



Strategic alliances and product development in high technology new firms: The moderating effect of technological capabilities

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ABSTRACT

High technology new firms have extensively used strategic alliances to gain access to knowledge, resources and capabilities. However, given their inexperience and limited resources, these firms are vulnerable to their more established partners' potential opportunism. This raises the question: How can new firms maximize the benefits of these alliances while reducing their risks? In this study, we address this question by drawing upon the capabilities perspective to propose that the impact of upstream, horizontal, and downstream alliances on product development depends on the degree of specialization of new firms' technological capabilities. Using a database of biotechnology firms, the results support this argument even when different types of strategic alliances are considered.

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1. Executive summary

New product development (NPD) and market introduction are important for high technology new firms' (HTNFs') successful performance. Yet, developing, testing and commercializing new products can be costly and time consuming processes and their outcomes are uncertain. As a result, many HTNFs have employed strategic alliances to gain the knowledge necessary to develop or acquire the capabilities needed for NPD. Many of the alliances that HTNFs have formed have been with established industry incumbents who possess the NPD-related resources, skills and expertise.

However, the need to access, acquire and assemble capabilities quickly may lead some HTNFs to join alliances under unfavorable conditions that make alliances unstable and prone to failure. These alliances could increase the risk of expropriation of the firm's own knowledge, undermining the new firms' competitive position. Reducing potential expropriation through the

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Careful selection of partners and the use of contracts can be costly and HTNFs may lack the experiences or resources to do so effectively. HTNFs also lack the experience to manage the complexity of a large alliance portfolio and may not have the time, skills or resources necessary to monitor their partners.

How can HTNFs use strategic alliances more productively and mitigate the risks of these alliances? We address this question invoking the capabilities perspective to propose that the specialization of HTNFs' internal technological capabilities can significantly mitigate potential alliance benefits and risks. Using a sample of 199 biotechnology firms from Germany and the UK, we advance that the degree of specialization of a new firm's technological capabilities serves as a key organizational contingency that influences the impact of strategic alliances on NPD. This focus departs from, and extends, the literature that highlights the role of the alliance experience and slack resources as potential contingencies. Our results show that new firms can gain significantly from joining alliances by carefully exploiting their own technological capabilities to mitigate the risks involved. Given that different alliances can lead to different capabilities, we separate vertical upstream from downstream alliances that are vertically vs. horizontally in order to assess the interdependencies between a new firm's technological capability specialization and different types of alliances for a firm's NPD. Appreciating these varying effects can help HTNFs avoid unsuccessful alliances that can depress their performance and threaten their survival. For managers and entrepreneurs, our results suggest that HTNFs need to consider technological capabilities when selecting alliance partners. In particular, the specialization of HTNFs' technological capabilities can significantly influence their ability to acquire or access capabilities from external sources and to protect themselves from opportunistic partner behavior. The level of specialization of these capabilities, however, appears to have different effects with different types of alliances.

Our results also underscore the importance of new firms' technological capabilities in gaining and capturing knowledge from alliances and then using this knowledge in NPD. These capabilities and the level of HTNFs' specialization provide an important basis to examine the benefits and risks associated with alliances of different types, an issue that deserves examination in future studies in different high technology sectors. It is important also to identify and investigate the mechanisms by which HTNFs use their technological capabilities to absorb knowledge from their alliance partners. We hope our findings encourage researchers to pursue these issues.

2. Introduction

Turning research discoveries into marketable products and taking them to the market is important for new firms operating in high technology industries such as biotechnology, software, medical technology, and semiconductors. High technology new firms (HTNFs) are small and medium-sized enterprises that are too young to have completed a full new product development (NPD) cycle.³ These HTNFs often compete in dynamic and fierce environments (D'Aveni, 1994) and need to develop and commercialize new products in order to exploit promising market opportunities, generate needed cash flows, and make a profit. Yet, developing, testing and commercializing new products can be costly and time consuming processes, and their financial outcomes uncertain. For example, NPD in the biopharmaceutical industry can generate several billion \$US in revenues when a new blockbuster drug is successfully introduced to the market. Conversely, it can lead to the loss of hundreds of millions of \$US if the drug candidate fails during late development stages (DiMasi et al., 2003).

HTNFs are often unable to assemble the right mix of capabilities needed for NPD internally (Eisenhardt and Schoonhoven, 1996). Capabilities denote “the set of tangible and intangible assets that enable an organization to develop, make, and market goods” (Gomes-Casseres, 1996: 30). In HTNFs, “those organizational capabilities or competencies which give rise to competitive advantage are not “simple” assets, but compound asset structures which are built over time and are path dependent” (Deeds et al., 1999: 213). For example, HTNFs' capabilities include the skills of their research teams, R&D management skills, and access to external information sources (Deeds et al., 1999). Since it often takes years to develop these capabilities many HTNFs have joined strategic alliances to develop the capabilities needed for NPD (Hagedoorn, 1993; Rothaermel and Deeds, 2004; Shan et al., 1994; George et al., 2002; Patzelt et al., 2008). A strategic alliance is a cooperative relationship between two or more firms to develop and commercialize a product (Deeds and Hill, 1996). Many of the alliances that HTNFs have formed have been with established industry incumbents who have strong NPD-related resources. HTNFs are desired partners for incumbents to ally with in order to adapt to new technology and fill their product pipelines (Rothaermel, 2001).

However, the need to access, acquire and assemble capabilities quickly may lead some HTNFs to join alliances under unfavorable conditions that make these alliances unstable and even prone to failure (Lerner and Merger, 1998; Lerner et al., 2003). Indeed, in industries where NPD is based on specialized and complex organizational knowledge – defined as the explicit (e.g., patents and publications) or tacit (e.g., research expertise and R&D management experience) knowledge embedded in the people and processes of the HTNF (De Carolis and Deeds, 1999) – alliances can increase the risk of expropriation of the firm's own knowledge (Pisano, 1990; Teece, 1986), potentially undermining the competitive position of new ventures. However, curbing potential expropriation through careful partner selection and the use of contracts can be costly and HTNFs may lack the experiences or resources to do so effectively (Lerner and Merger, 1998). HTNFs also lack the experience to manage the

³ For example, in the software industry NPD might be completed within one year or less and a two-year old software firm might not qualify as a HTNF. However, in the biopharmaceutical industry NPD takes on average 12 years (DiMasi et al., 2003) and a 10-year old biopharmaceutical firm might still be a HTNF. While some HTNFs may not possess the skills needed for NPD in-house to market the resulting product, they may have licensed in/bought and marketed a product from other firms.

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