Enhanced predictive modelling process of broadband services adoption based on time series data

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ABSTRACT

In this paper, the importance of the predictive modelling process of broadband services adoption is described. A detailed overview of different analytical models used for prediction, i.e., fitting and forecasting processes of broadband services adoption are presented. Furthermore, a comparison of several analytical models commonly used for prediction of broadband adoption is conducted. In order to more accurately fit to the existing broadband adoption time series data, and to forecast the future broadband services adoption paths, the features of the most accurate common predictive models have been identified for different phases of broadband services adoption. Considering the given results, usage of additional models in the predictive modelling process is analyzed. The objective of these analyses is set to improve the accuracy of the existing predictive modelling process. The accuracy of the predictive modelling process using additional models is tested and compared in different phases of broadband adoption. The model which gives the most accurate results is identified. Finally, in order to enable the usage of this model within a whole broadband service life cycle, as well as to include a greater number of explanatory parameters in predictive modelling process, an enhanced predictive modelling process is proposed.

1. Introduction

Following the global liberalization process of telecommunications markets currently present all around the world, the processes of stable development of telecommunications services within the telecommunications industry have been replaced with the very intensive development and deployment processes of a wide range of services. Therefore, for the investment policy of every participant in the telecommunications markets, the analyses and comparisons of possible business models involving various telecommunications solutions, i.e., different technologies and services are crucial. In order to find the optimal business models, the techno-economic assessment processes are often used since they merge any given technological context with the actual business and market contexts. These processes involve a variety of different technical, economic, regulatory, geographical, and socio-demographic data. Since the timely application of all relevant data and new knowledge generally represents an important competitive advantage within every business modelling process, various prediction models whose implementation contributes to the improvement of business modelling are used.

The models for prediction of every stage in adoption of telecommunications services are becoming increasingly important for optimal business modelling. Hence, in this paper, the predictive modelling

used within telecommunications business planning process and the models used for fitting and forecasting of broadband adoption in different stages of broadband services life cycle are analyzed. The scope of this paper covers both: the analyses of the existing predictive models, as well as a proposal of a new model. The objective of the proposed model is set to improve the accuracy of the existing predictive modelling processes.

The paper is outlined as follows. In the first part of the paper, the importance of the predictive modelling of telecommunications services adoption process is described. An overview of analytical models that use the time series data in prediction of telecommunications services adoption processes is presented. In order to highlight the efficiency of the application of these models, a broadband services adoption analysis is conducted for two groups of areas, classified into rural and urban areas according to the EU's criterion of rurality, and the separate results for these groups are presented. The presented results are used in order to show that the broadband adoption processes in these areas could be adequately estimated by a chosen predictive model. Also, the given estimations are used to indicate the differences in the broadband adoption volumes present between these groups of areas. Finally, the given results indicated that the conducted modelling processes should be used in defining the appropriate strategies for enhancing further broadband adoption processes.

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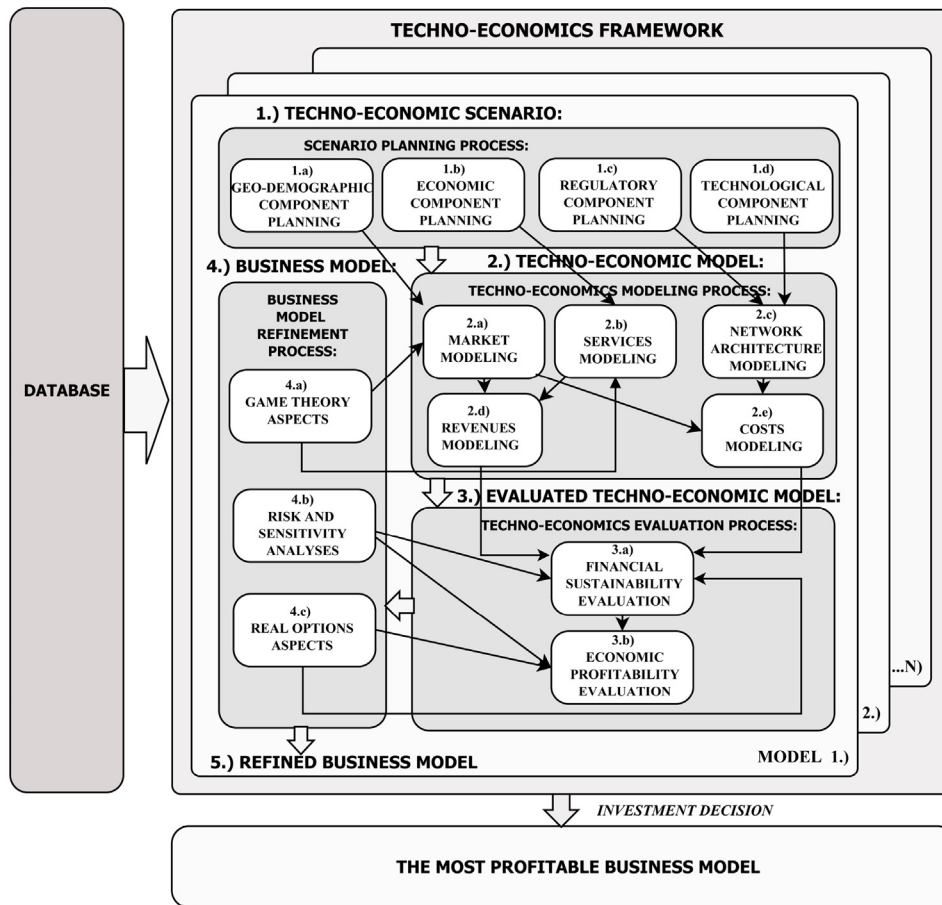
Fig. 1. Techno-economic model structure.

Next, the comparisons of several commonly used models for the predictive modelling of telecommunication services adoption are conducted. The objective of this part of the paper is to estimate the accuracy of fitting and forecasting processes at different phases of services adoption using the common models. The analyses conducted aimed at the identification of the most appropriate types of models for each phase of broadband adoption processes. Furthermore, the accuracy of the predictive modelling of broadband services adoption using several additional models has been tested in different phases of broadband services adoption in order to find the most accurate model. Considering the given results, application of a model which incorporates the best properties of the commonly used adoption models has been proposed. The model is additionally modified in order to fit to both: non-competitive markets in which the impact of competition on the services

adoption among operators is not considered, and the competitive markets in which multiple operators compete for their share in service adoption. The most important features of the proposed models are highlighted.

Also, in order to expand the existing set of parameters used for broadband services adoption processes with the most important factors for interpreting differences in cross-scenario patterns of broadband adoption, the application of different types of regression models is examined. Based on the given results of the conducted analyses, the most appropriate models, i.e., the ones that result in the most accurate prediction in different segments of broadband adoption are identified. Finally, an extended predictive modelling process for broadband services adoption has been proposed.
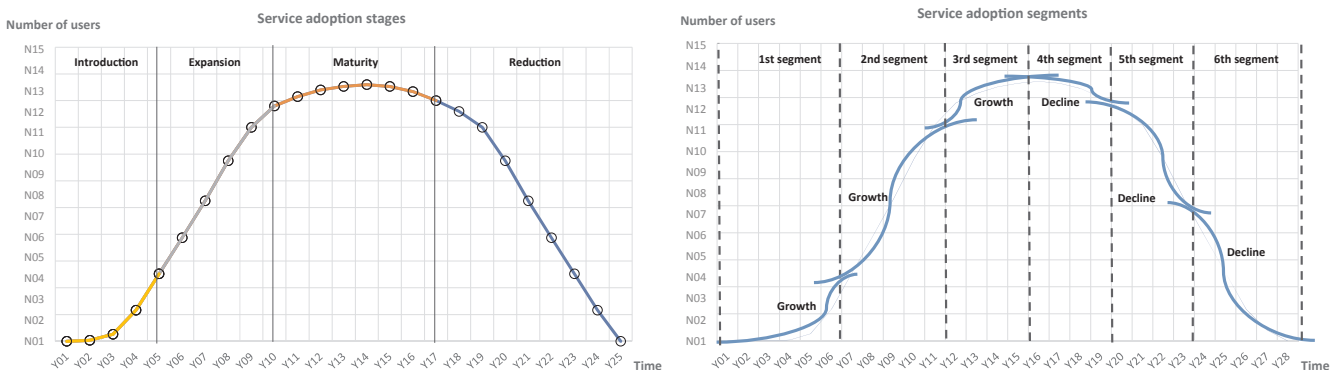

Fig. 2. The stages within the service life cycle (*left*), and the growth and decline segments within the service life cycle (*right*).