Research Policy 43 (2014) 597–607

Contents lists available at ScienceDirect

Research Policy

journal homepage: www.elsevier.com/locate/respol

A latecomer's strategy to promote a technology standard: The case of Datang and TD-SCDMA

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ARTICLE INFO

Article history:
Received 18 March 2012
Received in revised form 2 September 2013
Accepted 4 September 2013
Available online 12 October 2013

Keywords:
Technology standard
TD-SCDMA
Latecomer disadvantage
Transitional institutions
Firm strategy

ABSTRACT

This paper studied the key strategies used by Datang, a local Chinese firm, to promote TD-SCDMA in order to explore an under-researched topic: how could a latecomer promote a technology standard? The findings suggest that Datang faced formidable challenges because of latecomer disadvantage and transitional institutions. The development of innovation capabilities and new technologies is needed but far from sufficient. It is necessary to develop special capabilities to get support from the government and public stakeholders such as scholars. The experience of Datang offers new insights into the development and adoption of technology standards sponsored by latecomers in developing countries.

1. Introduction

The literature on technology standard development and adoption has focused mainly on developed countries and multinational enterprises (MNEs) (Gandal, 2002), and the development and adoption of technology standards sponsored by developing country firms as latecomers is under researched. This paper tries to fill this gap by examining the promotion of TD-SCDMA (time division synchronous code division multiple access), one of the technology standards of 3G mobile communications, by Datang Telecom Technology and Industry Group (Datang), the company that developed the key technologies supporting this standard.

The phenomenon this paper tries to explore is: although many stakeholders recognized the potential benefits offered by TD-SCDMA, the development and adoption of this technology standard turned out to be a long and complex process (Li, 2006, 2010; Gao and Li, 2010). Specifically, the research questions this paper tried to answer include the following: (1) what are the strategies used by Datang to promote TD-SCDMA; (2) are these strategies similar or different from those used by MNEs; and (3) how to make sense of the similarities or differences.

In answering these questions we used a case study method and followed the grounded theory development principles (Eisenhardt, 1989; Yin, 1989). The findings suggest that there are major differences between the processes of developing and adopting technology standards sponsored by MNEs and that by latecomers: Neither strategic maneuvering nor government regulation was able to play as important a role in the case of TD-SCDMA as the literature suggests; Rather, the development and adoption of TD-SCDMA was a fragile and complicated social sociopolitical process heavily influenced by latecomer disadvantage and transitional institutions (Tushman and Rosenkopf, 1992).

The two concepts, latecomer disadvantage and transitional institutions, will be discussed in detail in Sections 4 and 5, but the basic meanings are explained here. First, based on reviewing the literature and coding the data collected, latecomer disadvantage is defined as the fundamental difficulties facing latecomers in promoting technological innovations such as the TD-SCDMA standard. Compared with MNEs, latecomers such as Datang usually have both resource disadvantage and reputation disadvantage, and

Abbreviations: 3G, 3rd Generation; 3GPP, the 3rd Generation Partnership Project; CDMA, code division multiple access; CDMA2000, 3G technology based on code division multiple access technology; CWTS, China Wireless Telecommunication Standard Group; FDD, Frequency Division Duplexing; GSM, global system for mobile communications; ITU, the International Telecommunications Union; LTE, Long Term Evolution; MII, the Ministry of Information Industry; MIIT, the Ministry of Industry and Information Technology; MOST, the Ministry of Science and Technology; MPT, the Ministry of Posts and Telecommunications; NDRC, the National Development and Reform Commission; SASAC, the State Owned Assets Supervision and Administration Commission; SCDMA, synchronous code division multiple access; SDOs, standards development organizations; TD Alliance, the TD-SCAMA Industry Alliance; TD Forum, the TD-SCDMA Technology Forum; TDD, Time Division Duplexing; TD-LTE, Time Division Long Term Evolution; TDMA, time division multiple access; TD-SCDMA, time division synchronous code division multiple access; WCDMA, wideband code division multiple access.

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http://dx.doi.org/10.1016/j.respol.2013.09.003

this makes it hard for innovations developed by latecomers to be adopted.

Second, the concept of transitional institutions is based on the study of Scott (2001, pp. 48–49). According to him, institutions are composed of regulative, normative, and cognitive elements that, together with associated activities and resources, provide stability and meaning to social life. However, during the development and adoption of TD-SCDMA, institutions in China were experiencing a lot of big changes. Accordingly, transitional institutions reflect two different kinds of institutions going through different processes: old institutions, which were related to the transfer of technologies from MNEs, were declining but still had strong negative impact on TD-SCDMA, and new institutions, which were related to the promotion of indigenous innovation, were growing but still not strong enough to provide effective support to TD-SCDMA.

The paper is organized as follows: we first review the related literature, followed by the description of the research methodology and data collection. We then report the key findings about the strategies used by Datang to promote TD-SCDMA. We conclude by discussing how to make sense of these findings and suggesting future research directions.

2. Theoretical background

The grounded theory development approach used in this study implies that it is inappropriate and impossible to specify ex ante any specific extant literature to guide the research. Rather, it is in the process of doing the research that the researchers find the relevant literature. In this study, in addition to the studies on TD-SCDMA, two more streams of literature turned out to be closely related: the literature on how standards or dominant designs emerge and the literature on what kinds of capabilities are needed in order for latecomers to catch up.

2.1. The emerging of technology standards

According to this stream of literature, when standards are defined broadly, a dominant design becomes the industry standard (Suarez and Utterback, 1995). Following this definition, there are three major perspectives on the development and adoption of dominant designs or technology standards.

The first perspective is about the role of dominant buyers or sellers (Besen and Farrell, 1994; Cusumano et al., 1992; Greenstain, 1992; Lint and Pennings, 2003; Schilling, 2003; Subramanian et al., 2011). Qualcomm was able to make its CDMA technology accepted as a leading technology standard in the US, although this technology came after TDMA, the then more accepted technology (Mock, 2005). In the VCR industry, it was primarily JVC's strategy, not the technological advantages, made VHS the dominant design in the 1970s. JVC was very active in establishing alliances with other firms to support VHS, while Sony tried to rely mainly on itself to promote its Betamax technology. Microsoft, Intel, and Cisco also had effective strategies such as providing financial and technological assistance to their partners to promote their technologies as industry standard (Gawer and Cusumano, 2002).

The second perspective is about the role played by the government. Although standards development organizations (SDOs) such as ITU (the International Telecommunications Union) set most of the telecommunication technology standards (David and Shurmer, 1996), SDOs do not have legal authority to enforce a technology standard. In this regards, the government could play an important role in technology standard development and adoption (Baron, 1995, 1997; King and West, 2002; West, 2000; Zhang, 2000). One important factor contributing to the much bigger market share of GSM than CDMA, a technology that is at least as advanced, and the strong competitiveness of EU firms in GSM, is the stronger support from EU than that from the US government, which believes in a free market based standard setting approach (Funk, 1998; Funk and Methe, 2001). Similarly, with strong government support CDMA has been very successful in South Korea, and South Korea companies have also been very successful in penetrating the international CDMA market (Jho, 2007).

The third perspective is that technology standards emerge in a sociopolitical process (Fuentelsaz et al., 2008; Tushman and Rosenkopf, 1992). The more complex the technology, the more important the influence of sociopolitical factors is. According to Tushman and Rosenkopf (1992), dominant designs (standards) for simple products mainly emerge based on technical factors, while dominant designs of complex products and systems emerge based on not only technical factors but also social, political and cultural factors.

2.2. Strategies and capabilities for latecomers to catch up

According to this stream of literature, the key strategy for latecomers to catch up with MNEs is to transfer technologies from MNEs and develop strong manufacturing capabilities (Amsden, 2001; Kim, 1997; Lall, 1982; Lee and Lim, 2001; Liu, 2001; Westphal et al., 1985). In sharp contrast with the technology transfer perspective and more relevant to this study (which is about catching up through new technology development), some studies indicate that it is hard for local firms in developing countries to catch up by relying on the development of capabilities to transfer "mature" technologies but it is possible for them to catch up or even leapfrog through the development of innovation capabilities when new technologies are emerging during periods of "paradigm transitions" (Abernathy and Utterback, 1988; Clark, 1985; Henderson and Clark, 1990; Hobday, 1995).

The study by Perez and Soete is illustrative (1988, pp. 475–477). They argued that in mature technology systems, "products build upon one another and are interconnected". This means that "each new product benefits from the knowledge and experience developed for its predecessors and its producer benefits from the already generated externalities". The situation is different for new technology systems for two reasons: "First of all, there is time for learning while everybody else is doing. Secondly, given a reasonable level of productive capacity and locational advantages and a sufficient endowment of qualified human resources in the new technologies, a temporary window of opportunity is open, with low thresholds of entry where it matters most".

Hobday (1990) also argues that there is opportunity for firms in developing countries to make technological leapfrog if certain kinds of technological change significantly lower the entry barriers. One example is the telecom equipment industry. According to him, the successful development of stored program controlled (SPC) switching systems in the 1970s significantly lowered the entry barriers for firms in developing countries. One reason is that the divisibility of the new telecom system increased the demand for PBX switches and small scale public switches, of which the software is far less complex than the traditional large scale public switches. The second reason is that the modularity of software design in digital switches made it possible for firms in developing countries to develop technology gradually.

A central issue in catching up through new technology development is about the advantages and disadvantages of followers or latecomers as a special group of followers because they are from developing countries (Liberman and Montgomery, 1998,1988). Some studies argue that latecomers as new entrants could be more likely to be successful in developing emerging technologies, because incumbent firms face a lot of constraints when new technologies are emerging. One constraint is related to the possibility