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## LEAN PRODUCT DEVELOPMENT IN THE COMMERCIAL SPACE ERA

**Abstract**

With the recent successes of commercial space companies such as California's SpaceX, New Mexico's Virgin Galactic and Virginia's Orbital Sciences Corporation, the landscape of the space industry is rapidly changing. As the space industry breaks away from its government-based paradigm not only are commercial companies taking over launch responsibilities for big government, but new companies, and even new sectors, are being formed. In the last year alone two groups, with important and creditable ties to the space industry, have announced their intention to mine asteroids in the medium term.

One area where change is coming slowly is to the smaller and medium sized businesses (SMEs) in the space sector whose history of working for one or two customers on lucrative, cost-plus, process and requirements driven programs is rapidly going the way of the dodo. These companies need to find a way to follow the lead of companies like SpaceX and carve their niche in the new space landscape. Agile business models and diversification of target customers are two examples of the innovations required. A major part of this transformation will be the ability of smaller space companies to develop products and bring them to market without a reliance on traditional funding channels.

Lean product development has been studied for many years. This paper examines lean product development as it applies to the space sector. A literature review is summarized and provides the basis for analysis and conclusions pertaining to the application of lean product development approaches for space sector SMEs.