

IAF SPACE EXPLORATION SYMPOSIUM (A3)  
Moon Exploration – Part 1 (2A)

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SMART RESOURCE MANAGEMENT BASED ON INTERNET OF THINGS TO SUPPORT  
OFF-EARTH MANUFACTURING OF LUNAR INFRASTRUCTURES (SMARTIE)**Abstract**

An Off-Earth manufacturing architecture based on a combination of 3D printing and the Internet of Things (IoT) could provide the smart and efficient management of available resources for long-term survival of both crew and technological assets in harsh space environments. The SMARTIE concept presented in this proposal connects the following critical technologies and processes to advance a sustainable exploration scenario: Off-Earth Additive Manufacturing machineries Off-Earth recycling processes storage systems for end-of-life products and in-situ materials Qualitative and quantitative assessment of off-Earth resources Off-Earth logistics and navigation systems

Included in this architecture is a communication relay to Earth, and utilization of IoT networks for the optimization (and control) of printing objects off-Earth, including best choice of printing technology and available material resources. A tracking system for each off-Earth printed item is also envisioned for future recycling at the end of the item's life-cycle; thus, enhancing the self-sustainability of the entire off-Earth manufacturing process. Current industrial developments in intelligence and data processing

can be applicable to off-Earth construction, with the potential to streamline manufacturing processes, and devise novel material solutions for printing off-Earth items, valuable to both autonomous building operations and mission crewmembers.

Projects currently underway that support the SMARTIE vision, are the 4G network planned for the Moon, a collaboration between SpaceX, Vodafone, Nokia, and Audi, and the 3D printing technology developed by Israeli company Nano Dimension, capable of printing PCB in layers, especially for IoT needs.

SMARTIE offers an inclusive feasibility study analysing the requirements for future network infrastructures considering items such as data management and budget to exploit and optimize Moon Factories Management and available resources to assure high-grade self-sustainability.