

ESSAYS ON STANDARDS CREATION, MODULARITY AND ITS EFFECT ON FIRM PERFORMANCE

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Abstract

In information-intensive industries standards play a critical role in shaping markets by enhancing and constraining competition. For new technology firms, the standardization process is a critical make or break decision in their technological journey. Standardization of interfaces also leads to the development of modular product architectures. Firms invest heavily in the creation of modular architectures and products with the objective of being able to create new product varieties quickly. Hence, modularity has been a subject of interest in research in high technology markets where the rapid pace of change creates uncertainty.

In the first essay, we address the research question of how new technology based firms (NTBFs) from emerging markets can overcome their liabilities through the standards creation processes, using a case study based research methodology. Firms engage in the process of seeking and obtaining legitimacy to get access to resources and capabilities needed for growth. Legitimacy has been viewed in the literature as a “perception that the actions of an entity are appropriate within a system of socially constructed norms and values” (Suchman, 1995). For new technology based firms to get social acceptance in a sociotechnical system, potential users of products, existing firms and industry champions have to be convinced about the capabilities of the new firms. The patterns of adoption are affected by regulatory issues, availability of features, technology availability and ease of use. Hence, new technology ventures have to face varying demands from different set of stakeholders that lead to legitimacy issues (Uberbacher, 2014). New firms often need “market legitimacy” to get access to mainstream customers who will have doubts about the competencies of the new players (Dacin, Oliver & Roy, 2007). Hence, “market legitimacy” determines the firm’s ability to conduct business in a particular market. Cooperating with larger companies enables them to access development activities and substitute their research and development efforts (Blind and Mangelsdorf, 2013) but small enterprises often find engaging with MNCs difficult because of inherent risks in such relationships (Prashantham, Birkinshaw, 2008). The “how” question, relating to the processes and tactics that new technology based firms from emerging markets can employ to get the needed legitimacy has not been adequately explored in the literature and this forms the subject matter of our first essay.

In the second essay, we study the relationship between modular architectures and the performance of firms using survey data from managers in R&D intensive industries. We also study the effect of technology turbulence and strategic flexibility on this relationship. There have been prior studies in the literature that address the aspect of how architectural modularity has resulted in improved time to market for derivative products, reduction of development costs and processes. But there have been very few empirical studies testing the relationship between modularity and firm level performance reported in the literature, particularly in industries with a high level of technology turbulence. Architectural modularity has transformed product design in ways that bring strategic flexibility to new suppliers. Modular architectures enable a firm to identify and leverage knowledge, extend and accelerate learning processes. Architectural innovations change the product architecture without changing the components (Henderson & Clark, 1990). But they have a tendency to destroy the useful knowledge that is embedded in the routines of the existing organization. Creating modular architectures implies upfront investments in architectural knowledge, and understanding the boundaries, interfaces, processes & the nature of interdependence between them (Henderson

& Clark, 1990; Von Hippel, 1990). Our research findings suggest an inverted U shaped relationship between modularity and long term performance, with strategic flexibility and technology turbulence moderating this relationship. In the third essay, using survey data from managers in R&D intensive firms, we study the governance choice decision often faced by MNEs in R&D outsourcing: using (or establishing) captive centers or third party offshore centers. Modularity has been a subject of interest in research in high technology markets where the rapid pace of change creates uncertainty that makes contracting difficult. Unpredictability in technology trends reduces the possibility of ex-ante specification of contracting terms and monitoring of incentives, particularly in the outsourcing of activities that are considered “core” to the firm (Williamson, 1991; Patibandla, 2006; Raghunath, 2011). The link between architectural modularity and the relationship to the governance choice decision is important as this enables us to examine questions related to the success of task partitioning at an industry level. The mirroring hypothesis (Sanchez & Mahoney, 1996; Hoetkar, 2006) suggests an isomorphism between product design architecture and organization design thereby implying that modular product design can substitute for organizational coordination (Henderson & Clark, 1990; Sanchez & Mahoney, 1996). This form of organizing design also lends itself to outsourcing. Recent work has explored the effect of R&D offshoring and captive insourcing on sales growth and innovation performance (Rodriguez & Nieto, 2016, Steinberg et al., 2017). The transfer of knowledge across firms in the location and changing nature of activities resulting in co-evolution of firms and locations has also attracted attention from researchers (Mudambi R, 2008; Mudambi R. & Venzin, 2010; Cano-Kollman, Cantwell, Hannigan, Mudambi Ram and Song J, 2016). Cultural issues are important especially due to the increased interconnection between different societies (Krishna, Sahay & Walsham, 2004). Findings from our study suggest that besides modularity, factors such as access to specialist expertise, availability of complementary skills and experience of the suppliers in a varied range of technologies and systems play a significant role in the governance choice decision.