The Effect of Pre-Existing Standards and Regulations on the Development and Diffusion of Radically New Innovations

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ABSTRACT

The controversy among scientists on whether standards and regulations hamper or stimulate innovation contains too little specificity and provides too few clues for innovation managers to act upon. In this article, we underscore the importance of timing and start by focusing on the effect of pre-existing standards and regulations on the subsequent development and diffusion of product innovations. The effect is assessed in terms of the time interval between the invention of a technological principle and the introduction of the first marketable product (development phase), and the successive time interval up to the start of large-scale industrial production and diffusion (adaptation phase). The authors analyse fifty heterogeneous cases studies of radically new high-tech product innovations from the year 1850 onward. The results indicate that pre-existing standards and regulations significantly shorten the adaptation phase of innovations, an effect not found for the development phase. The shortening effect on the adaptation phase is particularly evident for radically new innovations and innovations that are an integral part of larger technological systems. As the adaptation phase is often a time- and capital-intensive phase for industry, this accelerating effect on the diffusion of innovations is highly relevant for innovation managers and policy makers.

Keywords: Diffusion, Innovation, Radically New Products, Regulations, Standards

INTRODUCTION

The question whether standards and regulations hamper or enable the innovation and diffusion of radically new high-tech products has created controversy among scientists, while the policy and managerial importance of resolving it goes undisputed. A key issue explaining the controversy is the lack of specificity about the nature of the relationship. With the current article we aim to contribute towards its further clarification. We focus on pre-existing standards and regulations.

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Pre-existing standards and regulations refer to the set of standards, formal guidelines, rules, laws and conventions that exists prior to the invention of a new product. These standards and regulations have general relevance for the industry in which the new product develops, but do not specifically address it. Rather, they are part of the industry conditions within which a new product evolves. For example, a new product will have to comply to the safety and quality requirements prevalent in an industry.

Our focus is on radically new high-tech products. The contraceptive pill and Nylon, for example, have in common that, at the time of their introduction, they were radically new to the market and technologically state-of-the-art in their respective disciplines. This means that the product’s functionality was new to the market; its price-performance ratio was much better than that of contemporary products; and/or the product was based on new technical principles (e.g. contraception using hormones). Following the typology proposed by Garcia and Calantone (2002), we therefore refer to them as radically new.

In some cases, such as SMS, pre-existing standards and regulations facilitate the innovation and diffusion of new products. SMS is a short message text service sent via the control channel of the network. The control-channel or D-channel is first envisioned for ISDN and later on became part of subsequent cellular mobile telephony standards where the idea for SMS emerged (Brusoni & Corrocher, 2006). The availability of this standard and of regulation about the structure of the telecommunication network eased the innovation and diffusion process of the SMS-service (Brusoni & Corrocher, 2006; Lacohée, Wakeford & Pearson, 2003; Taylor & Vincent, 2005). However, in other cases pre-existing standards and regulations hamper the innovation and diffusion of radically new high-tech products in an industry. Kay (2002) and Constant (1980), for example, illustrate this with respect to the innovative jet-engine developments in both Germany and Britain at the start of the Second World War. In both countries the entire military air force system was organized around and restricted to facilitate propeller-powered airplanes.

In the afore-mentioned scientific controversy some scholars perceive standards and regulations as limiting variety and, more specifically, as restricting innovation (Temple, 2005) and product variety (Wölker, 1996), while others view them as allowing the build-up of critical mass and enabling economies of scale (e.g., Swann, 2000; Blind, 2004). A possible cause for these contradictory findings is the lack of specificity about the timing of standardization and regulation. Standards and regulations may already be in place at the time of the invention. However, they may also be developed and effectuated at later stages (Egyedi & Sherif, 2010). Whereas the adverse effects of standardizing and regulating too early or too late are well-noted (Blind, 2004, p.40), no systematic enquiry has been made into the way the timing thereof affects innovation (West 2003; Temple, 2005). In the following we refer to this as the ‘timing effect’.

While from a scientific perspective it is highly relevant to resolve the controversy, improved insight into the timing effect of standards and regulations may also help design institutional and policy frameworks that better catalyse innovation and diffusion processes. Such frameworks are needed to support more effective innovation policy at the governmental and company level.

In this article, we aim to clarify a few issues that cloud the debate and start by addressing part of the timing effect. In particular, we explore the effect of pre-existing standards and regulations on the time required for different phases in the innovation trajectory of radically new high-tech products. We investigate this effect for a heterogeneous set of cases from different historical periods and industries.

The article is structured as follows. First, we address theoretical considerations, such as the controversy about the impact of standards and regulations on innovation. Next, we present our methodology and research findings. We close with a conclusion and discussion section and a section on future research.
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