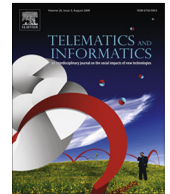




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Analyzing customer preference and measuring relative efficiency in telecom sector: A hybrid fuzzy AHP/DEA study

Ajay Kumar^{a,*}, Ravi Shankar^b, Roma Mitra Debnath^c^a Bharti School of Telecommunication Technology and Management, Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110016, India^b Department of Management Studies, Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110016, India^c Indian Institute of Public Administration, Indraprastha Estate, Mahatma Gandhi Marg, New Delhi 110002, India

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ABSTRACT

The purpose of this research paper is to develop a framework to understand the consumer's preference affecting variables and consumer's perception choice in telecommunication service providers in India. The present study use a hybrid approach to access the relative efficiency based on fuzzy AHP and DEA model. The fuzzy AHP is used to determine weights of the consumer's preference as criteria and DEA method is used to identify the inefficient service providers in terms of efficiency. Findings of the study suggest that the most preferred value that determines consumer's preference by mobile subscribers is network parameters, followed by low tariff scheme. Our results also show that technical efficiency and technical progress indicator are the main factors of resources allocation of Indian telecom industry. Most of the work on this hybrid FAHP–DEA is dedicated to either vendor selection, facility layout problem or supplier selection. A study of this kind, in the context of mobile subscriber's preference is an original contribution to the literature of Indian telecom sector. This research paper identifies the different variables and then a model is prepared for benchmarking of the mobile service providers in India. Based on the efficiency analysis decision makers can develop strategy to improve their performance according to efficient service providers as their role model. The other advantage of this hybrid AHP/DEA method is that by using inputs and outputs data we can derive mathematically all pair wise comparisons in fuzzy AHP and DEA models and there is no any form of subjective analysis engaged within the methodology.

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1. Introduction

Telecommunication is one of the fastest growing sectors across globe with excellent potential for the future. Telecommunication sector has played an important role for rapid growth for different sectors of the economy over the last decades. Telecom service sector made remarkable progress by allowing big amount of cross-boundary information flows, stimulating customer demand for top class brands, products, solution and services by reducing transaction costs. Telecom sector is playing very important role for growth in economy of all countries. Bohlin et al. (2007) have shown the different telecom technology and regulation implications for growth and competitiveness in European telecom market like spectrum policy, licensing scheme and network rollout. Investment in improving communication infrastructure does not imply the increase

* Corresponding author. Mobile: +91 9582618207.

E-mail address: ajay.tomar@dmsiitd.org (A. Kumar).

customer satisfaction and loyalty. If telecom service providers can understand the relation among the customer satisfaction, customer loyalty and the performance of operators then they may give the new dimensions in this sector toward the management. Benchmarking is a popular choice for this purpose. By benchmarking of different mobile service provider companies we can evaluate their efficiency and this study will be very helpful for measuring the differences in customer satisfaction and loyalty efficiency and will help telecom experts for making proper policies and regulations for customers. The question is how mobile operators benchmark the best practice. [Madden et al. \(2004\)](#) have also studied the growth of mobile network and economic factors by using dynamic demand model based on 56 countries telecommunication panel data. Improvement in telecom services can be a cause of socio-economic development of any country. More recently [Moreno et al. \(2013\)](#) have also applied DEA approach to evaluate LECs' performance from year 1997 to 2007 and regression analysis approach has been come out to construct the effect of regulation schemes upon efficiency. [Sung \(2012\)](#) have used MPI method to compute the productivity and calculated the impacts of competitive pressure, strategies and regulation schemes on downturn in production growth by TFP-type of level regression analysis. Some attempts have been carried out for the purpose of calculating technical efficiency in U.S. telecom services market ([Banker et al., 2010](#)). A Window analysis approach was used by [Yang and Chang \(2009\)](#) to measure the telecom firms' efficiencies in Taiwan over the 2001–2005 period. The impact of the deregulatory environment on the effectiveness of Incumbent Local Exchange Carriers from 1988 to 2000 had been examined to some level by [Resende \(2008\)](#) by Data Envelopment Analysis. [Sastry \(2009\)](#) additionally utilized DEA to study the links between these major modifications in competition and the overall performance features of telecomm service providers, focusing on the service quality. In the last few years progress in telecommunication are changing the world economy but policy makers and public are criticizing the mobile service providers for keeping call rate much lower but with improved quality of service ([Debnath and Shankar, 2008](#)).

The objective of this paper is to measuring the relative efficiencies using data envelopment analysis based on performance and customer's preferences for benchmarking the quality of service in Indian mobile sector. In this paper we use the fuzzy AHP for shortlisting the variables which are affecting the customer's preference and these variables will be used as inputs for DEA analysis. The paper is organized in this following way. The next section reviews the Indian mobile sector and also discusses the teledensity and robust growth over the years in India. Section 2 discusses the performance parameters and variables affecting the consumer's preference based on literature review. Section 3 provides the detailed methods of fuzzy AHP and data envelopment analysis for measuring the relative efficiency. Section 4 presents the result of fuzzy AHP analysis and DEA approach. The final section summarizes or findings and discuss the implications of this study for telecom policy makers and provides concluding remarks.

1.1. Indian telecom market

Indian mobile service market is facing a tough competition by reforming government policies and entry of new companies. Objectives of these new policies are increasing the number of customers with lower tariffs rates. Indian telecom network is the second largest in the world after China based on the number of mobile and landline phones. Indian telecom sector has one of the lowest call tariffs and third-largest Internet users in the world. This sector has marked an impressive growth during this 2011–12 year in Indian market by increasing telephone subscriptions from 846.32 million to 951.34 million with 12.41% growth. As per ([TRAI annual Report 2011–12](#)), the mobile user base increased by 107.58 million and landline base recorded a decline of 2.56 million. The mobile segment continued to register 919.17 million connections. The rural teledensity increased from 33.79 to 39.22 and urban teledensity from 157.32 to 169.55. Overall teledensity in the India increased from 70.89 to 78.66. The gross income of Indian telecom services has increase from Rs. 1,71,719 crore to Rs. 1,95,442 crore during this 2011–12 year with 13.82% growth. All telecom service providers are going to improve their service for increasing the profit due to global competition. In Indian telecom market Bharti Airtel, Idea, Vodafone India, BSNL, Tata Indicom and Reliance are the leading players in the mobile service area. In Indian mobile telephony sector Vodafone and Idea's overall performance is additionally shown in their sales revenue growth. Vodafone sales expanded 21.3% and Idea grew 26.4% during 2011–12 in comparison to the financial growth of 14.8%. Airtel, nevertheless, saw just a 10.7% growth in sales in 2012, and along with Reliance and BSNL—both recorded the negative rate of growth during this period.

2. Literature review

DEA has been widely used for benchmarking and evaluation of performance in different sectors. In telecommunication sector DEA has been applied for calculating relative efficiency of different companies. [Zeithaml et al. \(1996\)](#) have established a relationship between customer satisfaction, loyalty, customer profitability and service quality. [Majumdar \(1997\)](#) used the DEA for modularity and obtained the patterns of resources in US Telecom companies. [Madden and Savage \(1999\)](#) used the DEA approach for calculating the productivity index and told how the developing countries can improve efficiency using technological catch-up. [Giokas and Pentzaropoulos \(2000\)](#) used this data envelopment analysis for measuring the efficiency of telecom companies in Greece and investigated how much units were efficient and How much were inefficient. [Zhu \(2003\)](#) has been used DEA for evaluation the relative efficiency in Korean telecom industries with strong ordinal input/output. [Resende \(2008\)](#) used the DEA model for efficiency measurement in US telecom market and compare the result with stochastic frontier analysis for obtaining moderate consistency in these approaches for making new regulation in telecom industries.

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