

# Applications of Space Technologies to Sustainable Construction Business Opportunities

Y.S, Lee<sup>1</sup>, J.Y, Lee<sup>1</sup>, T.S, Lee<sup>1</sup>

<sup>1</sup>International Space Exploration Research Institute, Hanyang University, Ansan,  
Republic of Korea

Correspondence: Tai-Sik, Lee (yoonsunlee@hanayng.ac.kr)

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The United Nations (UN) Sustainable Development Goals (SDGs) are the blueprint agreed upon by the UN member states to achieve a better and more sustainable world by 2030<sup>1</sup>. The SDGs are a gift to business to help private sector companies guide their strategic plans by weaving these SDGs into their long-term business strategies and renewing their thinking about stakeholder engagements and business creation<sup>2</sup>. The space sector is a key partner in the global effort to achieve sustainable development by 2030. Space technology transfer has been shown to stimulate innovation in business, support economic growth<sup>3</sup>. The objective of this study is to identify business opportunities that can offer to accelerate breakthrough innovation in construction industry. Innovation in digital construction value chains, accompanied by exponential technologies such as artificial intelligence (AI), blockchain, internet of things (IoT), and robotics can ultimately contribute to creating new quality jobs and business opportunities. The suggested business ideas associated with SDGs, together with the participation of the government and investors, will serve as the basis for developing technology and fund communities of young job seekers and start-ups.

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[1] United Nations. The UN Sustainable Development Goals. United Nations, New York, 2015. Available from: <https://sustainabledevelopment.un.org/sdgs>

[2] C. S. Pedersen. The UN sustainable development goals (SDGs) are a great gift to business! (2018). *Procedia CIRP*, 69, 21-24.

[3] K. Venturini and C. Verbano. Space Technology Transfer: A Systematic Literature Review. *European Conference on Innovation and Entrepreneurship*, 2, 2013.

# **Blockchain Systems Supporting the Moon Society**

P.Tanasyuk<sup>1</sup>

<sup>1</sup>Spacebit Global Ltd.

Correspondence: P. Tanasyuk ([pavlo@spacebit.com](mailto:pavlo@spacebit.com))

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Blockchain technology is most widely known through its crypto-currency applications such as Bitcoin. However, blockchain systems (also known as Distributed Ledger Technology or “DLT”) have much wider applications in both the terrestrial and space economy that have nothing to do with crypto-currency. DLT can be used in space industry procurement and supply chain applications in order to provide end-to-end traceability and authentication of parts delivered to aerospace systems integrators. This supply chain security and transparency, as well as a fault-tolerant system that can accommodate thousands of nodes in a vast supply chain network from raw materials to finished goods. In addition, supply chain DLT systems can easily identify fraud and counterfeit parts and thus ensure quality as well as smart inventory management.

Blockchain systems can also be used to provide a Tokenization system architecture for distributed ownership of space assets and infrastructure, which of course are very expensive especially for cis-lunar infrastructure. Tokenization can in turn provide a path for innovative fundraising that can open space investment to larger participation. Most traditional fundraising and investment processes are highly regulated and expensive to use. Tokenization reduces these barriers and can potentially make fundraising easier, while still complying with securities laws. The tokenizing process can not only be applied to physical assets but data streams as well, such as geospatial or scientific data from lunar surface exploration. Finally, DLT systems can be used as an open architecture encryption system to provide secure satellite communication including eventual commercial cis-lunar communication constellations. DLT can also be used data security and provenance as part of a contract, and enhance value sharing, as well as for data processing applications and in-space data storage.

# Creating Lunar Cultures: Fashion Shows on the Moon for QOL

H. Sugimoto<sup>1</sup>

<sup>1</sup>CREST ASTRA Japan, Japan

Correspondence: H. Sugimoto ([hiroki.sugimoto@crest-grp.com](mailto:hiroki.sugimoto@crest-grp.com))

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The development of a new economy, in general, starts with building infrastructure and finishes with cultivating the culture. However, it can be approached from the opposite way: from culture to infrastructure although there still needs minimum infrastructure, e.g., low-cost launch vehicles or a space station. Some lessons are learnt from case studies on Earth such as growth and prosperity of Soho around art, the impact of art on tourism and the local economy by art in Tokyo, and the value creation and marketing strategies of Pitti Immagine Uomo in Florence. Marketing, branding, and designing strategies can be used as a catalyst to rapidly grow the space industry by increasing the demands and derivations from other fields and accelerate the realization of a moon village. I.e., a new town can be formed around artists; new markets and contents will gather around art; and art is to be a great attraction for visitors. The proposal is to conduct fashion shows in space for the purpose of establishing a new culture, economy, and infrastructure in space. By doing so, there is going to be larger demands for space travel, higher incentives to expand the markets in space, and more resources to use to grow the space industry.