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SPACE EXPLORATION TECHNOLOGY ROADMAPPING AT THE CANADIAN SPACE AGENCY: A CONCEPT FOR A CAPABILITY ANALYSIS BASED PLANNING METHOD

Abstract

Applying a systematic approach is desirable in order to allocate the available resources to Canada's technology development efforts for space exploration. Ideally, such an approach can not only help synthesize all the pertinent information related to technology development (such as purpose, benefits, risk, cost and schedule), but it can also bring analytical rigour and the capability to optimize investment options based on multiple criteria. Furthermore, planning products that are developed as part of this approach can also help with coordinating Canada's space exploration efforts with its international partners.

In the last few years, the Canadian Space Agency (CSA) has explored methodologies that can achieve these objectives (i.e., "technology roadmapping").The key activity of this technology roadmapping includes continuously tracking internal and external developments to map the intersection of future mission needs, Canada's evolving space exploration capabilities, and the inventory of existing technology solutions. The ultimate objective is not to "automate" decision making. Such a tool can likely never replace the expert judgement of decision makers, but it can help to structure and formalize the decision making process and give decision makers more confidence on the path taken.

This paper describes the key elements of the proposed approach and illustrates its application using case studies. By its very nature, technology roadmapping is a forward-looking exercise. However, since future investment decisions are intricately linked to past ones, it is essential that Canada's past investments in space exploration be categorised and tracked on a continuous basis. NASA's Technology Area Breakdown Structure (TABS) is used to categorise these investments in a consistent manner.

In the proposed approach, technology roadmapping is considered to be capability analysis based, and hence it should be technology agnostic. For example, if autonomy is identified as a key capability in robotics, then specific technologies that can advance this capability should be given priority over other ones that are linked to less important capabilities. However, this prioritisation does not necessarily indicate a preference for a specific autonomy-related technology. The merits of these specific technologies are best assessed by their respective subject domain experts. In addition, key capabilities should be selected based on their future potential, not necessarily on their historical pedigree.