

EE584 – S/C Design and Systems Engineering

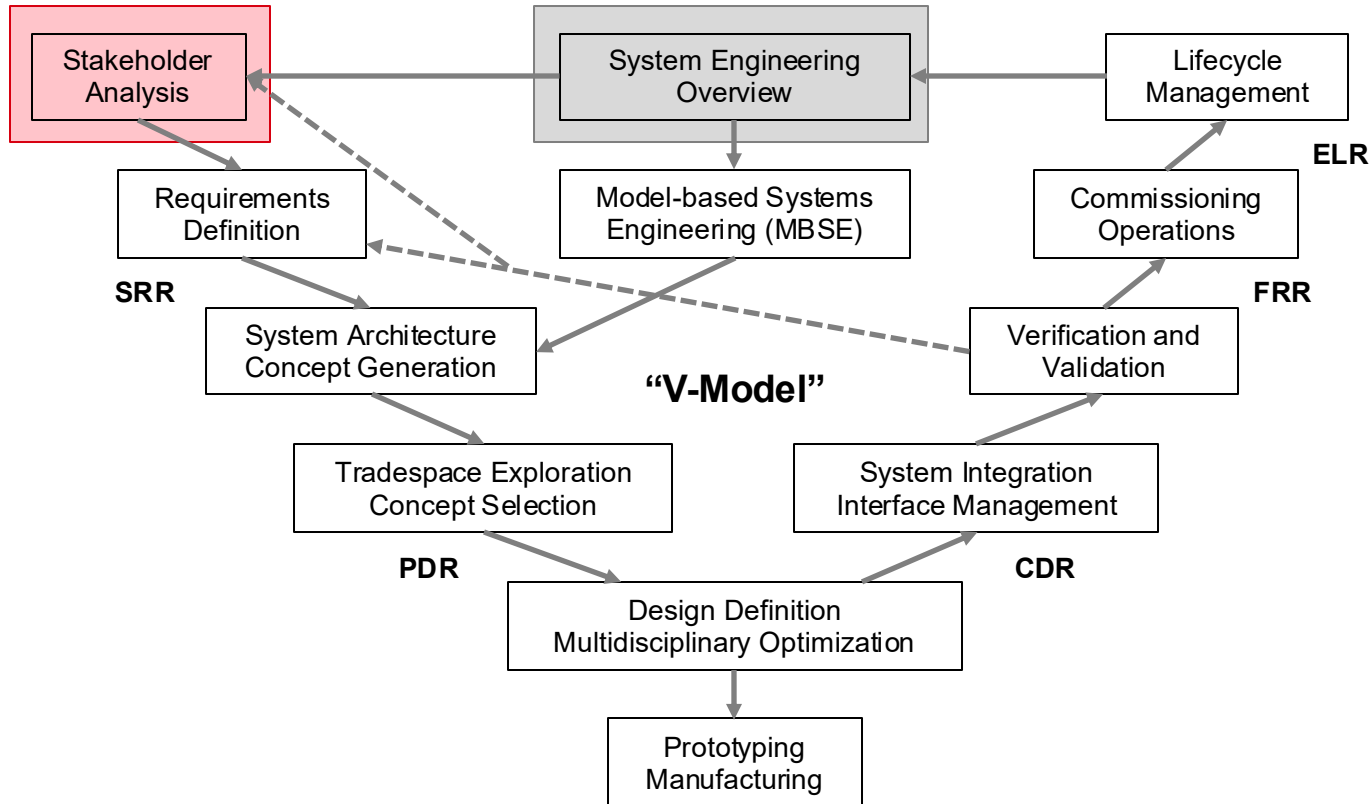
Lecture 2

Stakeholders

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*Based on the lecture “Fundamentals of Systems Engineering”
By Prof. Olivier L. de Weck MIT/EPFL*

The “V-Model” of Systems Engineering



Overview

- **Stakeholder Analysis**
 - Identifying Stakeholders
 - CONOPS
 - Stakeholder Value Network (SVN) Analysis

Stakeholder

- A person with an interest or concern in something, especially a business.

Oxford Dictionary

- A person or organisation with a legitimate interest in a given situation, action or enterprise.

Wiktionary

Concept Question

- Before rushing to propose or design something we need to spend considerable amount of time **engaging with stakeholders**, Why?
- Pick what you think is the most important reason
 - Because they have the funds
 - Because we need to understand their needs first
 - Who is my competition?
 - Need to understand regulations and laws
 - Other

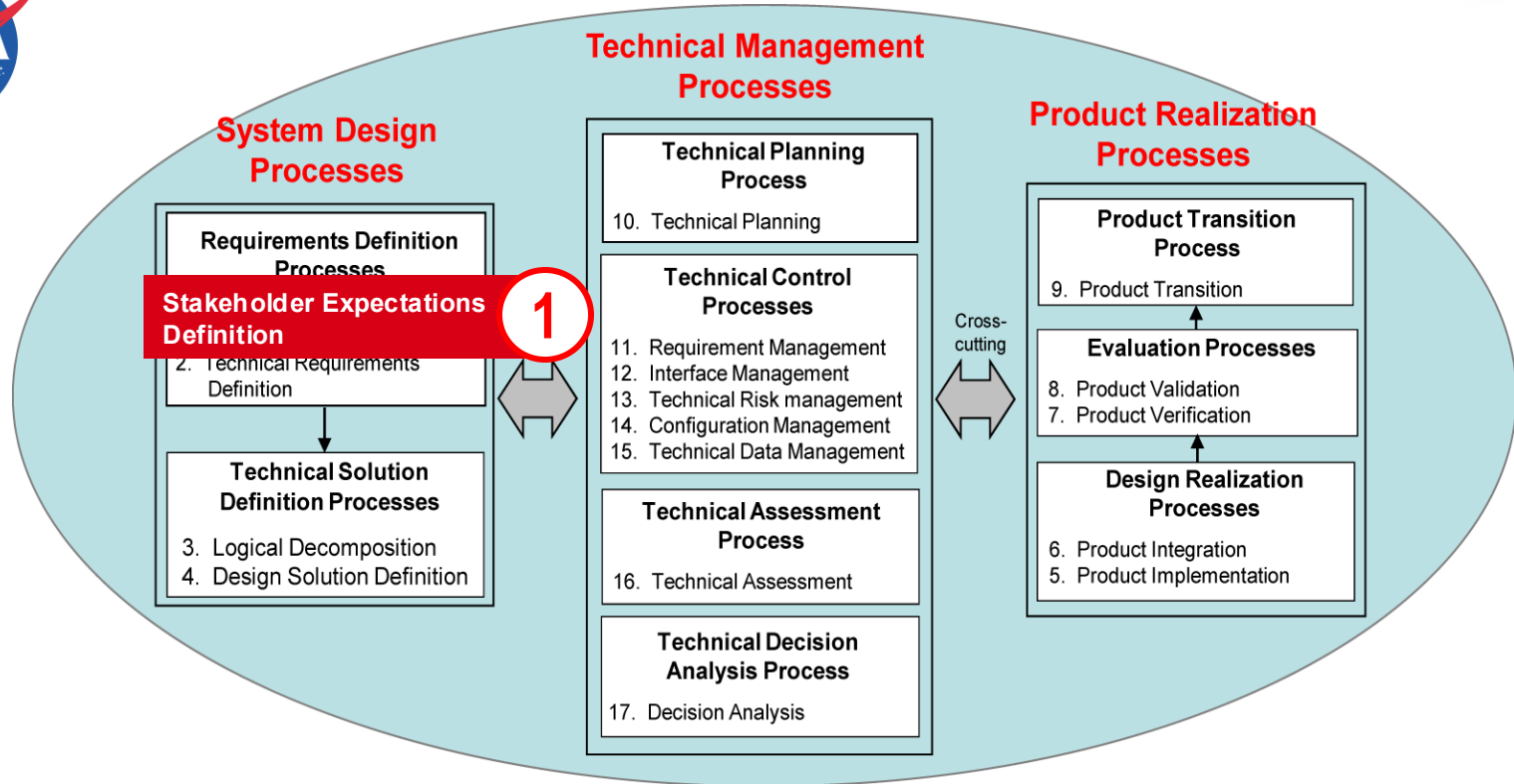
Submit your answer within
1 minute at the following URL

<http://tiny.cc/seintro02>

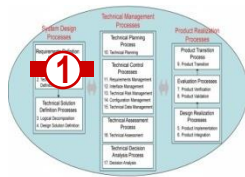


NASA view of stakeholder process

Stakeholder Expectations Definition Process

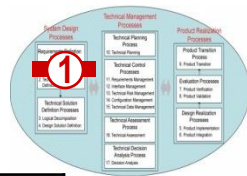


Who is a Stakeholder?



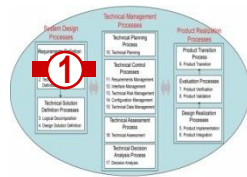
- A group or an individual who is **affected by** or is in some way **accountable** for the outcome of an undertaking
- **Stakeholders** can be classified as:
 - **Customers** – An organization or individual that has **requested** a product and will **receive** the product to be delivered. Examples:
 - An end user of the product
 - The acquiring agent for the end user
 - The requestor of the work product from a technical effort
 - **Other interested parties** who provide broad overarching **constraints** within which the customers' needs must be achieved, or who **have influence** on success of the system. Examples:
 - Those affected by the resulting product
 - Those affected by the manner in which the product is realized or used
 - Those who have a responsibility for providing life-cycle support services (e.g. design, manufacturing, operations, maintenance)

Examples of Stakeholders



Relative to Org.	Stakeholder	Typical Expectations
External	Customer	Expected level of product quality, delivered on time, affordable, life cycle support & services
	Subcontractors/vendors	Well defined requirements
	Local, State, National Public	Products must not contaminate the environment
Internal	Organization Management	Internal Commitments met (cost, schedule), good status provided, compliance with org. policies, directives and procedures
	Project Management	Expected technical work products delivered on time and can be used for decision making
	Technical Team members	Clear tasks, job security, rewards, teamwork
	Functional Organizations (e.g. test)	Test support products available, clear test requirements, recognition for project help

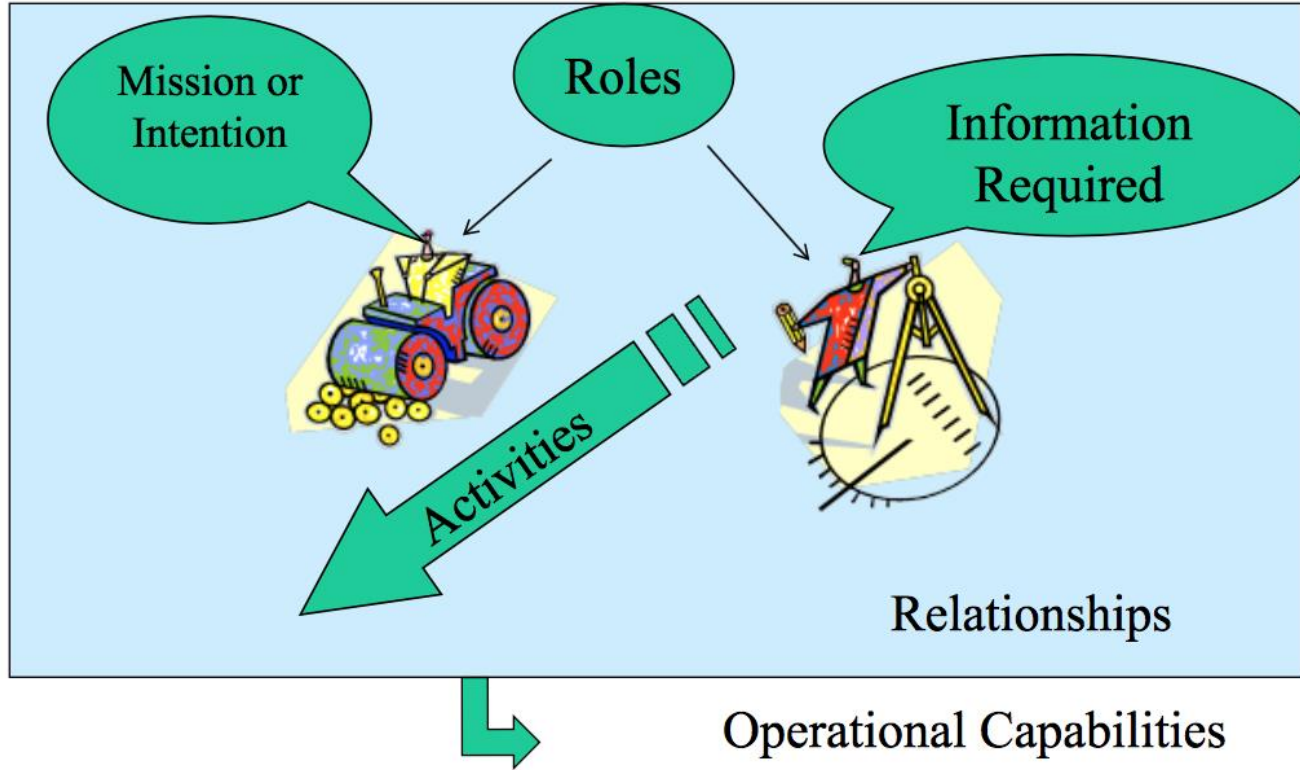
Concept of Operations (ConOps)



- One of the major outputs for capturing stakeholder expectations is the Concept of Operations or “**ConOps**”
- The ConOps is an important **component** in capturing expectations, forming requirements and developing the architecture of a project or system
- Should be addressed early in the project
- Thinking through the ConOps and use cases often **reveals** requirements and functions that might be otherwise **overlooked**

The CONOPS

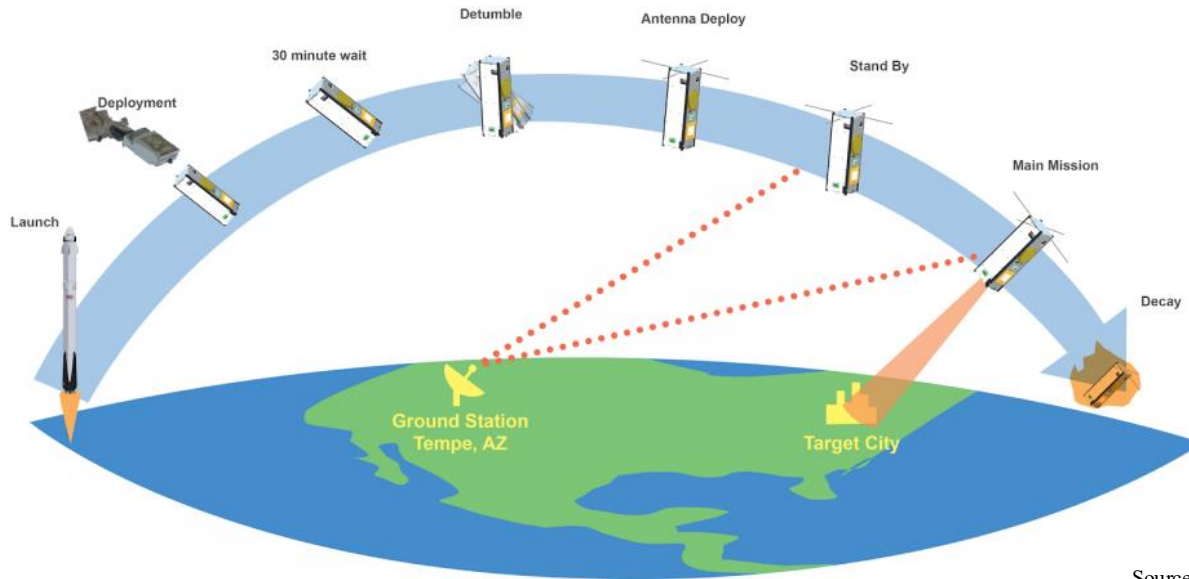
Reference: J. F. Laquinto INCOSE 2012



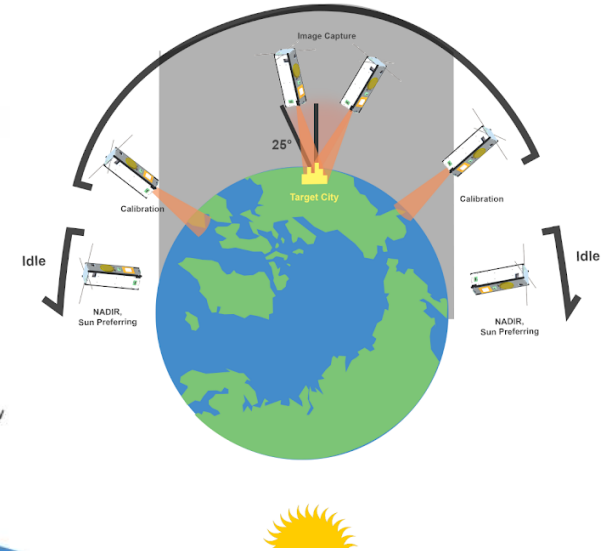
Example CONOPS:

Phoenix CubeSat

Initial Operations Phase



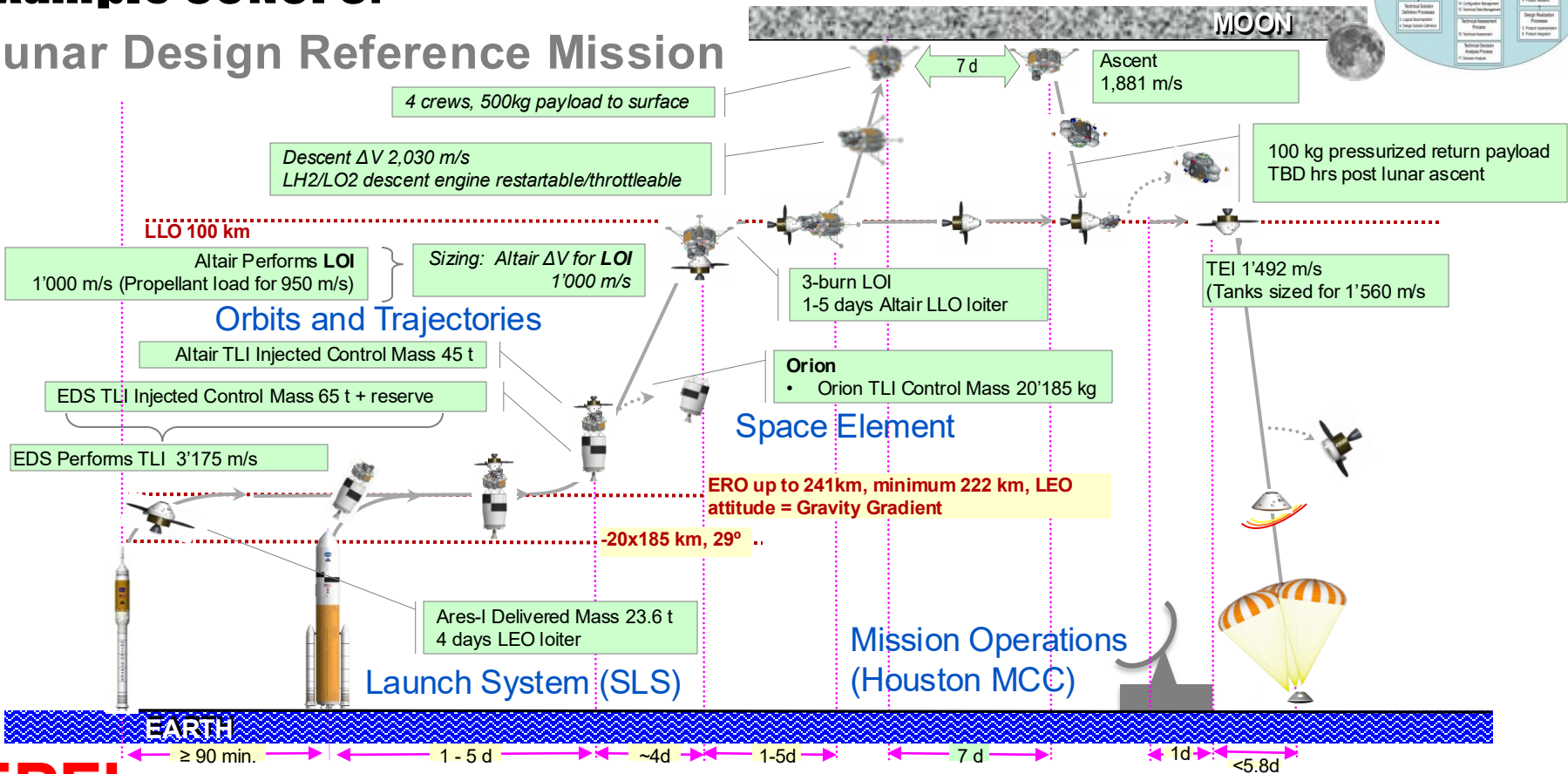
Imaging Operations



Source: Arizona State University (<http://phxcubesat.asu.edu/ConOps>)

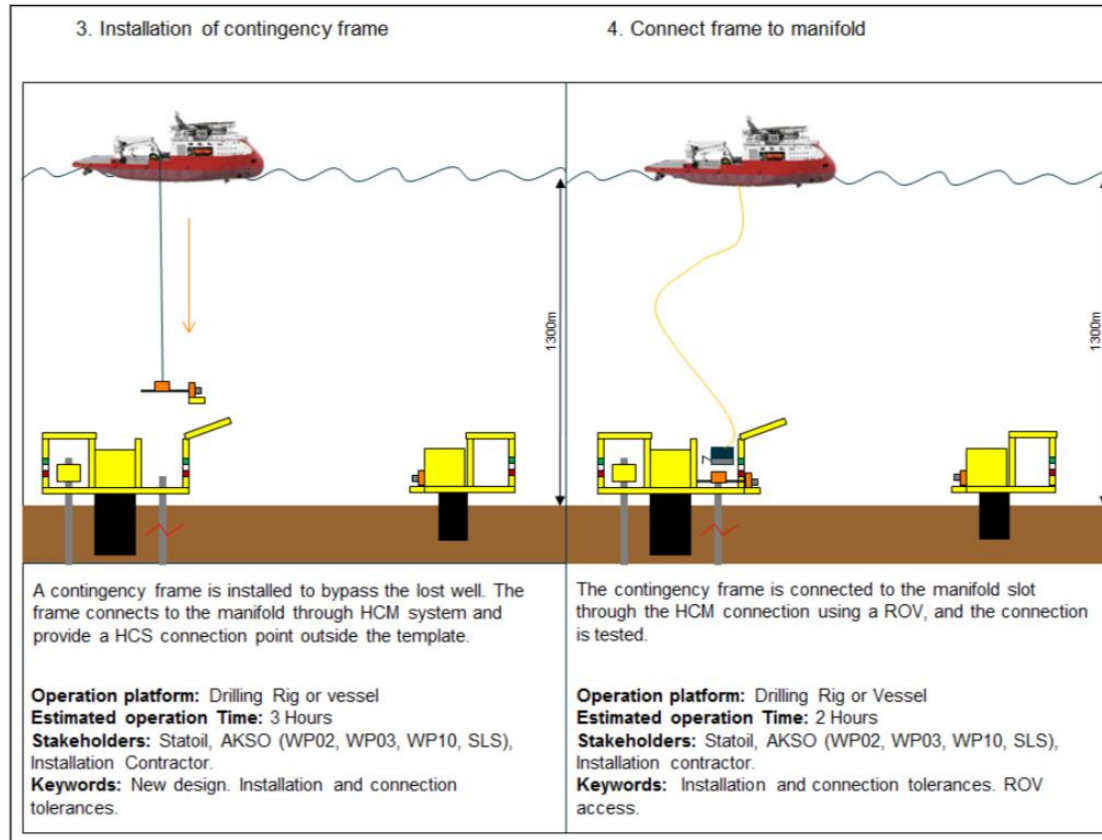
Example CONOPS:

Lunar Design Reference Mission



Example CONOPS:

Deep-water subsea production system (step 3 and 4)

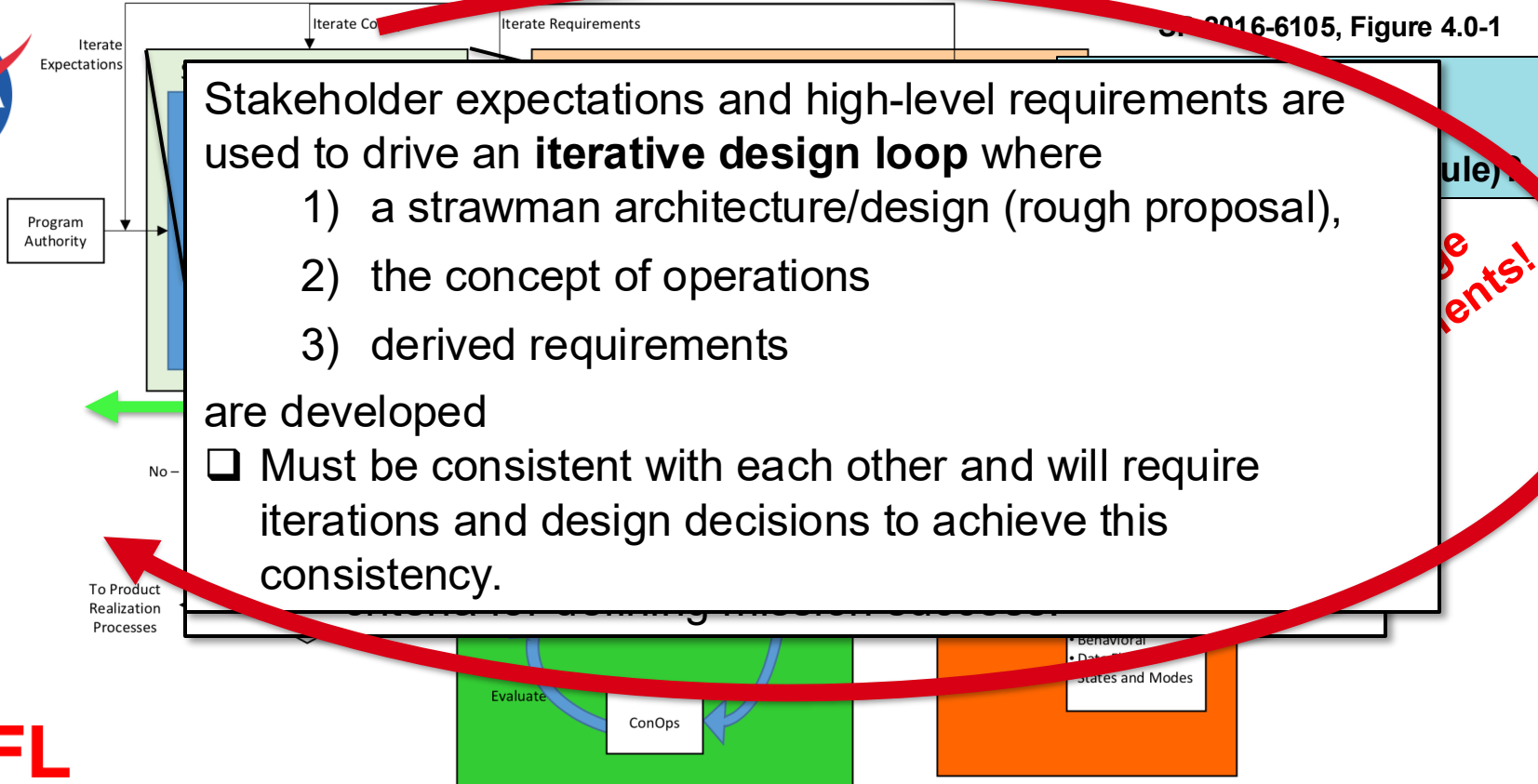


Reference: H. Soli et al., 26th Annual INCOSE International Symposium (IS 2016)

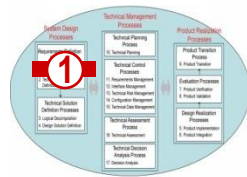
Relationships among the upstream System Design Processes



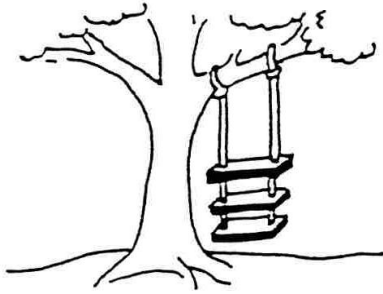
SPR-2016-6105, Figure 4.0-1



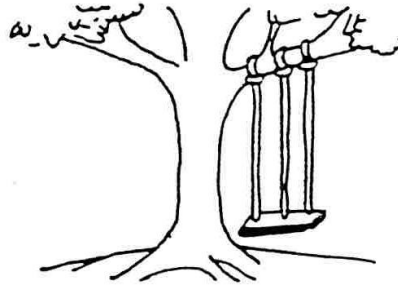
What are the Benefits of the Stakeholder Expectations Process?



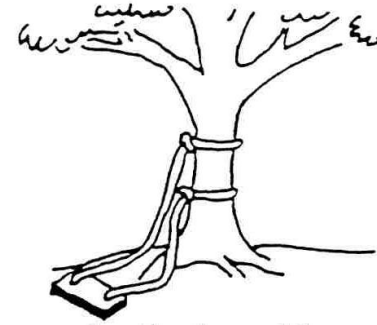
- Build a system that meets customers' **expectations**
 - Operators requirements
 - Support from Government and Public
- Build a system that can be **tested, operated and maintained**
- Ensure Stakeholder **commitments** are obtained and realized.



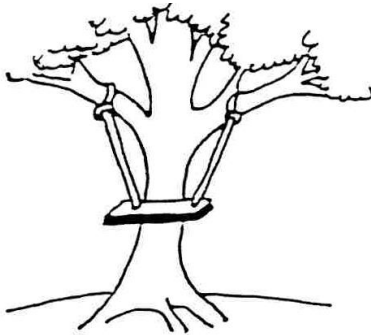
What was sold



What management approved



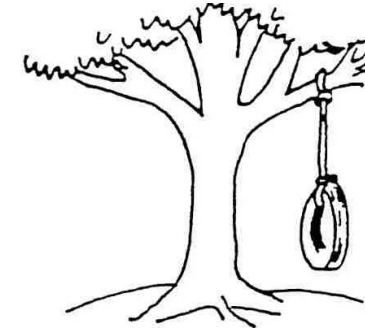
As designed by engineering



What was manufactured



What was integrated



What the customer wanted

Stakeholder Value Network (SVN) Modeling

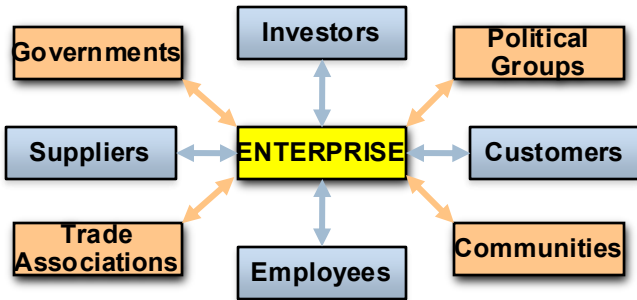
Most stakeholder models only focus on a single focal organization and ignore the indirect relationships amongst other stakeholders. This can lead to project failures if not recognized. Stakeholder Value Network (SVN) models attempt to capture these 2nd order effects and value loops.

Based on the PhD Thesis of Dr. Wen Feng

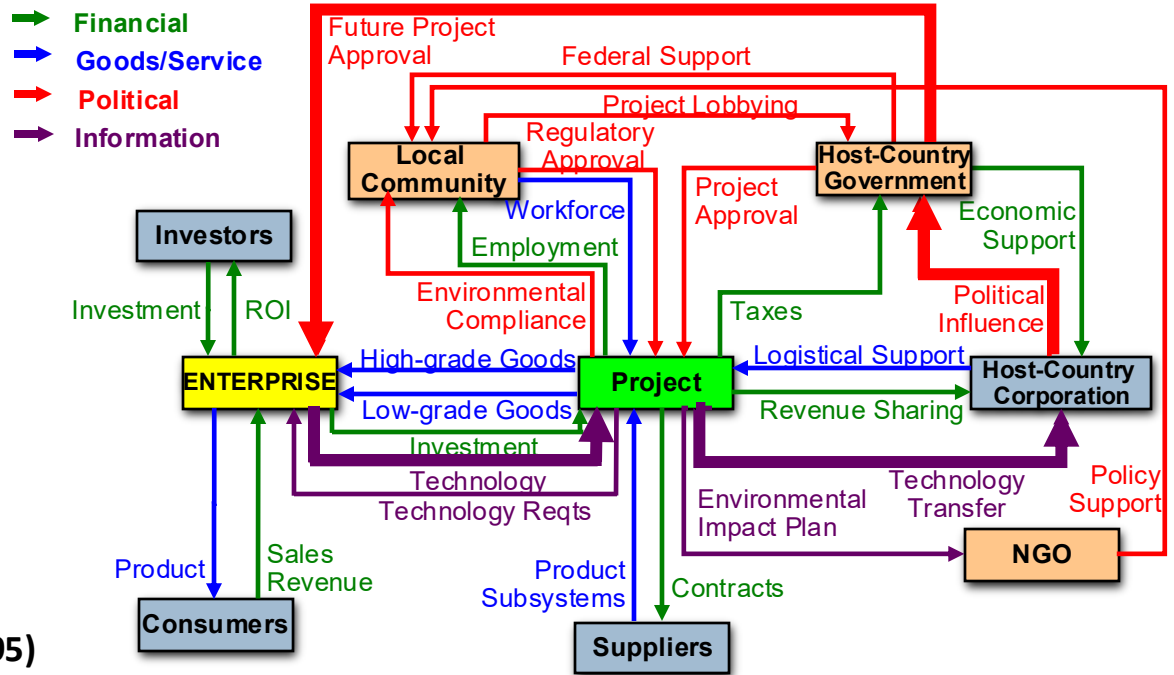
Reading [1d] summarizes this approach: Feng W., Crawley E.F., de Weck O.L., Keller R., Robinson R., “Dependency Structure Matrix Modeling for Stakeholder Value Networks”, 12th International Dependency and Structure Modeling Conference, DSM’10, Cambridge, UK, 22-23 July 2010

Stakeholder Value Network (SVN) Modeling

- Market Stakeholders
- Nonmarket Stakeholders
- The Focal Organization



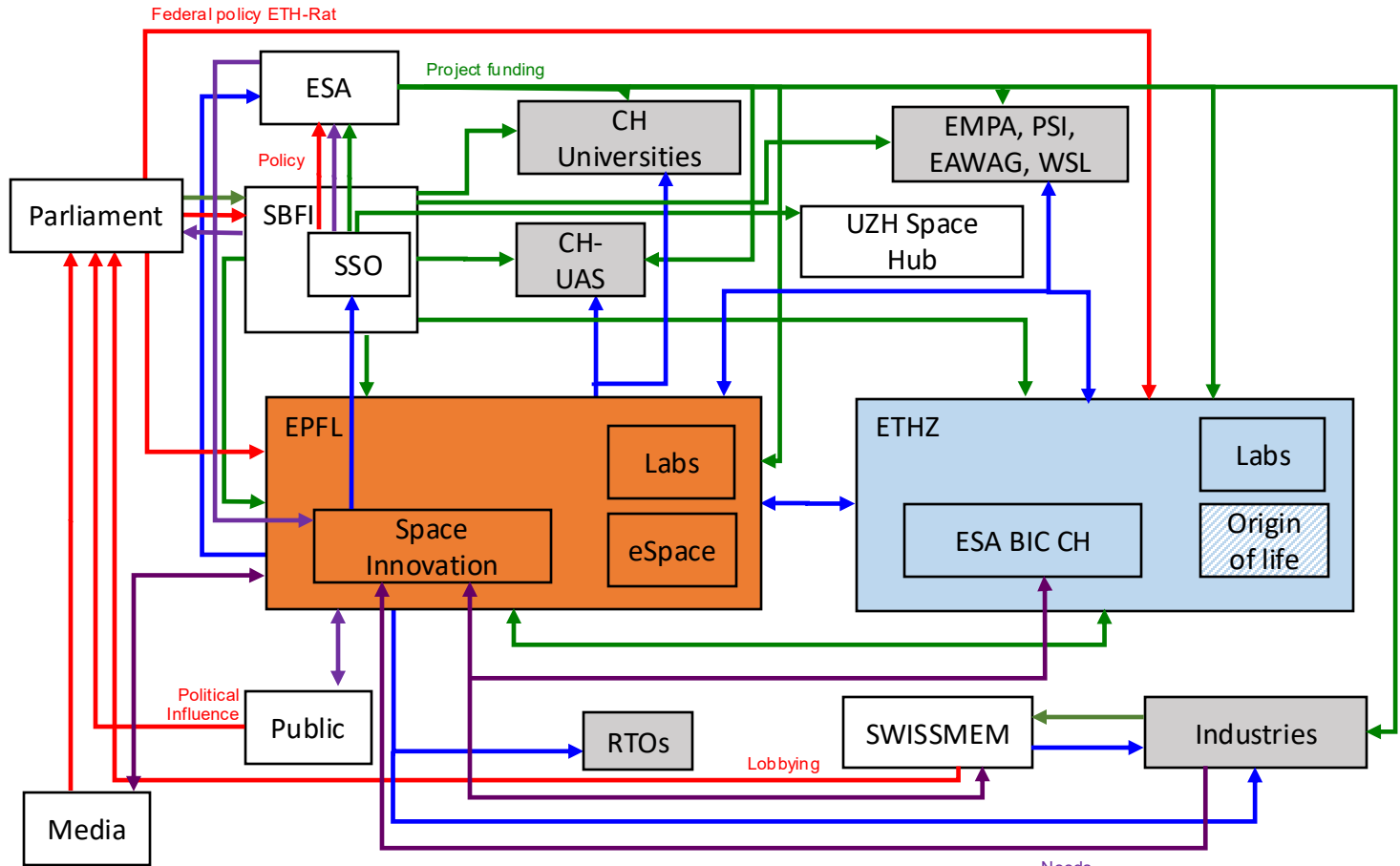
“Hub-and-Spoke” Stakeholder Model
(Adapted from Donaldson and Preston, 1995)



Stakeholder Value Network
(Feng, Cameron, and Crawley, 2008)

Current CH-Stakeholder Interconnections

- Political
- Information
- Goods/Service
- Financial

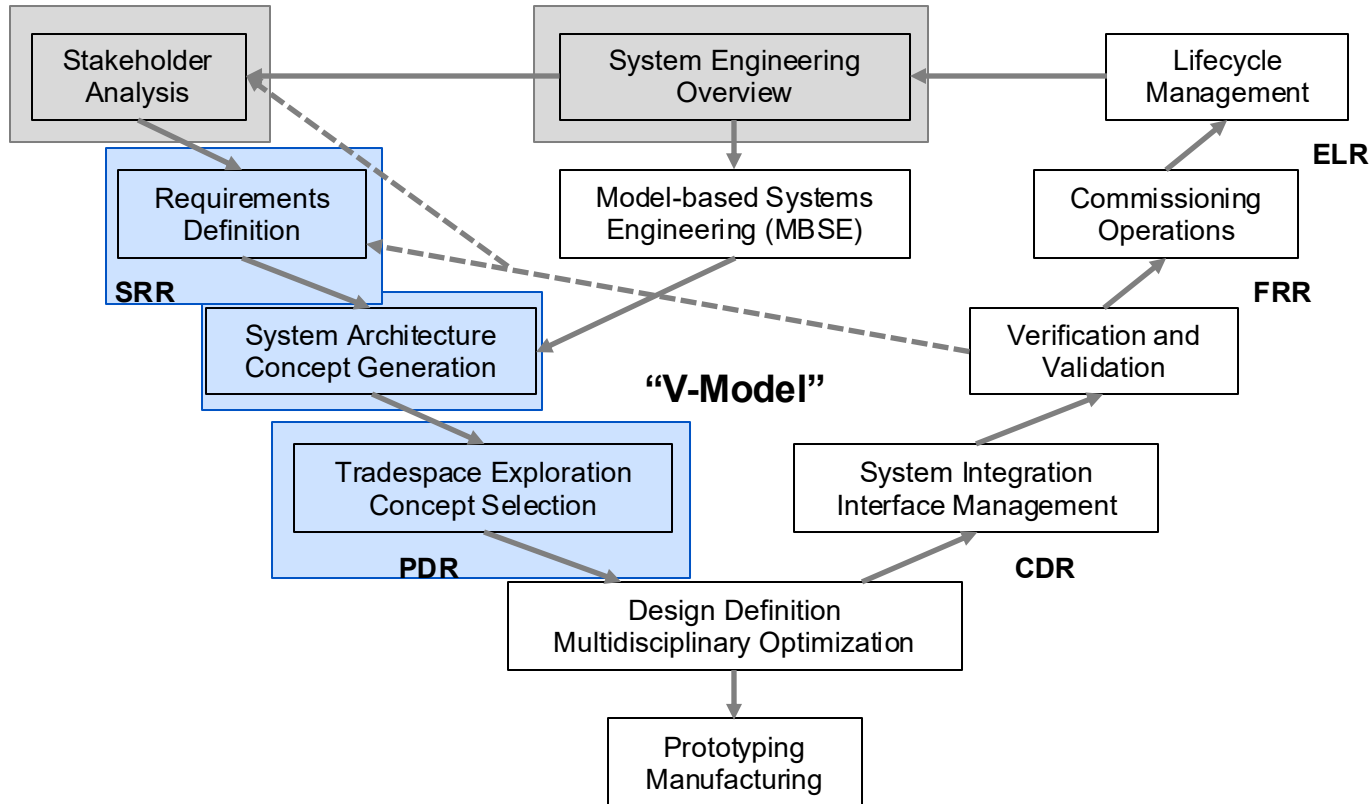


Summary : Stakeholder Analysis

- **Identifying all the Stakeholders for a project or undertaking upfront is critical**
 - List them first (with names, positions)
 - Draw a network diagram (incl. indirect relationships)
- **Elicit Stakeholder Needs**
 - Interviews, Surveys, Negotiations
 - Read documents from past, similar projects
 - Carefully read solicitations (e.g. ESA-STAR, ...) for new projects
- **Explicit Modeling of Stakeholder Needs**
 - ConOps (NASA) → how will the system be used?
 - Stakeholder value networks (MIT Approach) → where is the value?
 - ID stakeholder ranking, ranked value flows ...

The “V-Model” of Systems Engineering

➡ NEXT SESSION



Questions to be asked

- **Why** are we doing the project? → **Stakeholder Analysis**
- **What** must we achieve? → **Requirements Definition**



Start to think for next time!