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# A Delicate Balance

## Portfolio Analysis and Management for Intelligence Information Dissemination Programs

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# Summary

This publication describes the application of RAND's PortMan for NSA's ISS division. PortMan enables data-driven analysis of project portfolios and provides a means for monitoring the progress of potentially high-value projects and associated risk-mitigation strategies, to ensure that this value is achieved.

In 2006, RAND performed a pilot study of the applicability of PortMan to ISS's research and development (R&D) project portfolio. The results of that study demonstrated that project rankings using PortMan, which were based on explicit value and risk metrics elicited from ISS management, were significantly different from those obtained using ISS's then-current method, which was based on undocumented, implicit metrics. While a definitive assessment of the final outcome of the two different rankings was beyond the scope of the pilot study, the RAND PortMan method did produce for the sponsor open, auditable, and transparent data that could then be used by program managers and senior decisionmakers to support program-related decisions. As a result of these findings and the added decision support materials generated in the PortMan pilot, ISS sponsored the broader study described herein.

PortMan evaluations are based on estimates of Expected Value (EV) of each project, defined as

EV = *Value of Successful Implementation* × *Probability of Successful Implementation*.

*Value of Successful Implementation* is a measure of the benefit if the project is successfully implemented.[1] *Probability of Successful Implementation* is a measure of the difficulty or risk associated with either implementing an R&D project or sustaining an operations and maintenance (O&M) project.

RAND developed two different sets of metrics for estimating EV, one set for R&D projects and one set for O&M projects, based on elicitations of the important components of value and risk from ISS staff and analysis of documents provided by ISS management. To estimate the Value of Successful Implementation (i.e., value) and the Probability of Successful Implementation (i.e., risk) for each project, RAND con-

1 *Value of Unsuccessful Implementation* is defined as zero.

ducted a Delphi consensus-building exercise using subject matter experts from ISS's Senior Leadership Group (SLG). The 17 projects included in the evaluation are listed and briefly described in Appendix A, and the questions presented to the ISS SLG during the Delphi exercise to estimate value and risk are included in Appendixes B and C. Appendix D includes an analysis of the Delphi exercise by project and by question. A high level of consensus among the SLG was reached after four rounds; for only four of 85 questions (five questions for each of 17 projects) were less than five of the ten SLG members in agreement on a single answer.

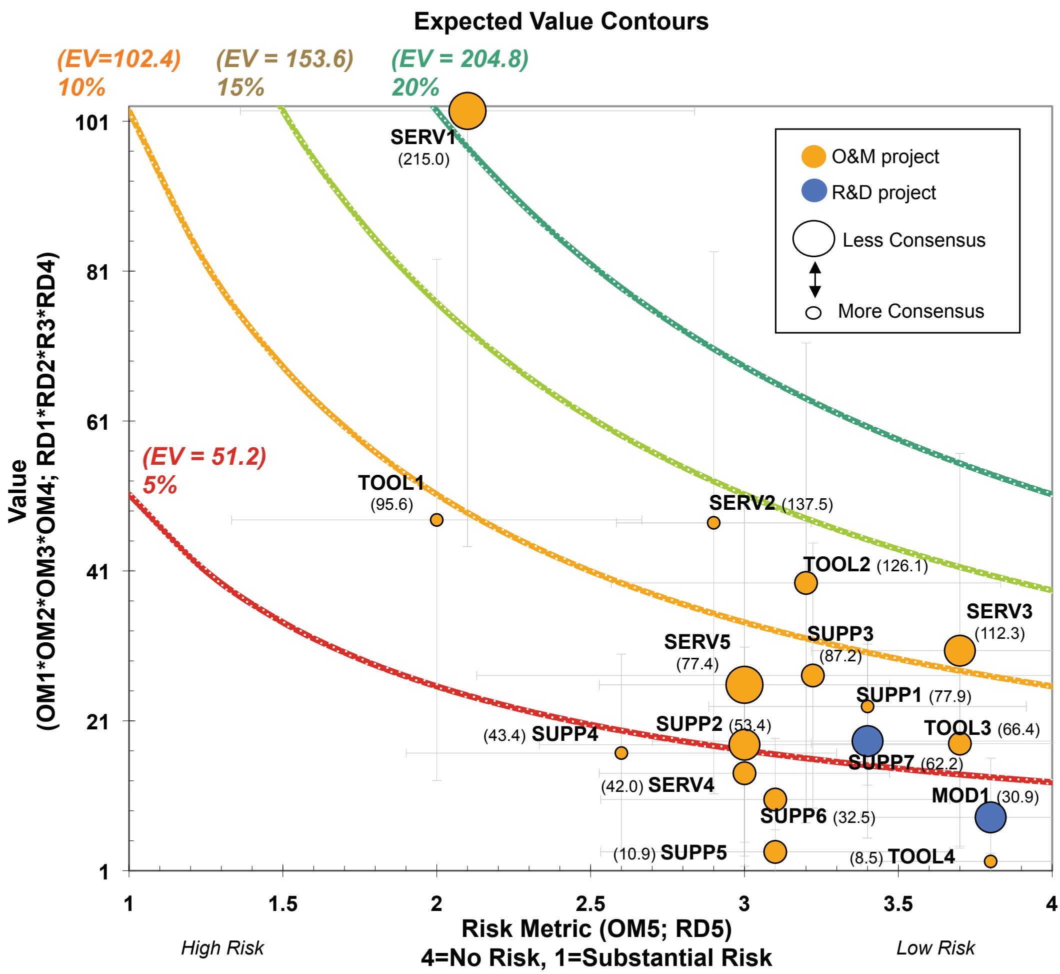
Figure S.1 is a plot of value versus risk for all 17 ISS projects listed in Appendix A, with O&M projects shown in orange and R&D projects in blue. Here value, which is plotted along the y-axis, is defined as the product of the four value components derived from the Delphi exercise using a 1-to-4 scale for the answers to the four value metric questions in Appendixes B and C.[2] The risk metric is defined as the answer to the risk metric question in Appendixes B and C. The risk scale is defined such that 1 corresponds to the answer *Substantial* and 4 to the answer *None*. In Figure S.1, the component of risk decreases as one moves from left to right along the x-axis. The size of the dot represents the level of consensus for each project: The smaller the dot the better the consensus. The gray lines show the standard deviation of the Delphi responses at the conclusion of the Delphi exercise. The EV of each project, calculated as *value* X *risk metric*, is shown in parentheses next to each dot. The four colored lines are constant EV contours at 5 percent (EV=51.2), 10 percent (EV=102.4), 15 percent (EV=153.6), and 20 percent (EV=204.8) of the maximum possible EV of 1,024.

Figure S.1 shows that the projects with the highest EV (SERV1), as well as the fifth-ranked project according to EV (TOOL1), have the highest risk compared to the rest of the portfolio. Thus, one clear recommendation that can be concluded from the PortMan analysis is to focus resources on risk-mitigation strategies or new R&D programs to support or replace these two projects. Figure S.1 also allows ranking of the projects according to EV, with the six projects falling below the 5-percent line identified as candidates for reduction or elimination.

However, PortMan also allows inclusion of project cost in order to balance value, risk, and cost in the analysis. In this case, ISS management provided RAND with the fiscal year 2008 (FY08) cost for each project and the total FY08 program budget. A linear programming (LP) model was used to select (from the 17 projects listed in Appendix A) a portfolio of projects that delivers the maximum portfolio EV (defined as the sum of the individual project EV for each project selected) for the available budget. Because projects have varying EV-to-cost ratios, this maximum EV portfolio includes three projects with less than 5 percent of the maximum EV (SUPP6, SERV4, and SUPP4) and excludes 2 projects with between 5 and 10 percent of the maximum

[2] This method of combining the value metrics highlights the differences between projects. The scale assigns 1 to the answer *No*, 2 to *Very Little*, 3 to *Significantly*, and 4 to *Substantially*.

**Figure S.1**
**Calculated Project Value Versus Risk**




RAND *MG939-S.1*

EV (SUPP3 and SUPP7), as well as one with greater than 10 percent of the maximum EV (SERV3).

Taking into account the fact that ISS partially funded some projects, the portfolio selected as achieving the maximum EV for the available budget was in good agreement with ISS's funding priorities for O&M projects.[3]

This PortMan analysis proved useful to ISS management in a number of ways. First, it generated reproducible and auditable data to support programmatic decision-making. Second, the Delphi exercise provided the ISS SLG with a venue in which to

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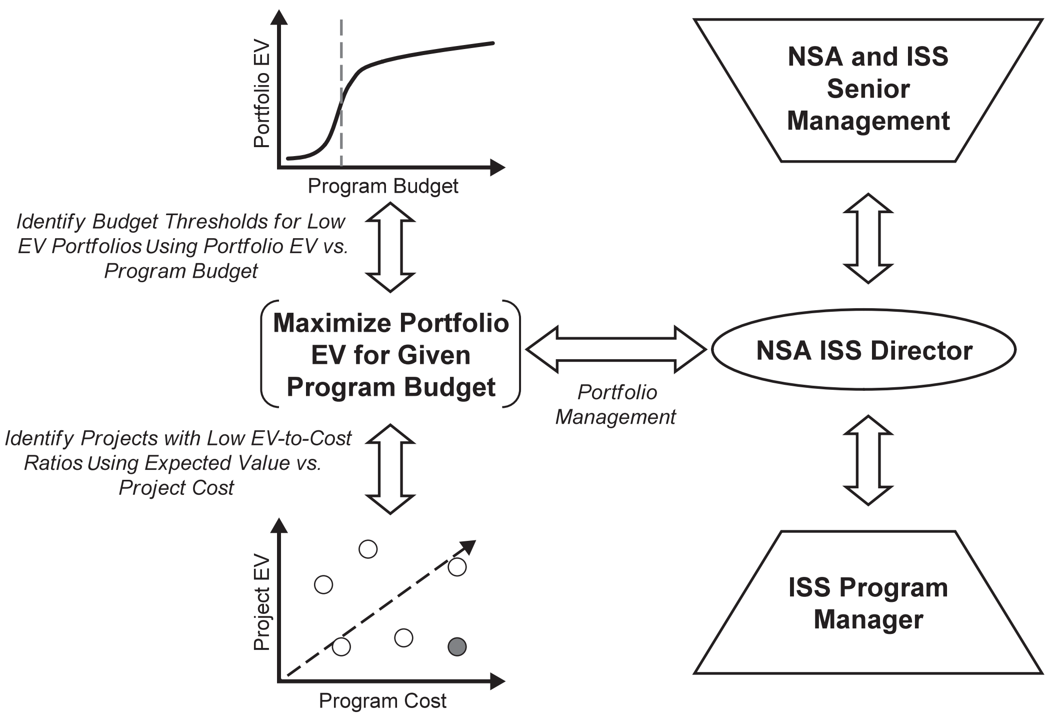
[3] If ISS funded a project at greater than or equal to 50 percent of the proposed cost, it was considered equivalent to being selected for the PortMan portfolio. See Chapter Three for details.

identify areas of consensus and non-consensus and to debate the latter. Finally, it provided data and analysis of EV versus program budget[4] and EV-to-cost ratios of individual projects that can be used by program managers and directors in discussions with supervisors and senior management, illustrated schematically in Figure S.2.

**Figure S.2**
**Function of Portfolio Management for NSA ISS**

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4 In addition to determining the maximum EV portfolio for ISS's FY08 budget, RAND used the PortMan with LP to determine maximum EV portfolios for budgets ranging from those sufficient to fund one project to those sufficient to fund all 17. See Chapter Three for details.

RAND drew the following conclusions from the results described in this report:

1. The RAND PortMan is a useful management method for both R&D and O&M portfolios.
2. Individual project cost can play an important role in achieving the highest expected value for a given portfolio.
3. RAND PortMan with LP is flexible enough that it may be applied to a single fiscal year or used to make strategic decisions that have implications for future fiscal years.
4. The Delphi method, as part of the portfolio management process, provides not only a mechanism for generating consensus, but also a forum for senior management to address and discuss areas of disagreement.