A Survey of Decision Support Tools for Comparing Cleanup Options and Increasing Decision-Making Confidence

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Background/Objectives. Traditional industry approaches to evaluate different cleanup alternatives, evaluate different optimization scenarios, and forecast future and present-value costs are often too simplified and may lead to suboptimal decision-making. Decision support tools can highlight key variables and complexities in decision making that can aid decision makers in understanding uncertainties and key trade-offs in decision making criteria. When these decision-making challenges are understood, project teams can improve decision making quality. This paper will overview different tools, ranging from simple spreadsheet approaches to commercial software, and provide examples of how these tools have been used on projects to improve decision-making.

Approach/Activities. A range of decision-making tools were surveyed for their ability to support evaluating alternatives and optimizing remedies. Multi-objective decision analysis (MODA) was evaluated due to its adaptability to the spreadsheet environment and ease of use. Other “what-if” spreadsheet tools evaluated include Solver, Goal Seek, and Scenarios for their use in optimizing solutions to support decision making. The Monte Carlo analysis tool, @RISK, was evaluated to highlight its strength in probabilistic decision making. Decision tree software was evaluated to highlight the potential cost growth associated with different potential future events and decisions.

Results/Lessons Learned. In all cases, the above analyses provided greater insight for decision makers. MODA was considered a good tool for sharing results with different stakeholders because it highlighted semi-quantitative differences for decision making criteria in a tabular and visual format. Differences of opinion related to criteria weighting could be addressed with stress-testing and cross-over analyses. The embedded “what-if” tools in Microsoft Excel were considered helpful in identifying optimal solutions for modestly complicated decisions in optimization projects. Monte Carlo analyses were considered optimal for understanding cost probabilities and uncertainties at the project scale. The process of identifying probability distributions for each significant variable aids the project team in understanding data gaps that can be further assessed to increase decision making confidence. Decision trees were considered most helpful in understanding cost escalation associated with discrete future events and decisions.

An overview of all the above decision making tools, and project examples will be presented to support the results and lessons learned.