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UNLOCKING SPACE: THE IMPACT OF STANDARDIZATION IN LAUNCH SERVICES ON ACCESSIBILITY AND INNOVATION

Abstract

This research investigates the impact of standardization in space launch services, focusing on rideshare opportunities and multi-satellite deployments, on reducing costs and increasing accessibility for commercial entities in the space industry. By applying microeconomic principles, the study examines the intricate dynamics of the space value chain, emphasizing the importance of efficient manufacturing processes, reliable satellite operations, and robust ground station networks.

CubeSats and mini satellites have emerged as cost-effective and accessible solutions for space missions. Standardized designs, reliance on off-the-shelf components, lightweight construction, and reduced launch costs enable rapid development and deployment, making space increasingly accessible to commercial enterprises. These platforms are pivotal in delivering diverse applications, including Earth observation, remote sensing, and communication services, benefiting sectors such as agriculture, disaster management, and urban planning. However, the growing prevalence of CubeSats also raises concerns about space debris and orbital congestion, particularly as satellite constellations become dominant players in the industry.

To address these challenges, the study emphasizes the need to optimize satellite lifecycles. This includes improving design and manufacturing processes, extending operational lifespans, and ensuring effective end-of-life decommissioning to minimize debris. Alternatives to CubeSats, such as modular satellite designs and multi-mission platforms, are also explored as potential solutions to enhance sustainability without compromising accessibility or functionality.

The research also examines the rise of large-scale satellite constellations, which provide scalable solutions for global connectivity and data services. While these constellations offer significant commercial and societal benefits, they amplify the urgency of addressing orbital management and debris mitigation.

By integrating principles of supply chain management, the study evaluates the impact of material and information flow optimization on reducing operational costs in space missions. Strategies for enhancing supply chain resilience and reducing dependencies, particularly in localized production, are proposed to support sustainable growth in the industry.

Through a comprehensive analysis of the space value chain, this research offers valuable insights into how standardization in launch services reduces costs and democratizes space access. Simultaneously, it highlights the importance of balancing economic viability with environmental stewardship, advocating for innovative approaches to satellite design, lifecycle management, and debris mitigation to ensure the sustainable expansion of the space industry.