Introduction to Economics and Governance of Future Networks

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With the Internet evolution, and the development of next generation networks, there are natural questions about how the network will be managed and if/how public intervention will be made possible to improve its mode of functioning, as well as what will be or should be the business model representing the economic relations between all involved actors. Those issues are related to the so-called Internet governance, defined as the development of principle rules to shape the evolution and use of the Internet. Those questions arise especially because of the evolution from an academic to an interconnection of private networks and actors, and the emergence of new technologies that have to be fully deployed. The decentralized nature of the Internet of next generation networks in general, makes it also difficult to lead to a (socially) acceptable situation, with economic actors often trying to behave only towards what suits them the best.

This chapter will partially answer those questions by starting from the governance and public intervention issue and continuing with key aspects of business models attached to next generation networks.

Section 1 on "Public Intervention in the Deployment of NGNs" by J. L. Gómez-Barroso and C. Feijóo, describes the public intervention in the deployment of next generation networks, explaining why and how a direct intervention is currently implemented, making the connection with the universality of access principle. More specifically, it also discusses the related issue of public investments promotion in next generation networks, describing the guidelines of the European Commission on that problem. The idea is to define when public aid is allowed or not, depending mainly on whether broadband is already available or not and on the number of available providers.

The work on "Public Private Partnerships and Next Generation Networks" in Section 2, by I. Williams and M. Falch discusses the much related public-private partnership in the development of next generation access infrastructure, which can be required for an efficient network, and network development, in certain areas. It is especially discussed how can be applied in sub-Saharan Africa.

Also related to this public/private relationship, Section 3 on "Internet Governance and Economics of Network Neutrality" by P. Maillé, P. Reichl and B. Tuffin, introduces the reader to the network neutrality debate, which discusses if access providers could charge or treat differently packets depending on their source and/or their type, a behavior opposite to the Internet initial philosophy. This issue is at the

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heart of the network governance, to understand if neutrality regulation rules have to be implemented, and at the heart of the next generation networks business model, by defining the possible economic relations between content and access providers, among others.

From Section 4 to Section 7, the chapter focuses on business models related to the deployment and evolution of next generation networks.

Section 4 on "Green Networks and Green Tariffs as Driven by User Service Demand" by L.-F. Pau describes an approximate model of energy consumption, capital expenditures and operating costs of a green 3G/LTE wireless network, i.e., a network minimizing energy consumption and CO2 emissions; such modeling is necessary to limit energy costs. The model characterizes the energy consumption due to the architecture, the type of traffic, and the services requested by users. The analysis is extended to renewable energy sources and allows determining jointly green tariffs and the operator profit impact.

The work on "Environmental Impact of ICT on the Transport Sector" in Section 5 by M. Falch discusses the environmental impact of ICT on the transportation system. It is in this sense related to the green ICT issue introduced in previous section because it searches to quantify the energy savings due to ICT thanks to telecommuting, teleshopping, or teleconferencing.

In Section 6 on "Cost-efficient NGN Rollout" by S. Verbrugge, J. Van Ooteghem, K. Casier, M. Van der Wee, and M. Tahon, business models for the deployment of optic fiber networks are introduced. Because fiber-to-the-home is deployed at a smaller speed than expected, the section describes the evolution in several European countries, identifies the reasons of the differences, proposes a holistic approach to improve the business, and presents a game-theoretic model to evaluate the impact of municipality investments on the market.

Finally, the work on "Software Business in the Telecommunications Sector" in Section 7 by L. Frank, E. Luoma, O. Mazhelis, M. Pulkkinen, and P. Tyrväinen, is about the software business model in the next generation networks. It introduces the evolution of the software market, the current trend for outsourcing, its interest with software seen as a service, a discussion on open source software adoption, and of future scenarios.