OPRE 6398.001 Prescriptive Analytics

Reading 6*

Bellcore is a research and development firm owned by the seven regional telephone companies created upon the breakup of AT&T. The goal is to offer engineering as well as technical support to its owners. Bellcore's operations program is organized into products, each of which can consist of several projects. A product involves work necessary to deliver technology on-line, and projects are essential components to enable completion of a product. In 1991 Bellcore had 222 products and 1,046 projects.

There are three basic project categories. Infrastructure projects benefit all Bellcore members and are, therefore, funded by all seven owners. Usage sensitive projects are funded by some or all of the owners in proportion to their use. Elective projects are funded only by those owners who receive the work. An owner may elect not to participate in a project because it has no need for the project's output or it chooses to apply its budget to other projects.

Bellcore's elective projects provide technical information, requirements, analyses, and software systems crucial to the evolution of the telephone business. In the past, these research projects have been instrumental in obtaining productivity improvements in the telecommunications industry.

A methodology was desired that would select a large number of high utility buy-ins for all owners so that each of them would receive as much benefit as possible. Toward that end, a nonlinear integer programming model was developed. The objective was to maximize the utility index assigned by each user to each project over each year multiplied by the price to buy into the project by year and a 0-1 decision variable, where a "1" indicated participation in the project and a "0" showed no participation in it. Constraints were included to assure that budgets were kept within the allowed limits and that participation requirements were met.

In the initial exercise, there were 143 elective projects that had one to six owner participants and the total budget was $143 million. Application of the mathematical program resulted in a participation increase of 30 percent, which in turn yielded significantly improved owner satisfaction. The optimization system has become an integral part of Bellcore's annual project budgeting process.

* Adapted from Hoadley, B., Katz, P., & Sadrian, A. Improving the utility of the Bellcore consortium. *Interfaces*, 1993, January-February, 27-43.