Chapter 80
Impact of Industry Conditions on Innovation: Pre-Existing Standards and Regulations

J. Roland Ortt
Delft University of Technology, The Netherlands

Tineke Mirjam Egyedi
Delft Institute for Research on Standardization, The Netherlands

ABSTRACT

This chapter underscores the importance of timing by focusing on the effect of pre-existing standards and regulations on the innovation and diffusion of new high-tech 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). Fifty heterogeneous cases of new high-tech product innovations from 1850 onward are analysed. Results indicate that pre-existing standards and regulations significantly shorten the adaptation phase, an effect not found for the development phase. The shortening effect on the adaptation phase is particularly evident for more radical innovations and for innovations that are more interrelated with a larger technological system. This accelerating effect on the diffusion of innovations is highly relevant for innovation managers and policy makers alike.

INTRODUCTION

The question whether standards and regulations hamper or enable innovation 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 chapter we aim to contribute towards its further clarification. We focus on *pre-existing* standards and regulations. Pre-existing standards and regulations refer to the set of standards, formal guidelines, rules, laws and conventions in force prior to the invention of a new product i.e., prior to the

DOI: 10.4018/978-1-5225-9273-0.ch080

demonstration of the first rudimentary version of the product. These standards and regulations apply industry-wide and have not specifically been set to address the new product . That is, they form part of the industry conditions within which a new product is developed and later on diffuses. An example of such standards and regulations are safety and quality requirements prevalent in an industry to which a new product has to comply.

The 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. Radically new to the market means that a product's functionality is new to the market; technologically state-of-the-art means that a product's price-performance ratio is much better than that of contemporary products or that it is based on new technical principles (e.g., contraception via hormones). Following the typology proposed by Garcia and Calantone (2002), we therefore refer to them as radically new.

In some cases, industry conditions, notably pre-existing standards and regulations, facilitate the innovation and diffusion of new products. An example is SMS in its time. SMS is a short text message service sent via the control channel of the network. The control-channel was originally introduced as part of the ISDN standard but later became part of subsequent cellular mobile telephony standards during which period the idea of using the control-channel for SMS emerged (Brusoni and Corrocher, 2006). The availability of this standard and of regulation about the structure of the telecommunication network eased both the innovation and subsequent diffusion of the SMS-service (Brusoni and Corrocher, 2006; Lacohée, Wakeford and Pearson, 2003; Taylor and Vincent, 2005).

However, in other cases industry-wide standards and regulations may hamper the innovation and market diffusion of radically new high-tech products. 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. The available budget for developing a jet-engine was limited as were the possibilities for the military to use it once developed.

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). In contrast, others emphasize the positive economic effects of standards, such 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 lack of specificity about the phase of the technology life-cycle concerned. 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. Whereas the adverse effects of standardizing and regulating too early or too late are well-noted (Sherif, 2003; Blind, 2004; Ho and Sullivan, 2016), no systematic enquiry has been made into the way the timing thereof affects innovation (West 2003; Temple, 2005; Egyedi and Sherif, 2010, Ho, 2017; Koch, 2017). In the following the authors refer to the effect of standards and regulations on the length of the innovation and diffusion process 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 policies at the industry and company level.