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Strategic Risk Management for Successful Space & Defence Programmes (4)

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HOW ARE SPACE ECONOMY TRENDS RESHAPING THE RISK LANDSCAPE OF THE SPACE INDUSTRY? A TAXONOMY AND FRAMEWORK

Abstract

Major Space Economy (SE) trends are fostering the space industry's evolution. New missions, infrastructures and in-space activities are envisaged under deep technological and business uncertainties, with strong implications on how space organizations identify, assess and treat risks at different levels.

Space organizations should enhance their risk management models and practices to cope with a rapidly evolving risk landscape. There are two main shortcomings in the extant body of knowledge (1) there are robust approaches to the modelling and analysis of risks in space projects under the SE paradigm; (2) there is still a limited understanding of how the major technological, business and regulatory trends taking place in the SE influence the risk profile of new space missions and services. Our key aim is to address these gaps by answering the research question:

How do SE characteristics and trends influence the risk exposure of space organizations?

Our research design consists of four phases. First, leveraging a systematic literature review, we developed a taxonomy of the 5 key trends (e.g., New organizational and operational models) characterizing the SE, divided into 25 sub-trends (e.g., Platformisation), and a risk taxonomy of 36 risks (e.g., De-orbit risk) targeting different space missions and businesses. Second, we developed rich bow-tie models for each risk where risk events, causes, consequences and types of impacts are linked. Third, we interviewed five space experts to validate the taxonomies and the bow-tie models. Fourth, we developed a SE Trends-Risks matrix following the logic of the "House of Quality" framework, setting the trends and risks taxonomies as main axes. Based on the literature and experts' opinions, we filled in the matrix showing SE trends' positive or negative impacts on space missions and business risks.

Our results include 40 mechanisms of influence between SE sub-trends and space mission risks, 82% are negative (i.e. lead to risk increase), and 18% are positive (i.e. mitigate risks). We also unfolded 59 mechanisms (64%) where SE sub-trends worsen the business risk exposure and 33 (36%) with a positive

mitigation effect.

Our research benefits space organization managers planning new space missions or innovating their business models. Space infrastructure insurers can leverage our results to develop appropriate risk assessment methods and insurance products. Future research can exploit our results as a reference for assessing risks of new system architectures or space-based services or for investigating the effects of new regulations and governance models on the risk landscape of SE.