

BUSINESS INNOVATION SYMPOSIUM (E6)  
Poster Session (P)

Author: Mr. Soon-Young Park  
Korea Aerospace Research Institute (KARI), Korea, Republic of, psy@kari.re.kr

Prof. Jaemyung Ahn  
Korea Advanced Institute of Science and Technology (KAIST), Korea, Republic of,  
jaemyung.ahn@kaist.ac.kr

QUANTIFICATION OF SUSTAINABILITY OF SPACE INDUSTRY USING VALUE NETWORK  
MODEL

**Abstract**

One of major challenges that a systems engineer during the conceptual design phase is faced with is that the architectural options associated with various decisions should be explored and selected with very limited set of information and large uncertainty. For complex long-term projects with numerous stakeholder groups such as the research and development of a new space launch vehicle, in particular, it is critical to make sure that the perspective of the sustainability be included as one of criteria for architecture trades. An approach without careful consideration of these long-term objectives often leads to a design solution that is vulnerable to environmental changes such as an economic downturn and a scientific paradigm shift – i.e., that lacks the flexibility to manage the changes. In this point, the definition of the sustainability of the space industry has to be settled down elaborately in a quantitative manner for the further discussion of the long-termed optimization of architecture selection.

In this study, we first elicited the stakeholders of the complex engineering project and defined the sustainability of it in a quantitative way using the value network model. In the value network model, different types of values such as fund, job opportunities, technical advancement, and political interest are considered for each stakeholder group, and the exchanges of these values among the groups were modeled using the graph theory. After that, the net value stream flux of each stakeholder was quantified, and the sustainability was defined by the positive definiteness of the individual flux. This definition of sustainability enables us to reveal the virtuous cycle of value stream through the stakeholders by which makes them more vigorous throughout the entire life cycle. A broader and long-termed architecture selection framework for the complex engineering project using this definition of quantitative sustainability of complex engineering project was proposed.