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Divergent patterns of engagement in Internet standardization: Japan, Korea and China

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ABSTRACT

This article analyzes the engagement of Japanese, Korean and Chinese participants in the development of Internet standards at IETF on the basis of four quantitative metrics: attendance, patenting, authorship and leadership. The results are strikingly divergent. Japanese involvement in Internet standardization began early and Japan was, for many years, second only to the U.S. in terms of IETF participation. Though Japanese participation has declined since the early 2000s, Japan remains a major contributor to IETF standardization. Korean involvement in IETF has always been significant, but below the levels of Japan and major European countries. Korean participation in IETF has also declined over the past decade, and has been dominated by one firm, Samsung. Though meaningful Chinese involvement in IETF did not begin until the mid-2000s, it has rapidly expanded in recent years. Today, China is a major player in numerous areas of Internet standardization in terms of three metrics (participation, patenting and leadership), and is rapidly gaining in terms of document authorship as well. Most of China's recent IETF involvement can be attributed to Huawei, though other Chinese firms have recently begun to increase their participation in the organization. Thus, contrary to some views that China's engagement with standardization is primarily one of indigenous innovation and "catching up", China's experience with IETF demonstrates deliberate and effective engagement with a major Western standards-development organization on its own terms.

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1. Introduction

Technical interoperability standards enable devices manufactured by different vendors to communicate with one another seamlessly and invisibly to the consumer. As markets for technology products have become increasingly global, the development of technical standards has also taken on an international character (Mattli & Büthe, 2003). Firms from different geographical regions routinely collaborate to develop standards in markets such as telecommunications, computing and networking (Funk & Methe, 2001). Despite this outward cooperation, it has been frequently observed that national differences shape firms' participation in collaborative standardization activities (Leiponen, 2006; NRC, 2013).

The experience of the three major Asian technology economies has been analyzed extensively with respect to standards for wireless telecommunications (Ernst, 2011; Funk & Methe, 2001; Jho, 2007; Liu & Cheng, 2011; Maeda, Amar, & Gibson, 2006; Vialle, Song, & Zhang, 2012), as well as other technology markets (e.g., digital television in Korea (Lee, Lim, & Song, 2005), microcomputer software in Japan (Cottrell, 1992), and audio video coding in China (Ernst, 2011)). Nevertheless,

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relatively little attention has been paid to the role that Asian participants have played in the development of Internet standards. Given recent estimates that more than one billion Internet users reside in Asia, representing nearly 45% of all global Internet users (IWS, 2012), a better understanding of the processes by which Internet standards are developed, and the role played by Asian participants in those processes, is called for.

This article analyzes, for the first time, the engagement of Japanese, Korean and Chinese participants[1] in the development of Internet standards at the Internet Engineering Task Force (IETF), the primary international forum for the development of Internet architecture, transport and security protocols, specifications and standards. We find that Asian participation in this group, which was initially dominated by U.S. and European interests, has gradually increased over the years. Initial early involvement by a core of Japanese Internet engineers soon gave way to broader participation by Japanese and Korean commercial firms. But today it is China that has risen to a position of dominance, with attendance and patent disclosures second only to the U.S. by 2012. Conversely, the prevalence of Japan (third in terms of overall attendance) and Korea (eighth in terms of attendance) have declined in both absolute and relative terms.

This article first discusses prior research on the institutional and national structure of technical standardization. It next summarizes the development of technical standards for wireless telecommunications in Japan, Korea and China, to provide a basis for comparison with Internet standardization. Third, it provides an overview of the existing institutional framework for Internet standardization, as well as Japanese, Korean and Chinese involvement in these activities. Fourth, it presents empirical studies of data pertaining to Asian participation in the IETF, comparing that of Japanese, Korean and Chinese firms. The article concludes with an analysis of the results, particularly the recent surge of activity by Chinese firms and suggests directions for future research.

2. Previous research

The positive market effects of broad product interoperability and standardization have been well documented (Shapiro & Varian, 1999). For this reason, the institutional and organizational structures of technical standard-setting bodies has attracted significant interest from researchers. It has been observed that national differences shape firms' participation in collaborative standardization activities (Leiponen, 2006; NRC, 2013). Individual participation in standardization organizations has been shown to facilitate coalition-building and influence within such organizations (Dokko & Rosenkopf, 2010). Because many standards organizations are driven by consensus decision making and are relatively egalitarian, any firm or country that is represented by individual participants can seek to influence the technical direction and outcomes of the organization (Loya & Boli, 1999). IETF makes many of its records and deliberations publicly available via the Internet, and prior research has made use of publicly-available data from IETF to draw conclusions regarding the operation and efficiency of IETF and standardization bodies more generally (Simcoe, 2007, 2012).

Previous studies that have quantified participation in standard-setting activities on the basis of national origin have typically done so at the firm level, rather than the individual level (Bar & Leiponen, 2014; Leiponen, 2008). However, because IETF is based on individual, rather than firm, participation (see Section 6.1), and because the number of individuals that a firm sponsors to participate in a standardization activity may be indicative of the firm's commitment to that activity, we measured participation in IETF on an individual basis. Ernst as well as Breznitz and Murphree have analyzed Chinese regulatory, economic and interview data to develop theories regarding the position and strategy of the Chinese government and firms regarding technical standardization (Breznitz & Murphree, 2012, 2013; Ernst, 2011). Breznitz and Murphree in particular observe that Chinese firms are becoming adept as participating in Western standards bodies (Breznitz & Murphree, 2013).

The patenting of standardized technologies has often been utilized as an indicator of firm engagement in standardization processes (Blind et al., 2011; Bekkers & West, 2008; Bekkers, Verspagen, & Smits, 2002; Gandal, Gantman, & Genesove, 2004; Simcoe, Graham, & Feldman, 2009;). Likewise, independent of standardization, patenting activity has been analyzed in terms of the patentees' national origin, including the increasing number of U.S. patents being obtained by Asian firms (Kesan, Marco, & Miller, 2014; USPTO, 2013).

Standardization typically involves the submission, evaluation, modification and adoption of one or more written documents setting forth the relevant standard. Authorship of a document suggests that the author or his or her firm is likely to exert some level of influence over the relevant standard. Thus, quantifications of editorial and authorial positions within standards setting organizations have been deemed to indicate meaningful influence of standardization processes (Dokko & Rosenkopf, 2010). Holding leadership positions in standardization organizations has also been identified as an indicator of

[1] References to Korea are to the Republic of Korea (South Korea) and do not include the Peoples' Democratic Republic of Korea (North Korea). References to China are to the Peoples' Republic of China and do not include Taiwan (the Republic of China) or pre-1997 Hong Kong. Representatives of other Asian countries participated in IETF activities during the periods studied, but in numbers and with regularity well below those of Japan, Korea and China. We have thus limited our study to these three countries, though the data presented includes participants from Singapore, Taiwan, Malaysia and other Asia-Pacific countries. We have not included southern Asia (notably India) in this study, as its development, geographical location and culture are not typically viewed in tandem with the countries studied. We also understand that geographical studies are inherently limited, and that comparing Japan, Korea and China with European and other Western participants as a whole may give the impression that European/Western participants can be viewed as a unitary bloc, which is of course not the case.

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