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TOWARDS A COMMERCIAL EARTH OBSERVATION SERVICES MARKET: BRIDGING THE GAP BETWEEN USER NEEDS AND MISSION DESIGN

Abstract

The Earth Observation (EO) services market faces a challenge as the volume of EO data generated surpasses commercial utilization. Conventional EO infrastructures were designed for providing services tailored to institutional needs. Despite this, EO holds potential across diverse applications in commercial sectors as well. However, effectively scaling institutional services to meet the needs of commercial user bases faces challenges and limitations.

While existing research explores how pre-determined solutions align with end-users' needs, a knowledge gap remains in understanding how the needs of commercial users might influence initial design stages of EO infrastructures and missions. Hence, our paper endeavors to establish the initial steps of a methodology aimed at allowing end-users' needs to impact the design of EO missions.

We applied Design Science Research Methodology, suitable for practice-oriented and research-oriented research objectives. First, we conducted semi-structured interviews to identify the problem, motivate the necessity for enhancing current methodologies, and delineate the study's objectives. Second, we performed a systematic literature review on EO services and requirements. This review, complemented with experts interviews, informed the development of the design artifact.

We provide a categorization of EO service parameters tailored to address user needs, prioritized to facilitate trade-off evaluations. We delineate a set of service elements aligned with such parameters, and link them to components of EO system architectures (e.g. Federated Satellite Systems, monolithic, fractionated) and EO service solutions (e.g applications, platforms), enabling the provision of such service elements. We incorporate considerations of emerging as-a-service business models to address the needs of commercial users. Finally, we present some configurations of EO system architectures and EO service solutions. This lays groundwork for identifying recurring service elements, with the potential to evolve into standard service modules, as well as customization modules tailored to specific applicative contexts and multi-mission purposes.

We contribute to theory by proposing a connection between emerging constellation configurations, such as FSS, and the needs of commercial users. Our framework lays a foundation for commercial needs to impact the design and development of new EO missions. This approach broadens the scope of EO service provision and offers avenues for innovation within the satellite industry.

Our contribution to practice is twofold. Firstly, practitioners gain insights into addressing diverse users' needs, transitioning from the traditional focus on single niche verticals inherent in the conventional constellation paradigm. Secondly, by identifying recurring modules and configurations, manufacturing companies gain insights on modifying spacecraft designs to transition into innovative paradigms.