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Alliance dynamics through real options: The case of an alliance between competing pharmaceutical companies

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Summary This paper aims to better understand the dynamic aspects of strategic alliances between competitors, by relying on both the real options approach and the system dynamics approach. It raises the following question: what are the behavioral dynamics of real options in alliances? The systemic qualitative model we built from the study of an alliance formed by two competing firms around an R&D project revealed three sets of feedback structures (the ''expected flexibility'', ''uncertainty'' and ''collaborative skills and knowledge'' dynamics), in which are embedded three types of real growth options (that is, unexpected discovery, relational reputation and interactive options). While previous studies have often focused on how partners unilaterally manage real options to reduce uncertainty, our study allowed us to identify the real options created by the alliance, which can be exploited collectively, independently by each partner or not at all, and to capture their dynamic aspects.

Introduction

The drug development process is a long and strongly regulated process, of which the outputs remain uncertain. It involves drug discovery and screening, laboratory testing, animal studies, clinical trials, regulatory registration, and post-submission activity (Chen & Hung, 2010). This process is very costly and the total R&D cost per new drug was estimated at US$ 802 million (DiMasi, Hansen, & Grabowski, 2003; Talay, Seggie, & Cavusgil, 2009). Because developing a new drug requires high investments and a broad range of innovative resources (Ohba & Figueiredo, 2007), a significant number of alliances focuses on drug discovery and commercialization (Santoro & McGill, 2005), including knowledge intensive alliances such as joint pharmaceutical R&D projects. In fact, interfirm collaborations have become the ''norm'' in the pharmaceutical industry (Talay et al., 2009).

According to the literature on alliances, many strategic alliances fail to yield the expected benefits or even lead to failure (Ariño & Doz, 2000; Hoang & Rothaermel, 2005; Park & Ungson, 2001), ''because of the difficulties in coordinating two independent firms and in aligning operations at the alliance level with parent firms' long-term goals'' and ''because of the opportunistic hazards as each partner

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tries to maximize its own individual interest'' (Park & Ungson, 2001, p. 37). In particular, while an increasing number of alliances are among direct competitors (Mitchell, Dussauge, & Garrette, 2002; Park & Zhou, 2005), as more and more rivals share resources (Mitchell et al., 2002; Ybarra & Turk, 2011), previous empirical studies have shown that such alliances are most likely to fail (Park & Russo, 1996; Park & Ungson, 2001). Direct competitors are certainly more likely to engage in future competitive behavior (Park & Ungson, 2001), and blur the distinction between competition and cooperation in alliances (Dussauge & Garrette, 1995). For instance, in R&D intensive industries such as the pharmaceutical industry, cooperation between competitors is seen as particularly risky (Miotti & Sachwald, 2003). Notably, while alliances have become a popular vehicle for acquiring and leveraging technological capabilities in R&D projects, the hazards of knowledge sharing are especially salient for competing partners (Oxley & Sampson, 2004). Strategic alliances between competing firms are therefore intrinsically difficult to manage and are characterized by a high level of uncertainty (Park & Ungson, 2001), regarding future states of nature but also about the partner's future behavior (Ariño & de la Torre, 1998).

Various theoretical perspectives were used to explain this phenomenon, including transaction cost theory, game theory, resource dependency theory, learning theory, agency theory, to name but a few (Park & Ungson, 2001). Among them, the real options approach can be found in numerous studies on alliances (*e.g.* McCarter, Mahoney, & Northcraft, 2011; Reuer & Tong, 2010; Santoro & McGill, 2005; Vassolo, Anand, & Folta, 2004; Wang & Miao, 2006). This approach is particularly interesting, as it is capable of incorporating not only the value of flexibility and growth opportunities but also of competitive strategies in an uncertain environment (Smit & Trigeorgis, 2006). The real options literature has mainly examined how partners individually use real options to reduce uncertainty in investment decisions (Folta & Miller, 2002). However, McCarter et al. (2011) introduced the concept of ''collective real options'', which are created by the alliance and can be exploited collectively (Li, James, Madhaven, & Mahoney, 2007) or independently by each partner (Pape & Schmidt-Tank, 2004). While collective real options may impact the management of strategic alliances (McCarter et al., 2011), they are not clearly defined in the literature. Most studies consider real options as exogenous data (Myers, 1977; Philippe, 2004). Moreover, the traditional approach often follows a linear approach, which leads to downplay the complexity of real options (McGrath & Boisot, 2005) and the importance of dynamic interactions between the factors involved in an alliance. As alliances develop and evolve under the influence of events and interactions between the partner organizations (Kumar & Nti, 1998), a more dynamic perspective is needed (Ariño & de la Torre, 1998; Dussauge, Garrette, & Mitchell, 2000; Saxton, 1997). The fact remains that the alliance literature tends to favor static representations and still suffers from a lack of dynamic perspectives (Park & Ungson, 2001). To address this gap, some authors suggested that the principles of systemic modeling could be applied to alliances in order to better understand the behavioral dynamics they imply (*e.g.* Kumar & Nti, 1998; Kumar & Nti, 2004). For instance, the system dynamics approach was used by Kumar and Nti (2004) to examine how international strategic alliances evolve. Besides, the same approach was used to explore real options regarding contractual relationships between clients and suppliers (Markez & Blanchar, 2004), and decision making in new product development projects (Ford & Sobek, 2005).

In line with these studies, this paper aims to better understand the dynamic aspects of strategic alliances between competitors, by relying on both the real options approach and the system dynamics approach. It raises the following questions: What are the types of real options created by the alliance? And what are the behavioral dynamics in which they are embedded? In this perspective, a systemic qualitative model was developed from the study of an alliance formed between competitors around an R&D project. This model, which is an influence diagram, allowed us to explore the behavioral dynamics of real options in this alliance.

We begin by first reviewing the opportunities and threats of strategic alliances, and essential elements of the real options approach. We then explain the research method used, which is based on a longitudinal case study of an alliance formed by two competing firms around a pharmaceutical project, and which leads to the development of an influence diagram according to the principles of system dynamics. We finally present and analyze this influence diagram, which enabled us to highlight three major feedback structures, before discussing the main modeling results, and the research limits and future perspectives.

Alliances through the option lens

After introducing the motives and threats of strategic alliances, this section legitimates the use of the real options approach in order to analyze alliances formed around an R&D project.

Opportunities and threats of strategic alliances between competing firms

Gulati (1998, p. 293) defines strategic alliances as ''voluntary arrangements between firms involving exchange, sharing, or codevelopment of products, technologies, or services. They can occur as a result of a wide range of motives and goals, take a variety of forms, and occur across vertical and horizontal boundaries''. Firms form strategic alliances for different motives, and notably in order to gain production efficiencies and the resultant lower costs; to expedite access to technology, markets, and/or customers; to promote organizational learning; to expand strategic competencies; and to launch a strategic response to a competitor (Bruner & Spekman, 1998). Strategic alliances enable partner organizations to access new technologies and reduce risks (Niosi, 2003). They are a good way to access, learn or share new knowledge, abilities, or assets (Hamel, 1991; Kale, Singh, & Perlmutter, 2000; Kogut, 1988). For instance, one party can offer a technical skill and the other a new market for the product (Teece, 1986). Partners may also build components together to reduce production and transaction costs, but final products will be competing on the market (Williamson, 1985).