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Author: Mr. Maxime Dargent
Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland

Ms. Lina Kuhlmann
Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland
Mr. Alvaro Martinez-Vizmanos
Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland
Ms. Angelina Frolova
Space Engineering Center (eSpace), Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland

STRATEGIC PROJECT MANAGEMENT IN STUDENT-LED CUBESAT MISSIONS: A COMPREHENSIVE ANALYSIS AND ENHANCEMENT FRAMEWORK

Abstract

The development of CubeSats has become an increasingly common trend among university student associations, primarily due to their relative affordability and simplicity compared to traditional satellite missions. These associations offer students the opportunity to engage in actual space missions, thereby providing valuable experience for their future careers in the space sector. Students can immerse themselves in various disciplines during the mission, training not only their technical skills but also their abilities in communication and management.

Managing student-led space missions presents unique challenges mainly due to their high interdisciplinarity and constrained resources. But the most significant challenge arises from the dynamic involvement of students whose participation is limited by their academic commitments, and their time within the association, is often shorter than the actual mission development. This dynamic nature complicates knowledge transfer and decision-making, often altering the missions' path and extending its duration.

To address these challenges, an efficient project management approach is thus essential to navigate the complexities of such missions and achieve the desired outcomes. This paper presents a management methodology that is adapted to the fast-paced nature of student-led missions, where major decisions are often driven by budget constraints or changes in team members. The study highlights the importance of fostering an environment where students can thrive on concrete projects, despite the extended duration of these missions, as the goal of such projects is mainly the learning process that precedes mission execution. Additionally, the major role of academic semester projects, offering students a valuable opportunity to earn academic credit for their work, effectively allowing them more time to dedicate to the project, is examined. The importance of expert reviews is also underscored, as external feedback is crucial for the success of such a project.

By combining existing literature, case studies, and interviews with various student associations, this paper examines the key factors contributing to a mission's success. By utilizing the case study of the student association EPFL Spacecraft Team and their 3U CubeSat mission, CHESS (Constellation of High-Performance Exospheric Science Satellites), the paper establishes guidelines to assist other student associations in overcoming the management challenges associated with CubeSat missions. These guidelines encompass various aspects, including team organization, communication techniques, risk management, and leadership strategies. By implementing these guidelines, student associations can enhance their project management practices and increase the likelihood of successful CubeSat missions.