Software Engineering in the Systems Context

(Towards a Systems Engineering Essence)

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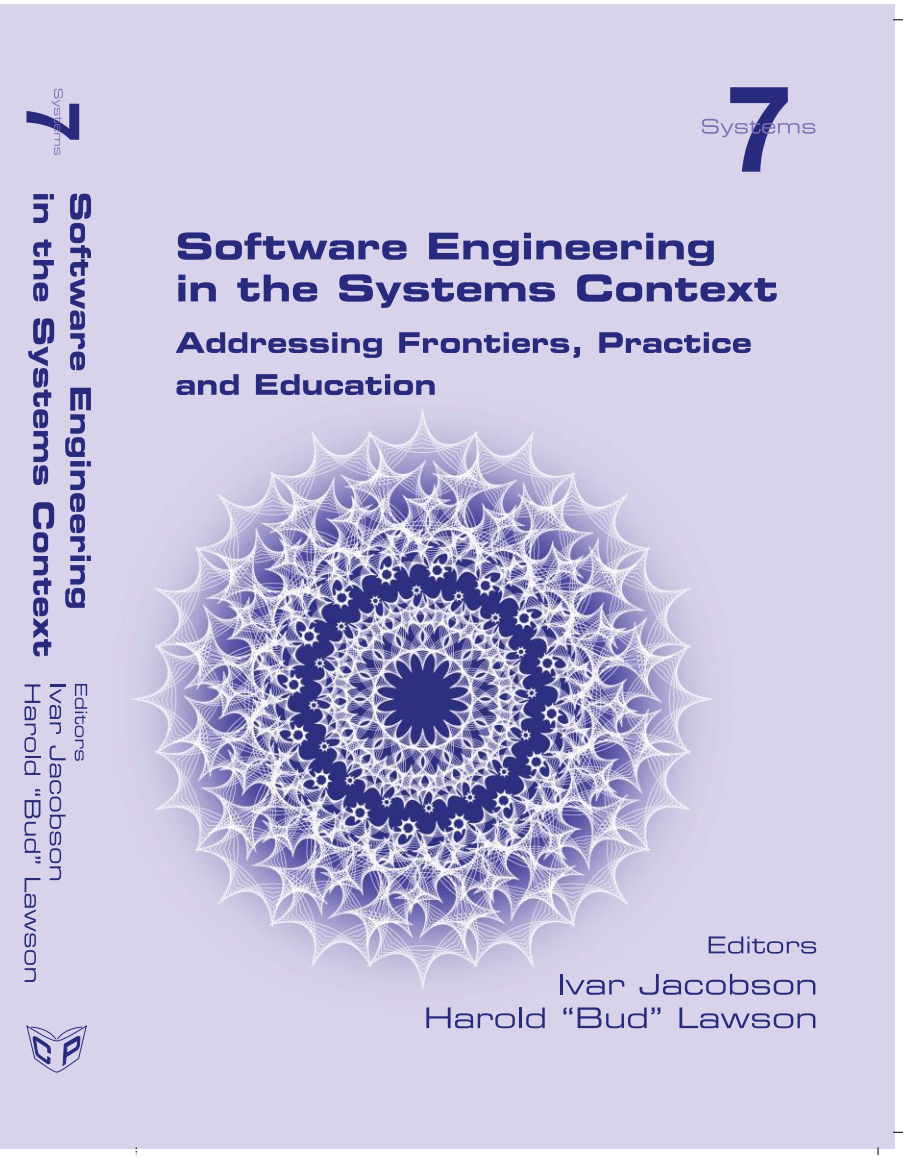
See: http://www.collegepublications.co.uk/systems/



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A MUST READ FOR ALL SOFTWARE AND SYSTEMS ENGINEERS!!!

Exploring and Defining Software–Systems Relationships

- driving concepts and principles
- issues of complexity
- stakeholder concerns and requirements
- the vital role of architecture
- technical debt
- guidance on selecting development approaches
- agility, governance
- socio-technical aspects
- resilience, trust, risk
- acquisition, supply chains
- Standards – ISO/IEC/IEEE 15288, 42010; ISO/IEC/IEEE 12207, ANSI/IEEE 1471, OMG Essence
- fundamental aspects of improving communication and understanding

Focusing on Essence

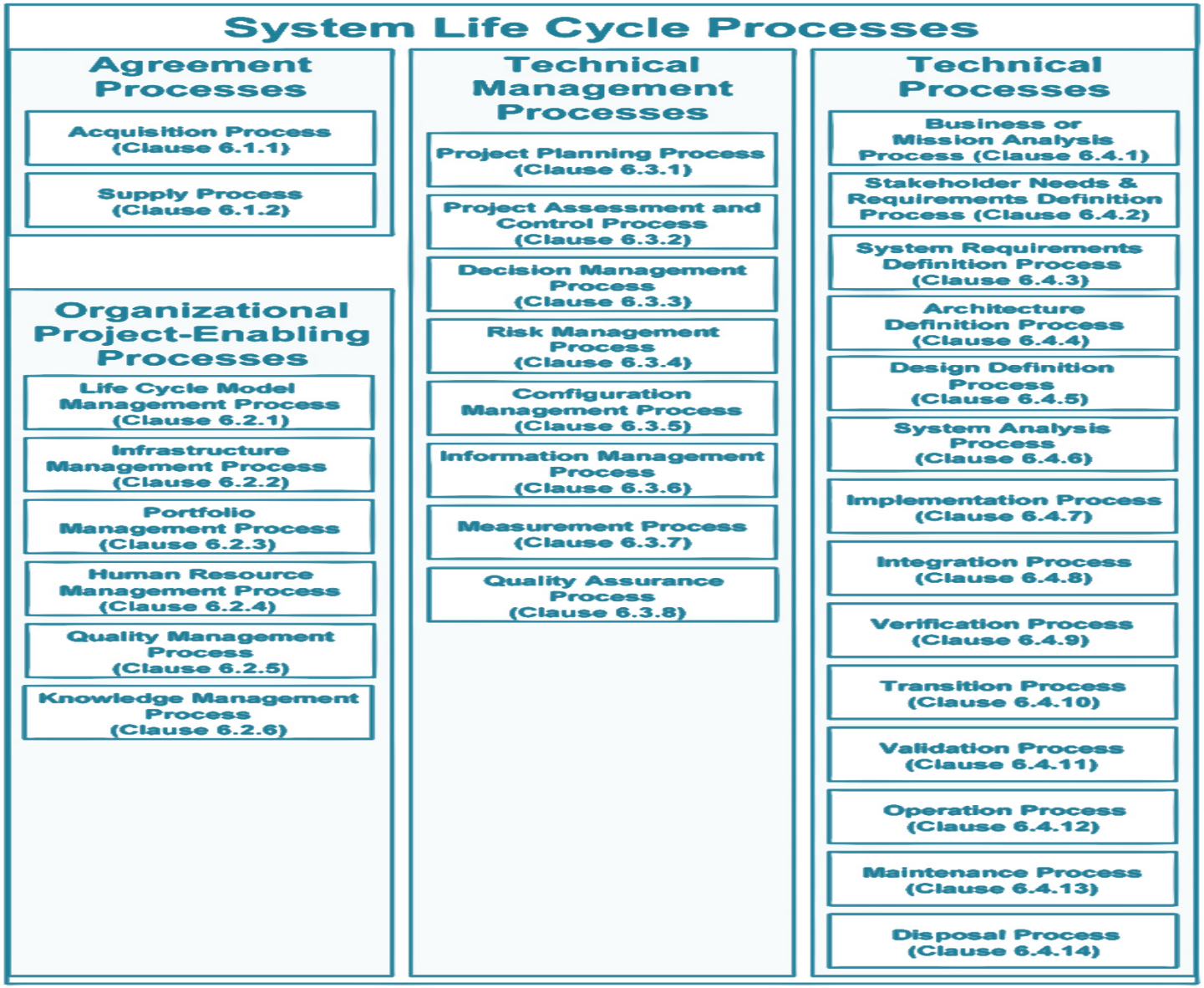
- Desirable to have a Unified Essence for Software and Systems Engineering (or at a minimum - very similar versions)
- A similar Process should be followed in developing a Systems Engineering Essence
- A Call for Action is issued

Important Systems Engineering Knowledge Sources

- ISO/IEC/IEEE 15288 (2002,2008,2015)
  - System Life Cycle Processes
- The INCOSE Handbook (2014)
- The SEBOK (Systems Engineering Body of Knowledge)

NOTE: The Handbook and the SEBOK are based upon the 15288 Standard

ISO/IEC/IEEE 15288: System Lifecycle Processes



Commonality

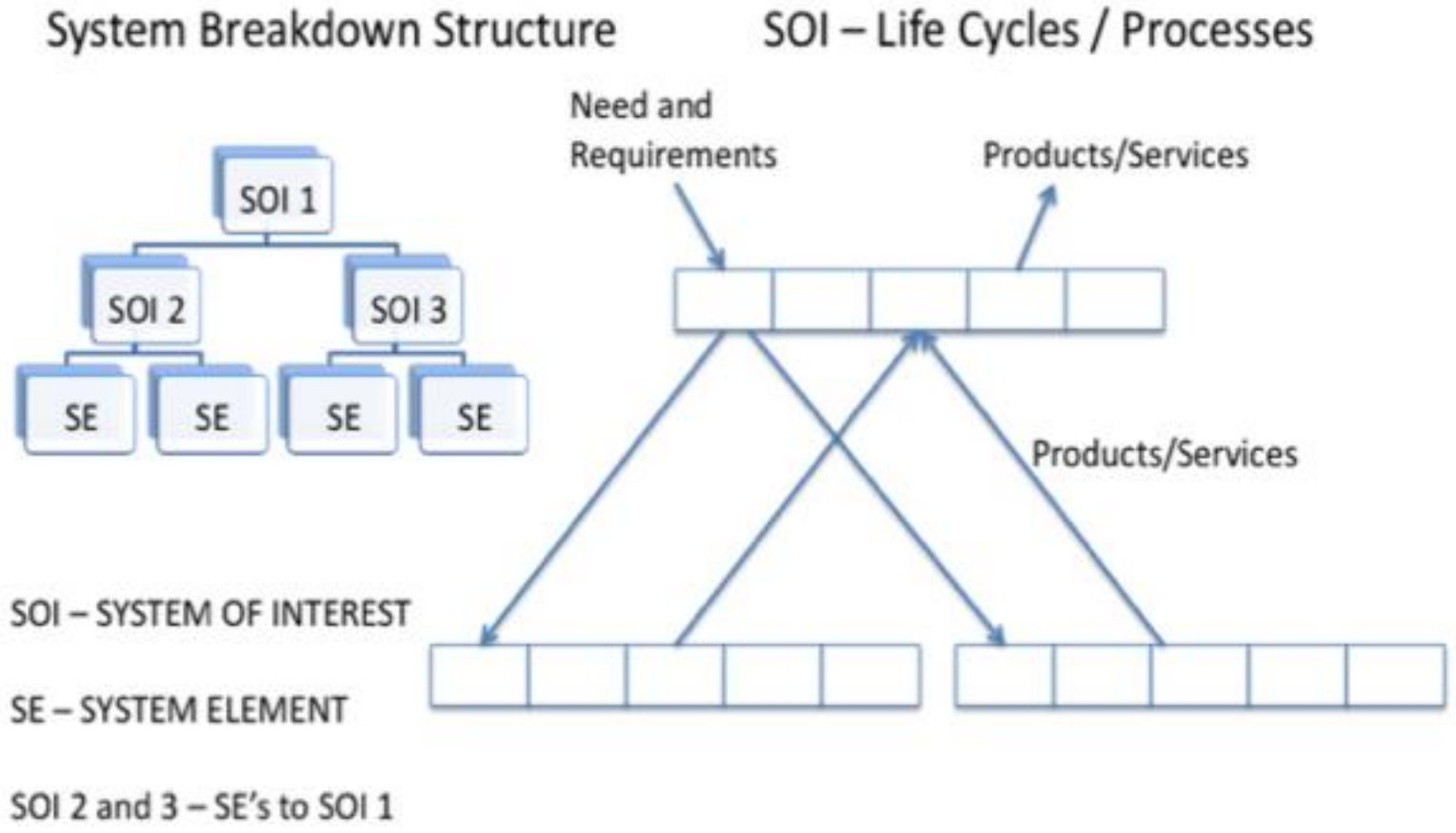
"In short, they both involve some form of endeavor that is aimed at providing added value for stakeholders, based upon their requirements. Further, a solution is sought by applying knowledge, concepts and principles in the analysis, development and delivery of a result in the form of a product or service. *They both perform their endeavors involving some type of Work, typically accomplished by some form of Team and by applying a Way of Working.*"

Some Common Concerns

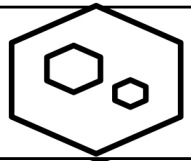
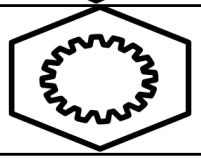
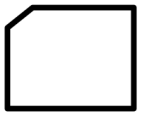
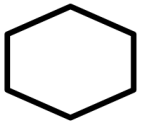
acquisition, agreement, architecture, design, assessment, audit, configuration management, decision management, development, disposal, enabling system, implementation, information management, infrastructure, integration, life cycle, life cycle model, life cycle stages, maintenance, measurement, operation, planning, process, process improvement, process reference model, process tailoring, process view, product, portfolio, quality management, requirements, retirement, risk management, service, stages, stakeholder requirements, supply, system, system structure, system-of-interest, tailoring, transition, validation, verification

Keywords from the ISO/IEC/IEEE 15288 standard (2015)

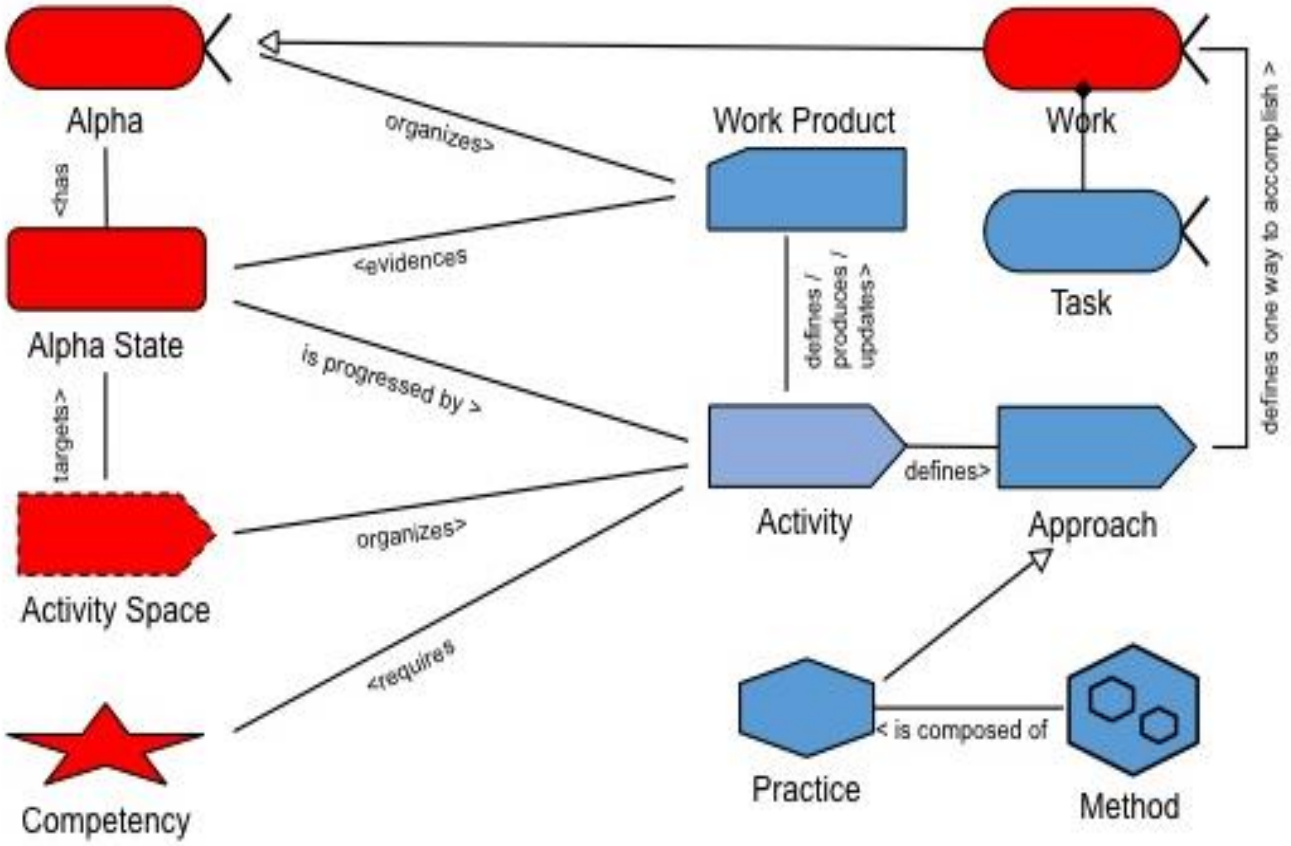
Generic System Structure



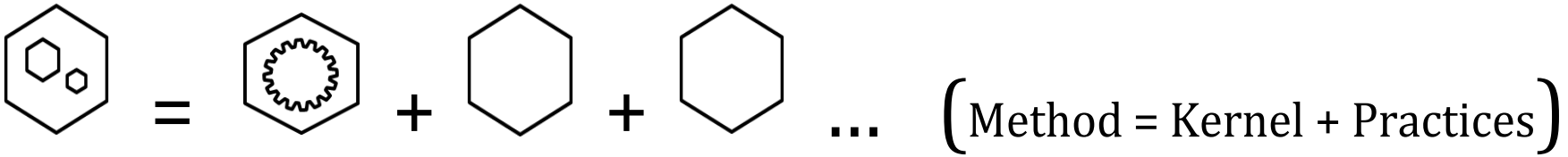
Utilizing Essence Concepts

Concept	Icon	Description
Method		A method is a team's way of conducting its work in a System of Interest development endeavor.
Kernel		A kernel is a set of elements used to form a common ground for describing a systems engineering endeavor.
Alpha		An alpha is an element (an attribute) of a systems engineering endeavor, which has a state relevant to assess the progress and health of the endeavor.
Activity Space		An activity space defines something that should be done in terms of a high level objectives description.
Activity		An activity defines one or more kinds of work items and gives guidance on how to perform these.
Work Product		A work product is an artifact of value and relevance for a systems engineering endeavor.
Competency		A characteristic of a stakeholder or team member that reflects the ability to do work.
Practice		A practice is a repeatable approach to doing something with a specific purpose in mind (to address a specific challenge).

Common Approach using Essence



Building Methods



Example: Development Method = Kernel + Define the System + Realize the System + Manage the Supply Chain + Integrate the System

Example: Governance Method = Kernel + Apply Life Cycle Model + Perform Change Management

System Engineering to Essence Mapping

- Replace Software Systems Alpha to “System” or “System of Interest” Alpha

  System of Interest – *Architecture Selected, Elements Implemented, Integrated, Verified, Operational, Validated, Retired*

- The other alphas Opportunities, Stakeholders, Requirements, Team, Work and Way of Working most likely do not have to be altered in any significant manner.

System Engineering to Essence Mapping

- System Lifecycle Processes → Practices
- System Work Breakdown Structure → Kernel Extensions
- Enabling Systems / System Assets → Resources
- System Engineering Unique Aspects → Patterns

Taking our Own Medicine

- There is a clear **Opportunity**
- The **Stakeholders** are all System and Software Engineers and their surrounding community of interests
- The **Requirements** have started to be identified in this book but need to be further developed
- The **System of Interest** is the Essence Kernel for Systems Engineering
- The **Team** should be composed some current Essence experts, experts in ISO/IEC/IEEE 15288 and 42010, experts in CMMI (Organizations – INCOSE, SERC, OMG?+ Others)
- The goals of the **Work** are certainly clear
- The **Way of Working** must be established by the team.