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Systems Engineering Management and the Relationship of Systems Engineering to Project Management and Software Engineering

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ODASD System of Systems Engineering Collaborators Info Exchange
July 19, 2011

Agenda



- BKCASE Overview
- Discipline Relationships

What is BKCASE?



- Project to create:
 - Systems Engineering Body of Knowledge
 - Graduate Reference Curriculum in Systems Engineering (GRCSE™ – pronounced “Gracie”)
- Body of Knowledge and Curriculum to Advance Systems Engineering (BKCASE)
- Started in September 2009 by Stevens Institute of Technology and Naval Postgraduate School with primary support from Department of Defense
- Project will run through 2012
- Intended for world-wide use



Our Partners



BKCASE Vision and Objectives



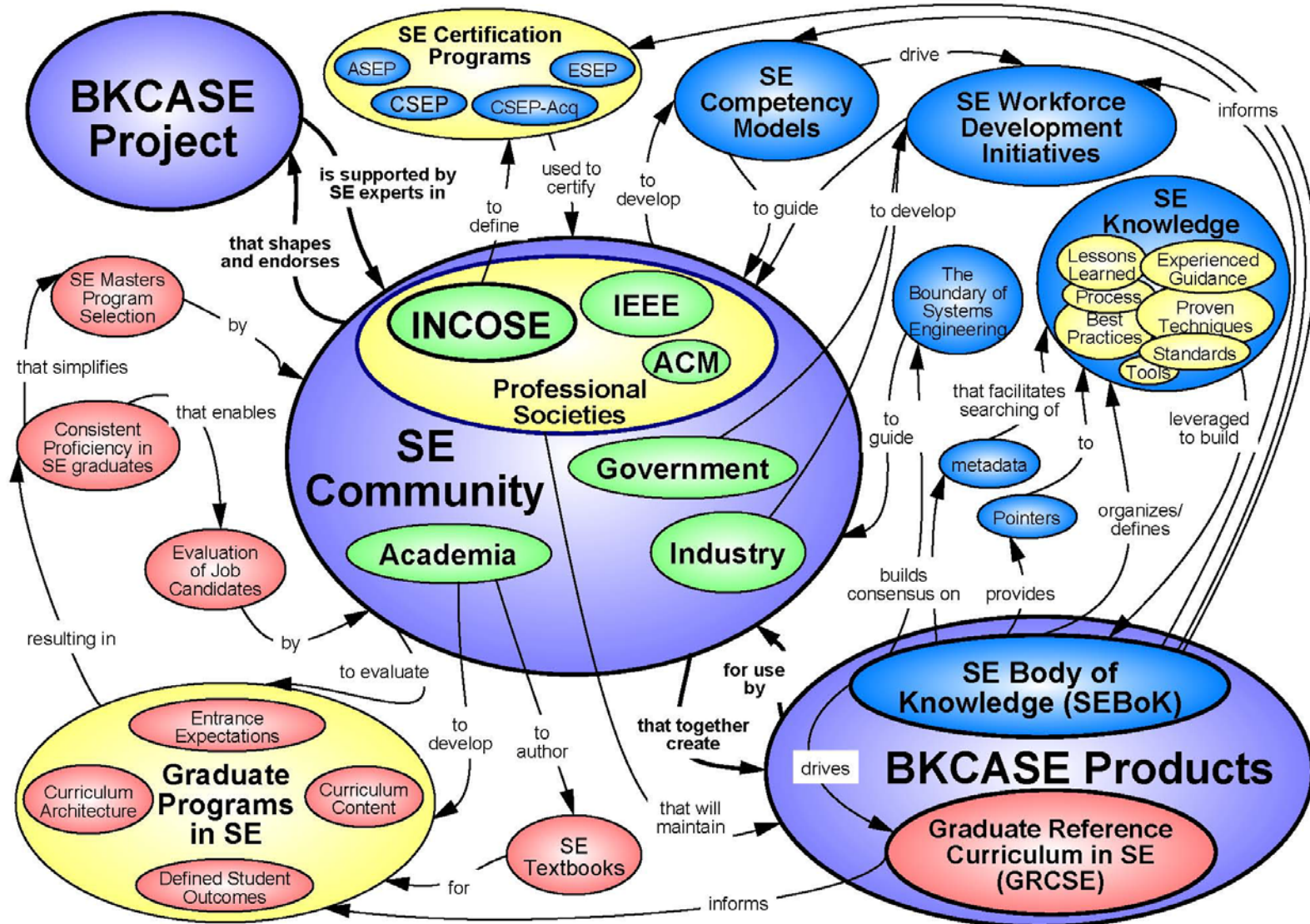
Vision

“Systems Engineering competency models, certification programs, textbooks, graduate programs, and related workforce development initiatives around the world align with BKCASE.”

Objectives

1. Create the SEBoK and have it be globally recognized by the SE community as the authoritative guide to the body of knowledge for the SE discipline.
2. Create GRCSE and have it be globally recognized by the SE community as the authoritative guidance for graduate programs in SE.
3. Facilitate the global alignment of related workforce development initiatives with SEBoK and GRCSE.
4. Transfer stewardship of SEBoK and GRCSE to INCOSE and the IEEE after BKCASE publishes version 1.0 of those products, including possible integration into their certification, accreditation, and other workforce development and education initiatives.

Body of Knowledge and Curriculum to Advance Systems Engineering (BKCASE)



SEBoK Value Proposition

1. There is no authoritative source that defines and organizes the knowledge of the SE discipline. Knowledge gap creates unnecessary inconsistency and confusion in understanding the role of SE and in defining SE products and processes.
- 2. Creating the SEBoK will help build community consensus on the boundaries of SE, including its entanglements with project management and software engineering.
3. A common way to refer to SE knowledge will facilitate communication among systems engineers and provide a baseline for competency models, certification programs, educational programs, and other workforce development initiatives around the world.
4. Common ways to identify metadata about SE knowledge will facilitate search and other automated actions on SE knowledge.

Acronyms

- Project Management (PM)
- Software Engineering (SWE)
- Systems Engineering (SE)
- Systems Engineering Management (SEM)

Challenges

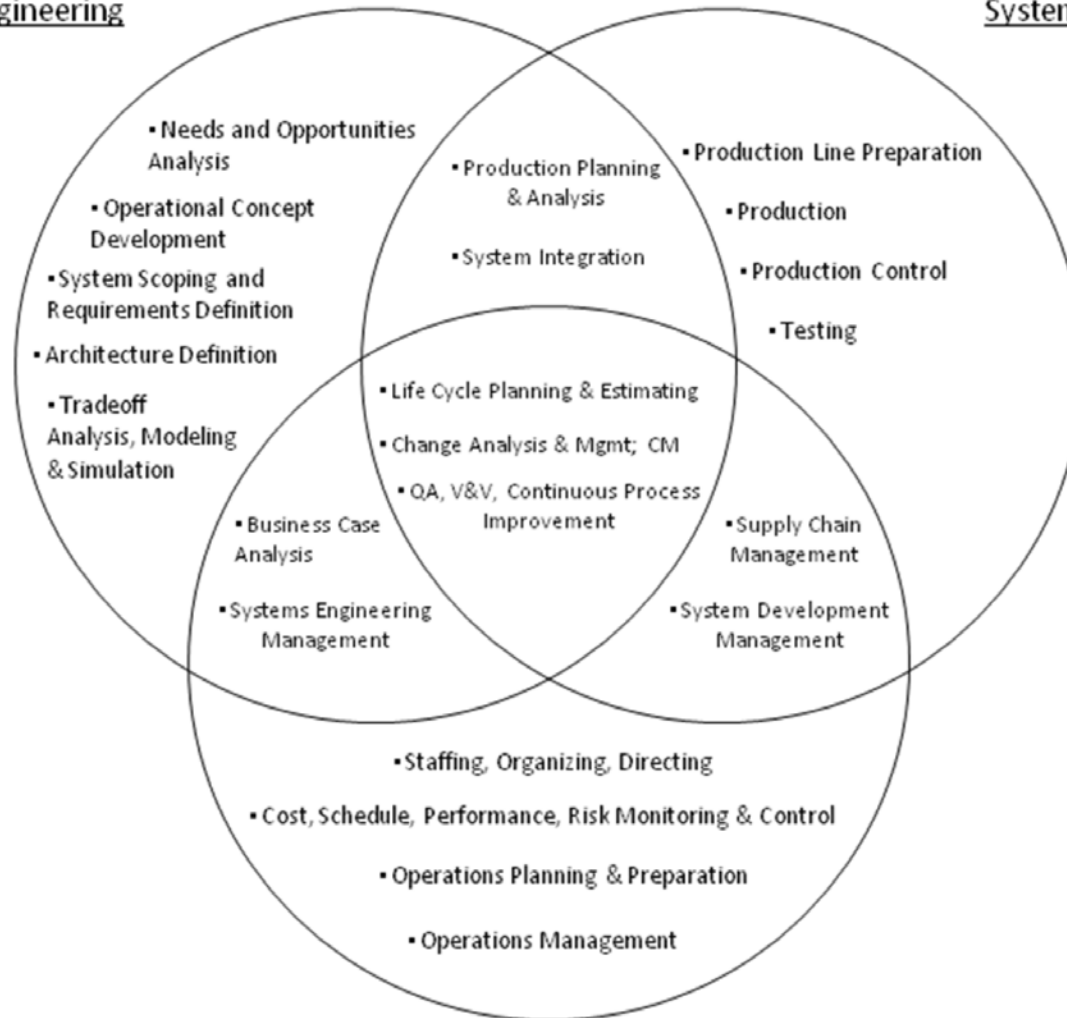
- Complex systems bring many disciplines together and their boundaries are not always the same in different project environments. There is no one-size-fits-all way to define the details of where various SEM functions are performed.
- The advent of net-centric systems has made SWE more critical to SE. Strong synergy exists between them, but there are key distinctions and management challenges between SE and SWE.
- Covering multiple domains and industries for SEM.
- Individual management processes (e.g. Project Planning, Measurement, Risk Management) may require different approaches when distinguishing SE, PM and SWE.

Primary Concerns of SE, PM, and Systems Development



Systems Engineering

Systems Development



Project / Systems Management

Systems Engineering Management



- SEM is distinguished from general project management by the focus of the former on the technical or engineering aspects of a project.
 - It also includes exploratory R&D activities at the enterprise level in commercial or government.
- No one-size-fits-all
 - E.g., An in-company SE organization will not run its own accounting system, but a company performing only SE will include accounting functions as part of its SE management.
- SE managers must always be actively involved in the management of all SE activities
 - Working out collaborative arrangements to best fit their situation
 - Remaining aware of management events in their environment outside the system boundary that may affect their ability to perform.

Project Management Processes



- Management processes may be performed in SE, SWE, PM or all of them.
- Some functions be managed exclusively within the SE function, while others are done in SWE or Project Management.
- SE is intimately entangled with technical management, which is a specialization of PM.
 - Technical management is often the purview of a systems engineer.

Software Engineering and Systems Engineering Entanglement



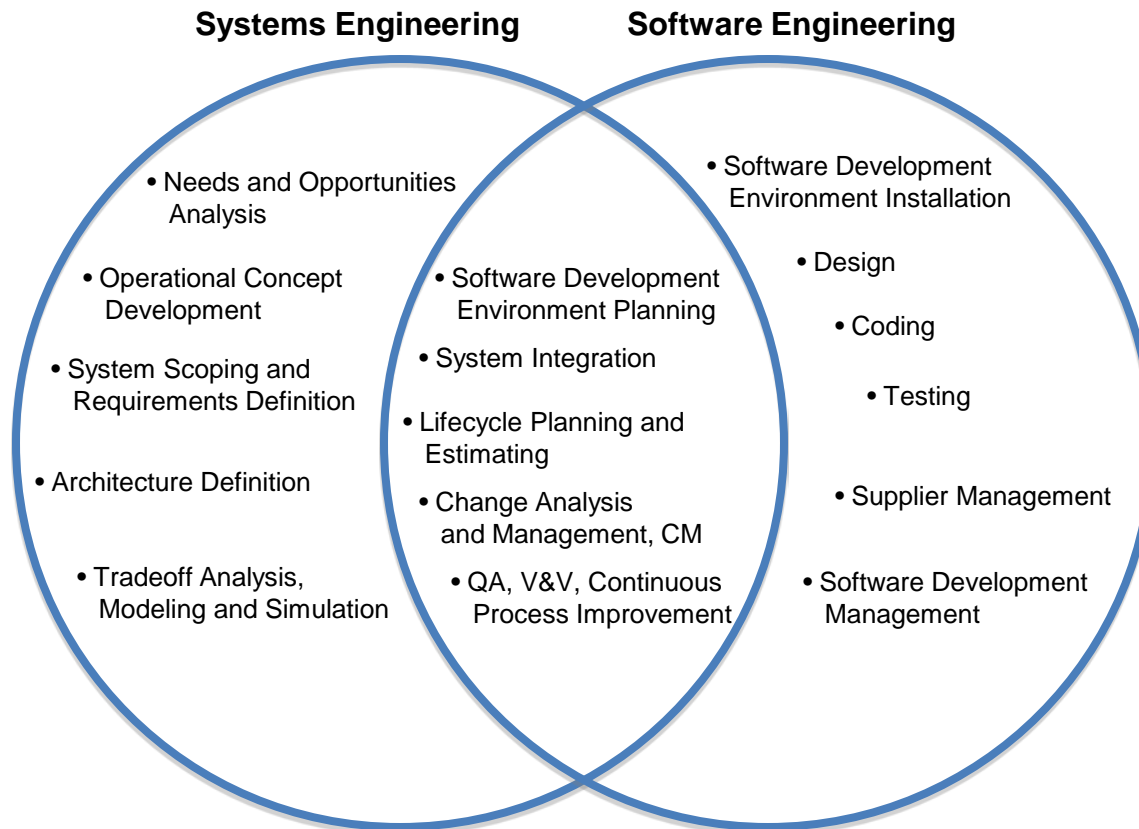
- SWE is not just an allied discipline to SE. Software is prominent in modern systems architectures, often the glue for integrating complex system components, and provides system flexibility.
- Software often plays a dominant role in differentiating competing systems in the marketplace.
- Relationship will become more important with increasing software needs of society

Systems Engineering and Software Engineering Comparisons



- Virtually all of the procedures and techniques of system engineering can be directly applied to software development.
- Strong synergy exists between them, but there are key distinctions and management challenges between SE and SWE.
- Software system engineers play the role of system engineers within the more limited context of software development and modification.
- Software engineer should be thought of as a systems engineer with a specialist skill in software, rather than as a supplier of bounded software subsystem.

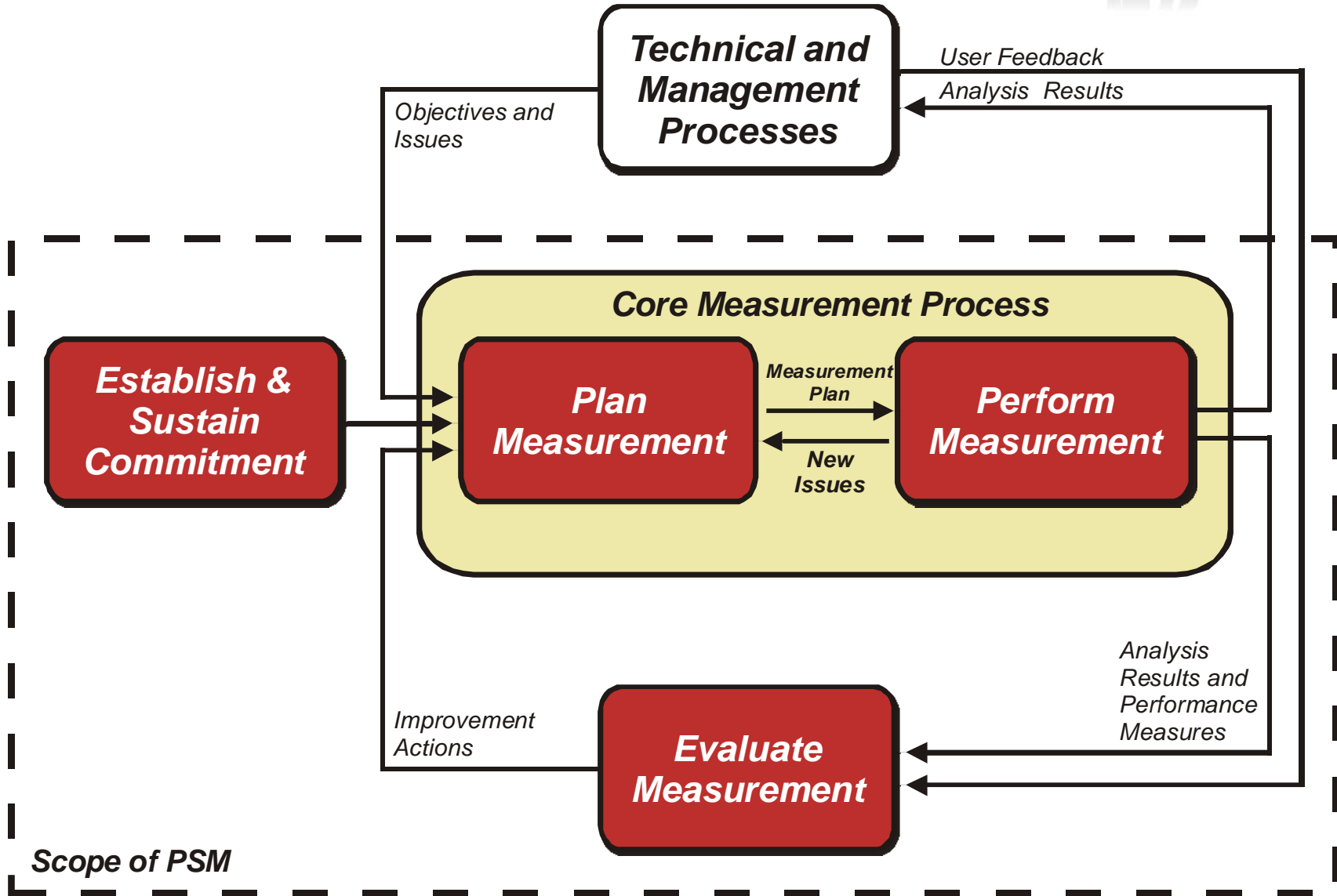
Systems Engineering and Software Engineering Concerns



Supplements

- Measurement Process Area
- Systems and Software Engineering Standards Integration

Measurement Activities



Four Key Measurement Process Activities

(Source: Practical Software and Systems Measurement (PSM) May 7, 2010)

Measurement



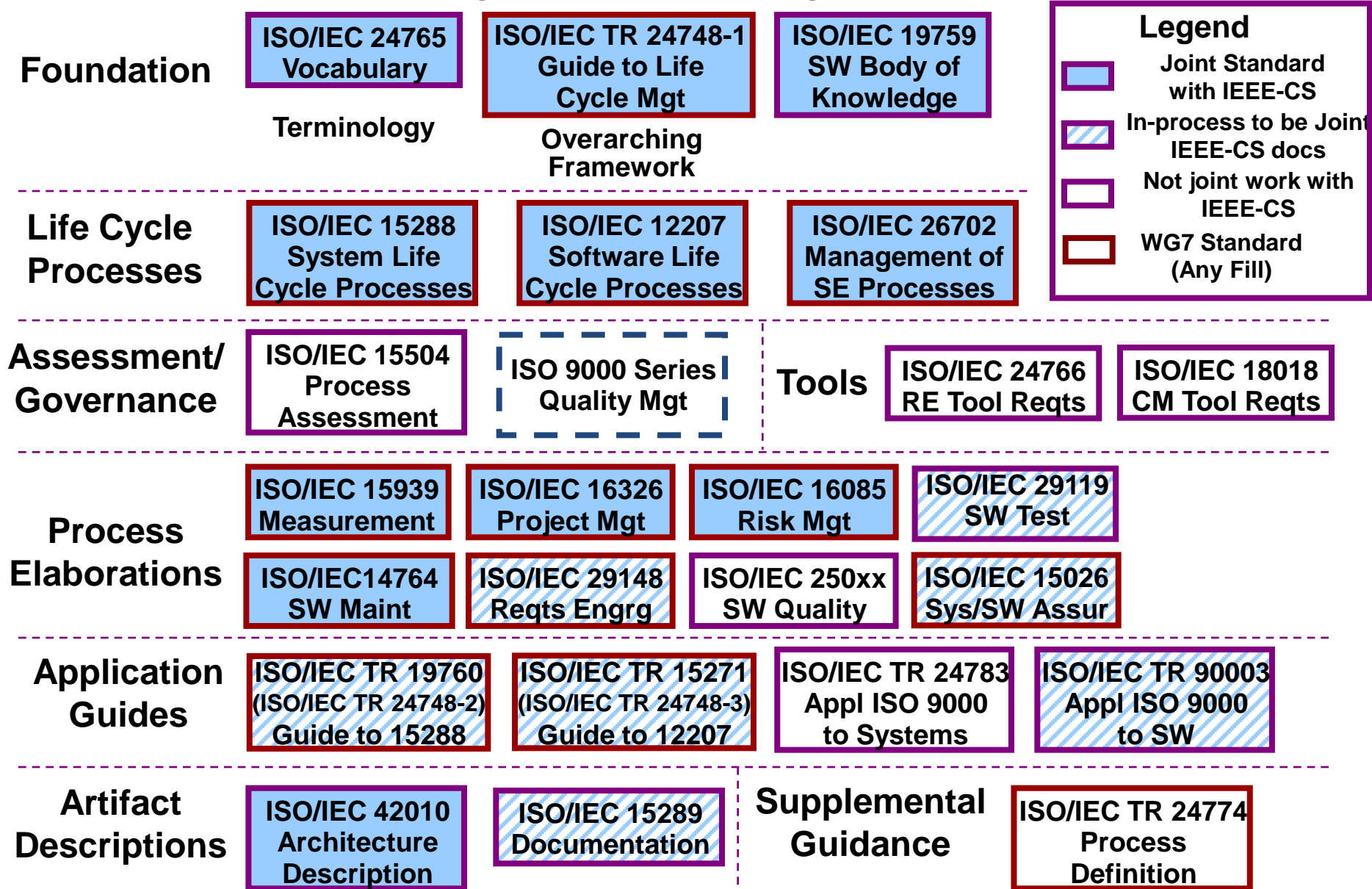
- Shared responsibility - Dependent on scope of function, focus of the work, and viewpoint
 - Cannot be stovepipes
 - Program Manager has the ultimate responsibility and ownership
- Project Management processes jointly support SE, SWE, and PM objectives
 - The scope of application is a key distinction
 - Project mgt processes rely on each other for information
- Sometimes dependent on ...
 - Understanding of SE/SWE by project leadership and other disciplines
 - Willingness to delegate authority
- Relies on:
 - Cooperation
 - Clear definition of roles and responsibilities
 - Integration of technical needs with programmatic needs

Measurement (Cont'd)



- As a significant element of most systems today, SWE continues to be more integrated w/ SE
 - The processes need to be consistent and aligned
 - Iteration and recursion are typically applied, driving a need for integration
- This has been seen in the past decade with the alignment of the ISO/IEC/IEEE Systems and SW Process standards
 - See Alignment / Integration Status chart
- As the alignment has progressed, there has still been a need for SW specific implementation and support processes to address the SW challenges
 - Focused on the production of the SW
 - See 15288 / 12207 process chart
- Some issues still exist between SE and SW that need to be resolved, including:
 - Verification and validation concepts
 - Configuration management concepts

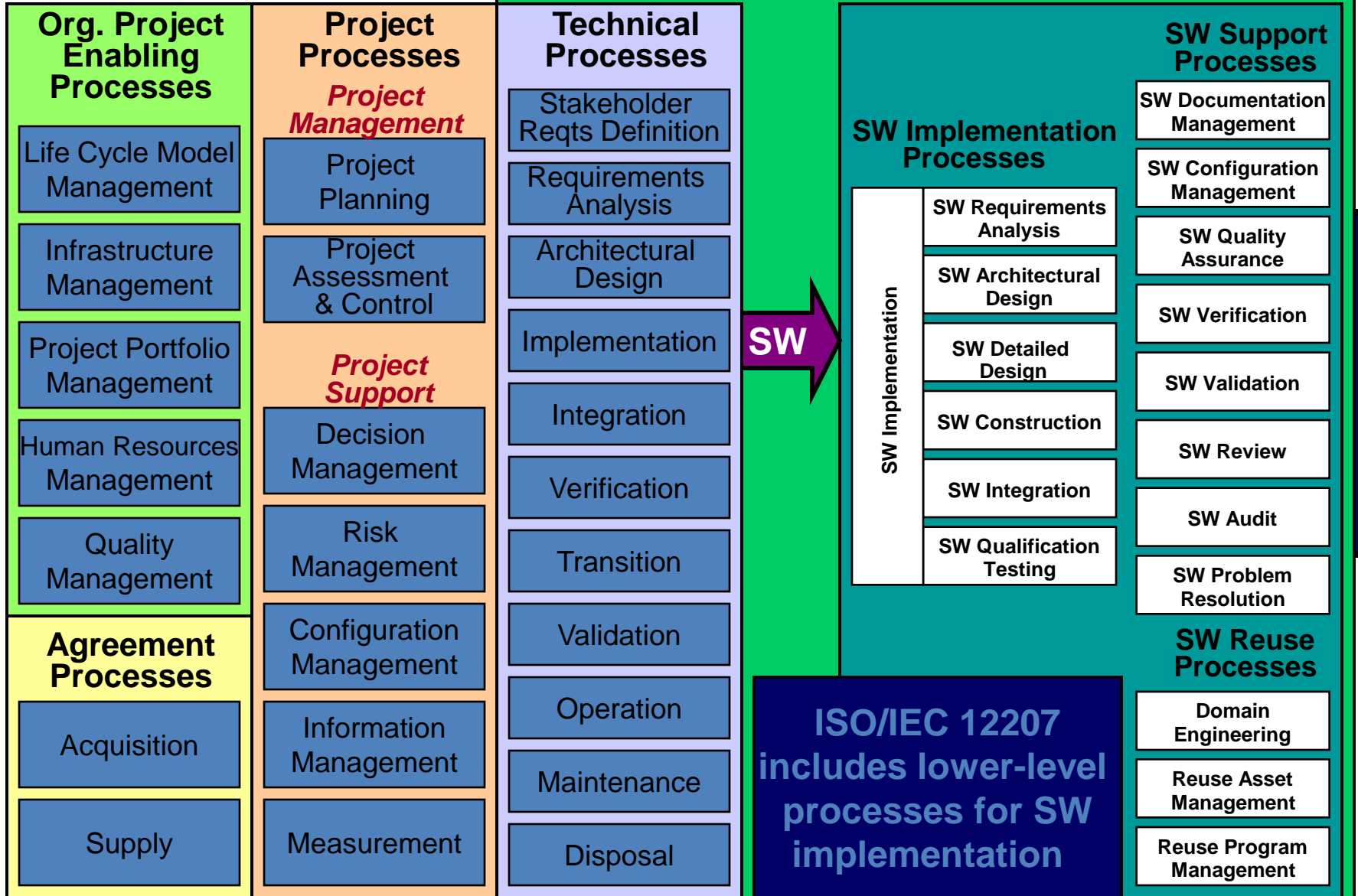
Current Alignment/Integration Status



Aligned Process Models for ISO/IEC 15288 & 12207



15288 ~~2207~~ Processes → 12207 Process Engineering





Call for Authors, Subject Matter Experts,
Reviewers and Early Adopters

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