



Introduction

Telecoms and computers gave birth to the Internet, which transformed its parents, leading to what has been called *the new ICT ecosystem*. The new ecosystem is made up of equipment (computers, servers, routers, switches, phones, etc.) configured in networks and providing platforms which Internet providers use to deliver content and applications. It is a dynamic system which provides a key engine for economic and social development at both the global and national levels. However, the New ecosystem requires new ways of thinking and new modes of governance if the most is to be made of its potential.

The main argument of this present book is that at the heart of the new ecosystem is *innovation*. It is innovation that fuels the system as it transforms it. However, the innovation that occurs at national levels of the new ecosystem does not occur automatically. It cannot be assumed that the innovation process in this system will always work the way we want it to. Indeed, the comparative analysis of the new ecosystem in different countries reveals that some components of the system work better in some countries and regions than in others. This raises at a national level the policy dilemma of whether to try and catch up in an area where a country has fallen behind or to abandon it to the shifting sands of the international division of labour.

For example, in the early days of the mobile industry, mobile communications worked best in Scandinavia. Europe was able to utilise the learning process (including standards) that emerged in Scandinavia and this resulted in the global system for mobile communication (GSM) which in turn encouraged the global diffusion of mobile and in the process helped turn companies such as Nokia and Ericsson into the global success stories they have become.

However, in terms of Internet-based content and applications it is US companies such as Google, Yahoo!, eBay, Amazon and MySpace that dominate the world stage. In consumer electronics it has been Asian companies such as Samsung and Sony that have dominated,

although the emergence of new products from the new ecosystem, such as the iPod and the iPhone, shows that success can rapidly shift to other parts of the global system. In optical fibre to the premises (FTTP), it is the Japanese who are way ahead.

These few but important examples have significant implications for thinking about policy and governance – more specifically, for a process of *re-thinking* in these areas. Indeed, it is the main aim of this book to contribute to this process of re-thinking. One key area in which re-thinking is required is *regulation*. The reason why re-thinking is needed in this area is that the conceptual framework within which regulation has evolved has omitted significant parts of the process of innovation. Since, as we have seen, innovation is at the heart of the new ecosystem, this state of affairs in the field of regulation is inadequate. A more appropriate conceptual framework is needed for both policy and governance purposes, one that puts innovation at the centre. This book suggests a way forward.

The book is structured in the following way. In chapter 1 a summary of the basic argument of the book is presented, including the major challenges facing Europe. Chapter 2 elaborates on the new ICT ecosystem, its various sub-sectors and how they are structured. Chapter 3 treats the new ICT ecosystem as an innovation system and asks how innovation can occur within such a system. In chapter 4 the contemporary ICT ecosystem is examined through a quantitative analysis. Chapter 5 examines the role of telecoms regulation in the new ICT ecosystem. Chapter 6 suggests how government policy-making might be formulated for the new ICT ecosystem and in chapter 7 the main conclusions of the book are presented, spelling out the message that is being sent to policy-makers. Finally, particularly for those who want more background on the ICT sector, ten appendixes provide further information.

1 *Summary of the argument*

In this chapter, a brief summary is presented of the arguments put forward in this book. The chapter begins with a discussion of the eight key challenges facing countries in the ICT area. The conceptual framework used to analyse the ICT sector is then discussed, including the idea of this sector as an ecosystem, the layer model of the new ICT ecosystem and the key symbiotic relationships that exist among the four groups of players in the system. Finally, the role of innovation and investment and of telecommunications regulation is discussed.

The importance of the ICT sector

It is widely accepted that the ICT sector – which includes telecoms, IT, consumer electronics and Internet/media – is a key part of the economy of all countries. Not only is it an important industry in its own right (making a significant contribution to GDP, international trade and employment) but it also provides the crucial information and communications infrastructure without which economies and societies cannot function. In this book Europe is used as an example, although the argument applies, with suitable modification, to all countries.

The new ICT ecosystem

However, with the widespread global adoption of the Internet since around 1995, the ICT sector has been fundamentally transformed, so much so that it has been referred to as a *new ICT ecosystem*.¹ This raises three important questions:

¹ The conceptualisation of the new ICT ecosystem in a four-layer model (equipment, networks, services and content) comes from Didier Lombard, Chairman and CEO of France Télécom group.

Exhibit 1.1. *Eight key challenges facing the new ICT ecosystem in Europe*

Challenge
1 Remaining/becoming <i>internationally competitive producers or providers</i> in selected parts of the new ICT ecosystem
2 Being <i>internationally competitive users</i> in selected parts of the new ICT ecosystem
3 Ensuring that Europe has a <i>globally competitive communications infrastructure</i>
4 Overcoming the <i>ICT/Productivity gap</i> with the USA and Japan
5 Strengthening <i>basic and long-term research</i> in the new ICT ecosystem
6 Providing for the <i>needs of heterogeneous European countries</i> while furthering the European single market
7 Invigorating the <i>richness and diversity of European cultures</i>
8 Developing <i>appropriate conceptual tools</i> to understand and shape the evolving new ICT ecosystem

- What exactly does this system contain, i.e. what are its component parts?
- How does the system work and how effectively does it perform in the European context?
- What can be done – specifically in terms of policy and governance – to make the system in Europe perform better?

It soon will become apparent to anyone working in this area that there are crucial challenges confronting the new ICT ecosystem in Europe. These are discussed in the following sub-section.

Some of the challenges facing the new ICT ecosystem in Europe

The eight key challenges facing the new ICT ecosystem in Europe are shown in exhibit 1.1.

Challenge 1: remaining/becoming *internationally competitive producers or providers* in selected parts of the new ICT ecosystem
Europe needs to be clear about those parts of the new ICT ecosystem in which it wishes to remain or become internationally competitive.

Shifting international competitive advantage has meant that European competitiveness is threatened in some parts of the new ecosystem, particularly by the USA and in Asia by Japan, Korea, Taiwan and, increasingly, China. Specialisation and the international division of labour means that it is neither possible nor desirable to try and be involved and internationally competitive in all areas, the experience of Japan, Korea and now China shows that it is possible for countries to become competitive in areas in which they do not initially have a classical comparative advantage. However, this raises the difficult challenge for Europe to define those areas in which the region wants to remain or become internationally competitive and those areas which it is prepared to abandon to the shifting sands of international competitive advantage. Examples discussed in this book include high-speed telecommunications networks (e.g. optical fibre networks) and Internet content and applications.

Challenge 2: being *internationally competitive users* in selected parts of the new ICT ecosystem

In some parts of the new ICT ecosystem, it will be sufficient for Europe to be competitive users of the most globally efficient technologies without necessarily becoming producers. For example, it may not be necessary for the computers that European users (such as banks and households) use to be made in Europe. Users may be just as efficient as their counterparts in the most productive parts of the global economy by using imported computers. However, in some areas efficient use and efficient production may go together. The challenge is for Europe to choose those areas in which it is content to be only efficient users.

Challenge 3: ensuring that Europe has a *globally competitive communications infrastructure*

It is essential that Europe has a globally competitive communications infrastructure, which includes the Internet. The challenge is for Europe to ensure that its infrastructure at least keeps up with the best in the global economy. If this infrastructure falls behind it may threaten the international competitiveness of other sectors (e.g. financial services, manufacturing, etc.). This is at the same time a financial challenge in view of the high sunk cost of modernising the infrastructure (e.g. through the development of all-IP Next-Generation Networks or NGNs).

Challenge 4: overcoming the *ICT/productivity gap* with the USA and Japan

There is substantial evidence to suggest that Europe has fallen behind both the USA and Japan and that there is now an ICT/productivity gap between Europe and these countries. This gap needs to be addressed if European competitiveness is not to be adversely affected.

Challenge 5: strengthening *basic and long-term research* in the new ICT ecosystem

Basic and long-term research in the new ICT ecosystem is important, for at least two reasons. Before the liberalised era in telecoms a good deal of basic and long-term research was done in the *central research laboratories* of the monopolist telecoms network operators (such as Bell Labs in AT&T, CNET in France Télécom and the Electrical Communications Research Laboratories in NTT). Some of this research generated substantial seeds that subsequently germinated to fuel the growth of the entire ICT sector and contributed to its openness.

However, one of the fallouts from the liberalisation of telecoms was that the resources devoted by the incumbent telecoms operators to such research declined as a result of the competitive pressures faced by these companies. Although telecoms equipment companies significantly increased their R&D in response to liberalisation, basic and long-term research tended not to be a high priority. A strengthening of basic and long-term research may boost the future prospects of the new ICT ecosystem, in both Europe and elsewhere.

A second reason for the importance of basic and long-term research in Europe is that it may help Europe to cope with the increasing pressures emerging from *lower-cost countries* that are rapidly developing the more sophisticated sectors of their economies, notably China and India. Countries such as the USA, Japan and Korea have come to the conclusion that this kind of research must constitute an important part of their response to this challenge. More generally, the challenge for Europe is not only to finance and undertake more basic and long-term research but also to ensure that it feeds productively into the *innovation process* which is the main source of dynamic growth in the new ecosystem.

Challenge 6: providing for the *needs of heterogeneous European countries* while furthering the European single market

It is obvious that the new ICT ecosystem is very different in the different European countries. It is therefore not possible for

Summary of the argument

7

policy-makers to come up with one size for the new ecosystem that fits all: account must be taken of the heterogeneous needs of these countries. But this raises the question of the methodology that should be used in order to identify these needs, and devise ways of meeting them.

Challenge 7: invigorating the *richness and diversity of European cultures*

Europe's distinctive cultures are a source of social stability, pride and in some cases international competitiveness. Since the new ICT ecosystem includes the Internet and media, it plays an extremely important part in invigorating the richness and diversity of European cultures.

Challenge 8: developing *appropriate conceptual tools* to understand and shape the evolving new ICT ecosystem

The final challenge is conceptual and analytical. The identification of strengths, weaknesses and solutions for the new ecosystem in Europe requires appropriate conceptual and analytical frameworks. One of the initial assumptions motivating the present book is that a further challenge must be faced in honing the conceptual and analytical tools that we need for this purpose.

Some stylised facts

The challenges faced by Europe in the new ICT ecosystem can be concretised by the four stylised facts shown in exhibit 1.2. Each of these raises numerous complex policy-oriented questions. In order to deal

Exhibit 1.2. *Four stylised facts*

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- Europe lags significantly behind the USA in Internet content and applications (c.f. Google, Yahoo!, eBay, Amazon, MySpace, YouTube, etc. are all US companies)¹
 - Europe lags significantly behind the USA and Asia in computers, semiconductors, and consumer electronics²
 - Europe lags significantly behind Japan in areas of telecoms infrastructure such as FTTP³
 - Europe lags significantly behind the USA and Japan in productivity⁴
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Notes:

¹ See appendix 7 for a further discussion.

² This judgement is based on international market share data (not shown here).

³ See chapter 6 for data.

⁴ See, for example, Van Ark, Inklaar and McGuckin (2002).

with these, we need an appropriate conceptualisation of what precisely the new ICT ecosystem is, what its components are and how it works.

The ICT sector as an ecosystem

It is suggested in this book that it is fruitful to understand the ICT sector as an *ecosystem*: an ecosystem refers to a number of organisms that interact within an environment. In this book, a relatively high level of aggregation has been chosen in order to analyse the ICT ecosystem as a whole.²

Four key groups of players can be identified:

- Networked element providers (who produce items such as PCs and their operating systems, mobile phones and telecommunications switches and transmissions systems)
- Network operators (who create and operate telecoms, cable TV and satellite networks)
- Content and applications providers
- Final consumers.

These players interact within their environment which is shaped by the institutions that define the ‘rules of the game’ and influence the players’ behaviour. The institutions that are important in the new ICT ecosystem include financial institutions, regulators, competition authorities, standardisation bodies and universities. In turn, institutions are driven by organisations that have the power to change them. Organisations include government, political parties, corporate interests and trade unions.

The interactions of the players are influenced by the architectural structure within which they exist. This structure may be depicted by a *layer model* that is summarised in the following sub-section and analysed in more detail in chapter 2. The dynamics of change within this system – including the key role of innovation – are examined in chapter 3.

A simplified model of the new ICT ecosystem

A simplified model of the new ICT ecosystem is shown in exhibit 1.3. A more detailed explanation of this model is provided in chapter 2, but here a brief summary will be given.

² For some purposes it will be necessary to disaggregate the analysis.

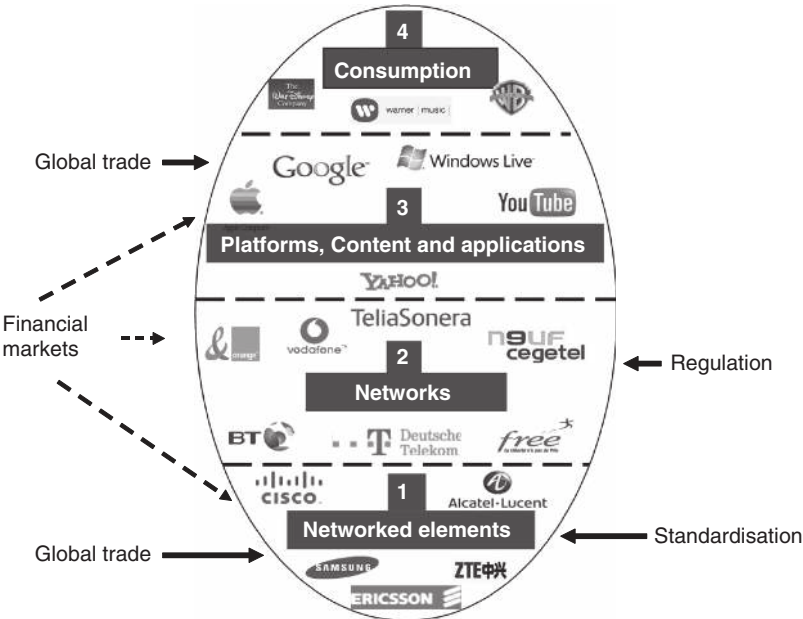


Exhibit 1.3. A simplified model of the new ICT ecosystem

Exhibit 1.4a. The four layers of the new ICT ecosystem

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- Layer 1: *Networked elements* (including switches, routers, servers, PCs, phones, etc.)
- Layer 2: *Converged communication and content distribution networks* (including mobile, fibre, copper, cable, satellite)
- Layer 3: *Platforms, content and applications* (including ICAPs)
- Layer 4: *Final consumers*
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The new ICT ecosystem may be conceptualised as a modularised, hierarchically layered system consisting of four layers, as shown in exhibit 1.4a. The new ICT ecosystem is structured in the following way:

- In layer 1, *networked elements* are produced (including switches, routers, servers and PCs).
- Some of these elements are strung together in layer 2 by network operators (including telecoms, cable TV and satellite operators) to form *converged networks* that are interconnected.

- In layer 3, the *platforms* are created upon which *content and applications* are provided to the *final consumers*, who sit in layer 4.

As this simple account of the new ecosystem illustrates, the four layers of the system, although hierarchically structured, are interdependent. Each layer depends on the layer (or layers) adjacent to it. For the system as a whole to operate, each layer needs to do its own functional job.

It is worth stressing that this system is at one and the same time both a technical and an economic system. Indeed, technical layer models were first developed by engineers in their attempt to understand the structure and functioning of computer and telecommunications systems. But the system is also economic. For example, the layers also define input–output relationships, where the activities within and between each layer are coordinated by firms and markets. Competition and innovation are important drivers of change in each layer, and in the system as a whole.

The layer model used by Japan's ministry-regulator, MIC

In Japan the country's ministry-regulator, the Ministry of Internal Affairs and Communications (MIC), uses a layer model very similar to that developed here. Exhibit 1.4b shows the author's representation of this model based on several MIC publications available on the Internet. MIC's Terminal Layer corresponds to our layer 1. Layer 2 in our model includes MIC's Physical Network Layer and Telecom Services Layer, while the ministry's Platform Layer and Content and Application Layer are incorporated in our layer 3.

In one of its publications MIC notes that the traditional domain of telecoms regulation pertains to the Physical Network and the Telecom Services Layers, as shown in exhibit 1.4b by the dotted square. In the present book, this traditional focus raises the question of whether changes that are occurring in one or more of the other interdependent layers (i.e. apart from the Physical Network and the Telecom Services Layers) are adequately taken into account within the limits of this focus.

Furthermore, the issue is also raised of coordination between other governance agencies that have responsibility for the other layers and the telecoms regulators. For example, it is traditionally the Ministry of Trade and Industry (MITI) (or the corresponding ministry in the