

IBM Rational Software Development Conference

Roma 7 ottobre Milano 9 ottobre 2008

WHERE TEAMS ARE **R-HEROES**



System of System e System Engineering -
Harmony/SE: un processo basato su SysML
utilizzando l'Eclipse Process Framework

Gianluca Monticone

What is Systems Engineering?

“Systems Engineering is an **interdisciplinary** approach and means to enable the realization of successful systems. It focuses on defining **customer needs** and required **functionality** early in the development cycle, documenting **requirements**, then proceeding with **design** synthesis and system **validation** while considering the **complete problem....**”

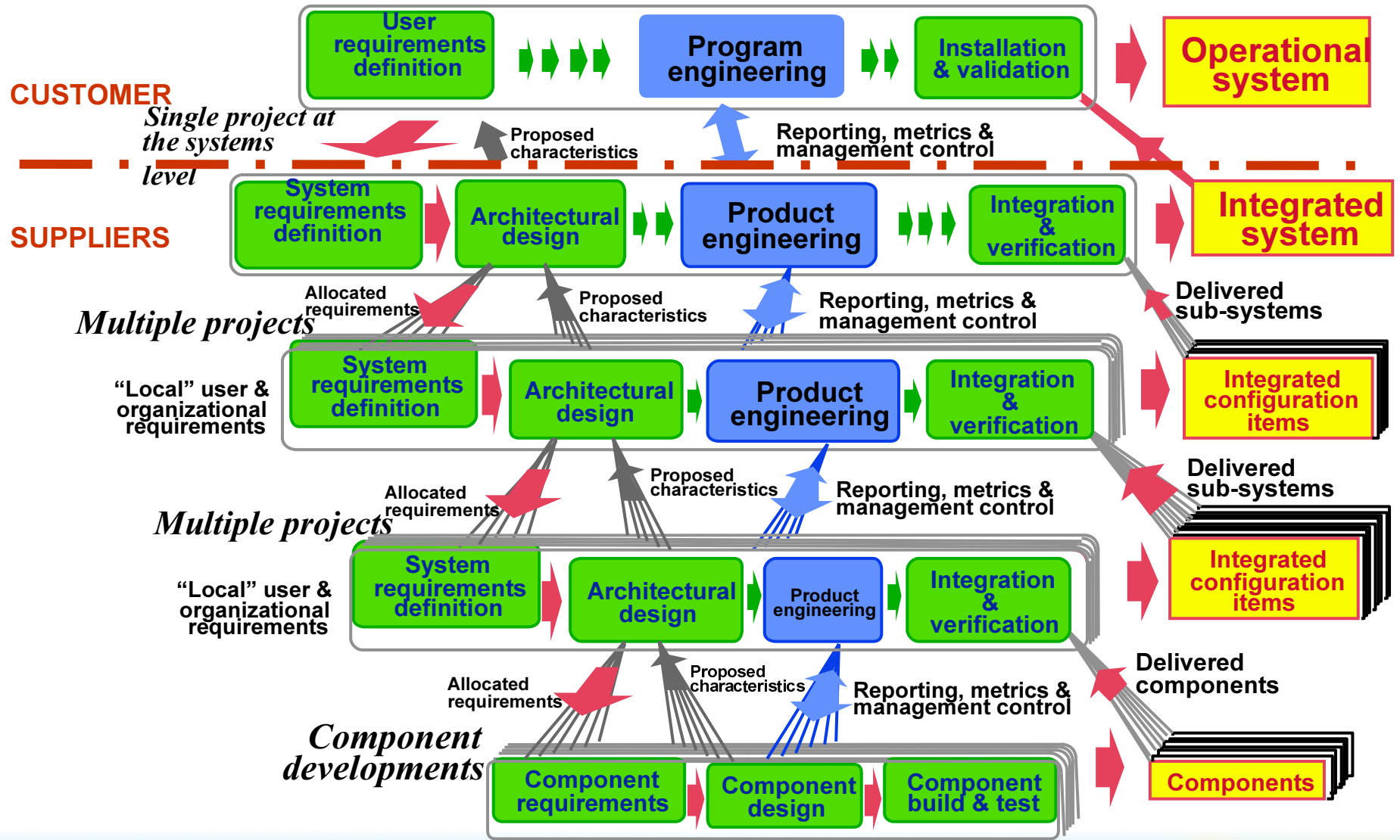
INCOSE

<http://www.incose.org/educationcareers/pdf/12-roles.pdf>

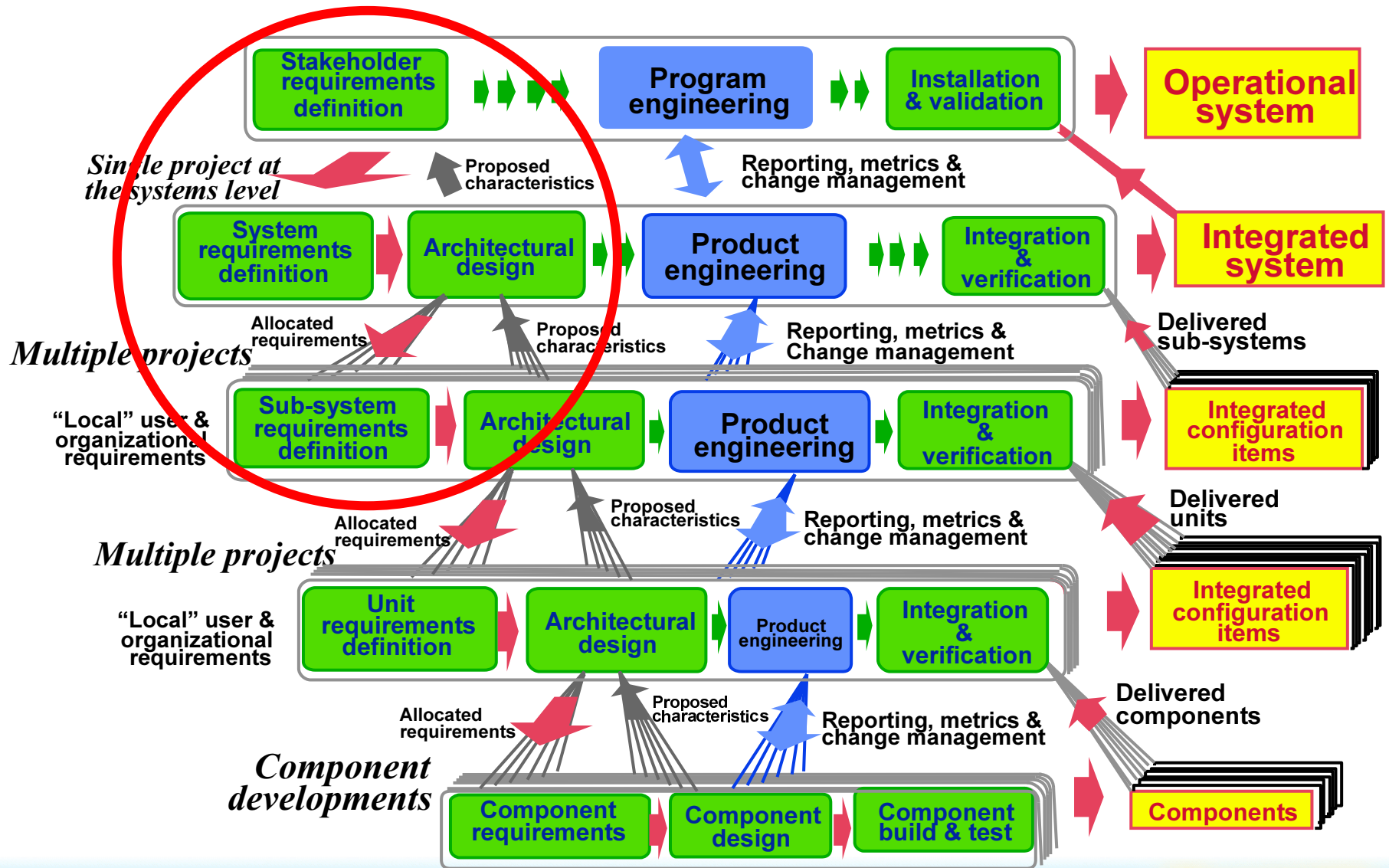
- Requires “Systems Thinking” – seeing the big picture & understanding the broader impact of changes/decisions
- A hierarchical approach is often used to manage complexity



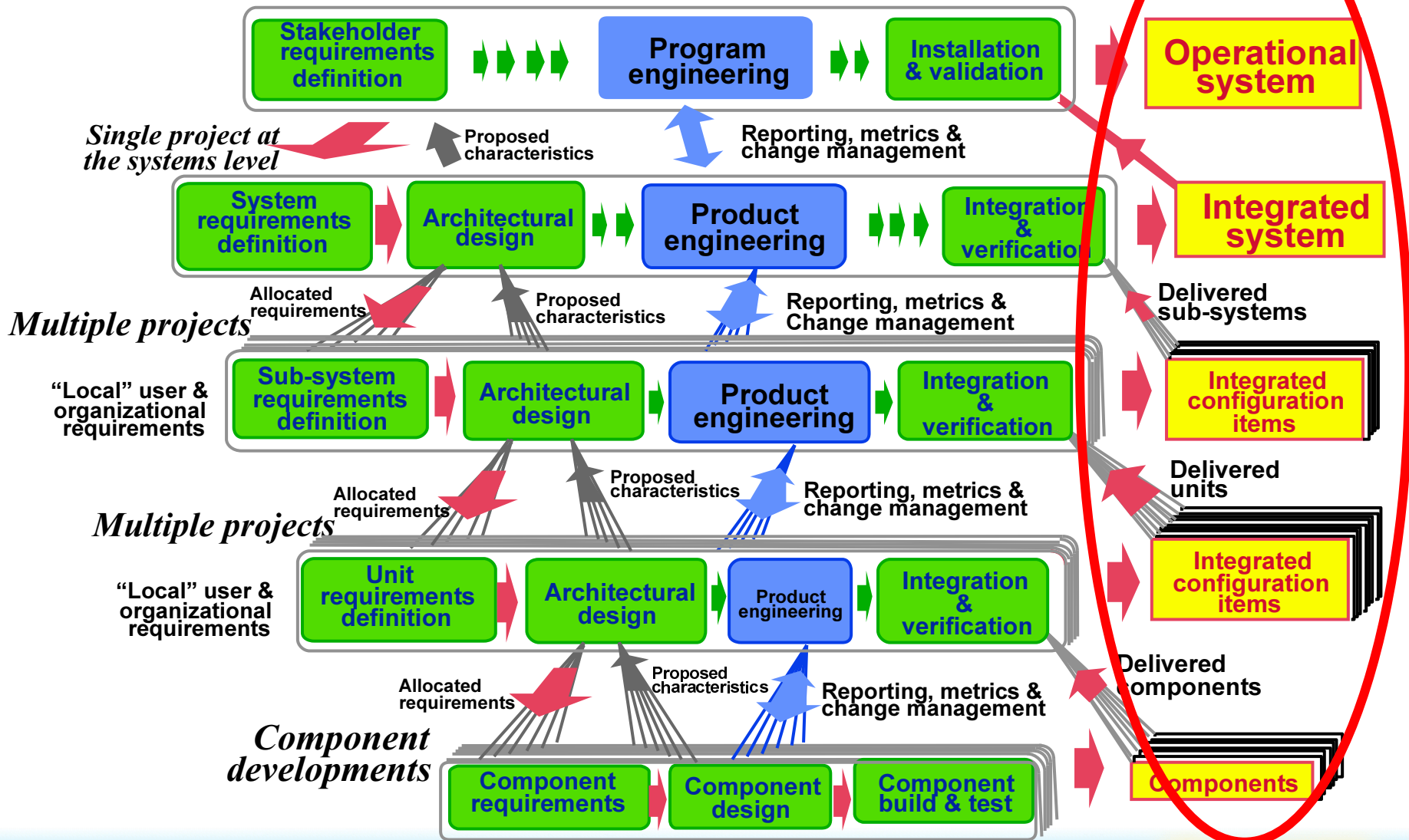
Traditional Systems Engineering



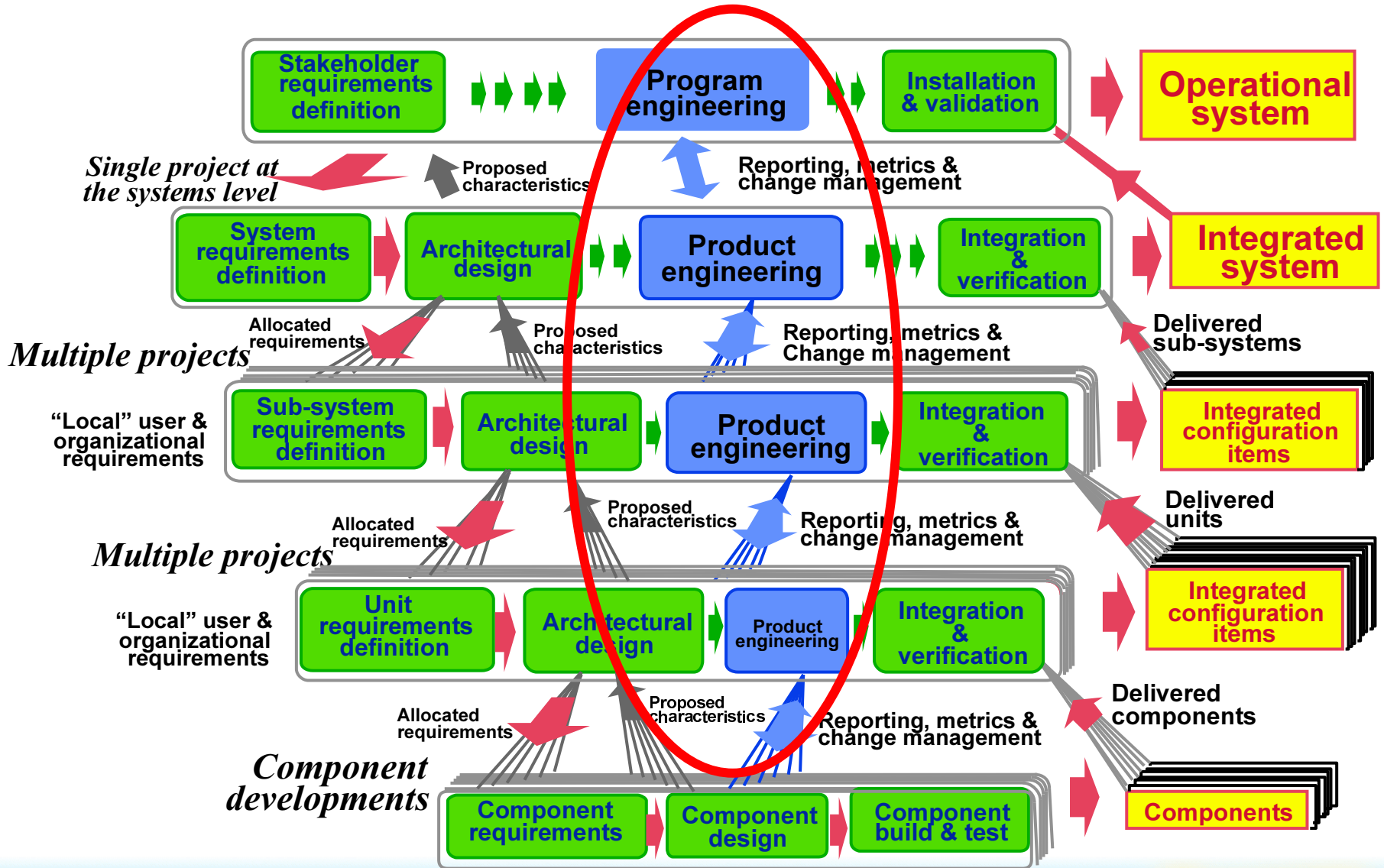
Integrating Requirements and Modeling



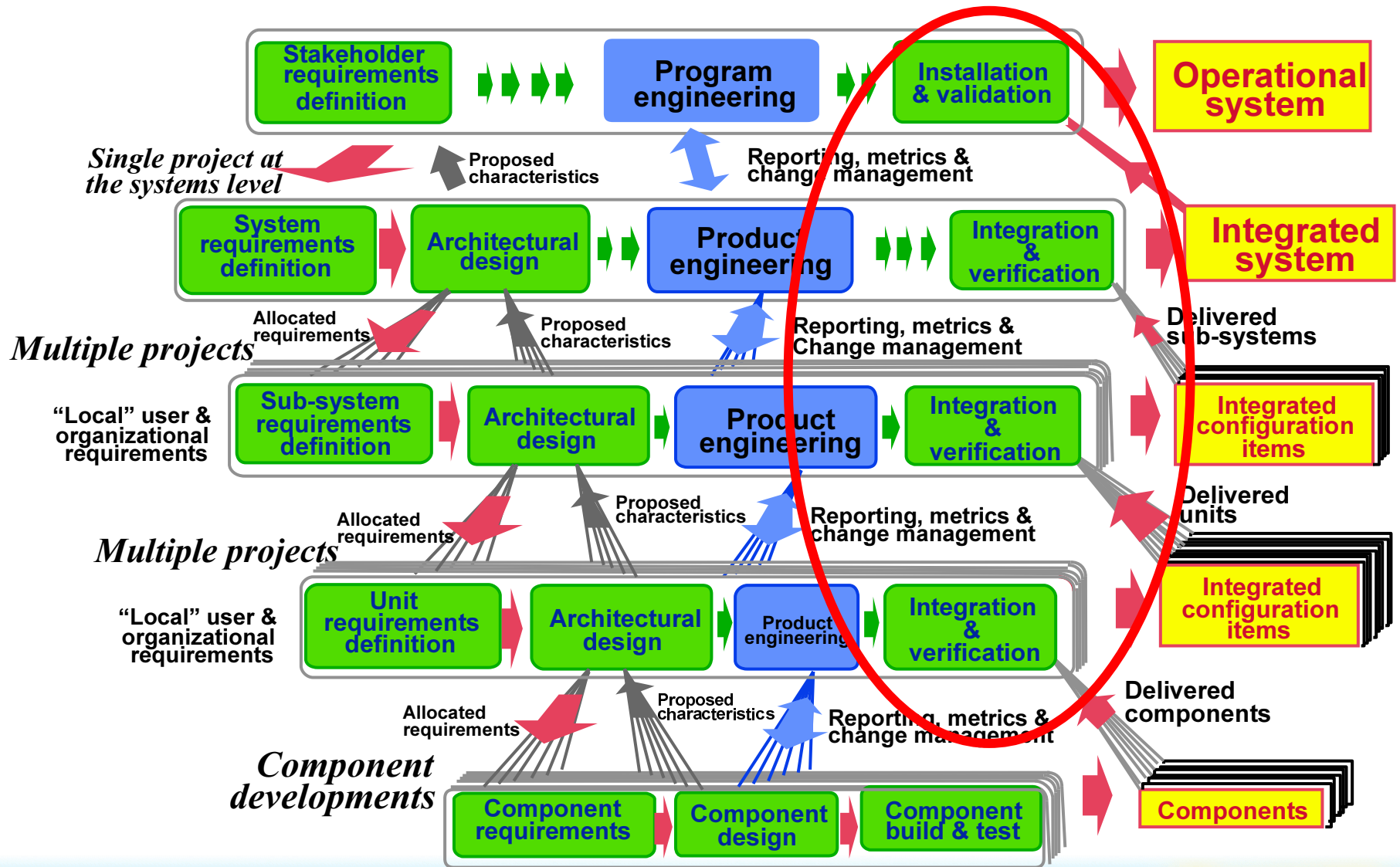
Integrating Configuration Management



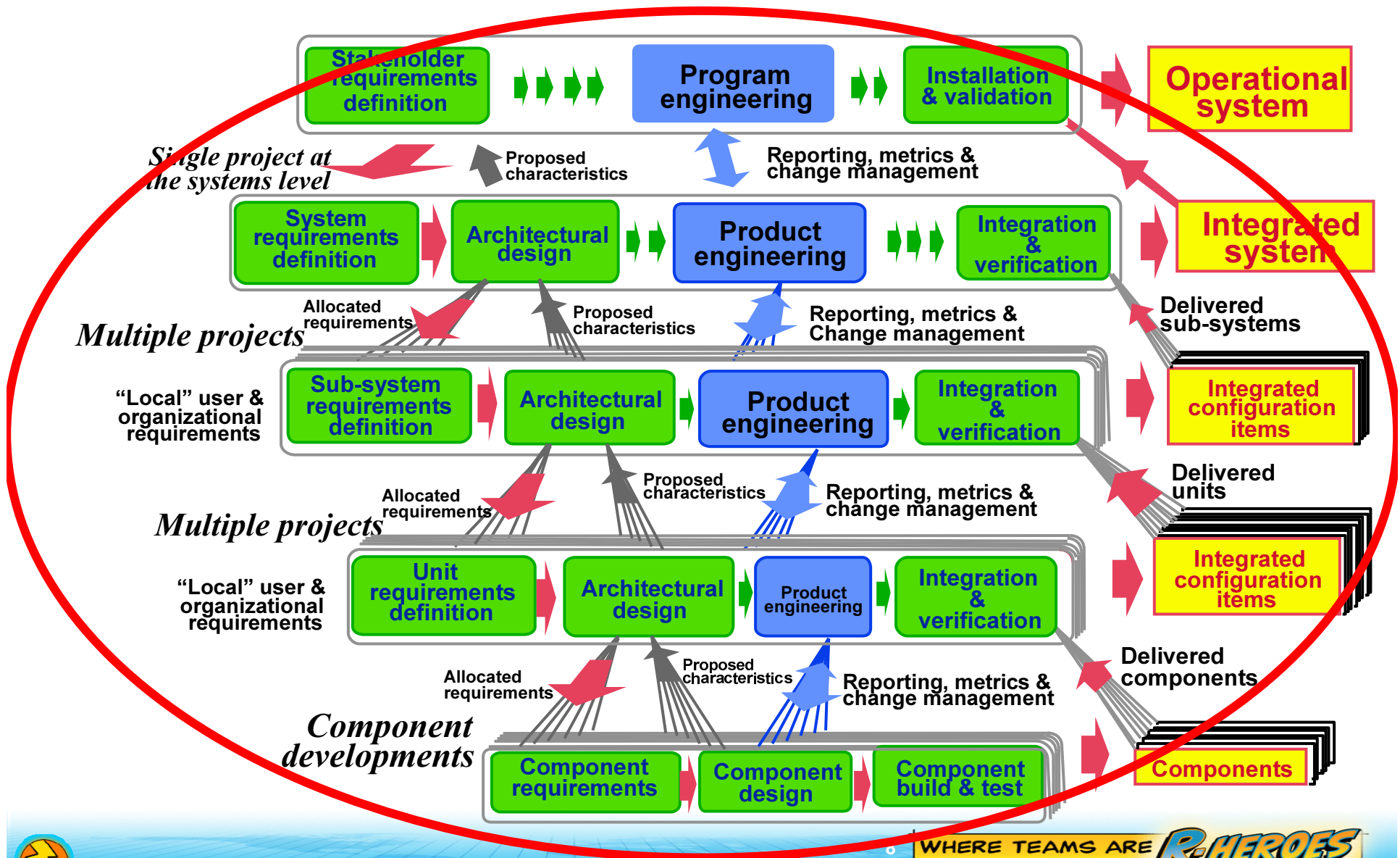
Integrating Reporting and Metrics



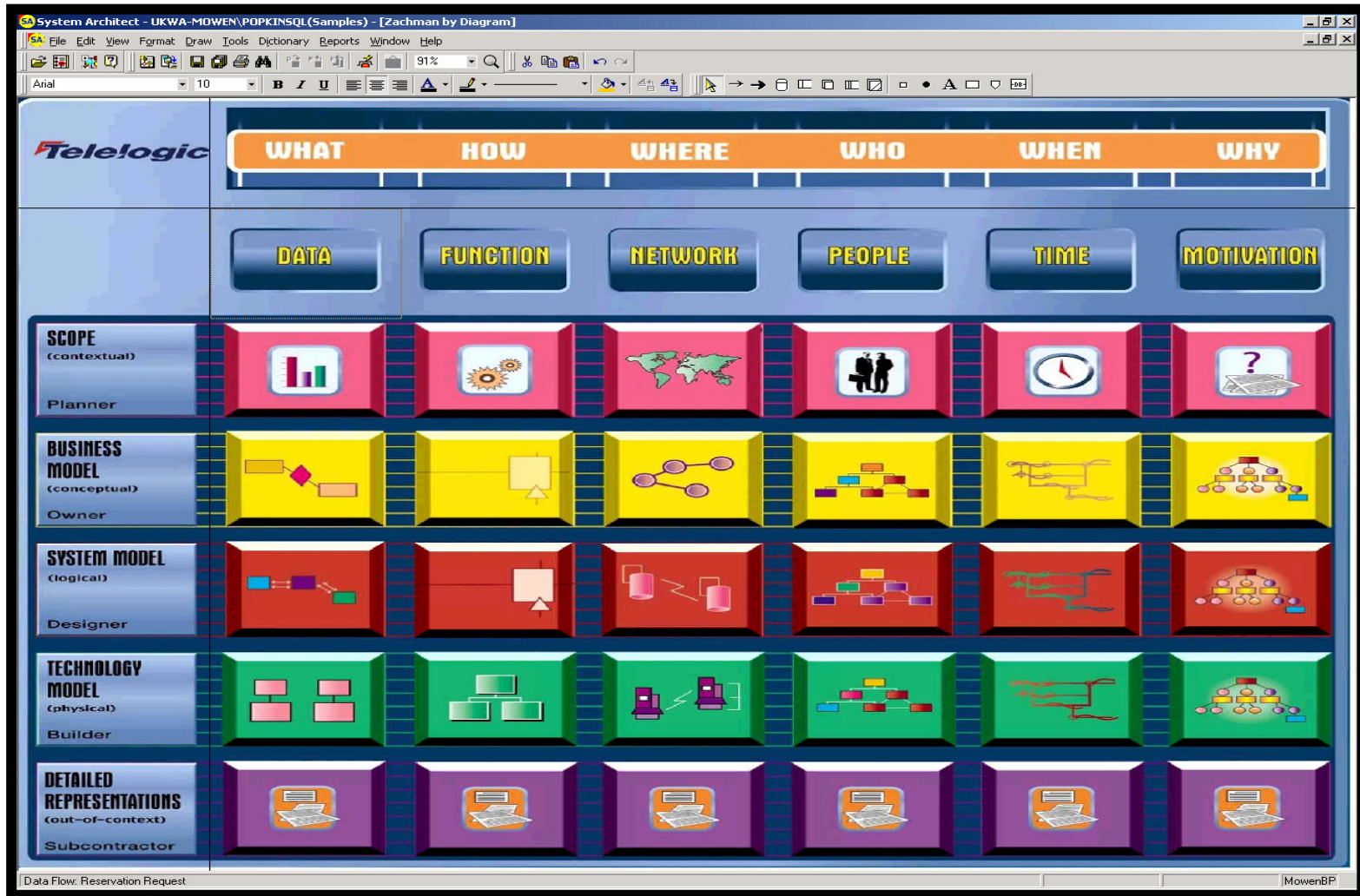
Integrating Verification & Validation



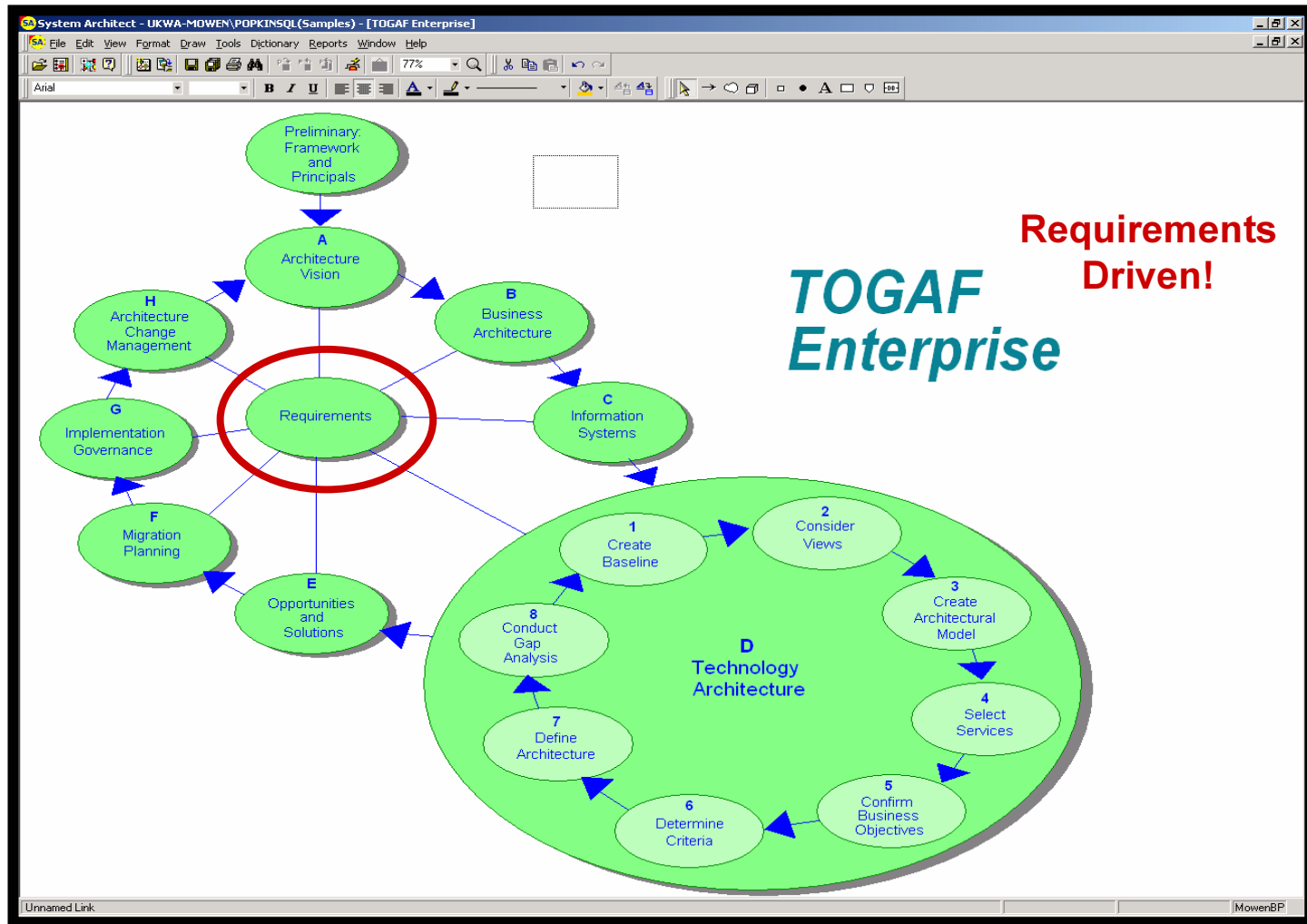
Bringing it all together – process definition



Architectural Framework Example - Zachman



Architectural Framework Example - TOGAF

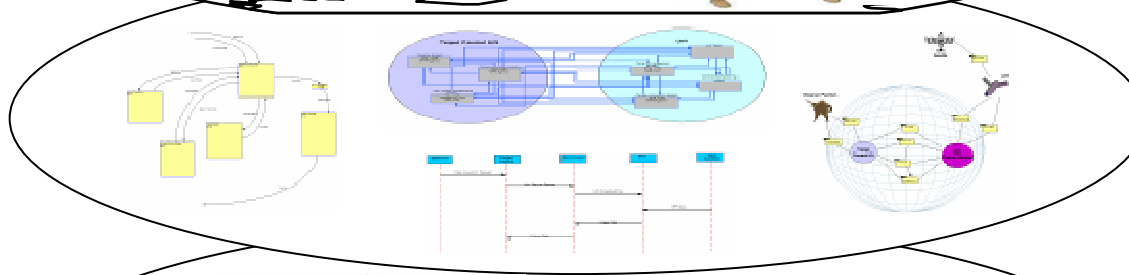


Architectural Framework Example – “x”DAF

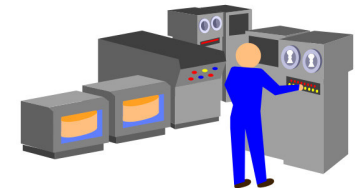
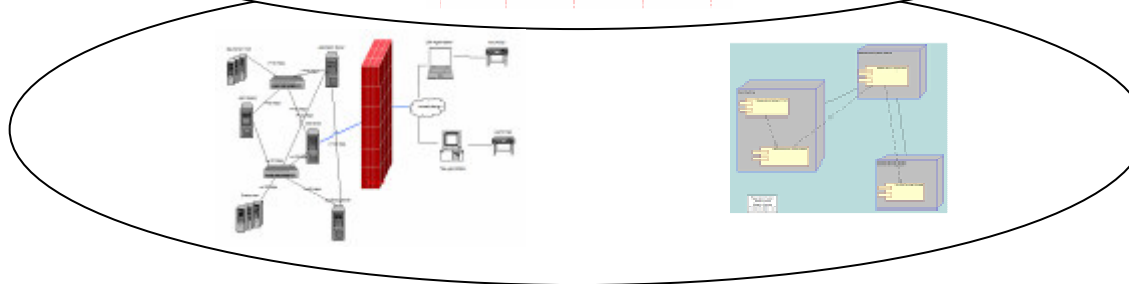
Operational
Views - OV



Systems
Views - SV



Technology
Views - TV

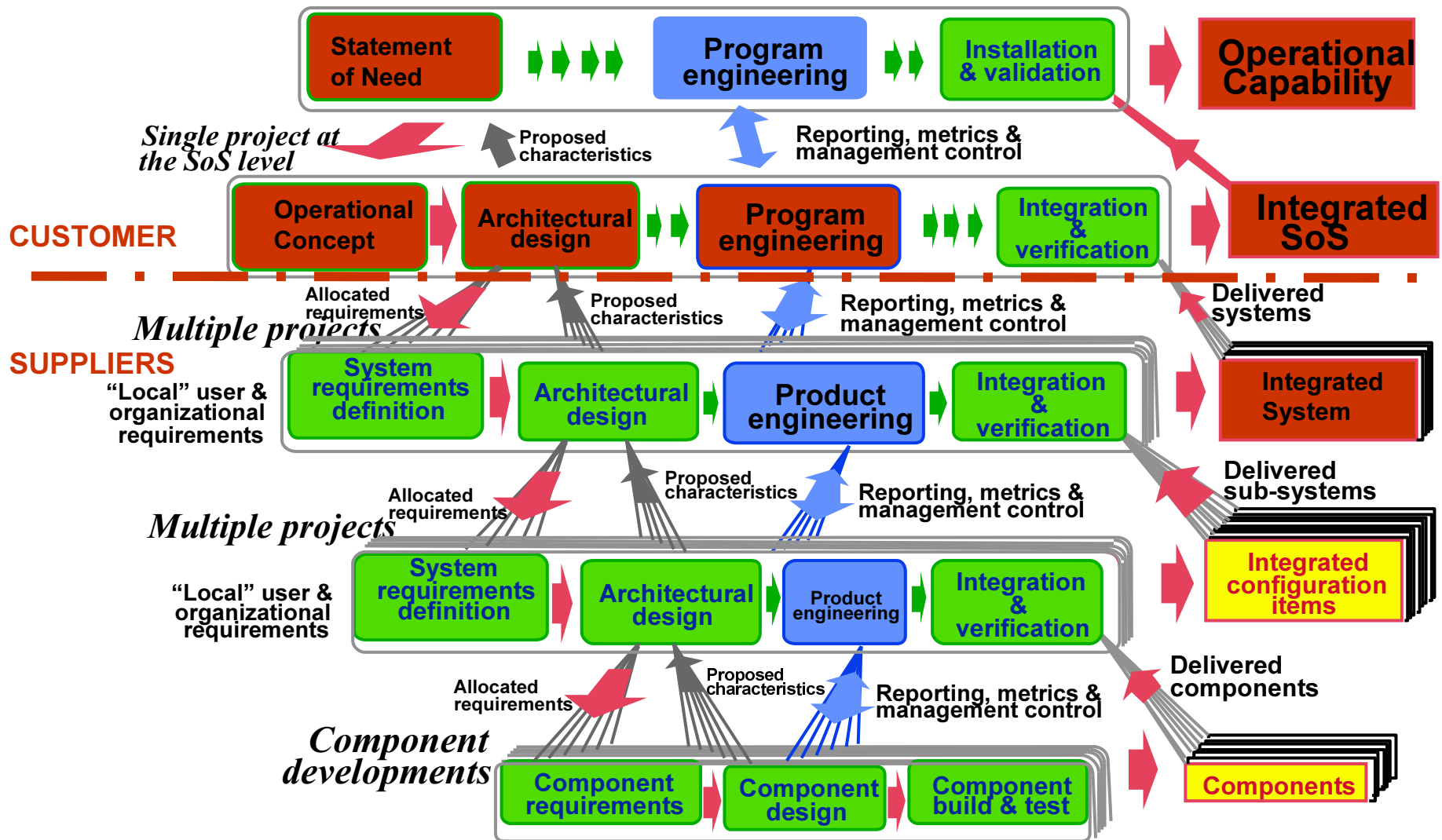


The Architectural Framework Promise

- Capability Analysis for IT Investment Decisions
- System Design and Development
- Modernization Planning and Technology Insertions
- Portfolio Management
- Joint Capabilities Integration
- Acquisition Strategy Support and Decision Making
- Interoperability
- Operations Planning and Execution
- Communications Planning

The Framework provides the guidance, rules, and product descriptions for developing and presenting architecture descriptions that ensure a common denominator for understanding, comparing, and integrating Families of Systems (FOSs), Systems of Systems (SoSs), and interoperating and interacting architectures.

Architecture based acquisition and development



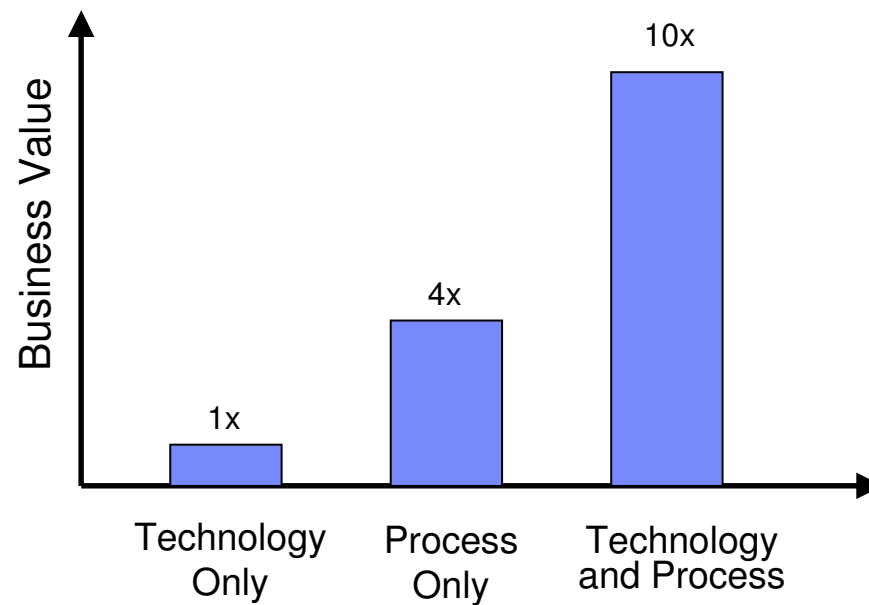
The Importance of Process & Best Practices

“...The quality of a product is largely determined by the quality of the process that is used to develop and maintain it ...”

based on: Shewhart, Juran, Deming and Humphrey



Combination of Technology and Process Results in 10x Business Value



Source: London School of Economics – McKinsey Survey



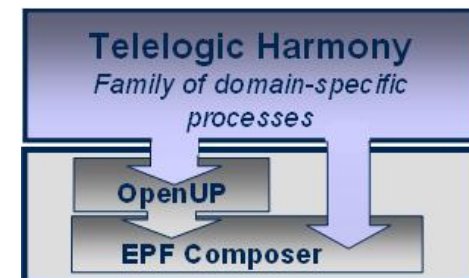
Telelogic Harmony

Library of Best Practices for Enterprise Adoption

- Library of best practices for development of IT and embedded software and systems
 - **Communicate best practices across the organization to accelerate adoption**

- Guidance on using Telelogic tools to automate your process
 - **Provide sustainable training ...Connect people, process, and tools**

- Available as Eclipse Process Framework plug-ins
 - **Easy to adapt processes for individual organization**



Lets take a closer look ...



Telelogic Harmony

A family of domain-specific best practices for building better software and systems

- **Harmony/ITSW**

- Agile Development Software Library

- **Harmony/ESW**

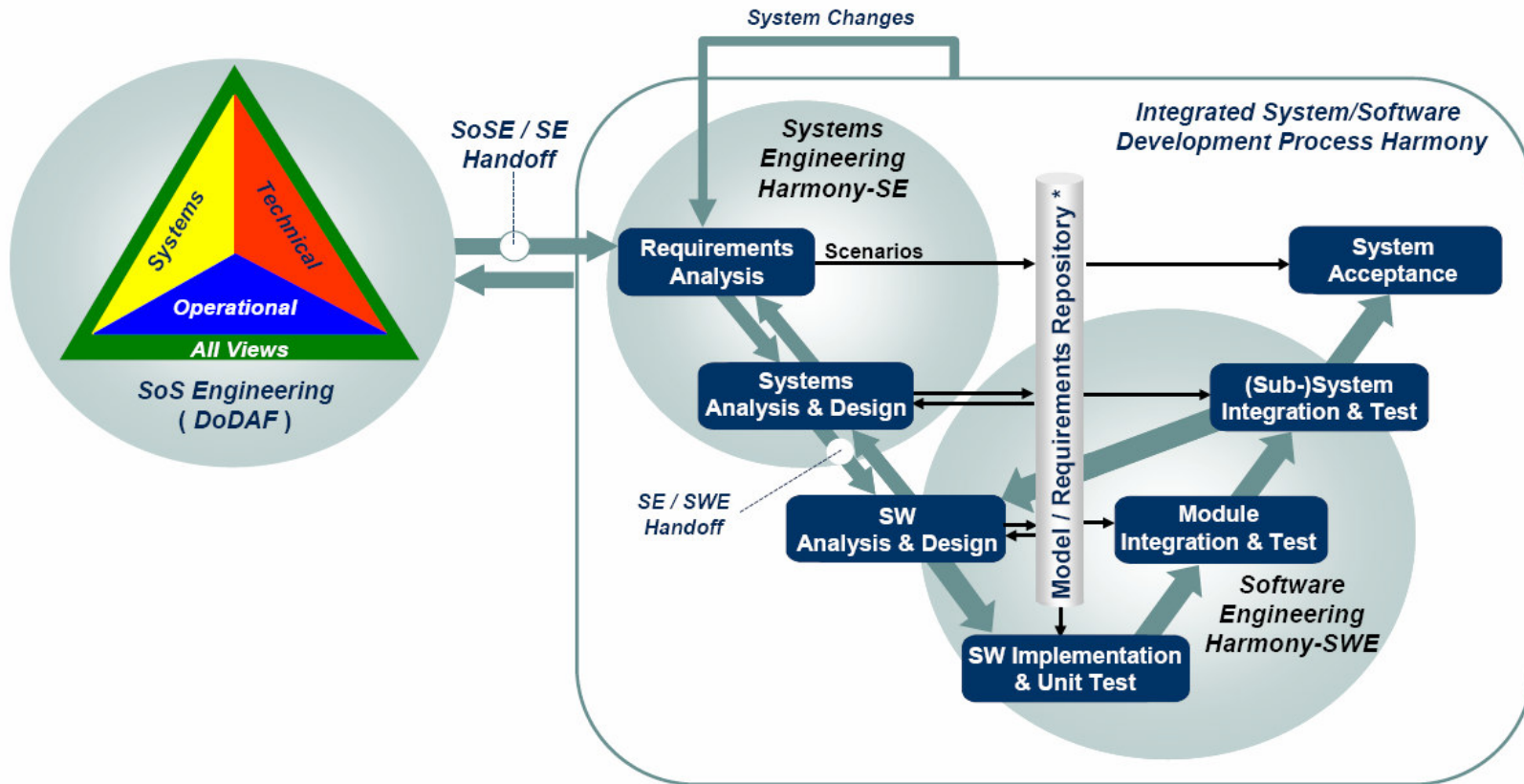
- Embedded Software Library

- **Harmony/SE**

- Systems Engineering Library

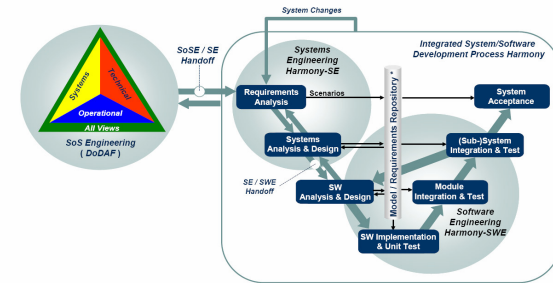


From Enterprise Architecture (DoDAF) to System Development – Integrated SoSE/SE/SWE Process



Integrated SoSE/SE/SWE Process

SoSE/SE Handoff Issue

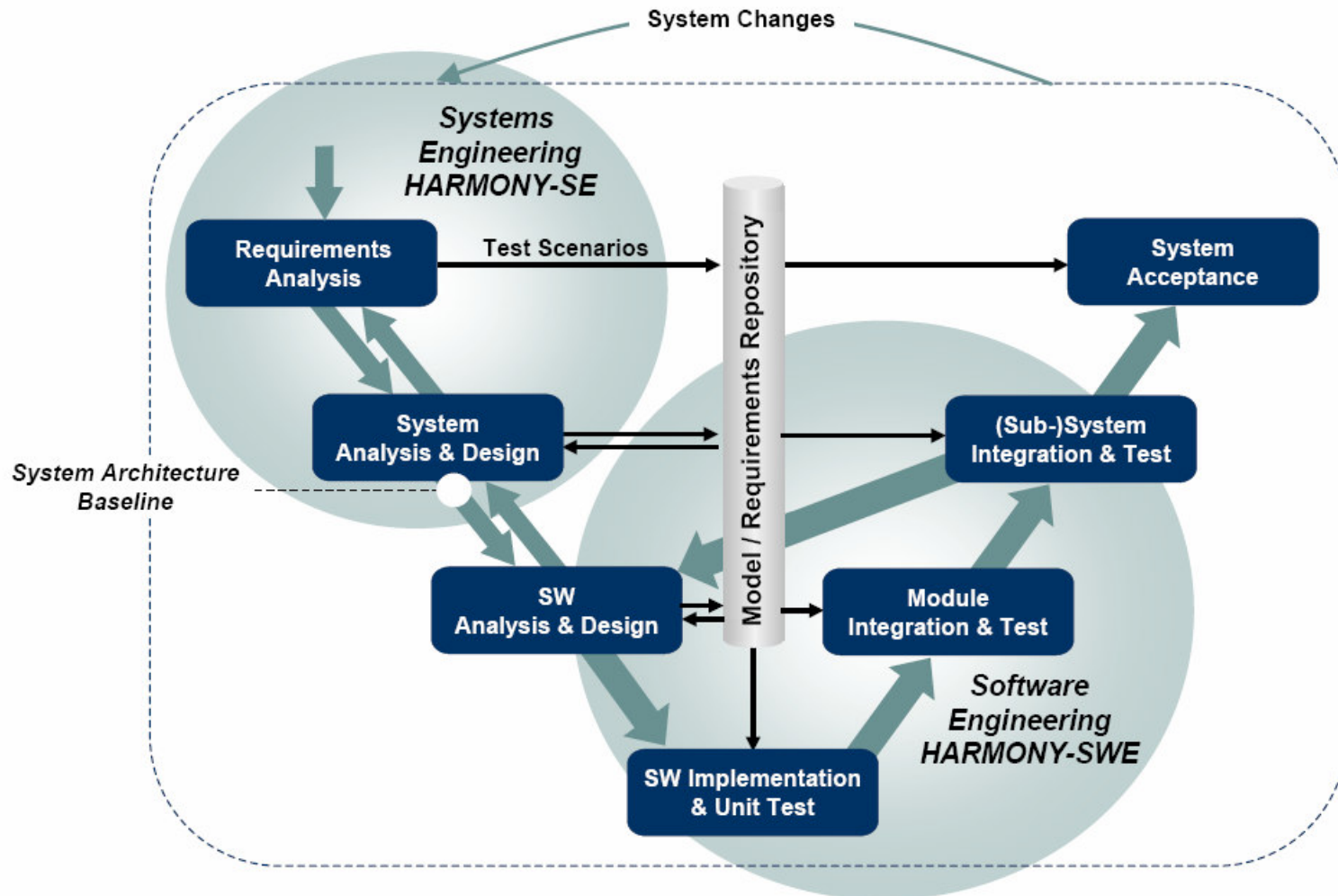


	SoS Engineering		SE / SWE (Harmony)		
Customer	AV / OV / TV				
Subcontractor	AV / OV / TV	AV / SV / TV			
			SE		
				SWE	
	Customer / Subcontractor Handoff		SoSE / SE Handoff	SE / SWE Handoff	time →

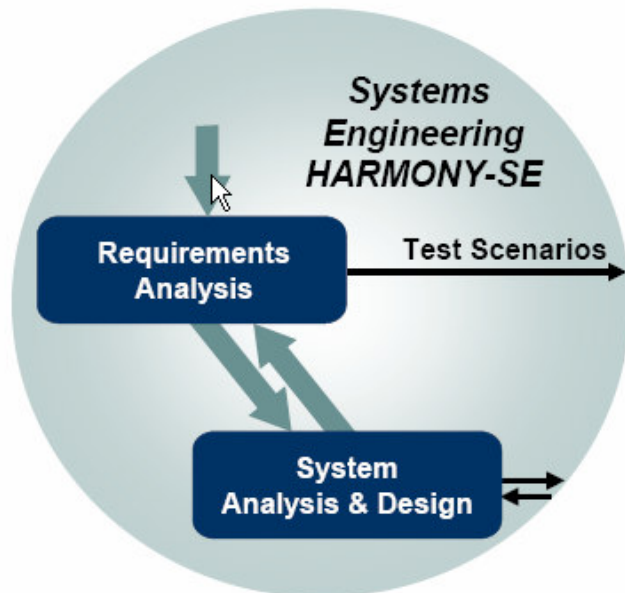
Note: A major issue of the Integrated SoSE / SE / SWE process is, that in many cases there is no clear definition, at which level DoDAF- based SoSE should stop.



Integrated Systems / Software Development Process *Harmony*®



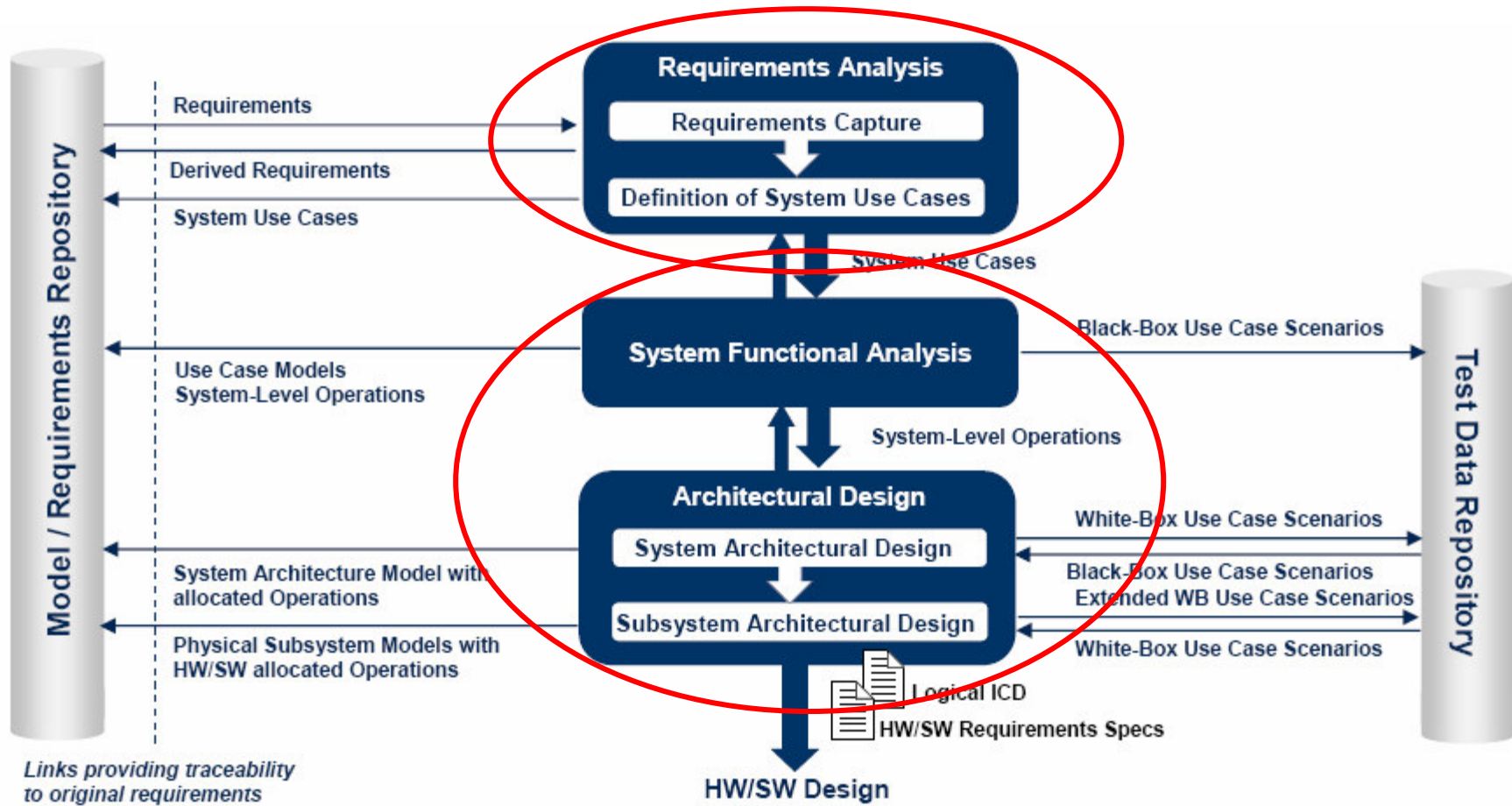
Systems Engineering Process - Key Objectives



- Identify / derive required system functionality
- Identify associated system states and modes
- Allocate system functionality / modes to a physical architecture



SysML-Based Systems Engineering Process



Harmony-SE Overview

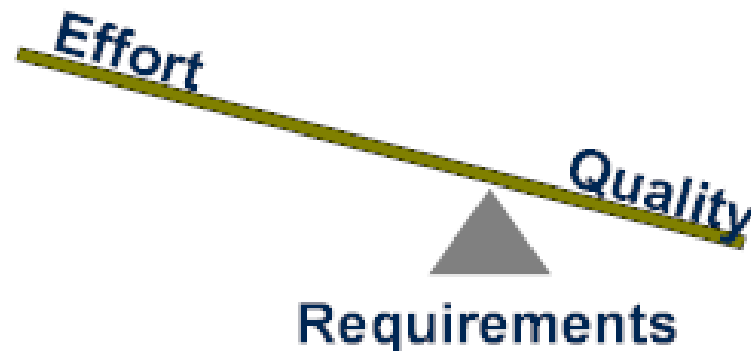
- **Requirements Analysis**
 - ▶ Capturing of requirements and grouping of requirements into use cases.
- **System Functional Analysis**
 - ▶ Use case-based identification and verification/validation of system-level operations (= set of functional requirements).
- **System Architectural Design**
 - ▶ Optional decomposition of system-level operations and allocation of operations to (functional or physical) subsystems. Definition of subsystem interfaces.
- **Subsystem Architectural Design**
 - ▶ Partitioning of operations between subsystem components (HW and/or SW). Definition of subsystem component interfaces.



What are Requirements?

(They are the TO-DO List of the Project Team)

- List of the goals and objectives of the business
- List of what the users need
- List of what the system must do to satisfy user and business needs
- List of what components must be built
- List of what each component must do, and how components will interact

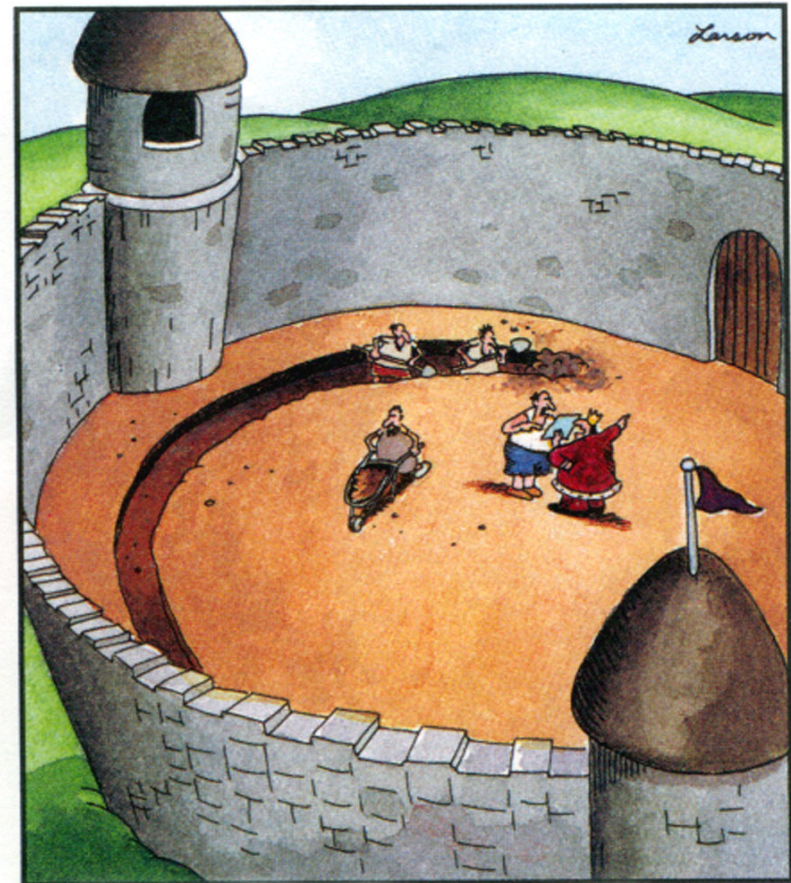


Requirements define the quality of the “system”



What is Requirements Management?

- Requirements capture
 - ▶ how to elicit, capture and express requirements in a clear, unambiguous way
- Requirements specification
 - ▶ how to organize and present sets of requirements as documents
- Requirements analysis
 - ▶ how to trace the effect and satisfaction of each requirement through the design layers
- Change management
 - ▶ how to understand the impact of changes up and down the levels of requirements
- Configuration management
 - ▶ how to manage the requirement sets relating to versions and variants of a system



Suddenly, a heated exchange took place between the King and the moat contractor, and hence, requirements management was born.



Benefits of Requirements Management

- Traceability from highest level requirements to lowest level requirements
 - ▶ Established via links through the database
- Impact assessments of proposed changes
 - ▶ Analysis tools let you see which other requirements, design elements, and tests will be affected by a change
- Controlled access to current project information
 - ▶ A shared database ensures that all users are working with current data
 - ▶ A central repository allows controlled access to essential information
- Change control
 - ▶ The Change Proposal System implements a controlled process for managing change

Requirements and Requirements Management are still central to the development and acquisition of systems and systems of systems.

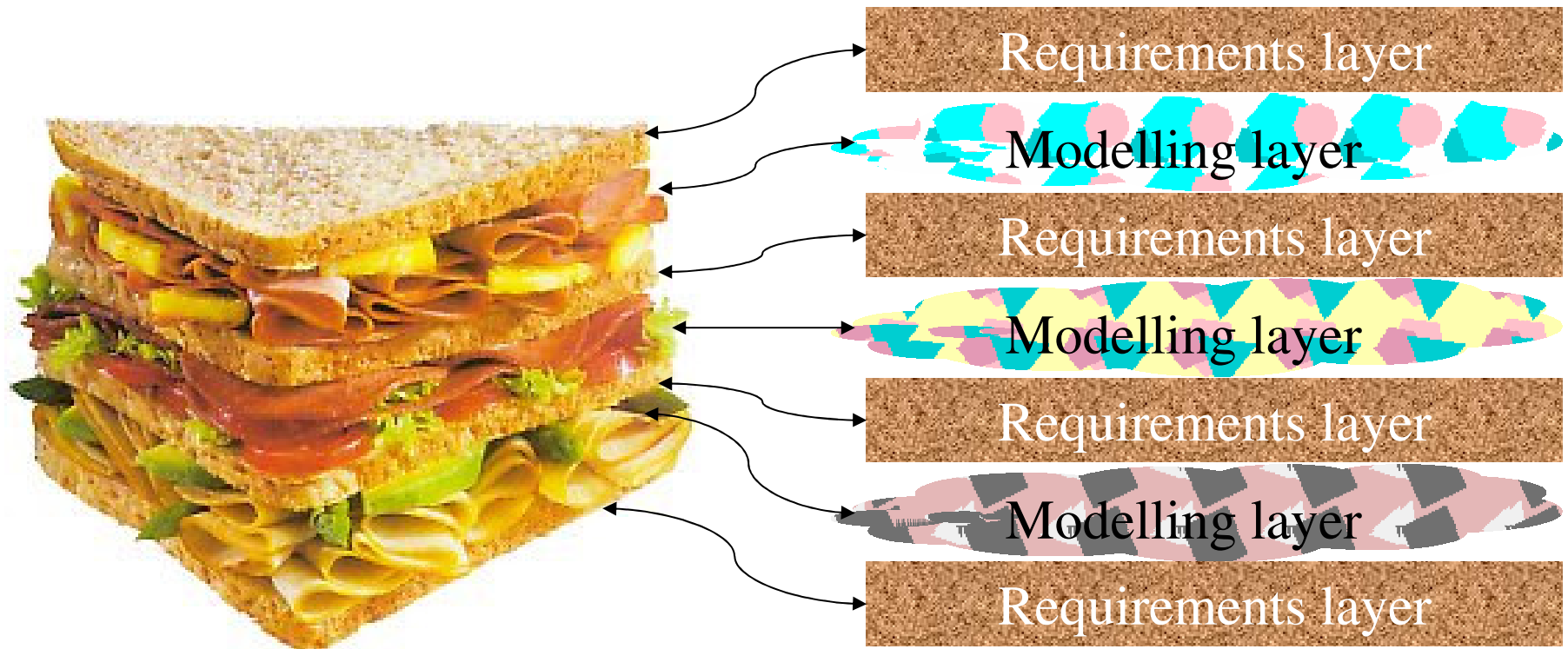


Requirements and Models are entirely complementary

- Requirements documents often incorporate **drawings** in an effort to explain the requirements.
- Diagrams, *not just drawings*, created via models using a formal and standard notation such as **UPDM** and **SysML** increase understanding of the textual requirements.
- Models aid **communication** with customers, development team and subcontractors
 - ▶ ‘A picture paints a thousand words’
 - ▶ Reduce chances of misinterpretation – more formalized
 - ▶ To avoid “That’s not what we asked for”
- Models can be **executed** for early verification & validation.



Systems Engineering is a Club Sandwich



The Role of Models

- The architecture model is the basis for:
 - ▶ costing,
 - ▶ interoperability analysis,
 - ▶ partitioning to different development teams,
 - ▶ scheduling (WBS),
 - ▶ analysis of alternatives,
 - ▶ early validation, and
 - ▶ risk management.

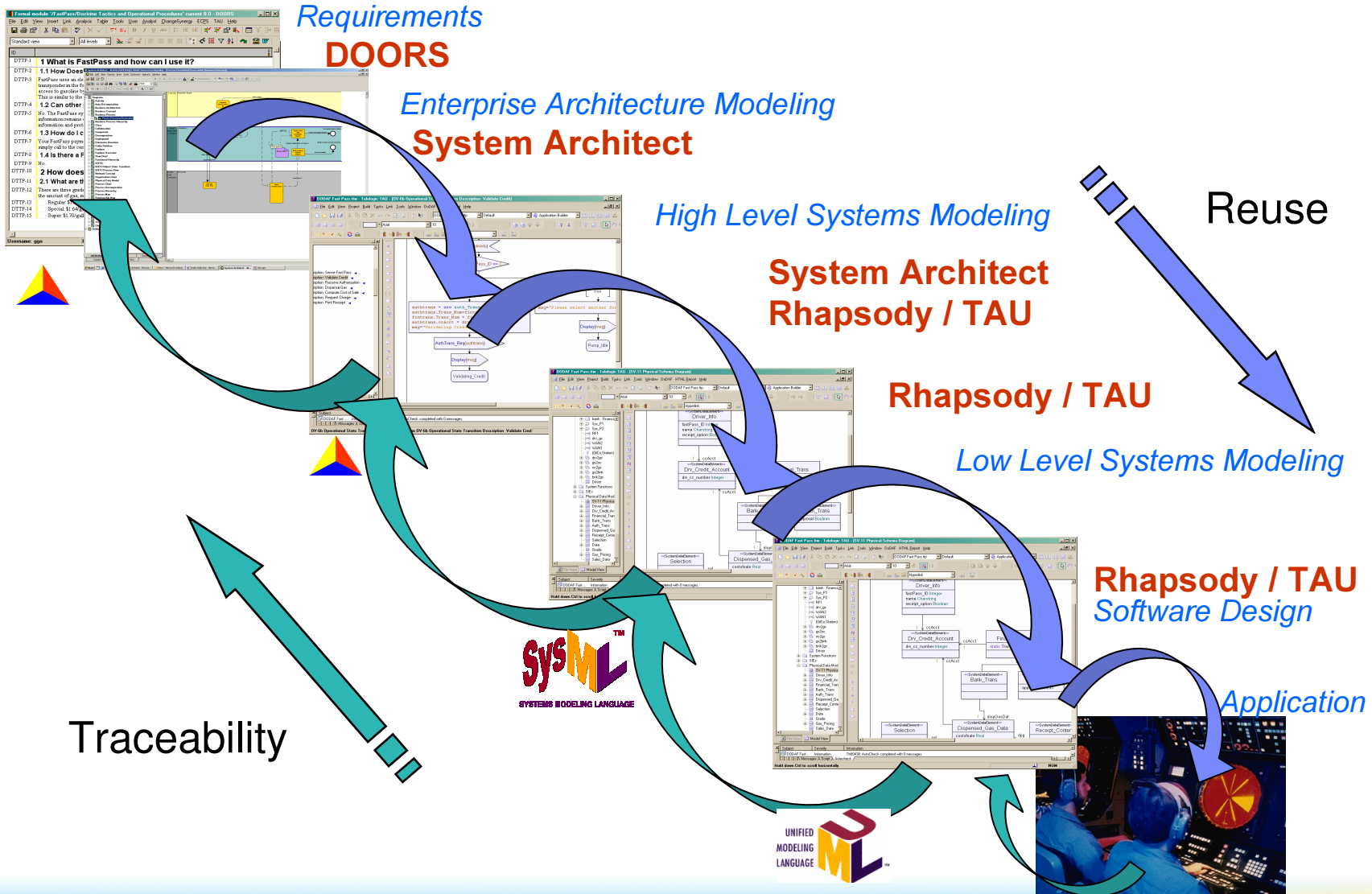


Benefits of Modeling

- Improve communications
- Enhance knowledge capture
- Promote re-use
- Identify problems early
- Cope with complexity
- Explore multiple options
- Reduce maintenance costs



From Business Goals to Implementation





Benefits of the SoSE/SE Harmony approach

- Help you build a world-class development organization
- Guidance from concept to delivered system
- Repeatable high quality SoS/System and software development
- Bi-directional interface between the systems-software groups
- Audit trail for regulatory agencies
- Continuous process improvement



IBM Technical Exploration Center



TEC e' un centro destinato alla conoscenza delle tecnologie SW, un centro di supporto per fornire a clienti e BP l'opportunità di sperimentare le soluzioni IBM Software, le tecnologie e i prodotti che non possono essere dimostrati con un semplice Thinkpad

Il TEC italiano fa parte di una rete mondiale di centri analoghi che consente di condividere ambienti di POT, esperienze e competenze tecniche.

Milano	Argomento
16-ott	Rational TeamConcert
22-ott	Rational Quality Manager
03-nov	Business Driven Development for SOA
11-nov	Automatizzare il processo di Build delle applicazioni: Rational Buildforge
18-nov	Le mie applicazioni Web sono sicure? Testale e scopriilo con Watchfire
02-dic	Rational for Systems development

Roma	Argomento
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13-nov	Automatizzare il processo di Build delle applicazioni: Rational Buildforge
20-nov	Le mie applicazioni Web sono sicure? Testale e scopriilo con Watchfire
04-dic	Rational for Systems development

Iscrizioni a TEC_MILANO@it.ibm.com, con: Nome, Cognome, Azienda e nome e data del workshop



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