

## The study of innovation

Innovation has long been argued to be the engine of growth. It is important to note that it can also provide growth, almost regardless of the condition of the larger economy. Innovation has been a topic for discussion and debate for hundreds of years. Nineteenth-century economic historians observed that the acceleration in **economic growth** was the result of technological progress. However, little effort was directed towards understanding *how* changes in technology contributed to this growth.

Schumpeter (1934, 1939, 1942) was amongst the first economists to emphasise the importance of *new products* as stimuli to economic growth. He argued that the competition posed by new products was far more important than marginal changes in the *prices* of existing products. For example, economies are more likely to experience growth due to the development of products, such as new computer software or new pharmaceutical drugs than to reductions in prices of existing products, such as telephones or motorcars. Indeed, early observations suggested that economic development does not occur in any regular manner, but seemed to occur in bursts or waves of activity, thereby indicating the important influence of external factors on economic development.

This macro view of innovation as cyclical can be traced back to the mid-nineteenth century. It was Marx who first suggested that innovations could be associated with waves of economic growth. Since then, others such as Schumpeter (1934, 1939), Kondratieff (1935/51) and Abernathy and Utterback (1978) have argued the long-wave theory of innovation. Kondratieff was, unfortunately, imprisoned by Stalin for his views on economic growth theories, because they conflicted with those of Marx. Marx suggested that capitalist economies eventually would decline, whereas Kondratieff argued that they would experience waves of growth and decline. Abernathy and Utterback (1978) contended that at the birth of any industrial sector there is radical product innovation, which is then followed by radical innovation in production processes, followed, in turn, by widespread incremental innovation. This view was once popular and seemed to reflect the life cycles of many industries. It has, however, failed to offer any understanding of *how* to achieve innovative success.

After the Second World War, economists began to take an even greater interest in the causes of economic growth (Domar, 1946; Harrod, 1949). One of the most important influences on innovation seemed to be industrial research and development. After all, during the war, military research and development (R&D) had

produced significant technological advances and innovations, including radar, aerospace and new weapons. A period of rapid growth in expenditure by countries on R&D was to follow, exemplified by US President Kennedy's 1960 speech outlining his vision of getting a man on the moon before the end of the decade. But economists soon found that there was no *direct* correlation between R&D spending and national rates of economic growth. It was clear that the linkages were more complex than first thought (this issue is explored more fully in Chapter 9).

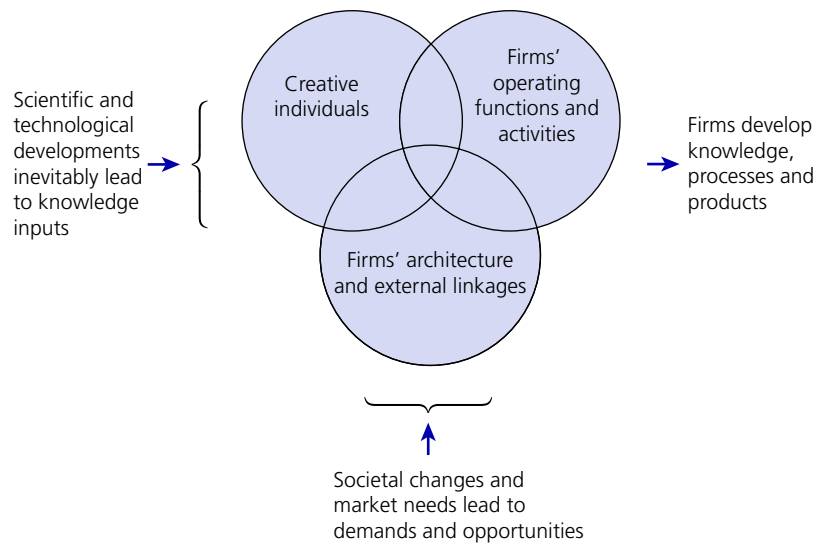
There was a need to understand *how* science and technology affected the economic system. The neo-classical economics approach had not offered any explanations. A series of studies of innovation were undertaken in the 1950s, which concentrated on the internal characteristics of the innovation process within the economy. A feature of these studies was that they adopted a cross-discipline approach, incorporating economics, organisational behaviour and business and management. The studies looked at:

- the generation of new knowledge;
- the application of this knowledge in the development of products and processes;
- the commercial exploitation of these products and services in terms of financial income generation.

In particular, these studies revealed that firms behaved differently (see Carter and Williams, 1957; Simon, 1957; Woodward, 1965). This led to the development of a new theoretical framework that attempted to understand how firms managed the above, and why some firms appeared to be more successful than others. Later studies in the 1960s were to confirm these initial findings and uncover significant differences in organisational characteristics (Burns and Stalker, 1961; Cyert and March, 1963; Myers and Marquis, 1969). Hence, the new framework placed more emphasis on the firm and its internal activities than had previously been the case. The firm and how it used its resources was now seen as the key influence on innovation.

Neo-classical economics is a theory of economic growth that explains how savings, investments and growth respond to population growth and technological change. The rate of technological change influences the rate of economic growth, but economic growth does not influence technological change. Rather, technological change is determined by chance. Thus, population growth and technological change are exogenous. Also, neo-classical economic theory tends to concentrate on industry or economy-wide performance. It tends to ignore differences amongst firms in the same line of business. Any differences are assumed to reflect differences in the market environments that the organisations face. That is, differences are not achieved through choice but reflect differences in the situations in which firms operate. In contrast, research within business management and strategy focuses on these differences and the decisions that have led to them. Furthermore, the activities that take place within the firm that enable one firm seemingly to perform better than another, given the same economic and market conditions, has been the focus of much research effort since the 1960s.

The Schumpeterian view sees firms as different – it is the way a firm manages its resources over time and develops capabilities that influences its innovation performance. **The varying emphasis placed by different disciplines** on explaining how innovation occurs is brought together in the framework in Figure 1.1. This overview of the innovation process includes an economic perspective, a business



**Figure 1.1 Overview of the innovation process**

management strategy perspective and organisational behaviour, which attempts to look at the internal activities. It also recognises that firms form relationships with other firms and trade, compete and cooperate with each other. It further recognises that the activities of individuals within the firm also affect the process of innovation.

Each firm's unique **organisational architecture** represents the way it has constructed itself over time. This comprises its internal design, including its functions and the relationships it has built up with suppliers, competitors, customers, etc. This framework recognises that these will have a considerable impact on a firm's innovative performance. So, too, will the way it manages its individual functions and its employees or individuals. These are separately identified within the framework as being influential in the innovation process.

## Two traditions of innovation studies: Europe and the USA

Benoit Godin has written extensively on the intellectual history of innovation. His work provides a detailed account of the development of the category of innovation. In his two papers 'Innovation Studies: The development of a speciality I and II' (Godin, 2010a; 2010b) he explains how two traditions emerged. The first in the USA was concerned with technological change as the use of inventions in industrial production and the second in Europe, which was concerned more specifically with commercialised invention. The European tradition, which was developed as late as the 1970s, restricted the previously broader definition of innovation as the introduction of change to a narrower focus on technology and commercialisation. Christopher Freeman is largely credited as responsible for this so-called European tradition, which shifted the focus of studies of innovation to the process from invention to diffusion and the consideration of policy issues, specifically economic growth. The idea of a professionalised R&D system was proposed as having a key role.

According to Godin, this is now the position adopted by many public organisations, including the OECD. Godin argues that Freeman transformed an old meaning of technological innovation; that of introducing technical change within firms to commercialising technological invention and so helped build a new tradition. The European tradition saw invention as part of the innovation process and introduced the function of market uncertainty. This begins to shift the focus to product development and the role of users in the testing of such products. In addition, Godin identified another rationale that Freeman put forward for wanting to include users of the technology. This was: 'Freeman believed that there is a failure in the market mechanism in relation to technical change in consumer goods and services' (Godin, 2010b: 26). Godin concludes by suggesting, somewhat mischievously, that the two different traditions have emerged on different continents and continue to exist in almost total ignorance of each other. This helps to explain the emergence of different views on how to delineate innovation.

## Recent and contemporary studies

As the twentieth century drew to a close, there was probably as much debate and argument concerning innovation and what contributes to innovative performance as a hundred years ago. This debate has, nonetheless, progressed our understanding of the area of innovation management. It was Schumpeter who argued that modern firms equipped with R&D laboratories have become the central innovative actors. Since his work, others have contributed to the debate (Chandler, 1962; Cohen and Levinthal, 1990; Nelson and Winter, 1982; Patel and Pavitt, 2000; Pavitt, 1990; Prahalad and Hamel, 1990). This emerging Schumpeterian or evolutionary theory of dynamic firm capabilities is having a significant impact on the study of business and management today. Success in the future, as in the past, surely will lie in the ability to acquire and utilise knowledge and apply this to the development of new products. Uncovering how to do this remains one of today's most pressing management problems.

The importance of uncovering and satisfying the needs of customers is the important role played by marketing and these activities feed into the new product development process. Studies by Christensen (2003) and Hamel and Prahalad (1994) suggest that listening to your customer may actually stifle technological innovation and be detrimental to long-term business success. Ironically, to be successful in industries characterised by technological change, firms may be required to pursue innovations that are not demanded by their current customers. Christensen (2003) distinguishes between 'disruptive innovations' and 'sustaining innovations' (radical or incremental innovations). Sustaining innovations appealed to existing customers, since they provided improvements to established products. For example, the introduction of new computer software usually provides improvements for existing customers in terms of added features. Disruptive innovations tend to provide improvements greater than those demanded. For example, whilst the introduction of 3.5-inch disk drives to replace 5.25-inch drives provided an enormous improvement in performance, it also created problems for users who were familiar with the previous format. These disruptive innovations also tended to create new markets, which eventually captured the existing market (*see* Discontinuous innovations, later in this chapter for more on this).