



Pergamon

Technovation 23 (2003) 281–290

---

---

**technovation**

---

---

www.elsevier.com/locate/technovation

# Innovation, market performance, and competition: lessons from a product life cycle model

C. Werker \*

*ECIS and Faculty of Technology Management, Eindhoven University of Technology, P.O. Box 513 (DG 1.23), Eindhoven 5600 MB, The Netherlands*

Received 12 March 2001; received in revised form 27 July 2001; accepted 19 October 2001

---

## Abstract

Detailed knowledge on how innovation, market performance, and competition are intertwined serves as a basis for decisions of firms and policy makers. In the course of market evolution various changes take place of which the emergence of consumers' preferences and of the knowledge that is needed to meet these preferences with appropriate products are the most important ones. In order to model the market evolution and the resulting changes, Dosi's concept of technological paradigms and Winter's concept of technological regimes are integrated into a product life cycle model. The simulations performed with this model help to understand how the dynamics of market evolution shapes market performance and competition. The results of the simulation runs show a much more differentiated picture than economic intuition suggests and therefore give useful hints for firms' strategies and innovation policy. The most striking result of the simulation runs for entrepreneurial strategies is that there are markets that are only interesting for firms which want to enter a market to realize some profits and then exit again whereas other markets are only interesting for firms which want to survive in the long-run. For policy makers the simulation results show clearly that policy measures must be carefully designed in order to have the intended effects.

© 2002 Elsevier Science Ltd. All rights reserved.

*Keywords:* Innovation; Market performance; Competition

---

## 1. Introduction

Detailed knowledge on how innovation, market performance, and competition are intertwined serve as a basis for decisions of firms and of policy makers. Firms try to achieve their individual goals, i.e. to make profits and to survive in a competitive market environment by using knowledge on markets as a basis for their strategies. On the contrary, the same knowledge enables policy makers to aim at an overall increase of social welfare by identifying disturbances in competition, especially situations in which the exploitation of consumers is likely. Moreover, policy makers may realize deficits in market performance that emerge from a lack of appropriate institutions, e.g. that patent laws protect the property rights of innovators too long or too short so that the investment in R&D is hampered.

It is clear that knowledge on innovation, market performance, and competition is crucial for entrepreneurial strategies as well as for policy. Unfortunately, it is not easy to derive guidelines for firms or policy makers from the literature on markets, because existing theoretical and empirical results provide a very complex and complicated picture on possible market environments. It is generally agreed that innovation, performance, and competition depend significantly on the maturity of markets (Dosi, 1997). The stage of maturity is usually presented by the market structure: new markets are normally described by competition between many small firms whereas older markets are more concentrated and are dominated by few larger firms. So, the turn of markets from new into mature ones is investigated in the following. At the core of the analysis is the question how does this change affect innovative output, market performance, and competition. The aim is to gain differentiated answers to this question within an evolutionary model of market dynamics and eventually to derive implications for entrepreneurial and political measures. In

---

\* Tel.: +31-40-247-4479; fax: +31-40-247-4646.

E-mail address: c.werker@tm.tue.nl (C. Werker).

order to do so, first of all, the concepts of technological regimes, technological paradigms, and product life cycles are integrated (Section 2) and the market evolution is modelled accordingly (Section 3). The results of the simulation runs are discussed in Section 4 by especially taking into account the implications for entrepreneurial and for policy strategies. A brief summary and some hints for future research round the paper (Section 5).

## 2. Product life cycles, technological regimes, and technological paradigms

The model used to derive implications for innovation strategies of firms and policy makers is based on three theoretical pillars: product life cycles, technological regimes, and technological paradigms. The well-known *product life cycle* approach describes the changing features of markets during their evolution. It may therefore serve as the theoretical framework within which the market changes can be explained (Klepper, 1997). In the beginning of a product life cycle, the consumers' preferences are not clearly defined. Moreover, firms have not yet agreed upon the kinds of knowledge that should be used to meet these blurred preferences. Therefore, many firms with a variety of knowledge enter the market in this stage. In the course of time, the consumers' preferences become clearer and the knowledge used to generate innovation is relatively agreed upon, so that the generation of innovation finally falls back on the same kind of knowledge. There exists a lot of empirical evidence that underpins this concept. The regularities that were found can be summarized as follows:<sup>1</sup> the number of firms starts from a low level and then increases considerably. Subsequently, a sharp shakeout-stage of firms follows, so that the number of firms acting in the market decreases. The industry output displays the highest growth rates in the beginning of the product life cycle; these growth rates decrease and ultimately become zero when the market matures. The industry price decreases with high rates at the beginning of the product life cycle. Afterwards the price decrease slows down and becomes zero when the market matures. This pattern is also supported by several other studies.

The second pillar, the *technological regimes*, contributes an explanation to the product life cycle story why markets mature. Two technological regimes that characterize different market environments can be distinguished: under the entrepreneurial regime, innovative market entry is favoured by the fact that there exist a

number of specific possibilities to exploit the profit opportunities of markets (Winter, 1984, p. 297). These profit opportunities are limited because only specific firms have access to the knowledge that is relevant for the market. This is due to the fact that innovative market entry does not only require knowledge about technology and products but also about the specific circumstances of the respective market. For this reason, suppliers of inputs or consumers of outputs appear relatively often among those companies which enter the market. In contrast, the market environment under the routinized regime is totally different. Here, innovation by established firms is favoured because the cumulative character of the market relevant knowledge becomes crucial which result in increasing returns to scale. Moreover, knowledge is usually protected by secrecy or patent protection, so that potential entrants face growing difficulties to gain access to the relevant knowledge and to compete with the established firms (Winter, 1984, p. 296). It is also shown by empirical studies that there exist markets that are favourable for innovation by entrants and markets that are favourable for innovation by established firms. Using the data of 4.5 Mio. firms in the US-Small Business Data Base from 1976 until 1986, Audretsch was able to show that significantly more firms entered the markets that could be defined as entrepreneurial than markets that could be defined as routinized (Audretsch, 1995). Similar results were derived by Malerba/Orsenigo: using patent data of US-American, German, French, British, Italian and Japanese firms in 49 different sectors in the period between 1978 and 1991, they reached the conclusion that in some industries innovation by market entrants were favoured whereas in others more innovation were generated by established firms (Malerba and Orsenigo, 1996).

The notion of technological regimes can very well underpin the product life cycle approach. By integrating both regimes a whole market evolution can be derived, because the entrepreneurial regime shows the evolution of a new and the routinized regime that of a mature market. This means that the entrepreneurial regime that is favourable for innovative market entry is followed by the routinized regime that is favourable for innovation by established firms. As a consequence, the question why and how markets change from an entrepreneurial regime to a routinized one has to be solved. This explanation can be provided by the third pillar of the model: the concept of *technological paradigms*. A technological paradigm can be characterized by some basic artefacts and a couple of technological paths that provide information on future research possibilities (Dosi, 1988, p. 1127; Dosi, 1982, pp. 151–153). It does not only define a research field but also gives directions for the search for new solutions as well as for appropriate tools. These directions of research are called technological paths. When firms follow these paths, new possible solutions

<sup>1</sup> Cf Agrarwal, 1997; Carroll and Hannan, 1989, p. 417–423; Geroski, 1995, 425f; Klepper, 1997; Klepper and Graddy, 1990, p. 28–35; Klepper and Simons, 1997; Utterback, 1994, p. 79–99.

متن کامل مقاله

دریافت فوری ←

**ISI**Articles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات