THE PRACTICE OF OR:
Between Art and Science

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Summary

Many application areas exist where an OR approach can be effective. This is especially true for many strategic and operational problems that arise in the field of distribution and logistics, due to major political and economical changes in Europe. However, in order to play its role, it is necessary but not sufficient for the OR society to have access to the science aspect (knowledge of sound mathematical models and techniques) of OR. Equally important is the 'art' aspect of OR. That is the art to decompose a problem in sub-problems, the choice of the level of detail and the role and the type of the techniques (including OR techniques) to be used.

1. Introduction

In this paper, I outline a view on the way that Operations Research (OR) should be used, and the consequences of this view for OR practitioners and theorists. This view is based on my experience both with the theory and the practice of OR. Practical experience comes from my work during the past 12½ years with ORTEC Consultants, a Dutch firm that uses OR techniques to solve practical problems for government and business organizations. Apart from ORTEC, I have always been active in the academic world, currently at the Free University of Amsterdam.

A central point will be, that I view OR both as a science and as an art. The science aspect focuses on mathematical models and optimization techniques. However, applying OR is also very much an art. It is an art, and demands good taste, to judge whether or not OR techniques are useful in specific cases, how the complex reality should be modelled, and how OR techniques should be mingled with possible other solutions and users knowledge and intuition. This art aspect of OR is crucial in the useful employment of the models and techniques offered by the science of OR.

To begin with, a short sketch of the history of OR is given. Although still very much alive, the status of OR is currently not what it could and should be. This has led to various discussions on how to proceed. Subsequently, I present my view on the role of OR and highlight on the implications of this view for both the universities and the OR consultants. Examples from the area of distribution and logistics will be used as an illustration. In the final section, I will give some more emphasis to this application area, which is a field of great opportunities for the OR society.
2. History

Building and manipulating mathematical models started centuries ago. Sets of linear inequalities were already solved by Fourier in 1826. However, the formulation of optimization methods only started in the 50's of this century. To quote Dantzig (1991) "Initially there was no objective function; broad goals were never stated explicitly in those days, because practical planners simply had no way to implement such a concept. Non computability was the chief reason, I believe for the total lack of interest in optimization prior to 1947".

In the first decennia after the second world war, a variety of models and techniques were developed. Applications were on an ad hoc basis. Applied mathematicians were confronted with practical problems, looked to its basic structure, and proposed solutions or solution techniques not thought possible before. It became apparent how amazingly powerful mathematics can be (c.f. Rinnooy Kan 1992).

OR was on his way to a bright future. This tendency was further accelerated by the extraordinary development of computer hardware and software. Due to the computerization of administrative processes, data to be used for optimization became available. Larger models could be solved due to increased computer power. The number of applications grew rapidly in the 60's and 70's. OR departments were established both in industry and universities. In the academic world integer programming, non-linear programming, stochastic programming techniques were developed, and larger and larger models could be solved. Standard packages for linear and integer programming became available.

Although one can speak of a triumph of mathematics, the current image of Operations Research is not overwhelmingly positive. This is indicated by a quote from an article about the mathematizing of economics (see Rinnooy Kan 1992) : "It is possible that economics today is following the same path as Operations Research (OR) did in the 1960's and 70's, leading to its heavily reduced status in industry. OR started life as a discipline for creative minds seeking original solutions to mathematical optimization problems. But within twenty to thirty years, the search for mathematical rigour and the solution to mathematical optimization problems was allowed to become an end in itself. Today, there is little demand for its services to help solve big problems of government and industry. It persists there among isolated specialists not involved with strategic decisions of the firm but, more typically, reporting to a 'production manager' whose problems are conceptually simple and for which a mathematically obtained optimum can reduce cost".

Apart from the fact that there is nothing wrong in solving operational problems for production managers, I think this quote exaggerates. However, we cannot deny it to be at least partly true. I guess that there are several reasons for the reduced status of OR. One reason has to do with the quality of most OR professionals. OR consultancy does not provide career possibilities within most companies. Persons who just come from the university use OR techniques for a few years, after which they are supposed to move to different kind of jobs, never to return. As a result the OR consultants generally have little experience in applying OR and hardly have any experience with the type of problems they have to tackle. There is a clear need for companies to increase the career possibilities of OR