SPACE SYSTEMS SYMPOSIUM (D1)
System Engineering Tools, Processes & Training (3)

Author: Ms. LeAnn Thomas
National Aeronautics and Space Administration (NASA), Marshall Space Flight Center, United States, Leann.Thomas@nasa.gov

Prof. Rajiv Doreswamy
National Aeronautics and Space Administration (NASA), Marshall Space Flight Center, United States, rajiv.doreswamy@nasa.gov

ORGANIZATIONAL CONSIDERATIONS FOR IMPLEMENTING SYSTEMS ENGINEERING AND INTEGRATION IN THE ARES PROJECTS OFFICE

Abstract

Systems Engineering and Integration (SEI) is a critical discipline in developing new space systems. In 2005, NASA performed an internal study of 24 agency and Department of Defense (DoD) programs to evaluate methods of integrating SEI practices and determine their effectiveness. The goal of the study was to determine the best SEI implementation strategy for the Ares Projects Office. The study identified six SEI organizational structures: 1. Lead systems integrator (LSI) with SEI responsibility and government technical insight. 2a. Integration contractor with government SEI responsibility (government insight). 2b. Integration contractor with government SEI responsibility (government oversight). 3a. Prime contractor with SEI responsibility (government insight). 3b. Prime contractor with SEI responsibility (government oversight). 3c. Prime contractor with SEI responsibility (government/industry partnership). 4a. Prime contractor with government SEI responsibility (government insight). 4b. Prime contractor with government SEI responsibility (government oversight). 4d. Prime contractors with total system performance responsibility (TSPR). 5. Prime contractor with government SEI responsibility and integration products through a Federally Funded Research and Development Center (FFRDC). 6. Government/FFRDC in-house development with SEI responsibility and function. The organizational structure used most often was number 4, using a prime contractor with government SEI responsibility and government technical insight. However, data analyses did not establish a positive relationship between program development costs and specific SEI organizational types, nor did it positively determine the relationship between successful programs or projects and their SEI structure. The SEI study reached the following conclusions: • Large, long-duration, technically complex programs or projects reach their technical goals, but rarely meet schedule or cost goals. NASA's recent successes have been smaller, short-duration development projects using heritage hardware/software, focused technology development, technical oversight and stable external factors. • Programs and projects have failed or been terminated due to lack of technical insight, relaxing of SEI processes, and unstable external factors. • The study did not find a single, clear optimum SEI organization type to fit all projects. However, while any organizational structure can be made to work, the fewer complexities in the program, the better the likelihood of success. • The most common successful SEI organization structure type in the study was type 4b, where the government maintained integration responsibility, with the prime contractor providing SEI products and the government providing technical oversight. This study was instrumental in helping the APO select organization structure 4, following the same SEI and oversight process used during humankind's last voyages to the Moon.