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# 1 Introduction

## WHAT IS INNOVATION?

What is innovation? To innovate, coming from the Latin word *innovare*, means to introduce something new.

The ability to introduce something new is an evolved capability. A crucial transformational moment in the history of humankind occurred with the emergence of the ability of *Homo sapiens* to introduce something new (although we are not yet sure how this ability evolved). From this moment on humans were not entirely constrained by what already existed. They were now able to some extent and in some areas to create the novelty that would change what existed. The evolutionary emergence of this ability would fundamentally alter not only what it meant to be human, but also the world in which humans existed.

What does the ability to introduce something new consist of? Most importantly it involves *the ability to imagine* something which does not yet exist but which might come to exist; that is, the ability to imagine what might be. The next step in human endeavour was to try to bring into existence what had been imagined.

But the ability to bring into existence is limited, not only by physical factors, but also by socioeconomic factors. Thus the ability to innovate differs in hunter-gatherer, feudal, and capitalist societies, to take three examples.

In capitalist societies, for instance, the ability to introduce something new is considerably enhanced by the ability to obtain and harness complementary resources such as money and people. Institutions, for example, the laws of property and contract, are further facilitators. The context within which innovation occurs, therefore, is crucial, shaping the innovation which is created under these conditions.



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## THE IDEAS OF JOSEPH SCHUMPETER

We begin this book by contextualising innovation through a discussion of the role that innovation plays in capitalist economies. This discussion is based on the approach adopted in Schumpeterian-evolutionary economics.

Joseph Schumpeter is commonly regarded as one of the greatest of twentieth-century economists. Through his study of economics Schumpeter was struck by the incessant change and restless characteristic of the capitalist economy. This change involved the continual creation of the new accompanied by the destruction of the old.

What is the main driver of this change? The main driver, according to Schumpeter, is innovation. Innovators, a subset of the population, begin by imagining something new. This they embody in an innovation hypothesis. The hypothesis is that the new something, if successfully introduced, will produce beneficial effects.

Schumpeter identified four kinds of innovation which he felt were individually, and in combination, very important drivers of creative-destructive change in the capitalist system. Innovators' imaginings and innovation hypotheses are embodied in these four kinds of innovation. The four are the following:

- new products and services
- new processes and technologies
- new ways of organising people and things
- new markets, ways of marketing, and business models.

How do these four kinds of innovation drive change? The answer is through substitutability and complementarity effects. The improved new substitutes for the inferior old. The improved new produces demands for complementary additions. Aggregated across the whole economy, these innovations drive restless change.

In Chapter 2 we examine the essentials of the framework that Schumpeter developed to understand the restless capitalist system, how it works, and some of the consequences. As we shall see,

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innovation lies at the heart of this framework. This examination is undertaken by developing a number of logically related propositions that, taken together, explain Schumpeter's framework.

## INNOVATION AS A SYSTEMIC PHENOMENON

How does innovation happen? The imagined innovation hypothesis is only the beginning of the innovation process. Further activities are necessary (taken in tandem or in parallel and with feedbacks being generated). The hypothesis needs to be implemented (or in Schumpeter's words, 'carried out'). As part of the implementation process the hypothesis must be tested to establish its validity. Finally, the innovation (for example, a new product or service) must be taken to 'market', i.e. delivered to the customer-user. The latter might be either outside or inside the innovating organisation.

Carrying out these activities will in most cases require the inclusion in the act of innovation of many other factors. Collectively we will refer to them as 'players and processes'. Often, for instance, the innovator or the innovation team will need to raise money for the innovation project and/or will need additional expertise. These may be provided by other players such as venture capitalists or university researchers. Processes of various kinds will also be required to harness these additional resources.

As this simple example illustrates, the implementation of an intended innovation involves far more than an imagining innovator even though this is the usual starting point of the innovation process.

In the last thirty years or so a conceptual breakthrough was achieved when several analysts with an interest in innovation came up with the idea that the many determinants of innovation were best understood from a systems perspective. That is, these determinants were best viewed as being part of a system with interdependent, interacting components. Two clusters of literature emerged pursuing this line of reasoning. These two clusters are the main focus of Chapter 3.

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### *The National Innovation Systems Approach*

The first cluster will be referred to in this book as the 'national innovation systems' approach. The pioneers and main contributors to this approach consist largely of Schumpeterian-evolutionary economists with an interest in long-term economic growth and development.

Dissatisfied with the approaches adopted by mainstream economics, which they regarded as oversimplified, they set out to develop a more robust approach, more in touch with the empirical realities of growing economies. They were also interested in related questions such as why growth rates differ between countries and why companies from different countries dominate different global industries. Their shared belief was that an understanding of economic growth requires primarily a deep understanding of the innovation processes that are the main drivers of growth.

We begin Chapter 3 with an in-depth discussion of the pioneering work of Christopher Freeman, whose book on Japan gave birth to the national innovation systems approach. Freeman was impressed with the performance of Japan which succeeded after the Second World War in rapidly catching up with the United States and Europe, the global leaders. Freeman asked questions such as the following: How did Japan manage to achieve this remarkable performance? What role was played by Japan's ability to master and harness the radical information and communications technologies that heralded the new information age? What role was played by the various organs of the Japanese state? How important were the contributions made by the main Japanese companies?

Since the approaches of mainstream economics had little to contribute in answering questions such as these, Freeman began to create his own approach, publishing his seminal book in 1987. This approach he called the 'national system of innovation' approach.

In subsequent years Richard Nelson and his collaborators elaborated on and further developed Freeman's work. In Chapter 3 two contributions in particular are closely examined. The first is an edited volume on the different national innovation systems of different

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countries published in 1993. The second is a collective study of industrial leadership in seven industries published in 1999 which uses the notion of innovation systems to explain this leadership.

Amongst the many contributions made by the national innovation systems approach, two are of particular importance. The first, as already discussed, is the demonstration that the determinants of innovation are best understood as being part of a broader system. In short, innovation is systemic.

The second contribution is the significant role played by institutions conceived of as including not only the 'rules of the game' adopted by a nation's (or sector's) innovation system but also the noncompany facilitators (and, at times, frustrators) of the innovation process. These institutions provide companies with the knowledge and money they need to implement their innovation hypotheses. In this way institutions such as universities and government research institutes; banks, venture capitalists, and angel investors; laws relating to matters such as intellectual property; and government policymakers and regulators become key components of innovation systems shaping outcomes.

### *The Business Ecosystems Approach*

The second cluster of literature that also took a systemic approach to innovation emerged and evolved entirely independently of the first. It is referred to in Chapter 3 as the 'business ecosystems' approach.

The first to pioneer this approach was James Moore in an article published in 1993 and a book in 1996. Moore was interested in business strategy and competition and worked closely on and with large American companies. As his work progressed he came to feel increasingly strongly that the approaches to strategy and competition then used in the leading business schools had lost touch with the practices of the companies that he studied.

Rather than individual companies going head-to-head in particular industries, he observed that groups of cooperating companies often tended to coalesce around emerging new innovations using and

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then further advancing these innovations in the products and services that they sold. Frequently, competition between companies was more a matter of competition between groups of companies unified around particular innovations. To conceptualise this process, he turned to the analogy of biological ecosystems where species and organisms cooperated and competed and by so doing co-evolved.

Innovation was central to Moore's narrative. Innovation provided the main rationale for a company to get together in the first place with a group of other companies, coalescing around a group of new innovations. Furthermore, subsequent rounds of innovation resulted as the companies, often motivated by competitive pressures, sought additional value-adding improvements.

Whilst Moore, who was the first to rigorously introduce the ecosystems idea into the business literature, felt that the biological ecosystems analogy was helpful in providing insights, he recognised that it could not be pushed too far. The reason was that whereas biological species and organisms are constrained by their genes, and the length of their lifespan limits how quickly advantageous characteristics can be reproduced within populations, this does not hold for companies. In strong contrast, companies can make relatively rapid changes to their behaviour, including strategies.

Marco Iansiti and Roy Levien, writing in the aftermath of the collapse of the Internet economy, wanted to understand better the ways in which complex networks of companies were managed. Like Moore, their concerns were also with company management, strategy, and competition. Their key article and book in this field were published in 2004.

Drawing significantly on Moore's work, however, and whilst also employing the biological ecosystems analogy, Iansiti and Levien focused their attention on the strategic decisions of a company's business units. Their reason is that it is mainly at the business unit level that a company's strategic decisions relating to their products and services are made. Different business units in the same company, they pointed out, may belong to different business ecosystems.

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One of their contributions that led to a rich seam of subsequent literature was the development of the idea of 'platforms' that was already nascent in Moore. Platforms they defined as services, tools, or technologies provided mainly by the so-called keystone players in the ecosystem to other members of the ecosystem which enabled the latter to develop solutions to some of the main problems that they confronted working within the ecosystem. These other members include niche players in the system.

Innovation enters Iansiti and Levien's narrative in two main ways. First, through the creation, largely by keystones, of 'integration innovations' that allow members of the ecosystem to leverage resources, including technologies, available in the ecosystem. In this way keystones seek to enhance the collective value-creation of the ecosystem as a whole whilst securing their own ability to appropriate part of this value. The second way is through the innovative activities of niche players attempting to safeguard and strengthen their positions in the ecosystem (whilst possibly also creating openings in other rival ecosystems) by allowing them to differentiate themselves.

### *Comparisons and Reflections*

In Chapter 3 the similarities and differences between the national innovation systems and business ecosystems literatures are examined. It is emphasised that their seminal contribution lies in their demonstration that innovation can be fruitfully conceptualised and analysed as a systemic phenomenon.

However, it is also shown that neither of these approaches considers in detail how innovation happens; that is, what innovators do and the questions and challenges that they must deal with to bring about the innovations they are attempting to create and implement. On the whole, these kinds of issues remain external to their analyses. This prevents a fuller picture of the innovation process being portrayed.

In Chapter 6 the question of *how* innovation happens is pursued further. This is done through a detailed examination from an ex ante

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perspective focusing on the real-time decisions that were made by those who created four key innovations. Together these four innovations crucially facilitated the emergence of the Internet and its supporting technologies and in this way changed the world. The four innovations are the transistor, the microprocessor, the laser, and optical fibre.

Also missing in the national innovation systems and business ecosystems literatures is a detailed consideration of *who* makes innovation happen. This question is taken up in Chapter 7 which includes a detailed discussion of the role of entrepreneurs and the entrepreneurial function and asks whether the entrepreneur has become obsolete.

## INNOVATION ECOSYSTEMS

To focus more directly on the evolving innovation process, including the how and who questions, it is proposed also in Chapter 3 that the idea of an 'innovation ecosystem' might be fruitful. The innovation ecosystem is defined as the collection of players and processes that through their cooperative and competitive interactions make innovation happen and, by so doing, co-evolve. The conceptualisation of the innovation ecosystem with its emphasis on the how and who questions draws significantly on the closely related conceptualisations of national innovation systems and business ecosystems. However, a different appellation is used to emphasise that how innovation happens and who makes it happen are at the heart of the conceptualisation of the ecosystem and its functioning.

In Chapter 4 the idea of innovation ecosystems is explored further through a detailed analysis of what is referred to as the information and communications technologies (ICT) innovation ecosystem. A layer model of this sector innovation ecosystem is developed bringing together four groups of interdependent players who through their interactions produce the products and services of the ICT sector whilst at the same time generating the innovations that drive both this sector and the wider economy.

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The four groups of players are the following: in Layer 1, the ICT equipment suppliers (who supply semiconductors, computer hardware and software, telecommunications equipment, etc.); in Layer 2, the network operators (i.e. telecoms, cable, satellite, and broadcasting operators who use the ICT equipment provided by the first layer players to construct their networks); in Layer 3, the platform, content, and applications providers (including the Internet players such as Google, Amazon, eBay, and Facebook); and in Layer 4, the final customers who consume ICT products and services. The cooperative vertical relationships and competitive horizontal relationships between these players are analysed, providing a more detailed picture of the context within which ICT innovations happen and the players who make it happen.

Chapter 5 contains an interview with the present author in which the conceptualisation and policy implications of innovation ecosystems are discussed.

## HOW DOES INNOVATION HAPPEN?

As already mentioned, in Chapter 6 this question is explored through a detailed ex ante examination of the innovation processes involved in the innovation of the transistor, microprocessor, laser, and optical fibre. This examination results in the distillation of nine propositions which together provide a richer answer to the key question addressed in this chapter: How does innovation happen? These propositions are incorporated in the analysis of the ICT innovation ecosystem undertaken in Chapter 4.

## WHO MAKES INNOVATION HAPPEN?

Schumpeter's answer is that it is the entrepreneur who makes innovation happen. According to his definition, anyone who makes innovation happen is an entrepreneur.

However, as we will show in Chapter 7, he distinguishes the entrepreneur from other players who also contribute to innovation happening. These players are inventors (who create the initial idea(s) for innovation), managers, and the providers of capital.

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But Schumpeter goes even further, arguing that an additional function of entrepreneurship, which provides a further rationale for the existence of entrepreneurs, lies in overcoming the resistances to innovation that frequently exist. These resistances are examined in detail in Chapter 7.

Perhaps surprisingly, Schumpeter also argued that in modern capitalist societies the role of the entrepreneur is becoming obsolete. His reasoning is that in modern large companies, innovation is becoming routinised and is being undertaken by cooperating teams. Schumpeter's arguments are examined in detail and their limitations revealed.

But Schumpeter's observations raise far broader and crucially important questions: How is the process of specialisation and the division of innovation labour changing in capitalist economies, what are the consequences for entrepreneurship, and who makes innovation happen?

To explore this question in more detail we draw on some of the ideas of three famous economists: Adam Smith and Alfred Marshall (who wrote well before Schumpeter), and Friedrich Hayek (who was a contemporary of Schumpeter's). The relevance of their ideas is explored through a discussion of the division of innovation labour in modern large companies.

Taking the discussion even further, Chapter 7 ends with a critical examination of a widely referenced contemporary book which purports to teach companies and not-for-profit organisations how to make innovation happen. This examination makes use of the ideas previously discussed in this chapter. This book is Eric Ries's *The Lean Startup*.

Chapter 7 concludes with an answer to the question: Is the entrepreneur obsolete?

## INNOVATION AND FINANCIAL INSTABILITY

As already discussed, the innovation process typically begins with the creation by the innovator of an innovation hypothesis. This is the first of the nine propositions that emerge from the analysis of four key

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