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# Differential effects of pre- and post-acquisition R&D expenditures on post-acquisition performance

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ABSTRACT

Drawing from the behavioral theory of the firm and the resource-based view, we argue that different types of R&D (explorative and exploitative) and the timing of R&D investments (pre- and post-acquisitions) have differential effects on post-acquisition performance. By using a sample of 396 technology acquisitions, we find that pre-acquisition explorative and post-acquisition R&D expenditures are more beneficial for post-acquisition performance than are pre-acquisition exploitative and post-acquisition explorative R&D expenditures. Our results also show that firms investing in explorative R&D in the pre-acquisition stage and then exploitative R&D in the post-acquisition stage have better post-acquisition performance than firms that do otherwise.



## 1. Introduction

Although acquisitions have been an important strategy for firms, empirical studies report that they generally fail to enhance acquiring firms' value (King, Dalton, Daily, & Covin, 2004). Researchers have attempted to explain this paradox for some time (Bruton, Oviatt, & White, 1994). Relatedly, researchers have paid increasing attention to acquisitions as a method for firms to acquire new technologies (Benson & Ziedonis, 2009). There has also been a contemporaneous debate as to whether technological acquisitions complement or substitute for internal R&D in order to enhance post-acquisition performance (Gans & Stern, 2000).

Internal R&D and external acquisitions can be viewed as "make" versus "buy" strategies, and thus substitutable for each other as a strategy for obtaining new technological capabilities (Cassiman & Veugelers, 2006). However, based on the resource-based view (Barney, 1991) and organizational learning theory (Cohen & Levinthal, 1990; Mahoney, 1995), recent studies have suggested that in-house R&D and external acquisitions may best be employed in a complementary way in order to generate technological innovations (e.g., Lane & Lubatkin, 1998). The relationship between R&D and acquisitions and their impact on post-acquisition performance remains ambiguous and should be further investigated (Gans & Stern, 2000; Tsai & Wang, 2008). Post-acquisition performance is a function of both the acquirers' capacity to pick targets ex ante and their capacity to integrate and exploit targets ex post (Barkema & Schijven, 2008). Different types and intensity of R&D expenditures may have differential effects on these capacities (Mansfield, 1980). Thus, it is important to understand the types and intensity of R&D expenditures acquirers should make before and after an acquisition.

Our paper contributes to this line of research by combining the resource-based view (Barney, 1991) and the behavioral theory of the firm (Cyert & March, 1963) to explain the relationships between different types of pre- and post-acquisition R&D expenditures and post-acquisition performance in the context of high-tech firms. According to the behavioral theory, whereas R&D activities in the pre-acquisition stage may enhance absorptive capacity and post-acquisition performance (Cohen & Levinthal, 1990), they may lead to increased local search and resistance to external knowledge, thus weakening post-acquisition performance (Benner & Tushman, 2002; Leonard-Barton, 1992). The resource-based view indicates that acquirers should make considerable post-acquisition R&D investments in order to fully exploit targets' technologies and create valuable synergies (Ahuja & Katila, 2001).

March (1991) suggests that firms tend to follow one of two learning strategies: exploration or exploitation. Exploration involves the search for new knowledge while exploitation involves the refinement and

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extension of existing knowledge. Accordingly, we postulate that firms tend to focus on either explorative or exploitative R&D activities. We suggest that explorative R&D expenditures are more beneficial than exploitative R&D expenditures in the pre-acquisition stage; whereas exploitative R&D expenditures are more beneficial than explorative R&D expenditures in the post-acquisition stage. As performance is determined by both pre- and post-acquisition strategies, we further hypothesize that firms that invest in explorative R&D in the pre-acquisition stage and exploitative R&D in the post-acquisition stage will have better post-acquisition performance. To test our hypotheses, we use a sample of 396 technological acquisitions from 1995 to 2003. Our paper contributes to the research on the effects of R&D, and the complementarity between R&D and acquisitions (e.g., Cassiman & Veugelers, 2006; Tsai & Wang, 2008), as well as post-acquisition performance (1998; King et al., 2004).

## 2. Theory and hypothesis development

### 2.1. Theoretical background

The acquisition literature suggests that acquiring firms can create value by selecting undervalued target firms and/or integrating targets so as to build synergies (Saxton & Dollinger, 2004). Acquisition synergies may result from various sources, such as economies of scale and scope, market expansion, and access to new technologies (King et al., 2004). Despite these potential synergies, acquisitions often fail to enhance acquiring firms' shareholder value (King et al., 2004). Recently, researchers have employed the resource-based view to explain this paradox (e.g., Heeley, King, & Covin, 2006). Unlike other theoretical perspectives, which tend to explain the generic benefits of acquisitions, the resource-based view (Barney, 1991) suggests that the extent to which firms can create value from acquisitions hinges on their idiosyncratic ability to identify and exploit target firms' resources (Heeley et al., 2006).

Acquisitions have become a popular vehicle for obtaining new technologies, which are crucial for firms to stay competitive in the new knowledge-based economy (Benson & Ziedonis, 2009). Absorptive capacity, a term coined by Cohen and Levinthal (1990: 128), which refers to a firm's ability to "recognize the value of new information, assimilate it, and apply it to commercial ends" is often used to explain technological acquisition performance. From the resource-based perspective, acquiring firms with superior absorptive capacity tend to have better acquisition performance. Organizational learning theory suggests that R&D is an important driver of absorptive capacity (Camison & Fores, 2010; Cohen & Levinthal, 1990). Thus, researchers have employed the resource-based view in conjunction with organizational learning theory to suggest that R&D expenditures tend to have a positive impact on acquisition performance (Heeley et al., 2006).

Yet, organizational learning theory and the closely related work in evolutionary economics (Nelson & Winter, 2002) suggest that internal R&D may also lead to organizational inertia and routines which may adversely affect a firm's ability to select and integrate target firms (Lavie & Rosenkopf, 2006). Though both organizational learning theory and evolutionary economics theory are rooted in the behavioral theory of the firm (Cyert & March, 1963), the former focuses on organizational learning and search; whereas the latter emphasizes the formation and effects of organizational routines (Argote & Greve, 2007). Characterized as path dependent and firm-specific, learning and routinization can be both beneficial for, and detrimental to firms (Hannan & Freeman, 1984). Specifically, internal learning may enhance firm knowledge and competence in certain areas but also lead to increased local search, innovation traps, and resistance to external knowledge, and not-invented-here syndrome (Benner & Tushman, 2002; Leonard-Barton, 1992). In the same vein, routinization may result in both increased efficiency and inertia in the forms of irreversible commitment and resistance to change and inadaptability (Lavie & Rosenkopf, 2006; Nelson & Winter, 2002). These insights suggest that greater R&D expenditures and internal learning will not uniformly lead to better technological outcomes and firm performance.

### 2.2. Types of R&D expenditures before and after an acquisition

Researchers have advocated that it is important to examine the determinants of acquisition performance in both pre- and post-acquisition stages (Barkema & Schijven, 2008; Saxton & Dollinger, 2004). The most decisive factor that determines acquisition performance in the pre-acquisition stage is a firm's ability to select an appropriate target, while that of the post-acquisition stage is a firm's ability to integrate and exploit its target (Saxton & Dollinger, 2004). An acquirer's technological and absorptive capabilities determine its ability to select and integrate a target (Barkema & Schijven, 2008). Firms build up these capabilities through organizational learning activities (Benner & Tushman, 2002). March (1991) suggests two types of organizational learning strategies — exploration and exploitation. Exploration involves the search for new knowledge while exploitation involves the refinement and extension of existing knowledge. Although there is a debate regarding whether exploration and exploitation are orthogonal (i.e., two different aspects of organizational learning) or continuous (i.e., two ends of a continuum), March's (1991) original argument that they are at opposite ends of a single continuum is generally accepted (Gupta, Smith, & Shalley, 2006). R&D activities are the main driver of organizational learning (Cohen & Levinthal, 1990). Thus, we reason that firms tend to focus their R&D activities on either exploration or exploitation within a certain period of time. We subsequently refer to R&D expenditures on exploration and exploitation as explorative and exploitative R&D expenditures, respectively. By definition, explorative R&D involves broad and new knowledge and technologies while exploitative R&D involves narrow and existing knowledge and technologies (Hauser & Zettelmeyer, 1997; Mansfield, 1980; March, 1991).

Fig. 1 summarizes the effects of explorative and exploitative R&D expenditures in pre- and post-acquisition stages on post-acquisition performance. In general, pre-acquisition explorative R&D expenditures are beneficial for post-acquisition performance as they help enhance a firm's ability to identify and evaluate a target without creating sunk costs, technical overlaps, and unlearning problems. On the other hand, post-acquisition exploitative R&D expenditures are beneficial as they help to integrate and exploit acquired technological resources and capabilities. Thus, acquirers that engage in pre-acquisition explorative R&D and post-acquisition exploitative R&D will achieve the highest acquisition performance, while acquirers that do the opposite will have the lowest performance. Acquirers in other categories will have intermediate levels of performance.

### 2.3. The effect of pre-acquisition explorative and exploitative R&D expenditures

Cohen and Levinthal (1990) argue that prior knowledge is a necessary condition for the development of absorptive capacity, which in turn decides an acquirer's success in identifying and exploiting a target. This argument has been supported by various studies (e.g., Benson & Ziedonis, 2009). R&D activities are a primary source of technical knowledge needed to identify and evaluate targets. For instance, Rosenberg (1990) maintains that internal R&D is requisite to the development of capabilities necessary to monitor and evaluate external technological opportunities. Thus, R&D expenditures enhance absorptive capacity (Cohen & Levinthal, 1990). However, different types of R&D activities in the pre-acquisition stage may have differential impacts on an acquirer's ability to select an appropriate target ex ante and integrate it ex post. Explorative R&D helps firms to broaden their knowledge and enhance their ability to understand, identify, and evaluate technological opportunities (March, 1991). With broader