innovation position, the approach is often not clearly delineated. It is critically important for managers to have a good understanding of the pathway from R&D/IP generation to commercial success. Our simple but elegant model provides such a pathway linking company's R&D/IP invention through internal knowledge transfer to the success of commercialization. A company struggling in the innovation front can use our model to analyze the its components and pinpoint where their strategic innovation position is, and especially focus on the weakest link, be it a low internal knowledge transfer coefficient or a low commercialization coefficient.

The strategy literature provides ample additional analytical studies for managers to further dig into sub-components in terms of knowledge transfer or success in commercialization, but this paper provides a high-level mapping tool for managers and strategists to apply in analyzing a company's current innovation position and map out desired direction and trajectory which will then fit a company's core competencies.

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