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The evolution of alliance structure in China's mobile telecommunication industry and implications for international standardization

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ABSTRACT

China has become a significant player in the international standardization regime of telecommunications. It is currently attempting international standardization of its indigenous technologies. This paper examines how China's approach for standardization has evolved in the cases of locally developed 3G and 4G mobile standards: TD-SCDMA and TD-LTE. The authors address the question in terms of alliance formation. They apply network analysis, which visualizes the formation and transformation of alliances. They argue that China's approach to standardization has evolved from techno-nationalism to techno-globalism. In building, developing, and maintaining alliances, relatively more weight is placed on links with foreign firms over time than on those with local firms, and China is increasingly open to foreign firms to gain their support and cooperation, which is required for international standardization and commercialization of locally-developed standards. This study makes a contribution in that it applies a quantitative method of network analysis and thereby visualizes the formation of alliances in 3G and 4G mobile communication industries.

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1. Introduction

As its economy grows at a fast rate and its telecommunication markets get bigger, China is expanding its role in the global telecommunication arena. Attracted by China's large domestic market, an increasing number of foreign firms that provide service technology or manufacture relevant equipment have entered China for technical or commercial cooperation. Chinese telecommunication firms such as Huawei and ZTE are aggressively expanding their influence in overseas markets such as in African countries (IDE-JETRO, 2009). Taking advantage of the gravitating power of its domestic market and its strengthening influence in developing countries' markets, the Chinese government has expressed its desire to become a global standard leader in ICT (information and communication technology) sectors (Lee, Chan, & Oh, 2009; Suttmeier, Yao, & Tan, 2006).

International standardization of indigenous technology can generate high demands for the technology in both domestic and international markets (Blind, 2004). It also provides an opportunity for participating in designing a new technological paradigm. Once a national technology becomes a global standard, it helps the country that developed it to attain multiple

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goals: financial gains (for example, reduction of outbound royalties and possible inbound royalties); growth of national firms; or sometimes political power to influence the development of future standards (Blind, 2004).

For these reasons, China recently began a drive for international standardization of indigenous technologies. Many attempts for national and international standardization of locally developed technologies have been made and are being made, such as WAPI (WLAN [wireless local area network] authentication and privacy infrastructure; Gao, 2007), AVS (audio video coding standard; Fomin, Su, & Gao, 2011), to name a few. Some have succeeded while others have been less successful (Kwak, Lee, & Fomin, 2011). Among them, its self-developed technology, TD-SCDMA (time division synchronous code division multiple access), won global recognition by ITU as one of the 3G international standards in 2000. Also, TD-LTE (time division long term evolution), an upgraded version of TD-SCDMA, was also adopted as one of the two 4G mobile communication standards in early 2012. In these circumstances, Chinese firms that are involved in the development, commercialization, and standardization of local technologies compete against, and collaborate with, foreign companies by forming alliances or networking.

Although there are many studies on China's attempts for international standardization (Cromer, 2005; Fomin et al., 2011; Gao, 2007; Kwak et al., 2011; Lee & Oh, 2008; Lee et al., 2009; Suttmeier & Yao, 2004; Suttmeier et al., 2006; Zhan & Tan, 2010), there is little research on the formation and shape of those alliances or networks. Some studies (Kwak et al., 2011) state that international standardization involves complicated networks of domestic and global stakeholders. But they do not show how complex those networks are and how they evolve, if they do, through the life cycle of each technology and/or in generational transition of a technology (e.g., 2G, 3G or 4G mobile communication).

This study aims to investigate how alliances or networks are formed, shaped, and evolved in China's attempts to set standards. For this purpose, the authors use network analysis through which they will visualize the formation and transformation of alliances in international standardization. The network analysis is applied to the cases of China's locally developed 3G and 4G mobile communication standards: TD-SCDMA and TD-LTE. As the two standards follow a similar path (i.e., international standardization via ITU) with an interval of about a decade, they provide a good ground for comparison. Specifically, the following questions are asked: are there any changes in China's approaches to standardization in terms of alliance formation in mobile telecommunication service industry as technology has evolved from 3G to 4G? If there are any changes, what are their implications for China's approaches and strategies for standardization of indigenous technology? To answer these questions, this paper draws on notions from the study of national innovation systems: techno-nationalism vs. techno-globalism. The two notions address the orientation of national technological innovation systems. Issues regarding knowledge transfer and coordination in China's mobile service industry are examined by employing the concepts from network analysis and implications for China's efforts for international standardization are to be discussed.

This study makes a contribution in that it applies a quantitative method of network analysis and thereby visualizes the formation of alliances in 3G and 4G mobile communication industries. While the mobile telecommunication industry in China has attracted attention from researchers and practitioners, particularly since the successful institutionalization of TD-SCDMA as a global standard, most research focuses on the regulatory framework (Xia, 2011, 2012; Xia & Lu, 2008; Yan, 2001; Yan & Pitt, 1999), the institutional aspects (Kshetri, Palvia, & Dai, 2011), the stakeholder perspectives (Gao & Liu, 2012) and theoretical conjectures like actor-network theory (Gao, 2007) by use of archival and media data, and at best, interviews. While most previous research on standardization in China examines regulation, which is an important dimension, it will be meaningful and interesting to approach and understand the alliances behind other structures. This study is, to the best of the authors' knowledge, the first attempt to quantify and visualize the alliances in China's 3G and 4G mobile industries by using network analysis.

This paper is organized as follows. In the next section of literature review, the authors introduce their theoretical resources; they are techno-nationalism vs. techno-globalism, and network analysis. Then background information on China's mobile telecommunication industry is presented. Subsequently, they describe the methodology including the dataset, variables and measurements, and the analytical approach applied. Presentation of statistical findings follows with visualized networks. Then they discuss meanings of those findings and conclude with implications for international standardization.

2. Literature review

2.1. Techno-nationalism and techno-globalism

The terms techno-nationalism and techno-globalism (TN and TG, hereafter) are used to describe the orientation of national innovation systems. They originate from the changed attitude of the U.S. government and firms regarding national technological innovations (Kohno, 1995; Reich, 1987). By the mid 1980s, TN and TG did not distinguish America's technological advances from those of other countries (e.g., Japan and West Germany), which is the principal tenet of techno-globalism. Threatened by Japan's technological achievements, techno-globalism was gradually replaced by techno-nationalism, which was characterized by the national orientation given to the development of new technologies. TN is defined as "ideological and policy orientations that favor, for national security reasons, avoiding or minimizing technological dependence on foreign countries" (Kohno, 1995, p. 220). It seeks technological autonomy for national security reasons.

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