

Preface

This book focuses on 'new' areas of the telecommunications sectoral system of innovation, particularly fixed data communications (including the Internet) and mobile telecommunications (including mobile Internet).¹ We largely disregard traditional telecommunications – equipment for fixed telecommunications systems and fixed telecommunications voice services, and concentrate instead on what is emerging and growing, i.e., how the sectoral system of innovation is currently changing and how previously independent systems are converging.

We address both equipment production (material goods) and the production (provision) of intangible service products. This is because innovations in manufacturing and services are *complementary* – service innovations are dependent upon manufacturing innovations, and the reverse is also true. It is hard to imagine a mobile phone call without a mobile handset, and vice versa. And the Internet is useless without content. Such a combined approach, addressing both the production of goods and services, is unusual.

Equipment production includes routers and other kinds of exchanges for the Internet as well as base stations, exchanges and handsets for mobile telecommunications. It might be noted that such equipment is currently constituted not only by hardware, but also by software to a very large extent. Equipment producers such as Cisco and Ericsson employ thousands of software engineers and might therefore be labelled giant software firms.

The provision of Internet service products is often said to be accounted for by so-called 'Internet service providers' (ISPs). However, with this term we normally mean provision of access to the Internet – which is certainly a service product. This means that firms usually known as Internet service providers would be better named Internet access providers (IAPs). This increasingly includes providers of access to mobile telecommunications systems. However, for the Internet to be useful and in demand there must also be content supplied. Other kinds of service products constitute this

¹ When we use the term 'telecommunications sectoral system of innovation' we refer to fixed data communications (including the Internet) and mobile telecommunications (including mobile Internet). In chapter 1 we address whether it is useful to talk about *one* system or *several* systems of innovation in this field.

content and other firms than the IAPs often supply it. A proper name for these would be Internet content providers (ICPs).² For these reasons we shall be talking about 'equipment production, access provision and content provision' in this book.

The findings reported in this book were part of a Targeted Socioeconomic Research project sponsored by the European Commission/DGXII.³ It was entitled 'Sectoral Systems in Europe: Innovation, Competitiveness and Growth', or more commonly called by its acronym, ESSY. ESSY was coordinated by Franco Malerba at CESPRI, Bocconi University. The ESSY Project is the result of the work of ten research groups in seven European countries. The overall purpose of the project was:

- to build a research methodology which focuses on sectoral systems,
- to understand the functioning and evolution of six major sectoral systems in Europe,
- to study the determinants of the European performance in these six sectors and
- to develop new policy options and implications on this basis.

We used a system perspective to analyse and compare the salient features of six sectoral systems of innovation.⁴ System boundaries, demand conditions, links and interactions among firms, non-firm organizations (government, universities and financial organizations) and institutions were analysed. Moreover, patterns of change and coevolution among technology, firms, market structure, demand and European international performance were assessed. We asked whether the factors conducive to European innovative and commercial international leadership, or to European lack of success, were sector specific or pertained to regions or countries. Finally, we aimed to develop policy implications and options for Europe.

Chapter 1 introduces the subject of the sectoral system of innovation in fixed Internet and mobile telecommunications. It discusses conceptual matters related to the systems of innovation approach. It is also partly a synthesis and partly a summary of parts of the rest of the book, in addition to addressing issues not covered in these.

In chapter 2, Bent Dalum and Gert Villumsen analyse the fixed data communication network with some emphasis on the development and

² Hence IAPs and ICPs constitute ISPs.

³ We gratefully acknowledge financial contributions from the European Commission and the Swedish Agency for Innovation Systems (VINNOVA).

⁴ The six case studies of specific sectoral systems were Services (Retailing, Airports and Medical services), Software, Fixed Data Communications and Mobile Telecommunications, Pharmaceuticals and Biotechnology, Machine Tools, and Chemicals.

production of equipment. Leif Hommen analyses second- and third-generation mobile telecommunications in chapters 3 and 4, and this is followed by Bent Dalum's account of the part of satellite communications that is related to telecommunication networks – both wireless and wired.

Chapters 6 and 7 are devoted to the Internet services industry, fixed and mobile. Nicoletta Corrocher analyses first the sectoral dynamics of the Internet services industry, where services include both access and content; then she provides an account of country-specific trends in the UK, Italy and Sweden. Finally, chapter 8 is devoted to the policy implications for Internet and mobile telecommunications as well as an account of the future of the sectoral system in Europe, the US and Japan.

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1. The Fixed Internet and Mobile Telecommunications Sectoral System of Innovation: Equipment, Access and Content

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1. INTRODUCTION¹

This chapter introduces the subject of the sectoral system of innovation in fixed Internet and mobile telecommunications. Sections 2 and 3 are mainly conceptual and theoretical discussions of the characteristics, general policy implications and boundaries of the systems of innovation approach. Section 4 deals with Internet and mobile telecommunications: it is part summary, part synthesis, of the following six chapters. Readers more interested in telecommunications and the Internet than conceptual and theoretical issues related to systems of innovation are advised to proceed directly to section 4.²

2. SYSTEMS OF INNOVATION (SI)

2.1. Characteristics of the SI Approach

'Systems of innovation' (SI) is a fairly new conceptual framework for the study of innovations. An SI can be defined as including 'all important economic, social, political, organizational, institutional and other factors that influence the development, diffusion and use of innovations' (Edquist 1997:

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² Chapter 8 draws together the policy implications of the analysis and discusses the future of the sectoral system of innovation and the relations between Europe, the US and Japan within the system.