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Industry technical committees, technological distance, and innovation performance

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ABSTRACT

In most technology-based markets, industry technical committees (TCs) that establish new technical standards and specifications have assumed importance for companies as a critical source of information on existing and emerging technologies. In this study, we investigate how the *technological distance* of a TC from the firm will shape the impact of TC participation on the firm's innovation performance. Specifically, we posit that participation in TCs that are *central* (low technological distance) to the company's existing product technologies and offerings will contribute to its *competence-enhancing innovation* whereas participation in TCs that are *peripheral* (high technological distance) to current technologies and offerings will contribute to its *new-competence innovation*. Given the need to interpret and apply the information internally, we also consider the moderating effects of the firm's absorptive capacity and knowledge integration mechanisms. The study hypotheses are validated by combining survey-based and archival data related to a sample of 168 US-based wireless telecommunication firms. The findings provide broad support for the study theses and imply the need for companies to carefully plan the nature of their TC participation so as to advance the desired type of innovation. Broader implications for future research on external knowledge sourcing and competence-based innovation are discussed.

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1. Introduction

In the last one decade or so, there has been a significant increase in the number of industry technical committees or consortia formed to formulate and promote new technology standards and specifications (Chiao et al., 2005; Funk and Methe, 2001; Leiponen, 2008). With the rapid evolution of new technologies and product markets, companies are often compelled to participate in these technical committees (TCs) as a way to keep themselves abreast of the abrupt shifts in the technological environment (Schmidt and Werle, 1998), and thereby ensure the continued relevance of their market offerings and their interoperability with a diverse set of complementary products and technologies. However, technical committees, when viewed as an external knowledge sourcing mechanism, imply considerable resource commitments for companies—in terms of membership fees, cost of the employees attending the meetings, time and effort in evaluating the external information obtained, etc. As such, a key decision issue for firms is which industry technical committees to participate in and to what extent. In this study, we focus on the *technological distance* of technical committees from a firm to offer insights on the above important issue.

Membership in technical committees allows companies to acquire information on new technology developments and evolving standards—both explicit knowledge (draft proposals of standards, formal evaluations, etc.) as well as tacit knowledge (goals and agendas of other member firms, support for specific technology evolution paths, etc.). Prior studies have suggested the significance of such informational advantages due from participation in technical committees (Schmidt and Werle, 1998; Weiss and Sirbu, 1990). However, the empirical focus in this area has so far been on the influence a company can exercise on technology evolution through its TC participation (Bekkers et al., 2002; Chiao et al., 2005; Dokko and Rosenkopf, 2010; Leiponen, 2008) and on other types of benefits that it could derive such as enhancing its industry visibility and technical legitimacy, identifying potential alliance partners, etc. (Rosenkopf and Tushman, 1998; Rosenkopf et al., 2001). There has been limited empirical attention paid to the relationship between a firm's technical committee participation and its innovation performance.

The informational advantages gained from participating in technical committees could directly shape a company's innovation performance. Specifically, such alertness to external technological or market developments could enable a company to adopt more proactive innovation plans and to pursue promising product/service market opportunities. At the same time, the technological distance or technological 'cognitive distance' (Nooteboom, 2000; Wuyts et al., 2005) of the technical committee

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from a member firm would likely determine the nature of impact of TC participation on the company's innovation performance. For example, a technical committee that is technologically 'close' to the member firm and whose deliberations are directly related to the firm's current set of product technologies and offerings might offer information that has impact on its immediate innovation plans, whereas a technical committee whose focus is on standards that are technologically 'distant' from the firm's current technologies and offerings might offer information with impact on innovation that reaches beyond the company's existing skills and knowledge. Thus, going beyond the relationship between technical committee participation and innovation performance, an interesting research question is: *How does the nature of a firm's technical committee participation (i.e. participation in technologically close TCs vis-à-vis participation in technologically distant TCs) impact its innovation performance?*

Given our focus on how TC participation may help firms gain competence in applying new technologies or standards, we relate the nature of a company's technical committee participation to the two types of competence-based innovation—*competence-enhancing innovation* (innovation that builds upon and reinforces existing knowledge or know-how) and *new competence innovation* (innovation that is based on competences new to the firm and requires it to reach beyond existing skills and knowledge) (Benner and Tushman, 2003; Gatignon et al., 2002; Tushman and Anderson, 1986). Specifically, we propose that participation in technical committee with low technological distance to the firm (i.e. *central TC*) will largely facilitate competence enhancing innovation whereas participation in technical committee with high technological distance to the firm (i.e. *peripheral TC*) will promote new competence innovation.

To effectively profit from the information gained from TC participation, companies would need to be able to analyze, evaluate, and apply such information. Prior studies in the area of organizational learning and knowledge management suggest that a firm's stock of internal technical knowledge, i.e. its absorptive capacity (Cohen and Levinthal, 1990) and the organizational mechanisms it offers for knowledge combination, i.e. knowledge integration mechanisms (Zahra et al., 2000; Zahra and Nielsen, 2002) would both be critical in enabling the firm to digest external information and to integrate it with internal knowledge for application. As such, we test the moderating effects of both absorptive capacity and knowledge integration mechanisms on the firm's effectiveness in deriving innovation-related benefits from information acquired through TCs.

We empirically test the study hypotheses in the context of 164 US-based wireless telecommunications firms. Data collected from the companies through an email survey were combined with publicly available archival data for analysis. Our research model and findings contribute to research in two important ways. First, we contribute to the broader literature on external knowledge sourcing (e.g., Katila and Ahuja, 2002; Laursen and Salter, 2006; Sidhu et al., 2007; Vega-Jurado et al., 2009) by empirically investigating the significance of *technological distance* in shaping the nature of impact of external knowledge acquisition mechanisms on firm performance (here, innovation). Further, by examining the moderating role of *knowledge integration mechanisms*, we also connect the above literature with extant studies on the design of organizational structures, processes, and mechanisms for enhancing innovation performance (e.g., Laursen and Foss, 2003; Nobel and Birkinshaw, 1998; Haas, 2006; Zahra and Nielsen, 2002).

Second, we contribute to the growing literature on industry technical committees by focusing on *innovation performance* as an important outcome of TC participation, and by informing on the differential impact on competence-enhancing and new competence innovation. Our study also informs on managerial practices that would bring coherence to a firm's participation in industry technical committees (and other such external knowledge mechanisms) vis-à-vis its innovation goals and priorities (specifically with regard to exploitative and explorative innovation). We start by offering the theoretical background for our focus on industry technical committee as an external knowledge sourcing mechanism.

2. Theory and hypotheses

Technical committees serve as a potential source of an important private benefit—as a *forum for learning about new and emerging technologies* (Schmidt and Werle, 1998, p. 97). By assuming membership and participating in such technical committees, companies can acquire valuable information that could enable them make informed innovation decisions. As an external information resource, technical committees exhibit two unique characteristics, both of which enhance the impact of such information on innovation.

First, in most technical committees, company representatives often belong to the cadre of mid-level technical specialists—people who are organizationally situated close to internal innovation initiatives and are well versed in technical matters. The involvement of such front-level technical and managerial people reduces the time it takes for organizations to absorb and respond to new technical information acquired from TCs. Second, while membership in TCs can give early access to formal information (standard specifications, technical reports, etc.), the more important membership benefit is getting access to informal or undocumented information—technical positions and plans of peer companies, potential roadblocks to standards agreements, size of investments made by peers on incorporating particular standards, etc.—as it enable firms to take proactive decisions (David and Greenstein, 1990). As the CTO of a wireless firm noted, "often there is hidden agenda that surfaces in discussions in such forums . . . such information is invaluable to us as it allows us to make sound judgments on the evolutionary cycle of specific technologies and the kind of bets we should place on them by appropriately refashioning our innovation plans."[1]

2.1. Technological distance and types of technical committees

The relevance, and thereby the value, of private information gained from technical committees would likely vary with how closely the technical committee relates to the firm's own product technologies and markets. The notion of cognitive distance has been advanced in organizational research, based on an interactionist view of knowledge, to capture the differences in knowledge and skills or cognitive frames between two entities (Weick, 1995). While cognitive distance can be measured along multiple dimensions including technological, marketing, and organizational, much of the empirical focus has been on technological 'cognitive distance', i.e. distance in terms of technological knowledge and points of reference (Nooteboom, 2000; Wuyts et al., 2005). Prior studies on inter-firm alliances have investigated the impact of technological distance between alliance partners on different aspects of alliance performance including innovation (e.g., Gilsing et al., 2008; Sampson, 2007; Wuyts et al., 2005).

Clearly, technological distance assumes importance when examining the impact of participation in technical committees. Here, we define the technological distance between a technical committee and a member firm as *the degree of overlap between the TC's primary technological agenda or focus and that of the member firm*. Thus, based on the extent of their technological distance

[1] Authors' interview conducted on 22nd March 2007.

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