Chapter 12

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

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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 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 technologi-
cally 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 in-
novation 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;

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 limit-
ing 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 frame-
works that better catalyse innovation and diffusion processes. Such frameworks are needed to support
more effective innovation policies at the industry and company level.

In this chapter, the objective is to clarify a few issues that cloud the debate and start by address-
ing part of the timing effect. In particular, the chapter will explore the effect of pre-existing standards
and regulations on the time required for different phases in the innovation trajectory of radically new