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Introduction to the special issue on telecommunications techno-economics

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The growing interest in techno-economics for services and networks has given rise to a number of studies to support strategic decision making by telecommunication operators, service providers, manufacturers, and regulators. The emergence of fourth-generation systems, the fast evolution of Internet technologies as well as the convergence of future wireless and fixed networks challenge the telecommunication community to acquire innovative business concepts via a financial and technology blend. Techno-economics refer to the decision support providing managers and policymakers with early, quantitative information enabling them to arbitrate among a variety of investment projects.

This special issue of *Netnomics* aims to contribute to the key concepts and criteria used by policymakers, network operators, and service providers to evaluate profitability in the telecom and information technology market. The issue hosts original contributions based on presentations given during the 5th Conference on Telecommunication Techno-Economics (CTTE2006) held in Athens, Greece on 8th and 9th of June 2006. The 5th CTTE (http://www.ctte-conference.org/2006/) was dedicated to economics of new telecommunication services and technologies and was the fifth in a series of international conferences/workshops, launched in 1997. Aiming to act as the major international event for the presentation of original and fundamental concepts and studies in the field of telecom techno-economics, it also serves as a forum for

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communication among researchers and practitioners working in a wide variety of scientific areas with a common interest in improving techno-economics and advanced telecommunications and services.

Contributions span investment analysis of telecom networks and business case analyses to demand, tariff and business modeling. Mobile and fixed networks have been analysed in a timely fashion. Harno et al. [3] present three business case scenarios in the context of emerging mobile access network technologies. The paper covers some of the most interesting business alternatives in providing the new third-generation (3G) and beyond services including cases where the operator may or may not have an existing second-generation cellular network and a license for the 3G UMTS network. The scenarios have been analyzed in different Western European country groups and investments and operational expenditures are identified. The results show how diverse business models and technologies lead to different revenue, cost, and profitability profiles. The business case scenarios include incumbent's 3G evolution with UMTS compared to an alternative 3G technology deployment with mobile WiMAX, new entrant's UMTS deployment business case, and a greenfield CDMA450 deployment business case.

Smura et al. [9] analyze mobile virtual operators by constructing techno-economic models for four alternative virtual operator scenarios. The results highlight the importance of wholesale contracts with incumbent mobile network operators in determining the virtual operator business profitability. Unbalance in termination prices between fixed and mobile networks is shown to give incentives for virtual operators to invest in their own network infrastructure.

Pöllänen and Säily [8] investigate mobile rural investment models, since investment planning for rural mobile networks is critically dependant on local conditions. Since there are limits beyond which network deployment is not economically justified, their paper presents a methodology to assess these limits. Two different network deployment scenarios are assessed for rural deployment and South Africa is used and discussed as a case study in the paper due to large demographic differences that affect the rural network planning.

The paper of Katsianis et al. [4] presents the techno-economic evaluation of a 3G rollout scenario followed by the identification of the market conditions for two operators in a simple game theoretic model. The considered scenarios reflect the point of view of both dominant operators and new entrants. Technoeconomic results are presented in terms of net present value (NPV), acting as the pay-off function in the proposed game theoretic model.

Monath and Kind [6] in their paper, present techno-economic results for fixed access networks which have been achieved within the first phase of the IST MUSE (Multi Service Access Everywhere; http://www.ist-muse.org) integrated project. The paper summarises the results from two major use cases, namely, network migration and the native Ethernet approach. By paying attention to the first mile deployment scenarios including Fiber to the Cabinet (FTTC), point-to-point and point-to-multipoint passive optical networks (PON), it has been observed that the migration from a best effort access

network to a QoS enabled multi-service architecture based on Ethernet or IP forwarding is favourable in comparison to an ATM-based evolution scenario. The authors investigate how service enabling new network functionalities like QoS, multicast and DHCP based auto-configurations are moving closer to subscribers which leads to an increased intelligence in access and related potential CAPEX savings of about 25% in aggregation.

The paper of Markendahl and Johnsson [5] investigates ambient networking and related business concepts as support for regulatory initiatives and competition. While future internetworking technologies would continue to open up new business opportunities for new players, new regulatory challenges are arising towards the support of new business models and value chains. The paper discusses whether the deployment of ambient networking concepts is supported by current regulation and if features of ambient networks can be identified among emerging networking and business concepts. Authors envisage that the Ambient Networks concepts like network composition, dynamic roaming and new interfaces, will enable the de-coupling of business roles of the traditionally vertically integrated value chain.

Bedo [1] in his paper makes use of portfolio optimization techniques in order to maximize the benefits and control the risks of bundling two products when customer value is uncertain. He shows that simulation techniques are efficient and truthful for real portfolio management and these techniques make the use of any customer value distribution very easy for the business analyst aiming to help decision makers to capture the complexity of the telecommunication markets.

Pohjola and Kilkki [7] provide a general view on the provision of communications services, and introduce a formal methodology to analyze the services. The methodology consists of three main tasks: how services create value to users, how users behave in real situations, and how these are combined into one holistic model. As a result, the authors analyze how different changes in the service have effects on the service usage, on the value created for the user, and on the business of service providers. Thus, the paper offers a rational basis for designing and optimizing communication terminals and services.

The paper of Stordahl and Elnegaard [10] presents long-term broadband penetration forecasts for Western Europe adjusted according to the broadband coverage. These adjusted forecasts are defined as adoption rate forecasts and are used as input to the techno-economic calculations to examine broadband roll out in the different access area types. The paper documents the profitability of broadband rollouts in sparsely populated areas and estimates the limits for having monopoly areas as a function of given characteristics. The identified monopoly areas will of course contribute to higher broadband coverage because the profitability in these small areas will be better than earlier expected because of no competition at all.

Finally, Deligiorgi et al. [2] contribute to the construction of a price index for ADSL connections across Europe and the definition of factors affecting these prices. Following a discussion about these factors, namely subscribers' profile, market competition as well as users' income and willingness to pay, the paper

provides an overview of tariffs for ADSL connections across Europe. By using a hedonic model, the authors construct a price index for ADSL connections.

In conclusion, the papers of this special issue address strategic topics of interest to all actors in telecommunications such as incumbent and new operators, providers of services, applications, portals and content, regulators, as well as equipment manufacturers and thus can stimulate future research in key topics such as techno-economic methodologies and modeling, network economics, investment and pricing strategies for new services as well as regulatory issues in convergent networks.

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