



Essential intellectual property rights and inventors' involvement in standardization



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ABSTRACT

Obtaining essential intellectual property rights (IPRs) is important for innovation and competition in the network industry, where technical standardization plays a critical role in development. In this study, we empirically investigate the determinants of essential IPRs for wireless communication standards using the patent database. In particular, we focus on the inventors' involvement in technical standardization by identifying and collecting their patent applications.

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1. Introduction

Standardization is known to have both positive and negative effects on the evolution of technology (Tassey, 2000). It facilitates the development of a commonly accepted system, thereby achieving compatibility with complementary systems. Simultaneously, however, standardization reduces the variety of choices. When a standard becomes necessary in business, each company is required to strategically harmonize the contradictory effects of their current technological development; that is, the companies are required to provide differentiated and specialized products while ensuring compatibility with other products. Standardization is particularly beneficial for the network industry, where the interconnection of different products and system components is required for reliable services with de jure standards such as a global system for mobile communications (GSM) and a universal mobile telecommunications system (UMTS) in the wireless communications industry.

Once a standard is realized, related technologies protected by patents become essential intellectual property rights (IPRs). The

essential IPR concept is well defined by the European Telecommunications Standards Institute (ETSI, 2011). Essential IPRs are those without which a standardized system cannot operate. Therefore, owners of essential IPRs can take advantage of relevant patents in their business strategies. First, essential IPRs are important for entering a market, and they correlate positively with market power (Bekkers et al., 2002). For example, Motorola conducted exclusive cross-licensing with other parties in the GSM market, selecting only those with valuable IPRs for Motorola. Consequently, Motorola came to dominate the market. Second, owners of essential IPRs can demand royalties from use of the patents incorporated into the standard. For example, although Qualcomm has a business of chipset development, which includes Snapdragon, its royalties represent a considerable portion of its revenue (Mock, 2005).

This paper makes two contributions to the field. First, the paper investigates the impact of inventor's involvement in the process of standardization to obtain essential IPRs. This paper is the first paper that compares inventors who attend standardization meetings and those who do not. This paper also explains how their performances are different between each other. Second, the paper further investigates which of the innovator's characteristics are important for the realization of essential IPRs in the standardization process. The discussion considers the topic of endogeneity.

The structure of this paper is as follows. First, Section 2 reviews prior literature on determinants in obtaining essential IPRs in

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wireless communications standards. In Section 3, we discuss the standard-setting process in detail and formulate related hypotheses. Section 4 describes the dataset used for this analysis. In Section 5, we discuss the results of our analysis and verify the hypotheses formulated in Section 4. Section 6 concludes with remarks on policy implications and a future research agenda.

2. Literature review

Studies have identified certain key determinants for obtaining essential IPRs in wireless communication standards. The first determinant is technological advancement (Rysman et al., 2008; Layne-Farrar, 2011; Bekkers et al., 2011). Essential IPRs are known to receive more forward citations than non-essential IPRs. For decades, forward citations have served as a proxy for technological impact (Carpenter et al., 1981; Karki, 1997). The interpretation of forward citation is that the more a patent is cited by follow-up patents, the more technologically important it is.¹ Although Rysman et al. (2008), Layne-Farrar (2011), and Bekkers et al. (2011) used different datasets, they drew the same conclusion by analyzing forward citations of their respective datasets.

The second determinant for obtaining essential IPRs is firm-level strategic involvement, which is important for standardization. Focusing on external alliances among members of the 3rd Generation Partnership Project (3GPP), Leiponen (2008) concluded that firms' external cooperative activities with standard-setting organizations (SSOs) and their active participation as core members of technical committees are important to the standard-setting outcome. Bekkers et al. (2011) further verified the importance of firms' strategic involvement in the standardization process by analyzing the number of participating work items in one company and voting weights in the standardization process.

Third, strategic patent filing process is also important. Patent filing behavior has been shown to determine whether a patent becomes essential. Berger et al. (2012) showed that essential IPRs contain more claims and more frequent amendments than those that are not targeted for standardization. This strategy allows patent owners to protect wider patent scope. Additionally, Berger et al. (2012) determined that essential IPRs have longer pendency than other patents. This reflects the fact that the early phase in standardization is uncertain about the technological components of the standardization. Thus, the applicants need to keep as open as possible to deal with any possibility.

The fourth determinant reflects national styles. SSOs' members adopt different strategies for standard setting because they have different histories and policies, and these differences influence their capabilities (Leiponen, 2006). For example, North American firms are more betweenness central in alliance networks and are likely to participate in a multitude of industry associations. Japanese firms also tend to participate in a multitude of industry associations. On the other hand, European firms put effort into activities within the 3GPP.

Standardization is a process to set a standard that can serve as a base to stimulate further innovation in an industry. In the wireless communications industry, standardization has served to establish a technological foundation for connectivity. Although essential IPRs include technology, many previous studies (Leiponen, 2006, 2008; Bekkers et al., 2011; Berger et al., 2012) highlighted factors in standardization that are not related to research and development (R&D).

3. Hypotheses

The hypothesis in this study is related to inventors who attend standardization meetings. The workflow of standardization can be understood as a repeating cycle consisting of three phases: preparations for standardization meetings; participating in these meetings; and the interval of time between two meetings (Fig. 1).

The tasks required in the first phase (preparing for the meeting) include developing strategies for the next meeting and making contributions (a type of report that includes technical proposals and discussions). The contributions represent a firm's opinion on relevant discussions and its technical proposals related to the standardization process. The second phase is the standardization meeting. Decisions about technical standards are made in this phase, and attendees from various companies and organizations gather for official and unofficial discussions. Unofficial discussions in this phase include technical and strategic negotiations between firms during break times. The final period – the interval of time between meetings – is when planners develop the agenda for the next standardization meeting and conduct private discussions with other companies and organizations that can take the form of e-mails, teleconferences, or personal visits.

As observed in the standardization process, it is clear that an inventor becomes the center of negotiations in the meetings. This increases the likelihood of the inventor's patents becoming essential for three reasons. First, an inventor, motivated to develop a standardized system favorable to the company's business strategy, can bargain with relevant technologies at the meeting. Second, discussions with other parties provide inventors with indications of what will appear in the next round of standardization; therefore, they can pursue inventions likely to be required for upcoming standards. Third, by participating in negotiations, inventors are required to involve colleagues in the process of technological development; they share information with affiliated non-attendees, colleagues, and supervisors. Thus, the attending inventor becomes the knowledge source for subsequent R&D in an indicated company. From this situation, we derive the first hypothesis:

Hypothesis 1. Inventors who attend standardization meetings are more likely to invent technology that becomes an essential IPR than are those who do not.

Here we further expand the discussion on inventors to address the characteristics most relevant to obtaining essential IPRs. The first factor considered is whether an inventor who obtained a patent attended a standardization meeting. Standardization meetings often include several inventors, and their experiences vary widely. For example, some may have attended meetings since the early 2000s, whereas others may have attended meetings only in the later 2000s. Some inventors participate in meetings sporadically, whereas others participate continuously. Accordingly, three phases can be defined in an attendee's invention lifetime: "invention before an inventor acts as an attendee;" "invention when an inventor acts as an attendee;" and "invention after an inventor retires as an attendee (although continuing to invent)." In other words, we argue that the patent registered by inventors "attending standardization meetings" has a greater probability of becoming essential than the patent registered by those "not attending." Among all the patents sought by an inventor, those sought when the inventor is a meeting attendee reflect the technological

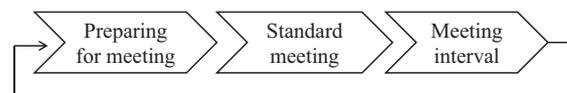


Fig. 1. Workflow of standardization.

¹ However, the use of forward citations as an indicator of technological quality in a patent, though widely adopted, is not without limitations. The limitations are discussed in Appendix A.

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