

Mathematical Optimization Techniques

High-level occupancy plans are often very complex with many different variables to consider and many alternatives from which to choose. To assess complex situations in other disciplines such as flight scheduling, supply chain management, telecommunication networks, and even the NFL football schedule, planners use mathematical optimization techniques that evaluate all of the possible alternatives and identifies the one that best meets the evaluation criteria. With this approach, decision makers can be assured they have reviewed all of the relevant solutions and are not overlooking significant savings.

Jane Mather, President of Critical Core, is applying these techniques to real estate, allowing planners to identify and evaluate alternatives more quickly and more accurately. Because the search process is automated, planners can find and evaluate solutions in seconds and minutes rather than hours and days. More over, in complex situations, they may be able to find solutions that save millions of dollars over solutions found using the traditional manual spreadsheet approach.

Per Mather, "The potential benefits can be significant. In one test case using data from a financial services firm that wanted to consolidate from 23 cities to 13 cities, we identified a solution that would have saved \$20 million more than their solution. In addition, by consolidating to locations where workers could be retrained for other activities, our solution would have reduced lay-offs by one third."

Excerpted with permission of the author from: Mather, Jane. "Best Practices in High-Level Occupancy Planning: Data and Analysis". Forthcoming in Journal of Corporate Real Estate.

To address future uncertainty in other business disciplines, some companies have started using simulation-optimization, which applies techniques called metaheuristics. As an example, OptTek Systems has worked with companies in the petroleum and energy industry to evaluate which investment projects to undertake when they have limited capital for investment and uncertain outcomes for individual project profitability. Using optimization-simulation, they reviewed the expected success of different investment portfolios and the range of risk associated with each portfolio and identified the investment portfolio with the best balance of cost and risk.

For complex real estate situations, such as high-level occupancy plans with many different business groups and facilities, optimization-simulation goes beyond standard simulation methods. The mathematical algorithms search through many different solutions to find the one that best meets the business requirements and provides the appropriate balance of cost and risk. This approach, for instance, can identify the appropriate increase in space over the next year given that the planners don't know what future demand will be. As with traditional optimization, these mathematical techniques enable planners to find solutions that can save millions of dollars.