The first part of this book unveiled four main findings. First, innovation is a subtle concept. Even if everybody has a broad idea of what innovation is, when we start digging, innovation appears to be a particularly complex notion. Second, innovation is mainly performed in firms. Although individuals or other types of organization, such as universities, research institutions, and hospitals, participate to a large extent in the innovation effort and can be the source of important innovations, the vast majority of innovations are in fact implemented by private firms. Third, innovation is crucial to economic growth and standards of living in the long run. In today’s globalized economy in which knowledge is crucial, innovation plays a key role in sustaining and developing competitive edge. Fourth, innovation is difficult to measure. As innovation is a continuous process involving some kind of novelty and qualitative change, it complicates its own measurement.

Although these findings contribute to a large extent to a better understanding of the economics of innovation, what particularly matters both from an economic perspective and for the purpose of this study is to understand how innovation occurs. On the one hand, as innovation is the main engine of economic growth, it is crucial to explore the mechanisms of the innovation process (Rothwell, 1992a, p. 73; Lindqvist et al., 2000, p. 95; Basadur and Gelade, 2006, p. 45; Bernstein and Singh, 2006, p. 561). A better understanding of the innovation process will not only allow policy makers to implement the most suitable policies to support innovation but also enable firms or any other organizations to manage innovation in the most appropriate way. It should be noted that the intrinsic nature of the innovation process has deep geographical implications. As stated by Feldman (1994, p. 21): “Innovation, at a fundamental level, may be viewed as a communication process that bridges different disciplines with distinct vocabularies and unique motives. While information may be easily transmitted across great distance, translating information into useable knowledge is a more complex [...] process.”

The aim of this chapter is therefore to explore the cognitive nature of the innovation process. It focuses on the internal mechanisms of the innovation
process at the level of the innovative entity, whether it is a firm or any other type of organization. This emphasis is a necessary intermediate step in the process of building a comprehensive examination of the geographical features of the management of innovation, which will be done in Chapters 5 and 6. To that end, this chapter is divided into two main sections. The first section introduces the complexity of the innovation process and explains why its study has long been neglected. The second section presents the main models that have been proposed to depict the innovation process from the first conceptual idea to the commercialization of the innovation. By putting forward the cognitive nature of the innovation process, this chapter unveils the characteristics that explain why innovation tends to be spatially concentrated and therefore provides the necessary basis for the more detailed analysis of the clustering of innovative activity that will be found in Chapter 5.

4.1 Entering the black box: innovation in the process

Although economists have devoted much energy to studying the factors that stimulate innovation (innovation inputs) and to measuring their resulting outcomes (innovation outputs) or the diffusion of already-developed innovations (Rogers, 1995), they have, until recently, dedicated much less attention to the analysis of the innovation process itself (Pavitt, 2005, p. 87). The reason why it has long been partially neglected and seen as a “black box” in economics is because an explanation of how innovations occur was seen as impossible to formulate, and innovation was commonly looked at as a random phenomenon (Fagerberg, 2005, p. 9). For a long time, the link between, on the one hand, engineers and technologists, who are directly involved in the technological process occurring inside that box, and, on the other, the market forces and institutional environment required for successful innovation was missing (Rosenberg, 1994, p. 9ss.). Kline and Rosenberg (1986, p. 276) explained this disjunction by the fact that the innovation process is among the most complex processes both technically and socially. Indeed, an innovation is the outcome of the combination of different types of knowledge, capabilities, skills, and resources, making the innovation process highly uncertain, disorderly and often unpredictable (Tidd and Bessant, 2009, p. 19). Van de Ven and his co-authors (1999) defined the innovation process as a “journey into the unknown” because it varies regarding the economic sector, field of knowledge, type of innovation, historical period, country concerned, size of the firm, and its corporate strategy or its prior experience with innovation (Pavitt, 2005, p. 86). In other words, the conditions for successful innovation greatly differ from case to case.

Schumpeter played a pioneering role in the study of the innovation process by being the first scholar to depart from theories which viewed innovation as a “manna from heaven” (Fagerberg, 2005, p. 9). He identified three main aspects of the innovation process: its inherent uncertainty, the