Technological Forecasting & Social Change 79 (2012) 771–788

Contents lists available at SciVerse ScienceDirect

Technological Forecasting & Social Change

FROM OUR PERSPECTIVE

Catch-up in ICT standards: Policy, implementation and standards-setting in South Korea ☆

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ARTICLE INFO

Article history:
Received 4 November 2010
Received in revised form 4 August 2011
Accepted 10 October 2011
Available online 21 November 2011

Keywords:
Formal Standards
ICT
Policy
Technological catch-up
South Korea

ABSTRACT

Korea is home to the world-first introductions of Code Division Multiple Access (CDMA) and subsequent third generation (3 G) mobile technologies. In addition to increased contributions to global ICT standards, Korean players gained prominence recently by proposing standards for homegrown systems. This paper takes stock of Information and Communications Technologies (ICT) policy design, implementations of projects and standards-settings during the Korean catch-up in ICT sectors and attempts at highlighting their commonalities during three different phases: Implementation, Participation, and Definition of standards. The co-evolution of two types of policies and implementations – 'generic' and 'targeted'[3] – affect the rate, direction and processes of catch-up. The patterns of raising standards-setting capabilities are generally in line with traditional technological catch-up. However, the evidence implies latecomers must address a few issues related to standards in order to sustain their rates of learning and continued growth in the ICT industry, namely: 1) Clarity of focus on over-arching industry and standards policy and their timely integration, 2) managing the balance between targeted and generic projects to gain both technological and non-technological capabilities for standards-settings, especially implementation, and finally 3) embedding necessary institutional flexibility within a national system catering to multiple standards-setting strategies and processes.

1. Introduction

The evidence suggests that leadership and control of international standards benefit in areas such as superior trade and competitiveness [1,2]. Technology standards are an important policy issue for managing evolution of new technologies due to their impact on innovation and diffusion [3]. Therefore, an important role for standards-setting capabilities is discernible in long term industrialization. However, it remains a playing field of governments and firms from developed nations, which has led to a "standardization gap" in production and control of ICT standards between developed, developing and least developed countries [4]. Many have studied different aspects of standards-setting by developed countries, but similar literature on developing countries is lacking. Although technological catch-up in the East Asian Newly Industrialized Countries (NICs) has been explored at length, standards and standards-setting have been somewhat neglected. A few available studies focused on the firm level but otherwise considered standards generically or over shorter spans. Whereas the rate of learning and accumulation of capabilities is viewed as a major source of catch-up in standards, the role of internal processes is discounted in literature.

☆ "Implementation" here represents the realization of policy. It should not be confused with the implementation phase in the summary findings of the article.

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[3] 'Generic' policies and projects do not pick up particular technologies or standards whereas 'targeted' policies and projects select and earmark investments for specific technologies and standards.

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doi:10.1016/j.techfore.2011.10.007

South Korea is a recent success story of technological catch-up, particularly in ICTs. The Korean innovation system and firms managed to accumulate technological capabilities in complex telecommunications and broadcasting systems, upgrading from simple capital-intensive products e.g. semiconductors and Liquid Crystal Displays (LCDs). The growth rests largely on development of indigenous digital switches, acquisition and commercialization of second generation wireless CDMA systems, and subsequent wireless, data and broadcasting systems. In fact, Korea is home to the world-first deployments of 3 G networks and a forerunner in usage of internet and digital broadcasting. Moreover, Korean proposals for formal standards of Wireless Broadband (WiBro) and Terrestrial Digital Multimedia Broadcasting (T-DMB) were recently approved by the International Telecommunications Union (ITU).

This article reveals the processes of a latecomer's catch-up in standards-setting by examining the history of the ICT systems and standards in South Korea. Multiple case studies spanning the last two decades show the changes in policy design, project implementation and standards-setting activities during the evolution of the national standards system. The evidence generally confirms traditional wisdom i.e. catch-up in standards occurs in reverse order to the technology cycle. However, it was dependent on two types of policies, projects and activities in parallel, each contributing partly to the accumulation of technological and non-technological capabilities for formal standards-setting. That makes it one of the first long term views on formal standards-settings by latecomers, especially for system products and technologies. This paper does not focus on theorization for latecomer standardization but attempts to fill this gap with first-cut empirical evidence. It can support theory-building when more cases will be available. This particular case provides stylized facts[4] for three phases drawn from detailed evidence about policy design, role and the extent of state intervention, and the standards-setting organization should be viewed in terms of how they impact the processes of catch-up.

The rest of the paper is organized as follows. The next section provides a review of the literature on catch-up in technology and standards by latecomers. The methodology, sources of data and structure of case studies are discussed in section three. Section four covers empirical evidence on the evolution of generic policy, implementation and standards-settings in Korea, while section five covers multiple case studies about strategic policies and projects, both of which are analyzed in section six identifying the phases of standards-setting and drawing stylized facts for each. Lastly, discussion and implications for second-tier catching-up nations are provided in section seven.

2. Literature review

2.1. Latecomers' technological catch-up and standards-setting

The closure of gaps in technology by forerunners rests mainly on the direction and rate of the catch-up. Regarding direction, international economies have different structures e.g. agriculture intensive, manufacturing based, hi-technology or service based. There is little doubt that an economy needs to industrialize overall, but the question remains, is it really possible to choose specific directions? Due to the fact that there is little chance for an economy to move onto service or hi-tech sectors without developing traditional industries [5], there is even less choice other than adopting foreign standards for traditional industries in the beginning. The meager resources should be allocated where they are more beneficial for the economy e.g. infrastructure. Even so, some studies have pointed at 'Windows of Opportunity' during paradigm shifts for new technologies [6], which imply the possibility of success by 'leapfrogging' into newer technologies without prior accumulation. For example, Korea's rapid growth is sometimes attributed to tapping such a window of opportunity in ICTs [7].

Second, the cumulative rates of endogenous learning and accumulation of technological capabilities determine the differences in industrial performance of East Asian Newly Industrialized Economies (NIEs), although they had similar levels of access to international technical knowledge, capital and equipment [8]. Moreover, in order to carry on with high rates of technological catch-up towards the frontier, the latecomers should sustain or improve their rates of catching-up in standards [9]. This implies a supporting role for standards in technological catch-up.

Lastly, the processes of catch-up are quite important. [10,11] demonstrated that the patterns of technology capabilities accumulation of latecomers occur in reverse order to the product cycle. Whereas product cycle describes rates of innovation in firms of advanced countries through fluid, transition and specific phases, according to the 'reverse product cycle' firms from developing countries advance by acquiring mature capital technologies from foreign nations in the specific phase. Next, with some level of technological capabilities, they can try innovations in relatively newer technologies that are taking-off (transition phase). Finally, with even higher technological capabilities they can make original innovations at the technology frontier. This process is commonly called the 'reverse product cycle'. [12] demonstrated higher rates of catch-up may be achieved by path-skipping or path-breaking in some cases; for example, Korea could leapfrog in the case of CDMA. However, [12] limited themselves to technology licensing and joint R&D for systems development, not going into details of standards-setting of CDMA. That necessitates some further understanding of catch-up in standards. There are new challenges near the technology frontier, which necessitate new capabilities and processes [13,14]. Knowledge creation processes and national science, technology and innovation capabilities are some of the main challenges pointed out for organizations to make it to leadership positions. Standards-setting capabilities at the national level play an increasingly important role in dissemination of knowledge, enhancing productivity and managing the evolution of technologies and markets [3].

[4] 'Stylized fact' refers to summarized themes or facts that are broad and ignore details of individual tendencies. It was introduced by Kolder (1961, 'Capital Accumulation and Economic Growth.' In: Lutz, F.A.; Hague, D.C (eds.) The Theory of Capital, London, pp. 177–222).