



Technological similarity, post-acquisition R&D reorganization, and innovation performance in horizontal acquisitions



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ABSTRACT

This paper aims to disentangle the mechanisms through which technological similarity between acquiring and acquired firms influences innovation in horizontal acquisitions. We develop a theoretical model that links technological similarity to: (i) two key aspects of post-acquisition reorganization of acquired R&D operations – the rationalization of the R&D operations and the replacement of the R&D top manager, and (ii) two intermediate effects that are closely associated with the post-acquisition innovation performance of the combined firm – improvements in R&D productivity and disruptions in R&D personnel. We rely on PLS techniques to test our theoretical model using detailed information on 31 horizontal acquisitions in high- and medium-tech industries. Our results indicate that in horizontal acquisitions, technological similarity negatively affects post-acquisition innovation performance and that this negative effect is not mediated by the reorganization of the acquired R&D operations. However, replacing the acquired firm's R&D top manager leads to R&D productivity improvements that positively affect innovation performance.

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1. Introduction

The impact of firm acquisition on innovation has received considerable attention in the economics and management literature. Early studies found that for the acquiring firm it lowers research and development (R&D) expenses (Hall, 1990) and innovation output (Hitt et al., 1991, 1996). Later studies suggest that the effect of acquisition on innovation performance depends on the characteristics of acquiring and acquired firms (e.g., Desyllas and Hughes, 2010). This stream of research identifies the *technological similarity* of the acquiring and acquired firms as an important predictor of the innovation impact resulting from acquisitions (Ahuja and Katila, 2001; Cloudt et al., 2006; Ornaghi, 2009). In their study of *horizontal acquisitions* (i.e., acquisitions of firms in the same industry as the acquiring firms), Cassiman et al. (2005) show that the more similar the technological resources and capabilities of acquired and acquiring firms, the more likely that the acquisition will result in a reduction in the combined R&D effort and the efficiency of R&D operations. Makri et al. (2010) find that technological (and

scientific) similarity appears to have no positive effect on innovation performance in the post-acquisition period – in terms of quantity, quality, and novelty of the patents awarded to acquiring firms.

Although these findings are interesting, our understanding of their underlying rationale is fairly limited. A popular view inspired by qualitative studies of the acquisition implementation process (Haspeslagh and Jemison, 1991; Jemison and Sitkin, 1986; Pablo, 1994), posits that in order to realize the efficiency gains that can arise from combining similar resources and capabilities, the operations of the newly combined firm need to be reorganized (Capron, 1999; Capron et al., 1998, 2001; Karim and Mitchell, 2000). However, reorganization efforts can result in collateral damage in the form of conflicts, and disruption among firms' personnel that ultimately can destroy the potentially beneficial effects of the acquisition of a similar firm. It might be assumed that these arguments hold also for R&D operations. However, the *chain of links* through which firms' technological similarity influences post-acquisition innovation performance in horizontal acquisitions has not been adequately explored. This is a serious weakness in the acquisition literature and this gap in the research is a source of causal ambiguity (King, 2007; King and Zeithaml, 2001; Lippman and Rumelt, 1982). Cording et al. (2008) argue that intrafirm linkage ambiguity, a type of casual ambiguity related to lack of understanding about the link between an action and its performance

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outcome within a focal firm (King and Zeithaml, 2001), is a source of problems for managers involved in acquisition implementation because it limits their ability to accurately predict the outcome of specific implementation decisions which in turn harms post-acquisition performance. Along similar lines, we maintain that a lack of understanding of these links between technological similarity and post-acquisition innovation performance severely limits managers' abilities to predict how the reorganization of R&D operations following a horizontal acquisition might differently influence innovation performance depending on the degree of similarity of the technological resources and capabilities of the combining firms. The aim of this paper is to address this weakness.

This study is inspired by studies that apply a process view to understand the relationship between the product and market relatedness of acquiring and acquired firms, and acquisition performance of the newly combined firm (Larsson and Finkelstein, 1999; Zollo and Singh, 2004). Thus, we apply a similar type of process investigation to the R&D and innovation contexts. We highlight the links between the technological similarity of acquiring and acquired firms and post-acquisition R&D reorganization actions; the effects of these reorganization actions on R&D operations; and ultimately, the links between these intermediate effects and post-acquisition innovation performance. In other words, the complex chain leading from the technological similarity of R&D operations to post-acquisition innovation performance is broken down into more manageable segments, and the underlying structure of actions and their effects is exposed. In so doing, we highlight the innovation impact of technological similarity mediated by R&D reorganization, and the impact that is generated by the direct (i.e., non-mediated) link between technological similarity and post-acquisition innovation performance.

Our empirical analysis is based on data gathered through face-to-face interviews with firms' top managers, conducted within in-depth case studies of 31 horizontal acquisitions of European firms that operate in the medium and high-tech industries.¹ We test our model using partial least squares (PLS) techniques. The results of the empirical analysis indicate that technological similarity between acquiring and acquired firms has a large and direct negative effect on post-acquisition innovation performance, and that the effect mediated by a reorganization of the acquired R&D operations – notably, productivity improvements achieved by replacing the R&D top manager – is positive but of small economic magnitude. These results provide an original contribution to the literature on the innovation impact of acquisitions by looking into the black box of the R&D reorganization process. They also offer fresh new insights for managers of acquiring firms which may help their identification of acquisition targets and improve the implementation of acquisition activities.

The paper proceeds as follows. In Section 2, we discuss the theoretical background and provide an overview of the model. Section 3 develops our hypotheses and in Sections 4 and 5 we describe the methodology for the empirical analysis and present our results. The findings are discussed in Section 6 where we highlight our contribution to the acquisition literature. We conclude by summarizing our findings, and indicating the limitations of our paper and directions for future research in Section 7 which also highlights some implications of our findings for managers.

2. Overview of the theoretical model

In this paper, we consider horizontal acquisitions. Therefore, the R&D operations of acquiring and acquired firms generally are in the same broadly defined technological area. However, there may be different *degrees of overlap* in these operations. At one extreme there are acquiring and acquired firms with completely overlapping R&D operations, that is R&D operations in the same narrowly defined technological fields (e.g., in the same 3-digit USPTO patent classes). This would refer for example, to two firms conducting R&D on medical devices used in cardiovascular surgery. In this case acquiring and acquired firms would exhibit a high degree of technological similarity. At the other extreme, although the two firms may operate in the same broadly defined area of R&D operations (e.g., their R&D operations are in the same 2-digit patent sub-categories; see Hall et al., 2001), they specialize in different, narrowly defined technological fields. For example, between two firms that conduct R&D related to semiconductors, one firm might specialize in power devices and the other in small signal devices. In this case, the R&D operations of acquiring and acquired firms are associated with a low degree of technological similarity. The distinction between the presence and the absence of overlapping R&D operations is not clear-cut. There can be intermediate situations where parts of the firms' R&D operations are overlapping and parts are not.²

Fig. 1 presents an overview of our model. Our model suggests that the degree of technological similarity of acquiring and acquired firms affects the post-acquisition innovation performance of the combined firm both directly and indirectly through different post-acquisition reorganization actions and intermediate effects. First, taking inspiration from insights offered by studies of the acquisition implementation process (Haspeslagh and Jemison, 1991; Jemison and Sitkin, 1986; Pablo, 1994), we suggest that in order to realize the innovation potential of an acquisition, managerial actions are needed in the post-acquisition period to reorganize the acquired R&D operations. As clearly stated by Zollo and Singh (2004, p. 1236), post-acquisition reorganization “involves the degree to which pre-existing resources within the acquired firm are replaced with the equivalent resources of the acquirer, or are simply dismissed.” In particular, we consider the following two R&D reorganization actions: (i) rationalization of the R&D operations of acquired firms by reducing R&D personnel, terminating duplicate R&D projects, and closing R&D laboratories, and (ii) the replacement of acquired firms' R&D top manager. Second, we consider two intermediate effects of these reorganization actions which are viewed as crucial determinants of post-acquisition innovation performance: (i) improvements in the productivity of the R&D personnel in the newly combined entity relative to the productivity of the two independent entities, and (ii) disruptions to the R&D personnel in the newly combined entity.

Several studies show the importance of rationalizing acquired operations and replacing acquired firms' top managers post-acquisition. Post-acquisition rationalization of manufacturing, sales, distribution, and logistics activities, in the form of the disposal or sale of physical assets, closing of facilities, and reductions to the workforce, have been examined extensively in previous studies (e.g., Capron, 1999; Capron et al., 2001). Analyzing 1483 acquisitions of US target firms in the period 1981–2000, Maksimovic et al. (2011) show that out among 12,893 acquired plants, 18.6%

¹ These case studies were conducted within the FP5 project “Mergers and Acquisitions and Science and Technology Policy” funded by the European Commission, DG Research (Contract No. ERBHPV2-CT-1999-13). Part of the output of the project has been published in the following work: European Commission (2003), Cassiman et al. (2005) and Cassiman and Colombo (2006).

² It is a matter of judgment as to whether the R&D operations of acquiring and acquired firms are or are not overlapping. As will become clear in Section 4, we devoted considerable effort to establish the degree of technological similarity of our sample firms in the course of the interviews conducted with firms' top managers, and through careful examination of firms' published and internal documents.

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