



## Interplay of innovation and standardization: Exploring the relevance in developing countries



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### ABSTRACT

A growing body of literature recognizes the positive interplay between innovation and standardization. International organizations such as OECD and WTO also increase support for developing countries in building capabilities in innovation and standardization. Yet the relationship between innovation and standardization in developing countries, characterized by relatively weaker technological, economic and institutional capacities, remain under-researched. We review 63 articles extracted from the Web of Science database covering the innovation–standardization nexus in the context of developing countries. We discuss whether and how the relationship between innovation and standardization provides implications for the socioeconomic development in developing countries, and draw a conceptual model to understand the dynamics. Our result shows that standards facilitate innovation in three ways: innovation by scaling, proving and coordinating. While inducing and blocking mechanisms are at play, various stakeholders are involved in the relationship. Among them, the roles of the government and the technology/industry support organizations are highlighted, as they complement the relatively weak technological capabilities of other actors. In contrast to the existing literature on developed countries where standardization is depicted as a dynamic process to shape the innovation path, the current discussion on developing countries is skewed toward the adoption aspect of standards. We also suggest that there is a chasm between the goals of economic growth and those of social development.

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### 1. Introduction

Recently, the increasing observation that innovation and standardization accompany each other in technology development has spurred research on their relationship. A renewed attention is given to the interplay between innovation and standardization, challenging the conventional view (for example, see Maxwell (1998)) that the two are at variance with each other. Even though far from conclusive, literature suggests that their synergetic relationship brings about economic benefits; standards feed information for innovation, accelerate diffusion of innovation, and reduce risks and time to market of innovation (Blind, 2013a; Tassej, 2000). Moving away from the economics to a broader domain of public service, some research begins to explore how standardization may induce innovation as a pathway to gain society-wise learning and to address societal challenges. Standardization is considered as a policy tool to

tap into the “social potential” (Drucker, 1984) of innovation, expanding the concept originally conceived by Schumpeter (1934) as an economic advantage.

An important implication arising from such renewed scholarly and emerging policy attention devoted to the relationship between innovation and standardization is associated with developing countries.<sup>1</sup> In the ever-integrating global value chain, the scope of innovation and standardization—mainly the process of development and the impact—spans transnational boundaries. Markedly under the multilateral trade regime, developing countries have become

<sup>1</sup> Development is a contested notion both theoretically and politically (Avgerou, 2010). Accordingly, the use of the term ‘developing countries’ and the attempt to define their scope also involve complications arising from different theoretical perspectives towards “development” which, in turn, characterizes the key attributes of such a classification. In this paper, the purpose of classification does not lie in identifying a comprehensive list of developing countries; rather, it is more focused on embracing multiple dimensions of development—economic as well as social (Sen, 2000)—that define the scarcity of a variety of resources faced by developing countries.

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active adopters of innovation in forms of standards, and in limited examples, aspiring producers of the innovation-standardization dynamics. In the absence of other strong regulatory systems and benchmarks for trans-border comparison, it has become a common practice for firms and governments in developing countries to adopt international standards and certificates for quality, safety, or sustainability as a signal of competence and innovation (Henson et al., 2011; Vieira and Traill, 2007). Furthermore, the rise of developing countries as key actors in international business, politics and technology has renewed attention to their strategies of innovation and standardization; the case specifically strengthened by the stellar performances of China and other BRICS countries (Lee and Oh, 2006). Last but not least, a number of initiatives have emerged recently at the scene of development practice, designed to support developing countries building capacities in areas of innovation and standardization (OECD, 2012; WHO et al., 2013).

However, due in part to the still nascent nature of the field, the absolute volume of scholarly works highlighting the context of developing countries at the intersection of innovation and standardization is small (for a recent example, see Ernst et al. (2014)). Findings from the current body of research have only limited explanatory power to understand how actors from developing countries affect and are being affected by the interplay, as most of the research draws on the experiences of advanced economies. Setting the focus on developing countries, in this sense, is relevant to a more comprehensive understanding of the dynamics between innovation and standardization. Just as significantly, this paper explores important yet under-researched implications of the relationship of the two that are specific to the socioeconomic needs in developing countries.

Building on this reflection, this paper aims to provide a review of current literature on the innovation-standardization nexus in the context of developing countries. In particular, we are concerned with how the recent academic attention given to the relationship between innovation and standardization finds its relevance in the developing countries in terms of economic and social implications. In doing so, we identify key topical areas and implications for further study in this increasingly important and multidisciplinary field.

This paper is organized in the following manner. We first provide a background by reviewing significant research strands from extant literature. In Section 3, we present the methodology, followed by Section 4 which provides a classification of the current literature. Section 5 discusses the findings and implications and we conclude in Section 6.

## 2. Contextualizing the relationship between innovation and standardization

### 2.1. The relationship: innovation and standardization, a paradox revisited

Literature on the innovation-standardization nexus reports that the relationship between the two may occur in two directions; standards and standardization contribute to the creation and the diffusion of innovation (Goluchowicz and Blind, 2011; Tassej, 2000). First, in line with the more traditional view, standards and standardization facilitates the diffusion of innovation. Standards as a set of technical specifications constitute a shared basis of advanced technological knowledge, refined in an easily transferrable form for a widespread adoption (Allen and Sriram, 2000). Standardization as a process of standards development offers critical junctures to build a focus of an emerging technology, which in turn facilitates the diffusion of innovation by increasing the economies of scale and the network benefits (Swann, 2000). Blind (2002) also recognizes the significance of *de jure* standardization as a diffusion channel of innovation. Second, standardization is considered an increasingly important tool to drive innovation in an extended process that encompasses both the creation and implementation of

innovation. This view, challenging the traditional perception of standards as being obstructive to innovation due to the “technology-freezing” characteristic, focuses on how standards can seamlessly connect and coordinate the innovation process, which is often laden with complexity and uncertainty. Notably, Blind and Gauch (2009) show how different types of standards facilitate innovation in particular stages of the R&D process.

In extension to the latter perspective that acknowledges the role of standards through the entire process of innovation, Blind (2013a) identifies four types of standards and their effects on innovation. Even though he cautions that a standard does not necessarily serve a single function and thus does not exclusively belong to a single category, his taxonomy according to standards' unique economic functions is useful for theoretical development. They include variety reduction standards, minimum quality standards, compatibility standards, and information standards. Variety reduction standards, by defining specifications of products and services and reducing the production variety, help firms attain economies of scale and critical mass for market success. Minimum quality standards reduce uncertainty and risks coming from the circulation of inferior goods in the market, thereby building consumer trust on new, innovative products. This leads to reduced transaction costs for a broader diffusion. Compatibility standards are central to achieving network externalities and avoiding lock-ins in old technologies. Information standards, by providing a common understanding of technological knowledge among standards users, reduce transaction costs and facilitate trade.<sup>2</sup>

On the whole, the current body of literature recognizes a positive interplay between innovation and standardization. It highlights how standards and standardization play an increasingly important role in shaping the direction of innovation, which goes beyond the passive role as a conduit of innovation diffusion. However, despite the burgeoning discussion, the fact that these findings are mostly drawn from the experiences of advanced economies significantly limits the applicability in developing countries. Building on these findings, we highlight the context of developing countries in the section following.

### 2.2. The context: developing countries in innovation and standardization studies

In the paucity of literature that explores the innovation and standardization link in developing countries, the departure point can be found from a review of how the contexts of developing countries are addressed in two separate camps of literature, one on innovation and the other on standards and standardization.

The tradition is stronger in innovation studies where an established community of scholars examines technological innovation as a catalyst to economic development (Crane, 1977; Crespi and Zuniga, 2012). In particular, the national innovation systems (NIS) approach provides a useful framework to understand the gaps in the achievement of innovation in different countries (Edquist, 1997; Freeman, 1995; Lundvall, 2007; Nelson, 1993). Even though the concept was originally coined to explain cases of advanced economies, the core of its argument that the knowledge links built through the interactions among different institutions and actors within the system are crucial to innovation also resonates well in the context of developing countries (Intarakumnerd et al., 2002;

<sup>2</sup> Information standards are usually treated as a different category from the other three types of standards. As Blind (2013b) mentions, an information standard usually functions as a combination of different types of standards. For example, a standardized product description as an information standard in itself is an expression of a product variety, and may entail a statement of certain quality requirements of a product that would facilitate its compatibility and interface with other entities.

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