Chapter XVIII
Curious Exceptions?
Open Source Software and "Open" Technology

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ABSTRACT

The aim of this chapter is to explore the differences and commonalities between open source software and other cases of open technology. The concept of open technology is used here to indicate various models of innovation based on the participation of a wide range of different actors who freely share the innovations they have produced. The chapter begins with a review of the problems connected to the production of public goods and explains why open source software seems to be a "curious exception" for traditional economic reasoning. Then it describes the successful operation of similar models of innovation (open technology) in other technological fields. The third section investigates the literature in relation to three fundamental issues in the current open source research agenda, namely, developers' motivations, performance, and sustainability of the model. Finally, the fourth section provides a final comparison between open source software and the other cases of open technology.

INTRODUCTION

Over the last 10 years, open source software development has increasingly attracted the attention of scholars in the fields of economics, management, and social sciences in general (for sociological contributions, see Himanen, Torvalds, & Castells, 2001; Weber, 2004; see Maurer & Scotchmer, 2006, for an account of the phenomenon from the economist's perspective). Although the significance of the software industry in modern economic systems can partially explain the increasing number of research contributions in this area, it is clear that the chief reason behind this growing interest is the fact that open source software development seems to represent a form of innovation process that challenges many facets of the current conventional wisdom concerning the generation of innovations in market economies (Lerner & Tirole, 2001).

Traditionally, economists have considered technological knowledge as a public good, that is, a good endowed with two fundamental features: (a) nonrivalry and (b) nonexcludability. Nonrivalry states that when one actor consumes or uses the good, this does not prevent other actors from consuming or using it. Obviously, this does not hold for standard economic goods: If Paul eats the apple, it is clear that Nathan cannot eat the same apple. On the other hand, both Paul and Nathan can breathe the fresh air of the park. Nonexcludability refers to the fact that when technological knowledge is in the public domain, it is no longer possible to prevent other actors from using it. Again, while Paul may force Nathan to pay for the apple, he cannot (legally) prevent Nathan from breathing the fresh air of the park. The traditional economist's viewpoint contends that market economies are characterized by a systematic underprovision of public goods as their production is, due to the two properties described above, not profitable for private firms. In these circumstances, the standard prescription is that governments should intervene, using tax revenues to supply directly the appropriate quantity of public goods. This reasoning is at the heart of the argument that is commonly used in making the case for the public support of scientific research (Nelson, 1959). It is worth noting that, historically, the allocation of public resources for the production of scientific knowledge has been organized around a rather particular institutional arrangement ("open science") capable of producing both incentives to create new knowledge and the public disclosure of scientific finding (Dasgupta & David, 1994).

Public funding, however, is not the only answer. Another solution put forward by the literature is based on the idea of inducing private firms to invest in the production of technological knowledge by means of an *artificial* system of property rights (Arrow, 1962). The most common example, in this respect, is the patent system. A patent assigns temporarily to its inventor the complete control of the new technological knowledge discovered. The rationale for this institutional device is straightforward: The prospect of the commercial exploitation of this temporary monopoly right will induce private firms to invest resources in inventive activities, that is, in the production of new technological knowledge.

In this context, open source software represents a case of the production of new technological knowledge (high-quality computer programs) carried out by individuals without any direct attempt of "appropriating" the related economic returns. Clearly, all this is at odds with the conventional wisdom summarized above.

Recent research has, however, shown that the innovation process characterizing open source software is not an isolated case. Instead, at least since the industrial revolution, similar types of innovation processes have been adopted in other industries in different periods. Following Foray (2004), we will refer to these episodes as cases of "open technology" in order to stress their similarity with open source software. It is worth warning the reader that in the literature, a variety of other terms and definitions such as "collective invention" or "community based innovation" are frequently used.[1] There is a growing awareness that these cases do not represent just "curious exceptions" to the traditional models of innovation based on public funding or on commercial exploitation by means of exclusive property rights. The aim of this chapter is to provide a compact overview of this literature and to compare these cases of open technology with open source software. Our belief is that this broader perspective can enrich our understanding of open source software.

BACKGROUND

Open Technology: A Neglected Model of Innovation

In a seminal paper, Robert C. Allen (1983) presented a detailed case study of technical change in