

NETWORKS AND TELECOMMUNICATIONS SERIES

Communication Networks Economy

Daniel Battu



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Preface

The term *economics* is generally understood to mean *sound management*. This is associated with openness, good faith, accurate figures and integrity in company accounts, with transparency ensured through satisfactory standards of good practice in relation to investors and the clients who have placed their trust in an organization's managers.

Network economics focuses on rational planning, which aims to implement only what is necessary and to provide, in the most effective way possible, universal access to the means of communication best suited to the required purposes. It is clear that this definition largely ignores understandings of what is considered necessary and what could be expensive.

Similarly, a country's economy is the result of an organizational structure in which efficiency is linked to clear objectives. For example, reducing the prices of sought-after industrial goods can encourage the mass export of those products to the international market. For a country's trading to be assessed positively, it should meet the subjective standards that it seeks to achieve. These may include improving the standard of living of its citizens, repaying the national debt, full employment and making culture and leisure available to everyone.

Without establishing strict rules on the maximum rate of debt or its repayment time, comparing the economic situations of nearby

countries may be used to justify the trends observed in balance sheets. To make such comparisons, indexes and suitable, stable metrics are necessary, although economic experts continue to disagree strongly on this issue.

On a technical level, the key criteria required by networks as a priority relate to quality of service, confidentiality and communications security. These criteria affect the economies of telecommunications networks, which may themselves be viewed in different ways if each partner has their own opinions:

- the first area concerns the network operator, which must respond to customer demands with the technology at its disposal. With the assistance of manufacturers who define the development and production of equipment, the operator is responsible for its installation and operation throughout the national network, as well as for selling communications services to professional and residential users. The company, while providing services to its clients, must make a profit that allows it to finance future investments and development and research work;

- the second area concerns network users and whether the services and applications offered by operators truly respond to their needs, taking into account the money spent.

Do each of the two parties, operator and customers, receive what they are entitled to from this exchange of services? There are several questions that can be used as examples to illustrate this issue. Is ISDN, with its two available interfaces, properly suited to the requirements of all companies? Why has frame relay undergone such an important development in the American banking sector in particular and why has its operating life been so brief? Has ATM technology, as logical as it appeared to network experts, been an essential improvement to business services? And is the Internet, as popular and rich in applications as it has become, satisfactory to the range of mobile and fixed users in towns and rural areas?

Internet technology offers bidirectional digital connections of varying speeds between users of all forms of connection, be it sound, text or multimedia. For all that, its implementation presents a certain

number of economic difficulties for the network operator. Is the operator properly remunerated for its efforts in this area? Are the regulations underpinning the introduction of competition to the communications market well-suited to managing such complex digital technology?

For almost three centuries, noted authors have posited a number of economic theories. The expression “political economics” (“EcoPo”, for French-speaking students, from “*économie politique*”) raises the idea of specific strategic principles or theoretical “natural laws”, able to facilitate the management of goods and services production, which itself requires the involvement of political authorities. The economics of telecommunications networks has developed alongside our society. If there are unmistakable connections between real parameters, developments in network technology should now allow them to emerge in a logical, clear and lasting way.

This work does not attempt to lay the foundations for a theory specifically geared toward the economics of tomorrow’s communications networks. On the contrary, this book presents a simplified picture of the principal elements of the economics of a network today, intended to be accessible to ordinary technicians, taking into account experiences they acquire in the field. The major elements associated with network economics that affect the quality of services and the profitability of investments are listed, step by step, accompanied by references to recent economic works. In order to discuss the effect of costs on the suitability of services offered by communications networks, this book is organized into the following five chapters:

- Chapter 1, based on the history of European networks, focuses on aspects related to building a national network.
- Chapter 2 focuses on the structures and architecture of a network.
- Chapter 3 discusses the general themes of regulation and tariff principles, including the latest developments.
- Chapter 4 is dedicated to supply and demand from the perspectives of professional and residential users and network operators.

– Chapter 5 brings together different aspects of the present situations of networks and the effect of the Internet on the economy.

In conclusion, the reader will find an overview of the most significant issues likely to influence the economics of communications networks as they are today.

Daniel BATTU
July 2016

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The Challenges of Building a Network

The user cost of a network is primarily affected by the guidelines put in place for its construction and management. The quality and security of the network dominate the choices made during its development, as they are indicators of a good level of usage on the part of customers and, consequently, of a good return on investment. However, well before taking the economic aspects of a network into account, conditions in the real world very often make it necessary to establish a network as soon as possible in specific places across the territory for political reasons.

1.1. Construction of a national network

1.1.1. *Network creation priorities*

The construction of a network is the result of will and political strategy. It requires jurisprudence required for managing the so-called “rare resources” attached to network operation. Regulations must be compatible with the development of the network.

1.1.1.1. *Primary physical conditions*

Responding to an unsatisfied demand, communications networks are constructed year after year, although the hypotheses taken into account at the start of planning may be substantially modified over time. The layout of the network should be designed to be able, going

forward, to respond to the needs expressed by citizens at the best possible price. Frugality (here meaning the economical use of resources) should be associated with the need to serve the entire population. The layout of the network must correspond to the territory's organizational needs, as decided by its political authorities. In the absence of a specific national directive, the person responsible should act "in the best possible way" and take forward-looking actions. From its inception, the network should be designed to serve the majority of large centers through grids that ensure the duplication of communications transmissions, with the largest number of users able to connect to the national network at a later stage.

The implementation of a national network requires planning made up of various stages and taking place over a number of years. Over time, this plan is often remodeled because of new technologies becoming available, proposals for economic development or new needs expressed by a new distribution of customers in the territory.

1.1.1.2. Scalability of regulations

Communications regulations are managed to accommodate any future developments. Initially, the State, which is the source of the project, fixes the legal rules on creating a national operating company (monopoly, cooperative management, administration, delegation to a designated commercial body), as well as the relevant primary legal measures (the rights of public authorities, State requirements, expropriation, certification and status of staff, establishment of user rights and of charges for services open to the public).

The opening of the communications services sector to competition introduces new aspects of regulation, taking into account various standard phases of development (basic services, infrastructure, combining fixed and mobile networks, for example). It is seemingly the relevance of the latest technical and economic events that, as a result of actual demand and economies of scale carried out on network costs, justifies the modification of regulations. The objective is to ensure that the available network services can be accessed by all

citizens, in any part of the country and at the best price, without unbalancing the budgets of authorized operating companies, without allowing any of the actors to establish dominance and without calling into question their infrastructure roll out.

1.1.1.3. *Initial investments*

As a result, significant investments only lose value when they are made too quickly and they should correspond to a purpose highly valued by users. A lot of work carried out in preparation for long distance extensions is often unjustified and does not contribute to the repayment of investments.

During the 1980s, network equipment was designed to last approximately 10 years, a period during which the operator could provide a production follow-up, a maintenance service, intellectual property monitoring and an after-sales service. Markets change quickly at present and marketing experts believe that public tastes are organized around a commercial cycle close to 3 years long. Provision of services, especially devices, should therefore be organized around cycles of approximately 3–5 years, subject to revision.

1.1.1.4. *Rare network resources*

Cutting investment costs by reducing some necessary work is feasible, if sharing is possible with other bodies. To facilitate wireless connections, high surfaces and antenna installations for hotspots may be shared. Private companies are often established for this purpose to serve as a single access point to provide competing network operators with fast solutions for the installation of antennas in urban areas. Some roof terraces, selected to be easily converted into relay stations, are accessible in exchange with the building's owners.

Other requirements must be taken into account when creating a network, such as the necessary cable channels, or the need to share the available space with other social amenities (known as common utilities in the United Kingdom), such as the operators of other, public or private, communications networks, highway operation companies, rail networks, quarries or water supply networks.