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LUNAR LABS FOR A MINIMUM VIABLE HABITAT. STRATEGIC DE-RISKING BY DESIGN, FOR COMPLEX INNOVATION, CO-CREATION AND STARTUP PROGRAMS, BY THE EXAMPLE OF A GLOBAL TECHNOLOGY PROGRAM FOR LUNAR HABITATION IN COOPERATION WITH NASA.

Abstract

How do you build a startup technology program for a challenge as complex as Lunar habitation?

Recent developments in space innovation, economy and politics have spawned renewed interest in Lunar exploration and exploitation. Many space agencies have joined NASA in its quest for a sustained Lunar presence, and a plethora of startup companies and industry behemoths are developing solutions for important parts of the challenge.

After NASA's and others agencies' successful commercial programs (e.g. COTS and CCDev), it is broad consensus that sustainably returning to the Moon will be a commercial endeavor. The space agencies will be acting as the first customers for the required technological solutions, paving the way for a sustainable cis-lunar economy.

The decision to apply a more open, ecosystem-style approach to the development of highly complex commercial solutions such as those for a sustained Lunar presence has multiple implications on strategic risk. These implications are felt not only by space agencies, but also by large and established (space and non-space) organizations world-wide, as many pursue more and more programs for co-creation, co-innovation, business acceleration, incubation and development, and 'company building', to achieve audacious goals in innovation and transformation.

On one hand, out-sourcing significantly decreases internal RD expenses, de-risks failure by applying a portfolio strategy (avoiding the "all eggs in one basket" dilemma), and significantly expands potential and capabilities in innovation. On the other hand, it leads to loss of control over specific innovations and timelines, and to dependency on outside research and development.

Considering complex projects through an ecosystem perspective - such as a permanent robotic presence for prospecting Lunar resources, or even a Minimum Viable Habitat (MVH) - the implications of a critical path failure can be detrimental, potentially leading to failures throughout the value chain, and critically endangering project success.

How can startup and innovation programs help significantly de-risk complex technological projects?

How can the risk of critical path failure be predicted and strategically contained by the design of the program?

This paper will discuss the potential of innovation, co-creation and startup programs for de-risking complex technological endeavors, by the example of a global technology program for Lunar habitation in cooperation with NASA. It will examine the players in a public-private-private partnership, and explore best practices from the world's most successful startup programs from in- and outside of the space industry. Finally, it will propose a basic architecture for programs for complex technological challenges.