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Preface

This issue covers diverse themes related either to socio-economic impacts of telecommunication and Internet, to techno-economic models of telecommunication development and markets, or to game-theoretical modeling of related subjects. It contains ten papers.

Andrzej P. Wierzbicki in his paper *Socio-Economic Challenges from and for Future Internet* takes the view that from the dynamics of the development of Internet itself (or Future Internet) result challenges for the socio-economic development and even for the paradigm of understanding economy; such challenges must be taken into account first, then – in a feedback loop – they lead to the modification of socio-economic challenges for Future Internet. This change of perspective is necessary because the analysis of socio-economic challenges for Future Internet is typically based on a classical paradigm of equilibrium economics. While useful, this paradigm is limited and has been shown incomplete, e.g., by the recent world-wide financial and economic crisis. This paper shows that the informational revolution – including but not limited to the development of Internet – has already changed the behavior of main socio-economic agents as well as of economic markets and our understanding of them; thus, new perspectives are needed. The paper also shows that a useful perspective is that not of expected benefits from Future Internet – there are many such benefits and they will surely motivate enough economic development of Future Internet – but of socio-economic threats resulting from the dynamic development of the Internet. There are several such threats and conflicts discussed in the paper.

Cristina Casanueva-Reguart and Antonio Pita S. in the paper *Telecommunications, Universal Service and Poverty in Mexico: a Public Policy Assessment (1990–2008)* analyze the design and implementation of telecommunications service policies targeted at the poorest regions of Mexico (1990–2008). It begins by defining universal access and service policies, their economic and social rationale. Secondly, it discusses the scope of public policies on universal service provision designed by Mexican authorities to achieve the goal of universal access. Thirdly, the paper analyzes the distributive effects of this set of policies among the poorest sectors of the population. The sources on which this research was based were two national surveys: the *Household Income and Expenditure Survey* (2008), and the *Household Survey of the Access and Use of Information Technologies* (2007). The additional information on regional economic development was based on the poverty indexes by the national population council and economic information given by Mexico Census Bureau. Additional use was made of the annual reports prepared by Ministry of Communications, statistics published by the Federal Telecommunications Commission and official documents prepared

by the government agencies. Finally, a series of in-depth interviews was conducted with the former representatives of the Office of Rural Telephony. Finally, the article discusses, in the light of available evidence, possible explanations for the apparent failure of the universal service policy that was implemented to bring at least basic voice services to Mexico's neediest. This explanation is seen in profit-maximizing policies of privatized telecom operators, not interested in providing universal service; to overcome this, a stronger regulation policies are needed. of available evidence, possible explanations for the apparent failure of the universal service policy that was implemented to bring at least basic voice services to Mexico's neediest. This explanation is seen in profit-maximizing policies of privatized telecom operators, not interested in providing universal service; to overcome this, a stronger regulation policies are needed.

Yousef Gasiea, Margaret Emsley, and Ludmil Mikhailov in the paper *Rural Telecommunications Infrastructure Selection Using the Analytic Network Process* analyze the applicability of a multicriteria decision-making method, specifically the analytic network process (ANP), to model the selection of an appropriate telecommunications infrastructure technology, capable of deploying e-services in rural areas of developing countries. It aims to raise awareness among telecommunication planners about the availability of ANP, and to demonstrate its suitability to enhance the selection process. The proposed model is constructed based on concerned experts' subjective views of relevant selection criteria and potential technology alternatives. Its network structure takes account of all possible dependencies and interactions among criteria and alternatives.

Paweł Olender in his paper *Stochastic Models in Techno-Economic Analysis of Broadband Access Networks* presents a techno-economic model of broadband access, which was implemented and used to carry out analyses for one of the biggest city in Poland. A stochastic approach was applied in order to take uncertainty into consideration, resulting in a more robust solution, therefore, improving the safety of investment. Analyses concern FTTH (fibre to the home) technology, a type of generic FTTx network architecture. It uses optical fibre in local telecommunication loop, what is becoming more and more popular. Presented results show the usefulness of techno-economic surveys in planning access networks development. The appropriate choice of network parameters, such as the aggregation ratio, is essential and could significantly influence the profitability of investment.

Wojciech Stańczuk, Piotr Pałka, Jozef Lubacz, and Eugeniusz Toczyłowski in their paper *A Framework for Evaluation of Communication Bandwidth Market Models* present a method of analysis of market-based models for resource allocation in communication networks. It consists of several stages: classification of a market model, generation of input data, data adaptation to a tested model, test calculations and, finally, presentation and interpretation of results. A set of general criteria to assess various models has been proposed. Tests are run using dedicated computer applications, data is stored in open XML-based format originated in the multicommodity market model. Network topologies are derived from the SNDlib library.

Piotr Pałka and Eugeniusz Toczyłowski in their paper *Pricing Rules Comparison in the Context of Bandwidth Trade* compare two pricing rules in the context of bandwidth trade. Allocation and pricing rules, together with a set of signals received from independent agents, constitute a market mechanism. The analyzed pricing rules are the well known Vickrey-Clarke-Groves rule (VCG) and the parametric pricing rule (PPR). These pricing rules are applied to the allocation rule specified by the balancing communication bandwidth trade model (BCBT).

Kamil Kołtyś, Piotr Pałka, Eugeniusz Toczyłowski, and Izabela Żołtowska in their paper *Bandwidth Trading: A Comparison of the Combinatorial and Multicommodity Approach* compare two different double-sided bandwidth auction mechanisms, that seem to be well suited approaches for trading indivisible units of bandwidth: combinatorial auction c-SeBiDA and multicommodity mechanism BACBR-I. The c-SeBiDA mechanism considers two types of commodities: inter-node links and paths consisting of particular links. Market participants may bid a single link, or a bundle of links, constituting a specific path. The BACBR-I mechanism is a multicommodity exchange model, that allows bidders to place buy offers not only for individual or bundled links, but rather for end-to-end connections. Therefore, it is the decision model that allocates the most efficient links to connections. A large set of experiments was performed to test the allocation and computational efficiency obtained under both approaches.

Krzysztof Malinowski, Ewa Niewiadomska-Szynkiewicz, and Przemysław Jaskóła in their paper *Price Method and Network Congestion Control* consider price instruments that are useful in achieving market balance conditions in various markets. Those instruments can be also used for control of other composite systems. The formulation and basic properties of the price method are reviewed and then the congestion control by price instruments in a computer network is described and tested.

Keiichi Niwa, Tomohiro Hayashida, and Masatoshi Sakawa in their paper *Computational Methods for Two-Level 0-1 Programming Problems through Distributed Genetic Algorithms* consider a two-level 0-1 programming problem in which there is not coordination between the decision maker (DM) at the upper level and the decision maker at the lower level. A revised computational method is proposed that solves problems related to computational methods for obtaining the Stackelberg solution. Specifically, in order to improve the computational accuracy of approximate Stakelberg solutions and shorten the computational time of a computational method implementing a genetic algorithm (GA) proposed by the authors, a distributed genetic algorithm is introduced with respect to the upper level GA, which handles decision variables for the upper level DM. Parallelization of the lower level GA is also performed along with parallelization of the upper level GA. The proposed algorithm is also improved in order to eliminate unnecessary computation during operation of the lower level GA, which handles decision variables for the lower level DM. In order to verify the effectiveness of the proposed method, comparisons with existing methods are outlined by performing numerical experiments to verify both the accuracy of the solution and the time required for the computation.

Ichiro Nishizaki, Tomohiro Hayashida, and Noriyuki Hara in the paper *Coordination Games with Communication Costs in Network Environments* deal with a coordination game in a network where a player can choose both an action of the game and partners for playing the game. In particular, a player interacts with players connecting through a path consisting of multiple links as well as with players directly connecting by a single link. Decay or friction of payoffs with distance as communication costs are represented, and the effect of the communication cost on the behavior of players in the game and network formation is analyzed. Properties of equilibrium networks are investigated by classifying the link cost and the communication cost, and the diversity of the equilibrium networks is indicated.

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Andrzej P. Wierzbicki
Guest Editor

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