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Strategic Risk Management for successful space & defence programmes (6)

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REDUCING DEVELOPMENT RISKS OF FUTURE SPACE SYSTEMS THROUGH EVIDENCE-BASED TECHNOLOGY ROADMAPPING

Abstract

Big space companies and organizations usually have a product portfolio of thousands of products and product families. They range from basic technologies, integrated into components or subsystems up until the final products.

One of the most pressing questions for senior management is how to plan research and development investments on the mid and long term to ensure a competitive product line-up, and which investments to prioritize in order to reduce the strategic risk in the long development cycles of space systems.

Technology roadmapping has been for many years the classical way of approaching this challenge: technologies are mapped out and traded against each other, using engineering judgement and market analysis. While allowing for a basic planning, this approach does not take into account technology interactions, nor adequately accounts for risks, side-effects and opportunities of cross-functional technology evolutions.

New decision-making frameworks are emerging that allow for investment planning based on engineering data. These allow for the identification of cross-discipline synergies and graph-like technology mapping to support management in the decision making process of RD planning: With this approach, companies can now track, which products with which key technical performances they are going to be able to build e.g. 10 years from now, if they decide to invest in certain technologies today. For example to answer the question: What are the impacts of a 10% capacity-per-mass increase of Li-Ion Batteries on development of launchers, satellites, space stations, rovers, etc.? By analyzing sensitivities through complex transfer functions in the implementation chain, the strategic risks and opportunities of these investments for future key performances can be quantified and evaluated.

This paper explores successfully implemented frameworks (e.g. “Evidence Based Technology Roadmapping”), methodologies (e.g. use of the concurrent design method in roadmapping activities), analysis approaches (e.g. dynamic pareto frontiers), as well as supporting software tools for the practical implementation of these concepts.