

Understanding the Rocket Economy

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Introduction

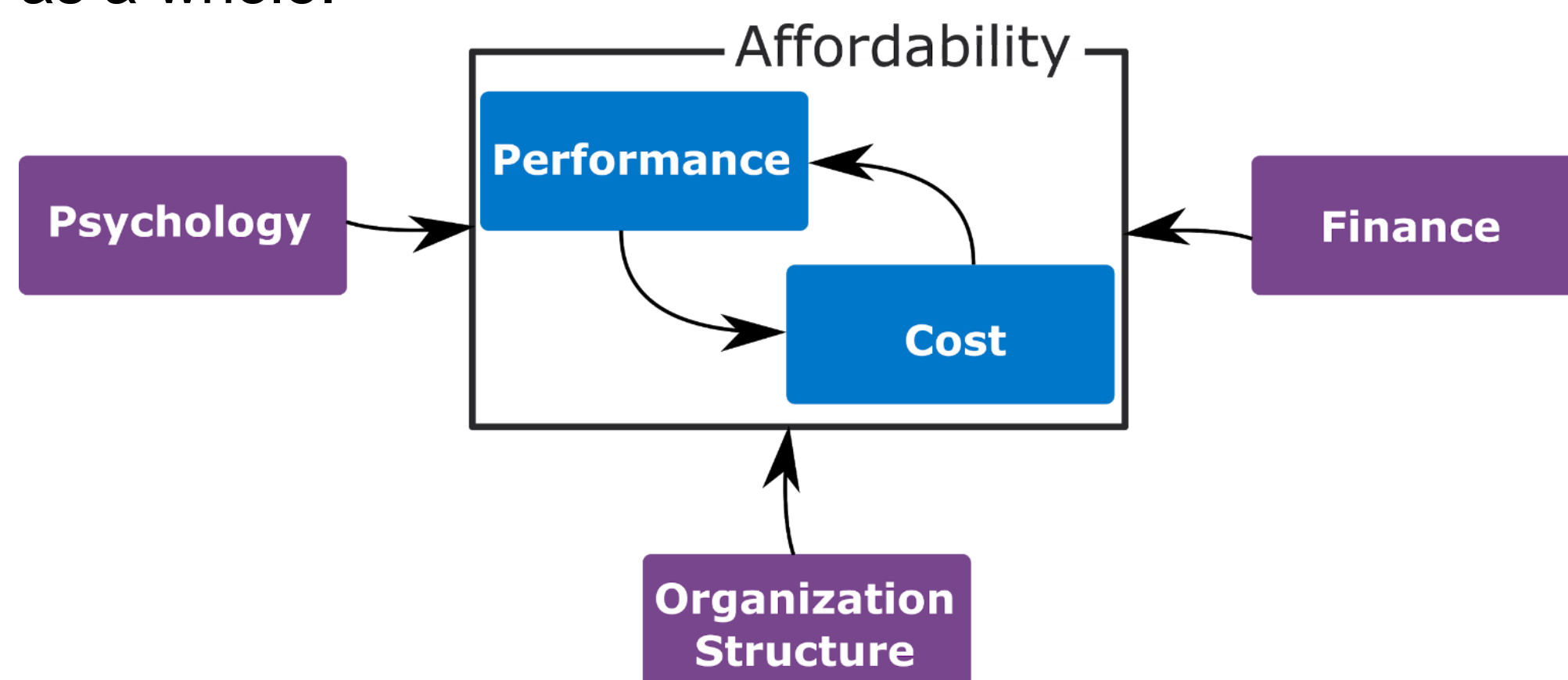
Affordability analysis involves the study of the interrelatedness of a system's performance and cost. By studying both performance and cost, affordability analysis can enable a broader, system-level view of an engineering product; however, without a system-level approach to cost itself, the full potential of affordability analysis will not be reached.



Image credit: Nasa.gov

Background

Cost is highly complex, and typical methods for modeling it often poorly predict costs for future systems [1]. Affordability analysis must draw on knowledge from fields too often ignored in engineering to close this gap. Motivation theory, for instance, provides a framework for studying how productive a workforce may be and what affects it, potentially influencing both major components of affordability. Product cost can also be influenced by preexisting financial conditions of a company. The cost of a product must cover not only production, but the cost of development and operating expenses of the company as a whole.



References:

- [1] Keller, S., Collopy, P., & Compton, P. (2014). What is wrong with space system cost models? A survey and assessment of cost estimating approaches. *Acta Astronautica*, 93, 345-351.
- [2] Harbaugh, J. (2018). "The Great Escape: SLS Provides Power for Missions to the Moon". NASA. <https://www.nasa.gov/exploration/systems/sls/to-the-moon.html>
- [3] Strickland, J. (2013). "Revisiting SLS/Orion Launch Costs". <http://www.thespacereview.com/article/2330/1>
- [4] SpaceX (2018). "Capabilities & Services". [https://www.spacex.com/about/capabilities\\$](https://www.spacex.com/about/capabilities$)
- [5] Sheetz, M. (2018). "Elon Musk says the new SpaceX Falcon Heavy rocket crushes its competition on cost". CNBC. <https://www.cnbc.com/2018/02/12/elon-musk-spacex-falcon-heavy-costs-150-million-at-most.html>

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Image credit: Nasa.gov

SLS Block 1

Projections:

Payload to LEO: 95,000kg [2]

Launch Cost: >\$1 Billion [3]



Image credit: SpaceX

Falcon Heavy

Projections:

Payload to LEO: 63,800kg [4]

Launch Cost: \$90-150 Million [5]

Ongoing Work

This examination of outside factors in rocket affordability is part of a broader study of the rocket economy as a whole. Rocket performance analysis, expert interviews, value modeling, and decision process modeling all contribute to a holistic view of system-level affordability.

