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A NOVEL BUSINESS MODEL TO SUBSTANTIATE THE COMMERCIAL VIABILITY OF A  
CUBESAT CONSTELLATION FOR ADVANCED EARTH OBSERVATION AND MONITORING**Abstract**

Innovative advancements in nanosatellite technology and refined business models are expected to fuel the global market growth of commercial satellite imagery. A phase-A study on the commercial and technical viability of a novel small satellite constellation and its operation for advanced Earth observation was conducted. The resulting CubeSat constellation design, C3EO is an empowering innovation, incorporating imaging capabilities of several ranges of spatial resolution, unprecedented large area coverage and real time monitoring at a more cost effective price than current Earth observation missions. This is substantiated by the developed business model. The basis of it is the global cooperation from specific organizations, short operating life time, the use of existing hardware and off-the-shelf components. Most of these features are enabled by the current trend of miniaturization in nanosatellite technology.

A team of students at the Delft University of Technology generated the overall system concept of the ground and space segment of C3EO in 2012-2013. It includes the detailed design of a new generation of 88 CubeSats with a minimum design life time of two years. To credibly estimate its mission viability, capital budgeting and cost accounting was performed. The investigation included a breakeven point analysis, a detailed cost breakdown and the payback period based on projected customer demands. The current percentage of imaged area sold and calculated revenue led to a projected square kilometer price. Additionally, existing missions were analyzed such as key player RapidEye with respect to the total mission cost and the science mission Delfi-C3 for a reference of a detailed CubeSat cost breakdown.

The designed commercial mission C3EO shows a promising technological and financial performance at a highly competitive price. The estimated US\$ 120 M total mission costs contribute to a square kilometer imagery price in the range of US\$ 0.13 - 0.27. The breakeven point is reached within one year through a price range that is 5-10 times lower than competitors. Limitations and contingencies are accounted for in the model. The new empowering business model of small satellite operations is harnessing the existing experience of scientific progress in nanosatellite technology for cost-effective commercial use. The model uses short-term cycles, innovation in the supply chain, a new customer base and new market applications as an advantage in the successful commercialization of the mission. It enables a cost-effective unique selling proposition in the market of advanced Earth observation and monitoring.