Essence for Systems Engineering (Systems Engineering Essence)

INCOSE
Russian
Chapter

Berlin
20 June 2013

Context

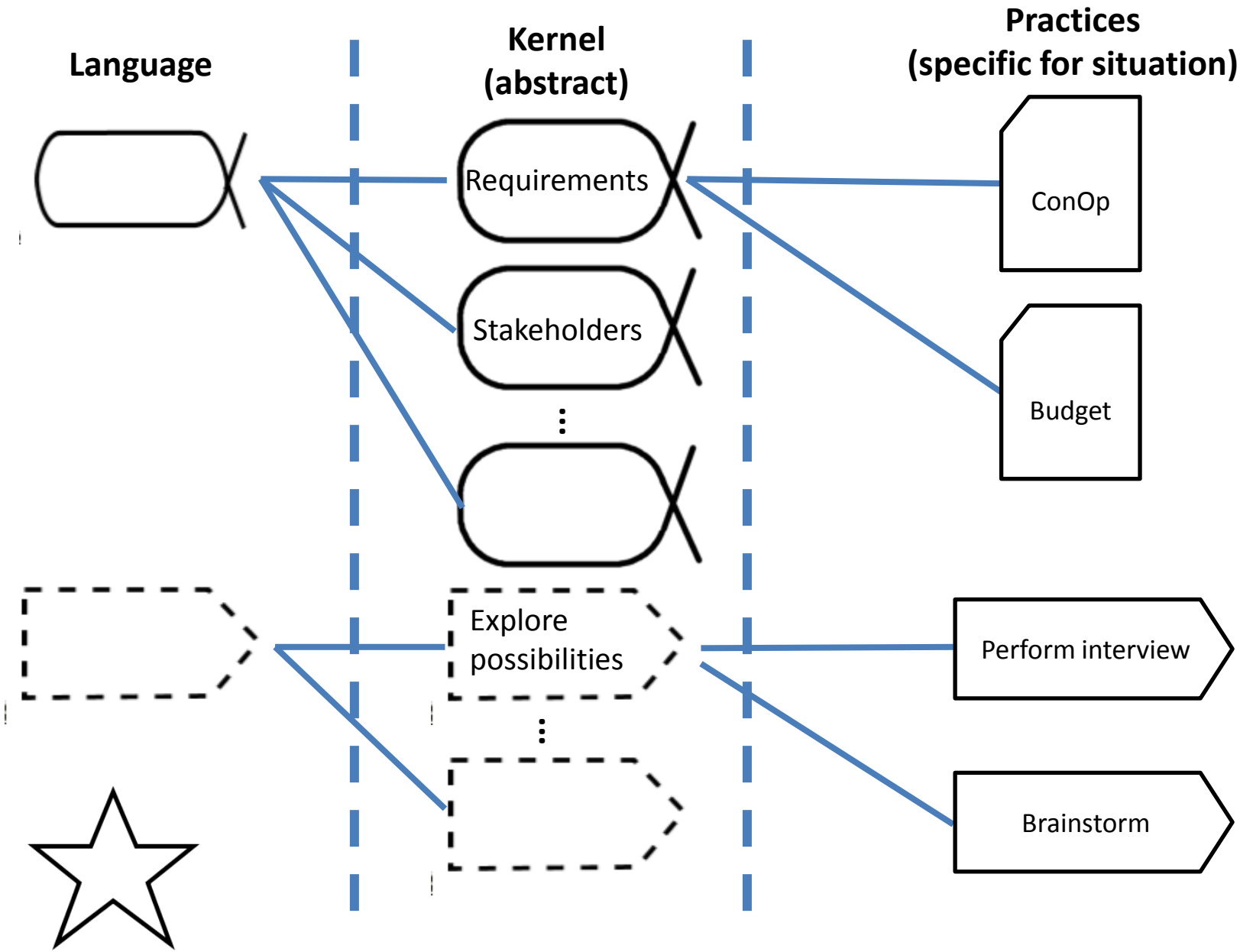
Roadmap (http://semat.org/?p=863):

- 1st of August 2013 – define model and architecture ontological status in the Essence
- 1st of September 2013 – publish first draft of the Essence kernel extension for Systems Engineering
- 1st of December 2013 – map Essence Systems Engineering kernel elements to ISO 15926
- End of December 2013 – publish first version of the “Essence systems engineering kernel elements (mapped to the ISO 15926)”

Achievements:

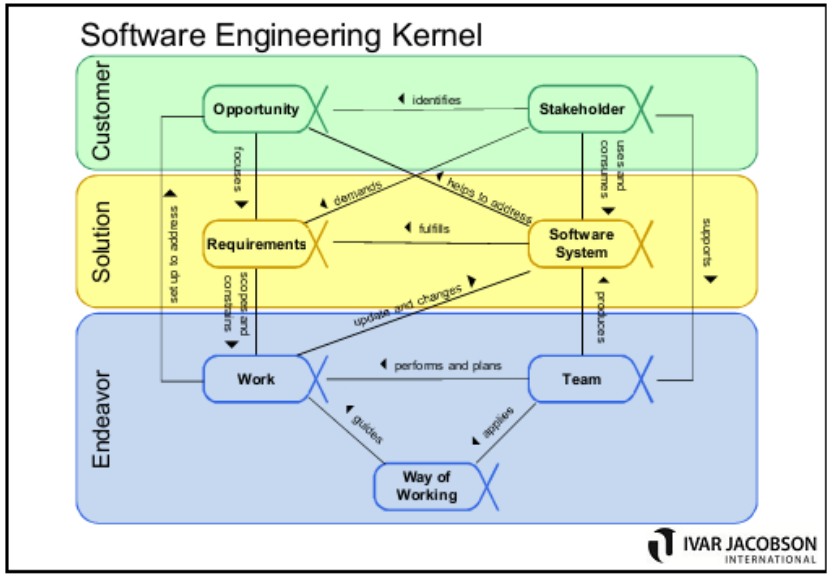
- Proposal discussed at the INCOSE Russian Chapter on 22nd of May 2013 (http://incose-ru.livejournal.com/42524.html).
- Proposal disussed at MESI conference on 6-7th of June 2013 (http://www.mesi.ru/our/events/detail/121699/) with Ivar Jacobson and wider audience.

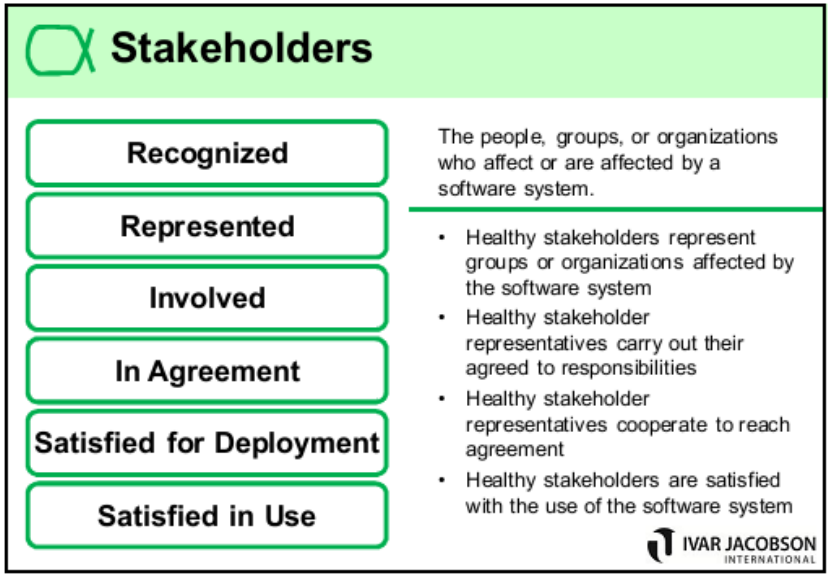
Language, kernel, practice

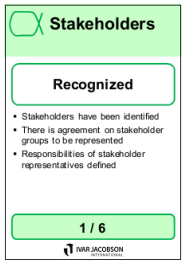


Alpha: states = checklists : checkpoints

ALPHA -- Abstract-Level Progress Health Attribute.







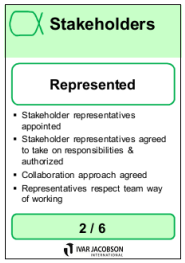
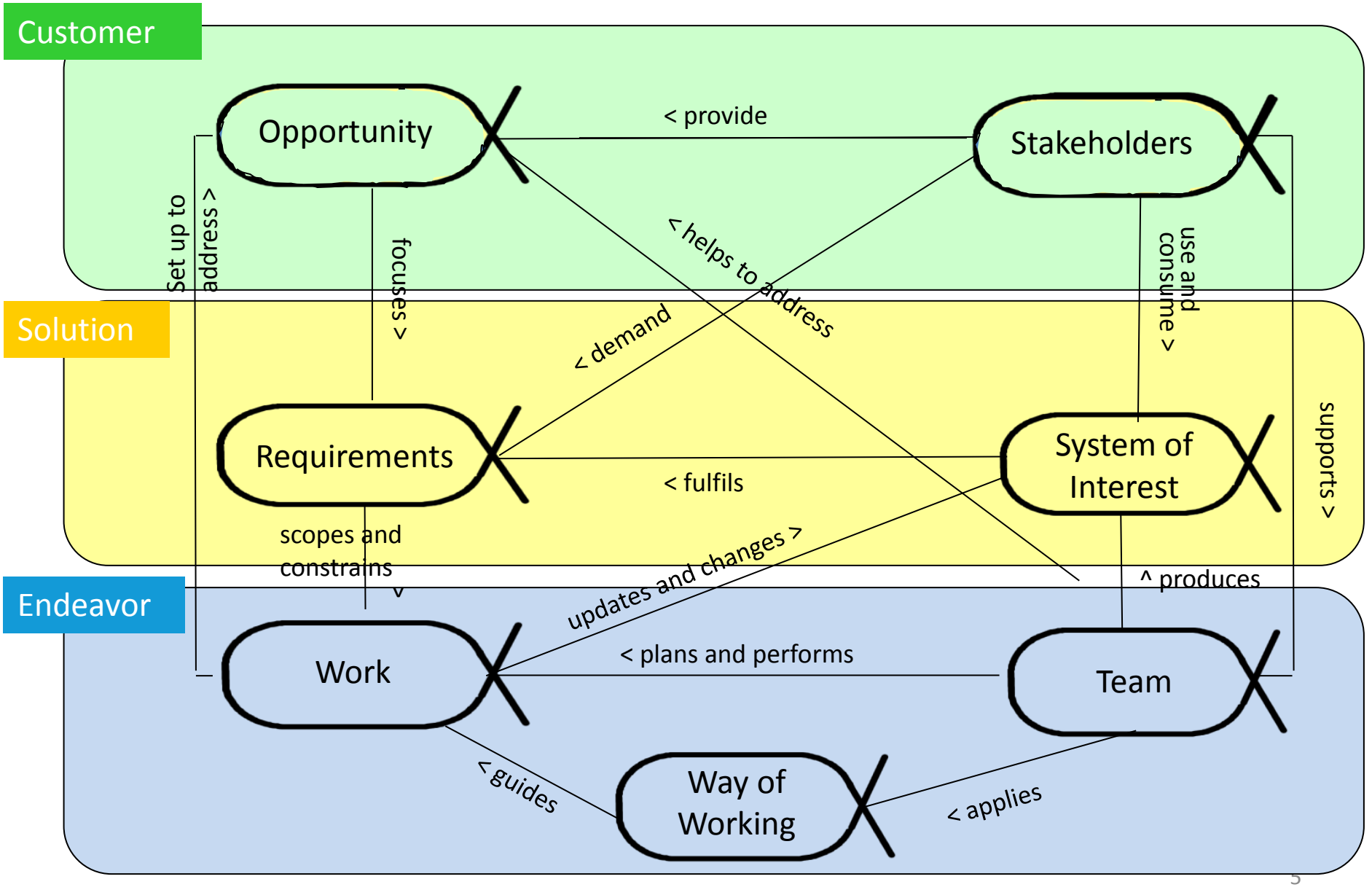


Table 8 – Checklist for Stakeholders

State	Checklist
Recognized	All the different groups of stakeholders that are, or will be, affected by the development and operation of the software system are identified. There is agreement on the stakeholder groups to be represented. At a minimum, the stakeholders groups that fund, use, support, and maintain the system have been considered. The responsibilities of the stakeholder representatives have been defined.
Represented	The stakeholder representatives have agreed to take on their responsibilities. The stakeholder representatives are authorized to carry out their responsibilities. The collaboration approach among the stakeholder representatives has been agreed. The stakeholder representatives support and respect the team's way of working.

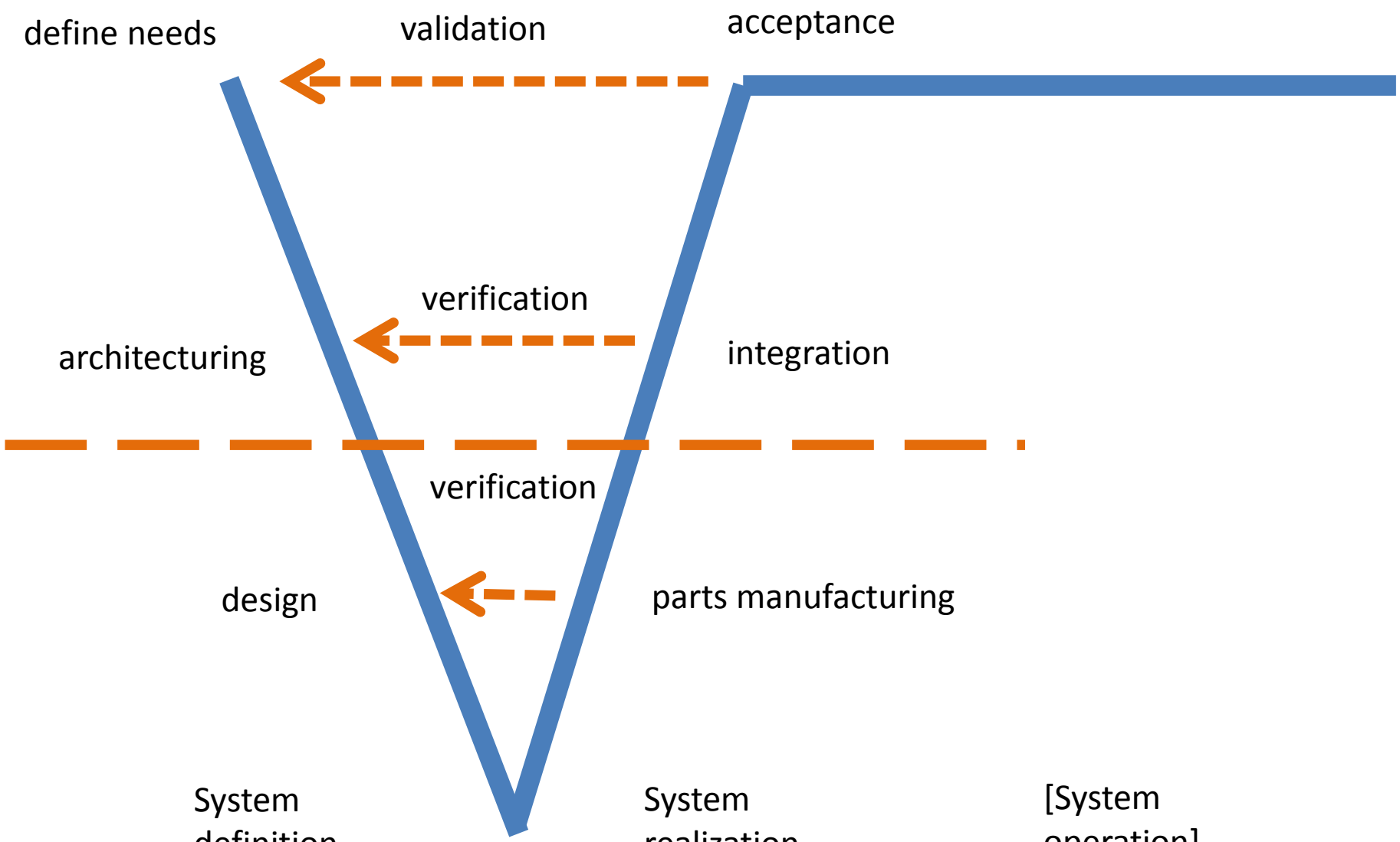
Engineering project alphas: as is



Systems engineering

- Intuition: V-model
- Focus on system definition (more resources to define the system, i.e. more work with bits rather than atoms)
- Agile in the work with bits, cascade in the work with atoms.
- Architecture and design are of the same importance as requirements (constraints to design solutions, focusing in Essence terms).

2D representation of Life Cycle: practices executed in time



Requirements, Architecture, Design and System: state redistribution is needed

System definition (bit)

System implementation (atoms)

*Requirements defined

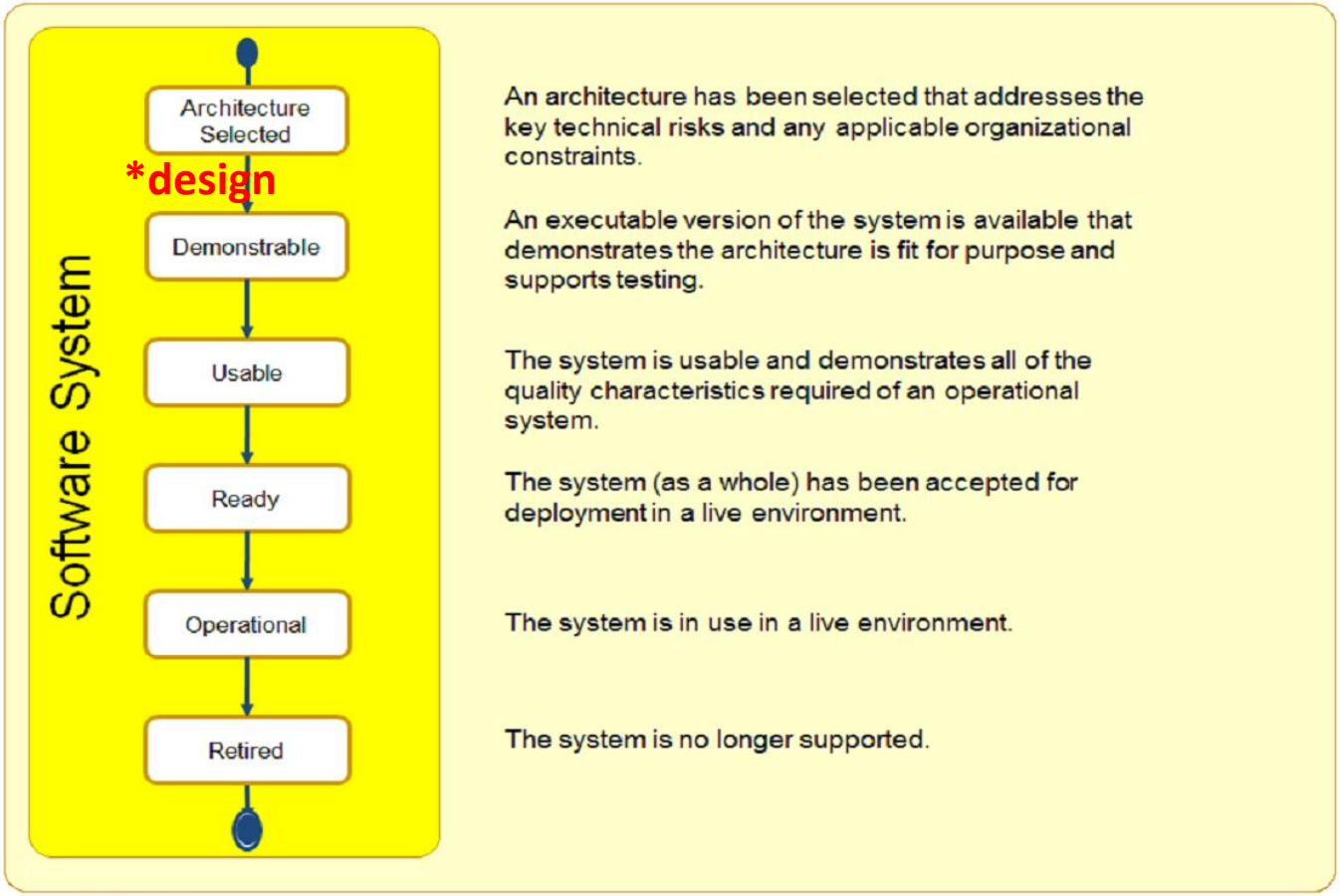


Figure 12 – The states of the Software System

Essence and Architecture

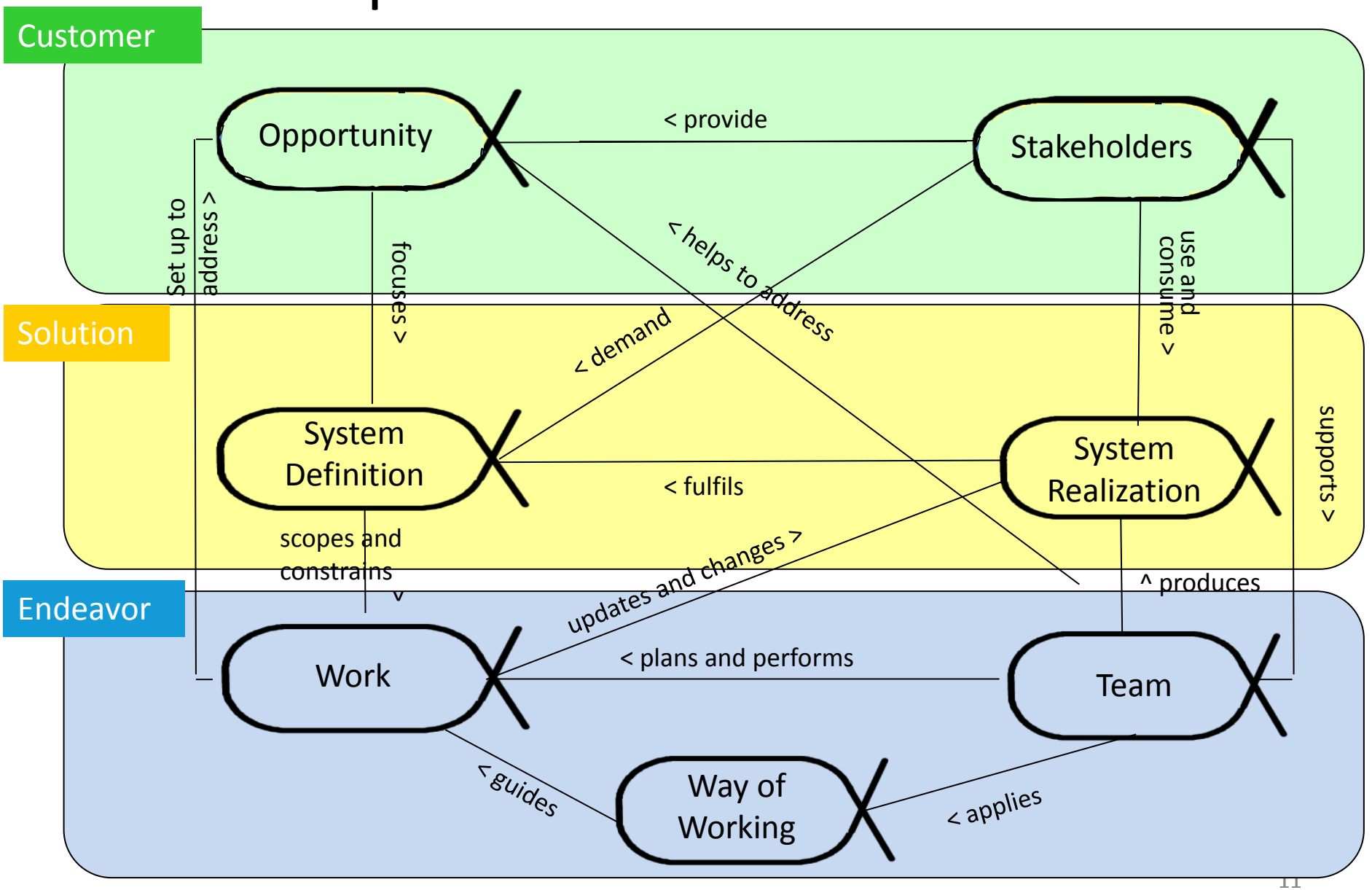
- Not present in current standard as alpha: «architecture wasn't addressed explicitly in many software projects»
- Required by systems engineering methodology (design should be architectural)
- Current Essence kernel choices for architecture modeling:
  - Architecture is an independent alpha
  - Architecture is a sub-alpha of alpha "System"
  - Architecture is a pattern

Trade-off options

- System **definition** (result of system definition activities in V-diagram) alpha with requirements, architecture and design as sub-alphas (with system **descriptions** as work products): with redistribution of states from System **realization** alpha

- Architecture and design as first class kernel alphas
- Architecture and design as sub-alpha of system
- Architecture as Patterns (according to Ian Dietz – link between requirements and system like GORE patterns is link between Opportunities/Goals and Requirements)

Proposal: kernel modification

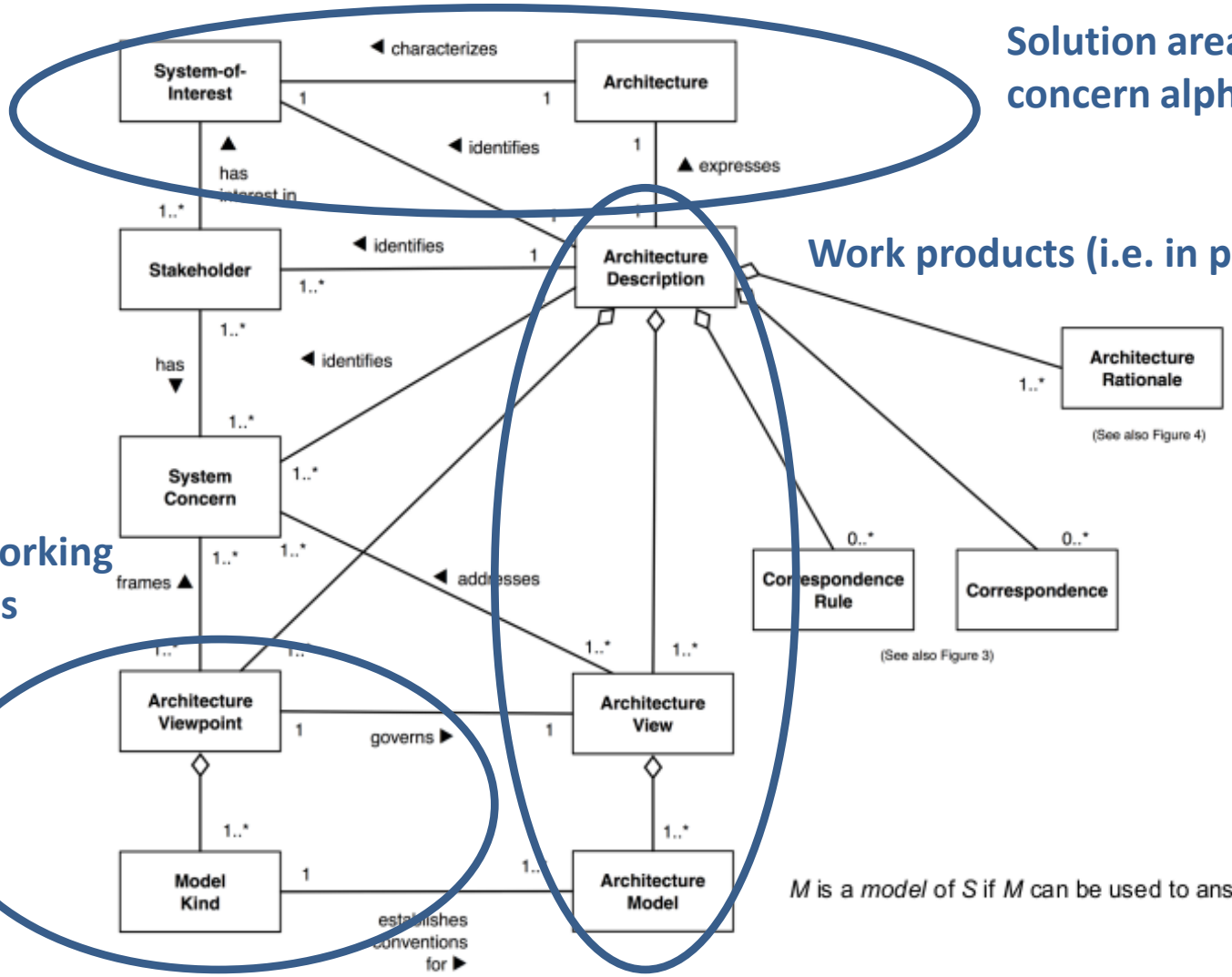


System Definition vs System Realization

- System Definition = Requirements, Architecture, Design
- Composed from models that grouped by views – generalized from ISO 42010
- System definition frameworks are sub-alphas of way-of-working (generalized from ISO 42010 architectural framework)
- System definition languages are sub-alphas of way-of-working too («language» is a practice in a method aka «resource» - «language» in ISO 24744)

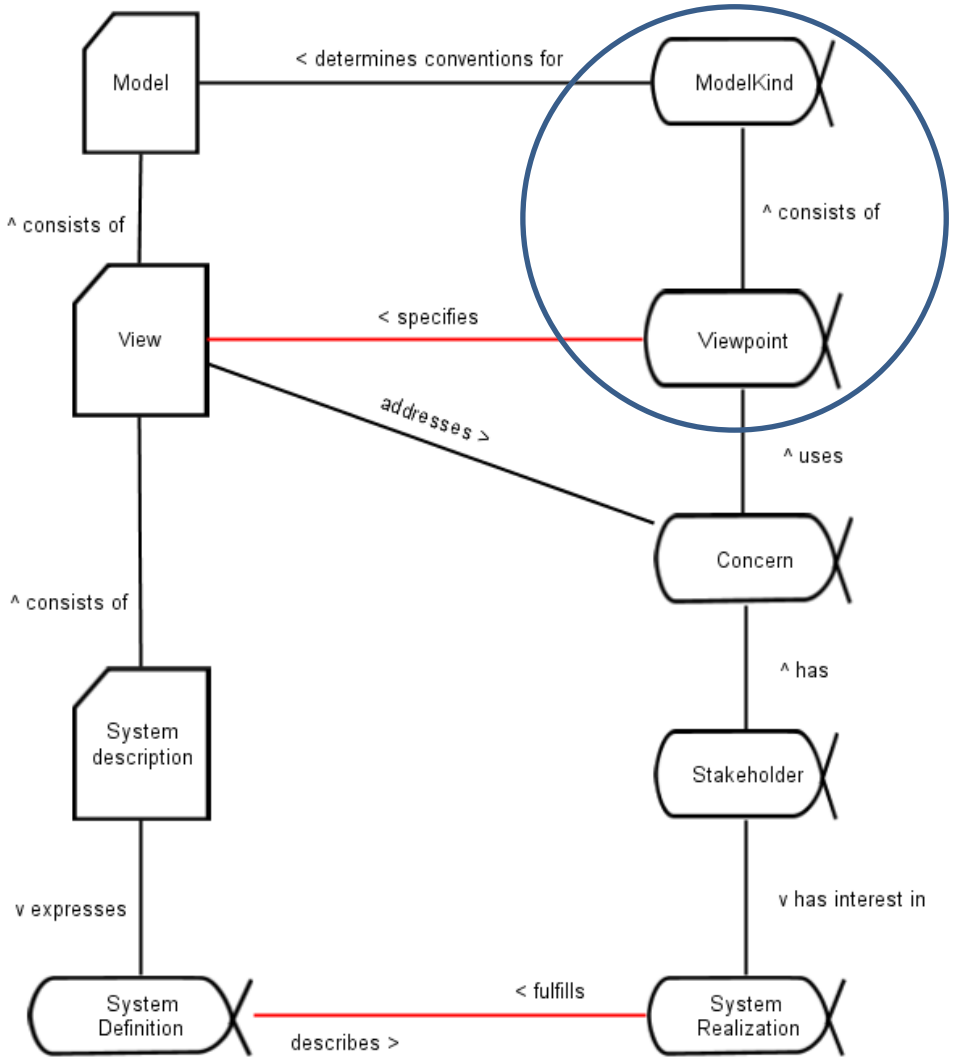
ISO 42010

Map to Essence



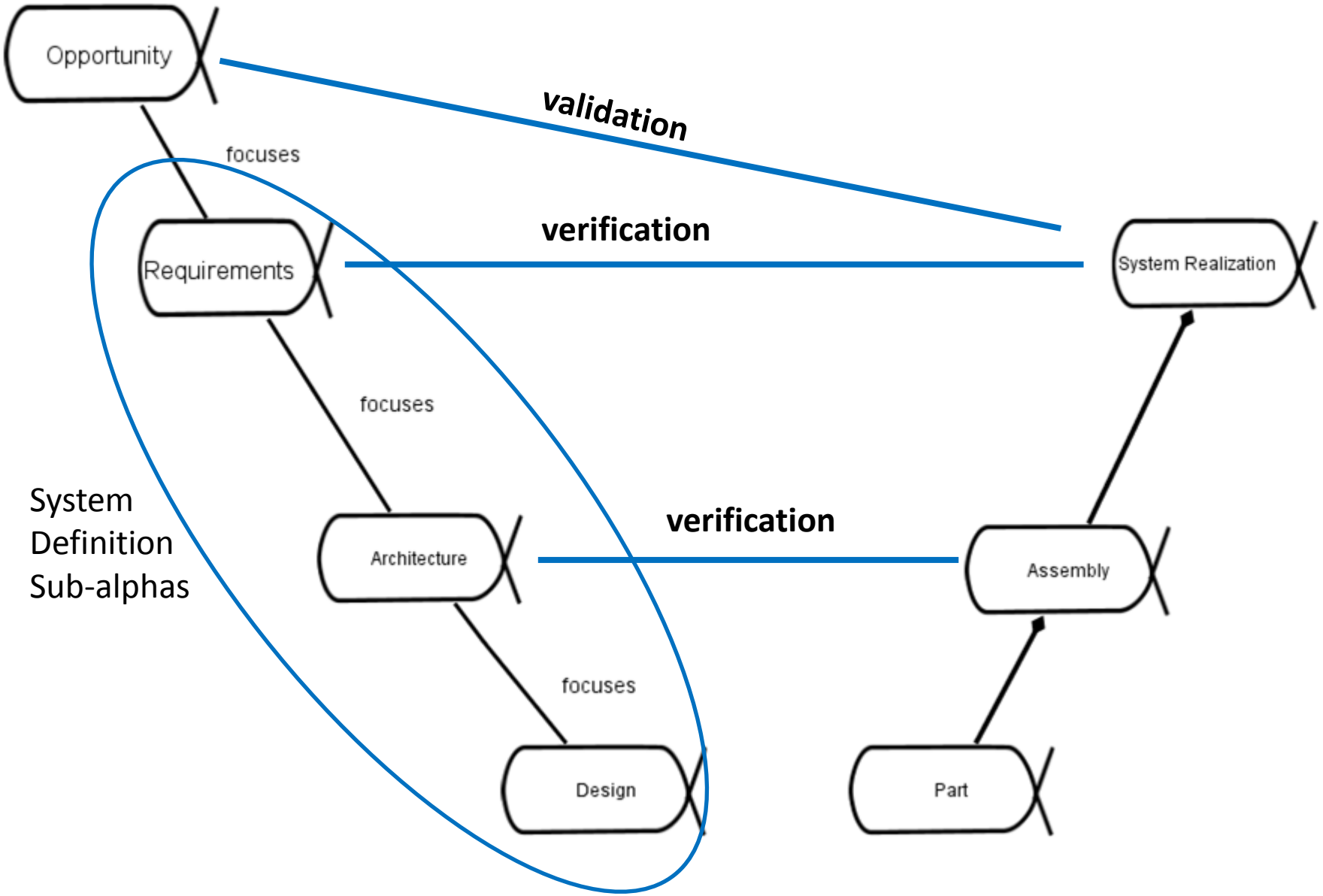
There are two common approaches to the construction of views: the synthetic approach and the projective approach. In the synthetic approach, the Architect constructs views of the system-of-interest and integrates these views within an architecture description using model correspondences. In the projective approach, the Architect derives each view through some routine, possibly mechanical, procedure of extraction from an underlying repository. This International Standard is usable with either of these approaches to views.

System definition and realization (ISO 42010 generalization)

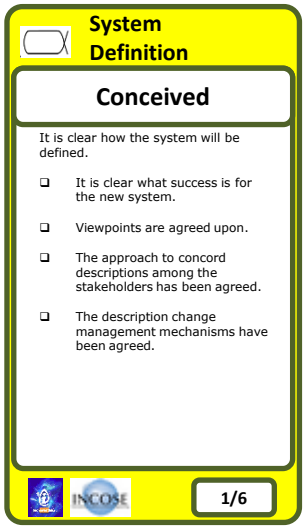


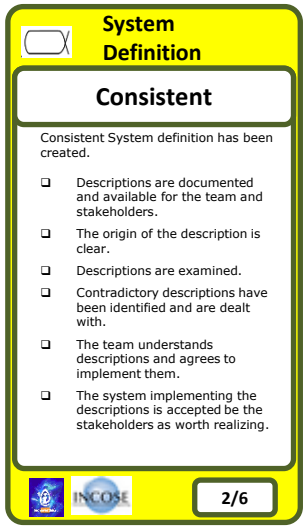
Way-of-working sub-alphas (specified by standards)

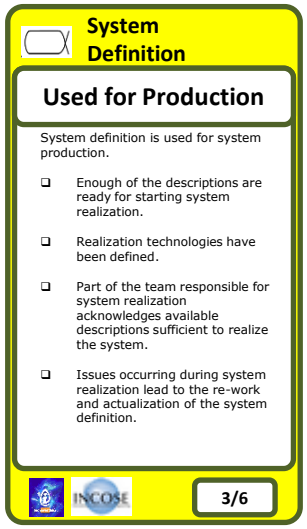
Solution area of concern alphas & V-model

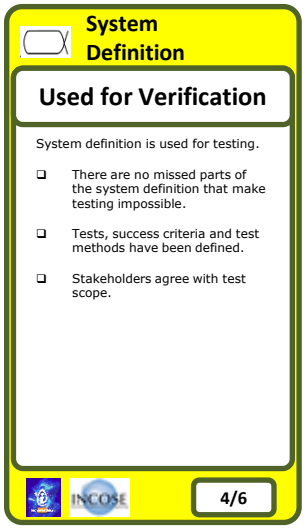


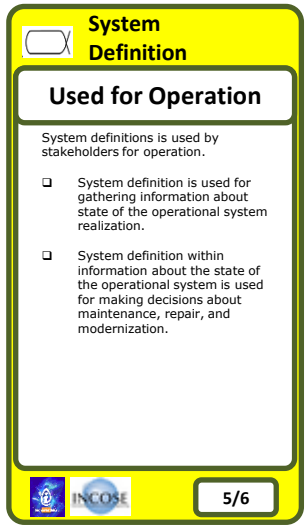
Solution Area of Concern Alpha States

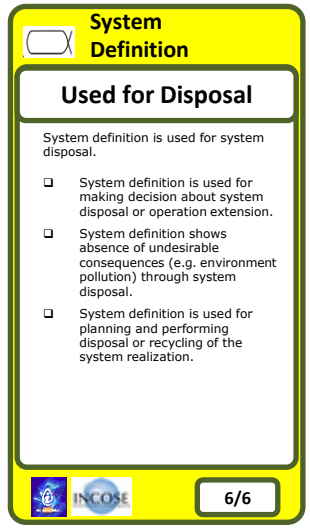


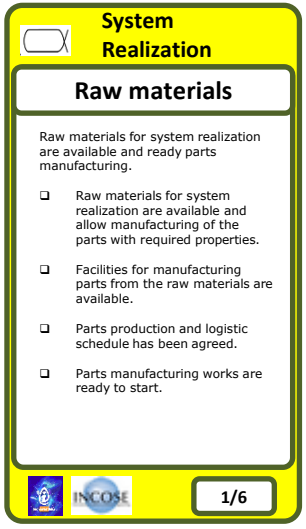


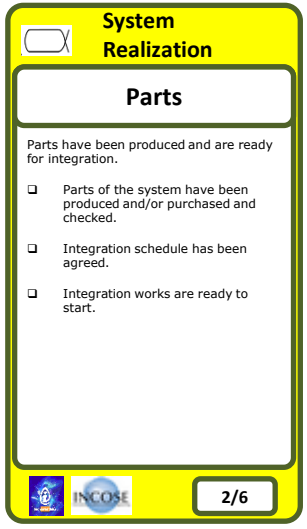


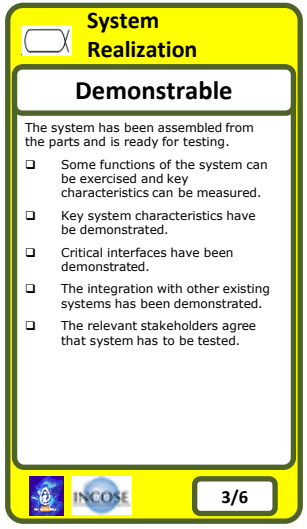


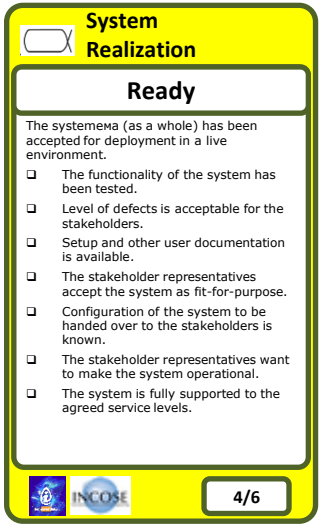


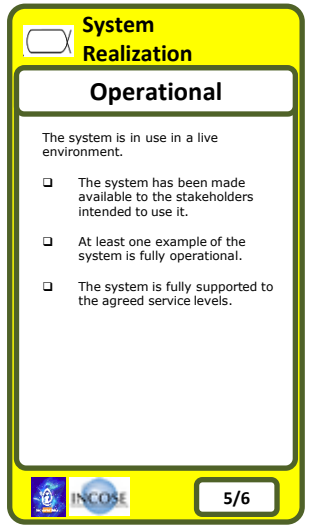


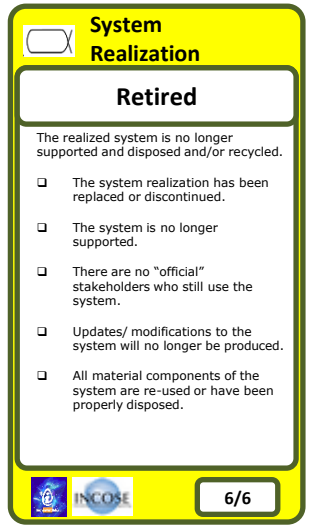












Thank you!

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