

An Introduction to Data Envelopment Analysis – A Tool for Performance Measurement. R. Ramanathan. Sage Publications India Pvt Ltd, B-42, Panchsheel Enclave, New Delhi 110 017. 2003. 201 pp. Price: Rs 250.

Decisions are taken routinely at the levels of individuals, organizations/corporates and governments. Many a time these decisions are taken heuristically, relying mostly on the experiences of those who are at the helm of affairs. With increasing complexities in the problems faced and associated issues, decision-making will not remain a simple process. Significant inputs in the form of data and information, along with appropriate analytical tools to analyse these are required to support the decision-making process. In other words, the need will be felt for the use of quantitative techniques in decision-making, and more so when the decision process involves evaluating multiple criteria. Also, there is an increasing feeling that the decision process needs to be transparent and consistent with reality. Search for such techniques has resulted in a rich variety of methods and tools for the design of transparent decision-making processes, particularly in the area of operations research. Basically, operations research is the application of the methods of science to complex problems arising in the direction and management of large systems of men, machines, materials and money in industry, business, government and defence. Data envelopment analysis (DEA) is one of the most versatile tools from operations research for multi-criteria decision analysis.

DEA is a technique for assessing and ranking the performance of corporations, technology alternatives, research projects or other entities where an entire array of indicators of performance is to be evaluated. It was invented by A. Charnes and W. W. Cooper in 1978 at the University of Texas at Austin, with support from their Ph D students. The heart of the analysis lies in finding the 'best' virtual producer for each real one. If the virtual producer is better than the original one by either making more output with the same input or making the same output with less input, then the original producer is supposed to be relatively inefficient. This DEA technique is becoming

increasingly popular as a management tool.

This contribution by Ramanathan written as a textbook is meant for graduate students and researchers who aim at advancing their knowledge in quantitative techniques for supporting management decisions. As is the standard for any textbook, every chapter ends with exercises that include questions and problems. The book contains seven well-written chapters, starting with the discussion on concepts like efficiency measurement and frontier analysis which are the basic ingredients of DEA, and ending with the presentation of practical issues that one needs to keep in mind while applying the DEA method to real-life situations.

The first chapter is introductory in nature and presents the preliminaries of DEA, including the concept of decision-making units (DMU), method of estimating the efficiency measures and determining the relative efficiencies of DMUs through frontier analysis using 'graphical method'. By taking simple examples, the author explains the method eloquently.

The 'graphical' approach to frontier analysis can be applied only to small problems. However, real-life applications of DEA need a far superior approach. The second chapter deals with this issue by presenting the linear programming technique as a mathematical framework to perform frontier analysis. The whole gamut of frontier analysis problems can be easily formulated as either input minimization or output maximization linear programming problems. In this book, these formulations are presented both as a general case and also with examples. The duality property of linear programming is exploited to reduce the problem size. The author intuitively interprets this duality with example formulations. The discussion continues with variations of dual formulations on to categorizing them into input-oriented and output-oriented envelopment DEA programmes.

The concept of economy of scale pertains to production function in an industry. Typically, an industry can operate at either increasing or decreasing returns to scale depending on the prevailing conditions. A combination of the two is called variable returns to scale. Modifications made to DEA to incorporate these aspects form the discussion presented in chapter 3. The first part pertains to additional constraints required to be added to incorporate the conditions of variable returns

to scale. Further, the possibility of distinguishing the technical and scale efficiencies is presented. In other words, these facilitate determination of the most optimal scale of production as well as input or output levels.

The author moves further from basic DEA models discussed in earlier chapters to important variations proposed in the literature. In the fourth chapter, the first variation discussed is an alternative from additive to multiplicative aggregation of inputs and outputs. This makes sense in manufacturing firms because of the domination of the Cobb-Douglas production function. The second variation proposed is the modification of DEA models to compare performance over time using time-series analysis. Practical applications of DEA need further extension to suit the issues encountered in real-life situations. Extensions described here include problems with inputs and outputs, which are non-discretionary or uncontrollable and categorical.

The complexity of using the DEA approach to performance evaluation increases with increase in the number of DMUs. Evaluating the relative efficiency of a particular DMU requires solving a linear program. If there are a large number of DMUs, then that many number of linear programs need to be formulated and solved. This necessitates robust computer software support for using DEA. In the fifth chapter the author deals with the available computer-based support for DEA approach in terms of software and Internet support. There is a good discussion on various software systems.

Chapter 6 presents brief discussions on selected DEA applications. The selection has been made in such a way that they effectively prove the capability of DEA as an evaluation tool for measuring performance of organizations, projects, institutions, technologies, etc. The applications presented in this chapter are productivity assessment of State transport undertaking in India, comparative performance of schools, comparative risk assessment of energy systems, energy efficiencies of transport modes in India and carbon dioxide emissions of various countries. The discussion on applications not only includes interpretation of the results in terms of relative efficiencies of DMU or ranking of DMUs, but also sensitivity analysis to check consistency of the results against variations in the input and output values. However, the value of this chapter could

have been enhanced significantly by including a few business examples from the corporate sector.

The last chapter presents some additional discussion on DEA. These discussions are important from the perspective of establishing the appropriateness of the DEA approach to problem solving in a particular case. Some of the issues covered are: need for considering homogeneous DMUs for evaluation, selection of appropriate inputs and outputs from the exhaustive original list and adoption of an appropriate DEA model to match the problem situation. The most important section in this chapter is the discussion on the strengths and limitations of the DEA approach.

Overall, the book is well written with greater emphasis on giving a detailed account of the basis of DEA methodology. The innovativeness is in terms of using the same example throughout the book in order to explain the DEA preliminaries, methodology, basic model, variations in models and related issues. This greatly helps the reader in assessing the strength and weakness of a particular model variation, selecting the appropriate model to suit the situation and also developing a greater understanding of the whole approach.

This book can be recommended as a textbook for students of management and industrial engineering. The exercises presented at the end of each chapter provide an opportunity for students to explore further on DEA methodology and applications. This book especially will be useful for those who would like to acquire advanced knowledge in quantitative techniques for management decisions. This can be used as a textbook for a full-fledged course on DEA or as part of any advanced course in operations research for students aiming at specializations related to management science. The book serves as a reference material in DEA methodology and is best purchased by libraries.

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People of India – Kerala, Parts 1, 2 and 3, vol. XXVII. K. S. Singh (General Editor), T. Madhava Menon, Deepak Tyagi and B. Francis Kulirani (eds). Anthropological Survey of India and Affiliated East–West Press Pvt Ltd, 105 Nirmal Tower, 26 Barakhamba Road, New Delhi 110 001. 2002. 490, 1132 and 1704 pp. Price: Rs 2015

The Anthropological Survey of India (AnSI), Government of India was established in 1945 to conduct anthropological studies on people of India and advice the Government on policy matters, especially with reference to the tribal affairs. The British and Indian ethnographers and administrators such as H. H. Risley, E. Thurston, J. H. Hutton, L. K. Anantha Krishna Iyer and H. V. Nanjundayya have done pioneering ethnographic work on the people of India.

However, the anthropological works done by them were not revised and updated for a long time. K. S. Singh, a historian by training and the then Director General of AnSI took up the gigantic task of providing an updated version on the people of India in 1985 and launched the People of India (POI) project. The purpose was to generate brief ethnographic profiles on all the communities of India. A team of about 500 scholars, mostly anthropologists, drawn from AnSI, other research institutes and university departments were all involved in data collection, analysis and report writing on 4694 communities. The study was carried out for about seven years, and was completed in 1992. As stated by Singh in ‘A note on the series’ (p. xiv), ‘the investigators spent 26,510 days in the field, which works out to be 5.5 days per community studied...’. The bulk of the data were collected from 24,951 key informants, which works out to be about five key informants per community (Ibid). Information was collected from two or three places for larger and dispersed communities.

The present volume has three parts. Each part starts with ‘A note on the series’ (five pages) and a foreword (22 pages) by the General Editor. It is followed by ‘An acknowledgement’ (13 pages) and an ‘Introduction’ to the volume (138 pages). The next part consists of descriptions of each community (about 2000 words on an average), arranged in alphabetical order. The three parts contain eth-

nographic descriptions on 225 communities of Kerala: A to I forms part I (352 pages); J to O forms part II (642 pages) and P to Y forms part III (464 pages). Part III contains an appendix on the current status of polyandry and matriliney in Kerala (eight pages), a glossary of indigenous terms (34 pages), a bibliography (27 pages) and an index (38 pages).

The ‘Introduction’ to the volume (given in part I) is an elaborate account on the major aspects of life of the people of Kerala. Some of the major topical areas covered in this section are geography and environment, bioanthropology, demography, economy and development, prehistory and history, languages and dialects, food habits, dress and ornaments, music and dance, religion, political organization, reform movements, and development programmes.

A review of the present volume cannot be taken in isolation as it was produced under a general framework provided by the Project Director (Singh). Hence, the present reviewer, deems it fit to make some general comments as well as some specific comments on the Kerala volume.

Methodologically, the entire project lacks anthropological perspective and the rigours of ethnographic research. If we compare the ethnographic works of Risley, Hutton, Thurston, and L. K. A. Iyer to the POI volumes, the latter works which were undertaken almost a century later, appear inferior in quality. The POI investigators have not added much in-depth data to the ethnographic details which were already available in the classic works, except adding some new communities to the list.

Data collection and report writing were done on the basis of a 15-point interview guide containing about 776 cultural traits. Singh has unfortunately failed to distinguish the various research tools used by the ethnographers such as schedule, interview guide and questionnaire (rarely used). The statement ‘questionnaire contained in the schedule guideline’ (p. xvi) is a mirror to the confusion which prevailed throughout the POI project. He also failed to understand the distinction between ethnography and ethnology which is evident in the statement, ‘Ethnography in those days was generally synchronic rather than diachronic’ (p. xxi). The POI project is primarily an ethnographic endeavour and none of the investigators ventured to write an ethnological account of the community which they studied.