

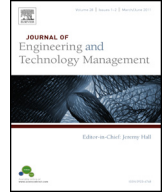


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Contents lists available at ScienceDirect

## Journal of Engineering and Technology Management

journal homepage: [www.elsevier.com/locate/jengtecman](http://www.elsevier.com/locate/jengtecman)



# When to commit more to a technological entry: Evidence of the follow-up patenting action of bearings manufacturers



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### ARTICLE INFO

#### JEL classification:

D810

L250

O320

L640

#### Keywords:

Technological deepening

Follow-up patenting

Asset specificity

Learning speed

### ABSTRACT

While consistently making forays into new domains is common practice, a follow-up action represents a greater realization of the value of a prior entry. Subsequent to technological entries into new domains, why and when to follow up, in terms of a follow-up patenting action in the newly entered domain, is relatively sidelined in the technology management literature. This paper departs from the knowledge-based view on follow-up patenting action to the moderating roles of competitive intensity and learning speed in order to explore persistent innovation behavior under uncertainty. In a sample of 474 technological entries of fifteen top bearings manufacturers during 1990–2004, the study serves as a multilevel account of the interplay between patent, firm and field. Our results show not only the contrasting influences of a firm's knowledge depth and breadth on its propensity to follow up on prior entries but also the boundary conditions of such causal relationships. As a response to the recent call for more empirical inquiry into the dynamics of R&D investment, our evidence identifies the theoretical sensitivity of the knowledge-based view to contextual factors and sheds new light on the complex nature of follow-up patenting, particularly when firms are subject to external uncertainty caused by competitive rivalry and internal uncertainty due to learning speed.

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## Introduction

Due to the uncertain nature of technological innovation, building an R&D portfolio is common practice for high-tech firms competing in ever-changing environments. Constant entries into new technological domains are thus considered a strategy to create more proprietary opportunities for further exploitation (Rycroft and Kash, 1999; Cho and Yu, 2000). Exploring the unknown by building bridgeheads into various technological domains is strategically important, but exploiting them by follow-up patenting in the newly entered domain depends on whether the firm is able to clarify the causal ambiguity between prior investment and profit potential (King and Zeithaml, 2001) and thus better realize the value of a prior entry.

It is well acknowledged that a creative idea or an invention per se cannot guarantee the success of a business in the market. Rather, follow-up activities are required to reap the benefits. Kelley and Nakosteen (2005) argue that new firms cannot rely on their initial invention for long-term advantages but must undertake further actions to strengthen their foothold. Discussion of persistent innovation efforts first appeared in the literature on strategy, according to which persistency (cf. discontinuity) in strategic actions is merited for its performance implications. This line of research is manifested in classic theory regarding path dependence (David, 1986), momentum (Miller and Friesen, 1982), convergence (Tushman and Romanelli, 1985), fit (Venkatraman, 1989), coherence/consistency (Nath and Sudharshan, 1994), and logical incrementalism (Quinn, 1980). Literature on technology management also offers few clues to the impact of follow-up efforts on innovation. Examining innovation history in a sample of multinational agri-food companies using their utility model patents, Alfranca et al. (2004) not only found that the length of innovation spells depends on firm size and certain market-related factors but concluded that most innovative companies remain so for a long period of time. In a study on the persistent innovation of German firms, Peters (2007) finds that firm innovativeness is longer lasting in the presence of external forces such as competitive pressure or governmental stimulus policies. However these accounts have been questioned for overlooking the micro-level origins of a firm's persistent innovation, prompting calls to pay closer attention to the unfolding of persistence or commitment as it arises from each decision to pursue follow-up patenting in a newly entered domain (Clausen et al., 2012).

On the theoretical front, the strategic moves of a firm are explicable either by the outside-in approach of competitive dynamics (Chen, 1996) or by the inside-out reasoning of the resource-based view (Barney, 1991). The knowledge-based view (KBV), an outgrowth of the resource-based view, stresses on knowledge not only as a strategically important resource underlying a firm's competitive advantage (Nahapiet and Ghoshal, 1998) but also as a tacit factor shaping a firm's organizing and problem-solving patterns (Grant, 1996). The KBV literature thus far has departed from the fundamental puzzle of why firms exist (Kogut and Zander, 1992) to a discussion of how different organizational forms facilitate knowledge exchange (Nickerson and Zenger, 2004). Despite KBV becoming a major theoretical pillar of knowledge creation, its reasoning about a firm's knowledge search behavior under uncertainty has been relatively sidelined. Specifically, a firm's knowledge profile, including depth and breadth, is generally deemed to be associated with its innovativeness (Katila and Ahuja, 2002; George et al., 2008), but the explanatory power of KBV may be blurred when the outside-in view is taken into consideration. For example, competitors' matching efforts may have the focal firm's knowledge in certain domains tied up as sunk assets (Zahra and George, 2002). In addition, TCE cautions that competitive uncertainty would neutralize the value of such assets and put the focal firm's decision to deepen the prior foothold at risk. Moreover, from the inside-out view, a firm's ability to quickly learn and assimilate new knowledge could determine whether existing knowledge elements are efficiently reconfigured with new ones and increase the odds of a follow-up innovation, which is suggested by the real options reasoning (ROR) as a way of reducing the costs of exercising an option (McGrath, 1997). On the other hand, a firm's decision to follow up its prior entry is subject to higher levels of external uncertainty when it encounters stronger competition in the field. By contrast, internal uncertainty arises when a firm is slow in transforming new knowledge into its own innovation because of recombinatory inefficiency between new and old elements (e.g., Anderson and Gatignon, 1986; Zhao et al., 2004). In this vein, either external uncertainty caused by competitive rivalry in the field or internal uncertainty due to a firm's adaptability to the advancement of

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