Seminar on Technological Innovation, Session 6
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Summary
The periods of technologically innovative experimentations are often brought to an end by the emergence of a dominant design (Abernathy & Utterback, 1978). A dominant design is characterized both by “a set of core design concepts that correspond to the major functions performed by the product and that are embodied in components and by a product architecture that defines the ways in which these components are integrated” (Henderson & Clark, 1990, p. 14). These accepted “standards”, which are constitutive of a dominant design, remain in force unless or until a new technological paradigm emerges, paralleling Kuhn’s scientific revolution (Teece, 1986).

Innovative firms have been striving to set their products/technologies as “standards” accepted in the market. First-mover advantages are unambiguous, as demonstrated in the case of QWERTY (David, 1985). Technical terminologies, such as “path-dependency”, “lock-in effects”, “switching costs”, and “network externalities”, accentuate the significance of standards. Recognizing the benefits of preemption, an increasing number of firms have been joining the competition of standards-setting. As it gets fierce and its ramification gets larger, some refer to this competition as a “standards war” (Lee & Oh, 2006; Shapiro & Varian, 1999). Intriguingly, an innovative firm’s technological superiority has often been defeated by its competitor’s strategic maneuvering, such as an alliance with firms producing complementary goods, in the battle of standards. Sony’s Betamax vs. JVC’s VHS is an exemplary historic case (Cusumano, Mylonadis, & Rosenbloom, 1992). The lesson is simple and clear: firms need strategies to win a war of standards. Those strategies include alliance, preemption and expectations management (Shapiro & Varian, 1999).

Modularity is inextricably related to standardization. A modular architecture facilitates standardization as it increases the likelihood that a component will be commonly useful and enables component interfaces to be identical across several products (Ulrich, 1995). A modular system consists of components that are designed independently but still function as an integrated whole. If a firm’s modular interface specification is accepted by a group of other firms, it turns into an industry standard, which will precipitate the introduction of new and customized products (Christensen, Verlinden, & Westerman, 2002). To take full advantage of modularity, such as product variety, a growing number of firms have been introducing a modular system in their production process, as well as their design stage (Baldwin & Clark, 1998). This phenomenon can also be explicated by the overshooting of the functionality, which shifts the basis of competition toward speed, flexibility and
customization (Christensen et al., 2002). Yet some, such as Fleming & Sorenson (2001), pinpointed the dangers of modularity as it undermines the innovation process by taking away opportunities to produce breakthrough products.

Aforementioned studies provide implications for a firm’s strategy with respect to alliance and R&D procurement. Firstly, coalition with others serves as a strategic tool to achieve a triumph in the battle of standards. Stuart (1998) conducted an empirical analysis to test his hypothesis that firms’ network positions and their propensities to collaborate are affected by two factors: 1) crowding—collaboration among firms in the highly crowded technological areas is likely to eliminate duplicative R&D efforts; and 2) prestige—it influences a firm’s bargaining position and the availability of partners. He found that firms in crowded positions and those with high prestige are more likely to form strategic alliances. In addition, when a technological change shifts the locus of R&D expertise shifts from vertically integrated firms to a horizontally stratified population of specialized firms, firms constantly confront a make-or-buy decision for R&D procurement. Pisano (1990)’s empirical study suggests that small-numbers-bargaining problems motivates firms to internalize R&D.

**Critique**

*Does standardization hinder innovation?*

While innovation concerns something new, standardization enables existing things to be widely used. These concepts are ostensibly paradoxical. For instance, people like Fleming & Sorenson (2001) argue that a modular approach, which expedites standardization, impedes the process of radical innovation. Yet some empirical studies, such as Blind (2004), demonstrate a positive correlation between standardization and innovation. Blind, Gauch, & Hawkins (2010) also conducted qualitative research relying on qualified expert opinions and showed ICT standards positively affect innovation, especially on product variety, the degree and speed of adoption of new products and services. The following interpretation, at least, can be derived from these studies: standards can provide a source of knowledge and thereby facilitate the process of innovation. Nonetheless, the impacts of standards on innovation are still controversial. For instance, Frenz & Lambert (2012)’s study shows that standards serve as a source of information for innovation, yet there is a low correlation between standards and other modes of innovation, including process modernizing. This ambivalent correlation between standardization and innovation is in part attributable to the ambiguous definition of a standard. The question, “what is a standard”, must precede a study of a causal mechanism between standardization and innovation.
References


