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Space Technology and System Management Practices and Tools (4)

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IMPACTS OF EARLY STAGE TECHNOLOGY PORTFOLIO ALLOCATION

Abstract

Early stage technology (Technology Readiness Level 4) is considered by conventional wisdom to be a good investment for technical organizations. However, measuring the success of early stage technology development is notoriously difficult, creating challenges in determining appropriate investment levels. Intuition suggests that early stage technology organically transitions into later stage and operational level technologies, but how many actually do? Given the uncertainty and non-linearity of early stage technology development, what resources should go to early stage technology versus later stage? This paper presents the experimental design necessary to examine an early stage portfolio within a technical organization (NASA), analyze the factors that influence early stage success, and determine an optimal investment ratio of resources. Additionally, we seek to create a methodology that could be extended to other technical agencies with similar structures and goals once identified. We take a multi-step approach to building a robust experimental design. First, a survey of NASA program offices, final reports, and other reporting mechanisms to compile a list of technology development projects over the last few years. The technologies surveyed will primarily be efforts funded by NASA's Space Technology Mission Directorate to provide a focused picture of activities. Second, we will use a set of common, cross-project metrics that that will allow them to be compared over differing years, NASA centers, technology areas, and resources invested. Third, we will identify a set of case studies in the form of current and planned missions from which we can examine early sources of their technological components. Through the case studies we expect to find relationships between technologies developed and funding cycles, revealing the influence of the technologies over the course of several budget cycles. We hypothesize that any correlations found will provide insight on the optimum relative size of early stage technological research in technology development programs. This paper is part of a long-term project that seeks to empirically determine optimal allocations through a method that may be applied generally by other space and technical agencies. By comparing the determined optimal early stage investment ratios across multiple organizations we hope they will converge on an ideal range to be used as the basis of future technology management policy formulation. Presented in this paper are the methods, a proposed data set, and some policy considerations. We save the case studies and actual recommendations for follow on iterations and updates.