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BEYOND THE BUZZ: MAPPING ISAM'S ECONOMIC DOMAINS AND BUSINESS LOGICS

Abstract

In recent years, In-Space Servicing, Assembly, and Manufacturing (ISAM) has emerged as a promising frontier in the space economy, driven by satellite life extension, debris removal, infrastructure deployment, and on-orbit manufacturing.

However, despite this momentum, the economic potential of ISAM remains poorly understood. This is primarily due to two interrelated challenges: (1) the emergent and evolving nature of ISAM technologies, which makes it difficult to define stable markets and value propositions; and (2) the lack of clear boundaries delimiting ISAM from other adjacent activities, such as traditional manufacturing, launch services, or satellite operations. As a result, stakeholders struggle to assess the concrete ISAM economic opportunities and viable business models.

This study addresses these gaps by developing and applying a structured exploratory framework to characterise ISAM's ecosystem, business logics, and drivers and challenges for its commercial uptake. Methodologically, we follow a three-step design: (1) boundary definition and ecosystem mapping ("what"), (2) business model and value-chain analysis ("how"), and (3) opportunity–challenge synthesis ("why"). We collect and analyse secondary data from academic, industry, and agency documentation, and primary data from 351 ISAM projects. We validate results through interviews with senior experts.

We identify six ISAM economic domains: Satellite Servicing Life Extension, Active Debris Removal Sustainability, On-Orbit Assembly, In-Space Manufacturing, Commercial Space Stations, and Lunar Deep Space Infrastructure. We map value chains across these domains and classify actors into six business model archetypes (Logistics-as-a-Service, Platform-as-a-Service, Core Integrated Operators, Mission-Critical Technology Providers, Foundational RD Catalysts, and Space Manufacturing Inputs Providers). We find that revenue credibility is strongest where ISAM delivers near-term operational services, often with the government as anchor customer and risk absorber. By contrast, in-space manufacturing remains structurally fragile: it requires not just technical feasibility but order-of-magnitude performance gains to justify the orbital supply chain. We identify a central scaling constraint: many ISAM providers are economically coupled to a small set of space operators, whose delayed demand maturation can stall the entire ecosystem.

Our paper provides a first systematic attempt to clarify ISAM's boundaries and to articulate the key dimensions of its economic value creation. We offer an integrative baseline for assessing where and under what conditions economic value can realistically be captured across the ISAM value chain. Future studies can examine specific domains to quantify value and identify drivers, barriers, and scaling pathways for viable business models.