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Cost-Benefit Study of a Project to Lower Cost and Improve Fleet Readiness through Integrating the Management of Technical Information

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Abstract

This paper describes a cost-benefit analysis by the Institute for Defense Analyses of the "Bridge Project" that ADL (Advanced Distributed Learning) is conducting for the Office of Secretary of Defense for Acquisition, Technology and Logistics (OSD(AT&L) to improve the management of Integrated Logistics Support (ILS). The Project is part of the OSD RTOC program (Reduction in Total Ownership Cost). The Bridge Project focuses on integrating (Bridging) the management and production of technical manuals and training courses. The benefits would be lower cost to produce these manuals and courses in the future, and improved readiness through insuring the delivery of consistent and up-to-date logistics support to the Fleet.

Manuals and courses are currently produced by entirely separate processes. Tech writers and course developers obtain contractor data on systems and equipments in parallel, they express the information in different formats, they organize the data in different structures, and they store the data in different repositories. Cost is therefore higher because of duplication of resources and the difficulties in re-using data. The lack of integration can also reduce readiness, since it opens up the possibility that the tech manuals and training courses present disparate information, thus depriving ship operators and maintainers of the most effective support.

The Bridge Project seeks to relieve these problems by designing new software, technical and business processes to integrate the production of technical manuals and training courses. All technical and learning content would be expressed by the same digital specification (the S1000D industry specification), they would employ the same structure (Data Modules), and the data would all be stored in the same repositories (Common Source Data Bases, or CSDBs). The project is developing an API (Application Programming Interface) to enable course developers to exchange data with any CSDB, and a Web Service to more quickly update tech manuals and training courses in response to Engineering Change Proposals (ECPs).

The analysis finds that the Bridge would achieve net benefits (benefits less costs) of approximately $87 million over 10 years, far more than enough to cover the $8.7 million 10-year cost of producing all Navy HM&E (Hull, Mechanical and Electrical) technical manuals and training courses delivered by Navy e-Learning, a part of the Naval Education and

Training Command (NETC). A sensitivity analysis of the most uncertain inputs yields a range of results (net benefits) from $32 million to $166 million.

The Bridge could also contribute to shipboard readiness by insuring the Navy's policy of providing up-to-date and consistent information to the Fleet upon installation of new systems and equipment. A parametric analysis indicates that by increasing the availability of the electronic, ordnance and HM&E components of a single new DDG 1000 destroyer for only a single day would increase effectiveness the Navy values at $2 million.

Executive Summary

The Institute for Defense Analyses (IDA) is conducting a cost-benefit analysis of the "Bridge Project" that the Advanced Distributed Learning (ADL) office is conducting for the Office of the Secretary of Defense for Acquisition, Technology and Logistics (OSD(AT&L)). The project is part of OSD's RTOC program (Reduction in Total Ownership Cost). The project's focus is on improving how the Navy manages several aspects of Integrated Logistics Support (ILS) in order to reduce the cost of producing technical manuals and training courses. A related benefit is increasing readiness through insuring the Navy's policy of having the appropriate logistics support on hand when new systems and equipment upgrades are fielded.

Under current ILS management, manuals and courses are produced by entirely separate processes. Tech writers and course developers obtain contractor data on new systems and equipment upgrades in parallel. They express the data in different formats, they organize the data in different structures, and they store the data in different repositories. The cost of producing logistics support is therefore higher because of the duplication of resources and the difficulties in re-using data. The lack of integration can also reduce readiness, since it opens up the possibility that the tech manuals and training courses present disparate information. And there may be delays in updating the information in response to Engineering Change Proposals (ECPs). These disparities and delays can deprive ship operators and maintainers of the most up-to-date information on their systems and equipment.

The Bridge project is designing a new process—new software, technical and business processes to integrate ("Bridge") the production of technical manuals and training courses. The initial beneficiary of the funding is the Littoral Combat Ship (LCS) Mission Modules Program (PMS 420), which is integrating the Mission Modules into the LCS. Under the Bridge Project, all technical and learning content would be expressed by the same digital specification (the S1000D industry specification), organized by the same structure (Data Modules), and stored in the same repositories (Common Source Data Bases). The project is also developing an Application Programming Interface (API) to grant all course developers access to any CSDB, and a Web Service to quickly identify the technical and learning content that must be reviewed for updating in response to Engineering Change Proposals (ECPs).

The cost-benefit study estimates the investment and implementation costs of designing and implementing the integrated approach. Investment is measured by the personnel and related expenses of the project during the second, or coming year of this 2-year project. (The first-year costs are sunk, and no longer relevant.) Implementation involves training technical writers and course developers in using the Bridge, and the licenses and user fees to cover the additional costs of maintaining the networks and the data repositories.

The Bridge Project's benefits are the anticipated reduction in the costs of producing future technical manuals and training courses, and possible improvements in shipboard readiness.

The cost savings were estimated by first listing the dozens of tasks (38 for the manual and 80 for the courses) to produce a nominal 500-page technical manual and a nominal one-content-hour training course. Project personnel estimated the number of staff hours to produce these tasks under both current and Bridge processes, and thus the staff hour savings from using the Bridge. Pay rates are used to convert the staff hour savings to cost savings. The final step is scaling up the results to the sample of yearly production of technical manuals and training courses. Costs and benefits were expressed in 10-year present values calculated using the 2.4% annual discount rate mandated by OMB for 10-year studies.

Two different samples were chosen for analysis, reflecting the different perspectives of OSD and the PMS 420 Program Office. The first analysis recognizes OSD's interest in seeing whether the new software and technical and business processes that comprise the Bridge would lead to positive net benefits to DoD overall—would the benefits cover the costs if implemented by the Navy and other Services as a whole. This analysis is therefore conducted for a substantial number of the Navy's yearly production of technical manuals and training courses: all Hull, Mechanical, and Electrical (HM&E) technical manuals produced by the Naval Ship System Engineering Station (NAVSSES) in Philadelphia (over 45,000 pages annually), and 50% of the Computer-Based Training (CBT) courses delivered by Navy e-Learning (NeL), a part of the Naval Education and Training Command (NETC) (approximately 3,300 content hours annually, in total).

Only 50% of the NeL courses were considered because our analysis of the course titles indicated that only half of the courses trained "hard skills." These are the training courses that deal with equipment and other technical content, and whose cost would therefore be reduced by integrating the production of training courses and technical manuals. (Although courses that train "soft skills" such as leadership and personal advancement would not be directly affected by integration, they might benefit from the information-organizing features of the other Bridge innovations.)

The second analysis, reflecting the Program Office's perspective, is a test case of the results of the aggregate analysis in which the Bridge is applied to a particular system, the LCS's AN/AQS-20A mine hunting sonar. The focus here is on the benefits alone—whether the Bridge would lead to reductions in future cost of producing future technical manuals and training courses for this system. It would not be reasonable to expect the benefits for a single program to cover the full investment and implementation costs of the Bridge, which could lead to savings across DoD.

The first analysis finds that the Bridge would save approximately $87 million in 10 year cost in producing the Navy HM&E manuals and 50% of NeL delivered courses—far more than enough to cover the $8.7 million investment and implementation costs of the program. The second analysis finds that the Bridge would produce substantial savings of almost $306 thousand in producing technical manuals and training courses for the LCS AN/AQS-20A.

Dealing with uncertainty was a major analytical problem. Although much of the analysis used historical data from NAVSSES, NETC and the AN/AQS-20A program, the cost savings are also based on several uncertain inputs relating to the new Bridge process. A sensitivity analysis was conducted of five inputs: 1) the future pay rate for technical writers and course developers who are trained in using the Bridge, 2) the percentage of training

hours that would be benefited by the Bridge, 3) the investment cost (to hedge against unanticipated cost of developing the Bridge), 4) the implementation cost (to hedge against problems caused by the cultural changes in Navy programming), and 5) the percentage saving in course developer staff hours from using the Bridge. Considering these changes in combination yielded a full range of net benefits (benefits less costs) for the aggregate case varying from a minimum of $32 million to the Base Case of $78 million ($87 million less $8.7 million) to a maximum of $160 million. Efforts will be taken in the second year of this study to further refine the inputs.

There is every reason to expect that net benefits would be significantly larger if the Bridge were applied to all Navy manuals and courses, and those of the other Services as well.

The final benefit for analysis was the improvement in Fleet readiness. Integrated production of technical manuals and training courses would increase the likelihood of providing the Fleet with up-to-date and consistent information, thus providing some insurance to the Navy's policy of fielding new systems and equipment upgrades only when the appropriate logistics support is available. A parametric analysis indicates that increasing the availability of the electronic, ordnance and HM&E components of a single new DDG 1000 destroyer by a single month would yield a gain in effectiveness the Navy values at $2 million.

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