

# The Development of Systems Engineering International Standards and Support Tools for Very Small Entities

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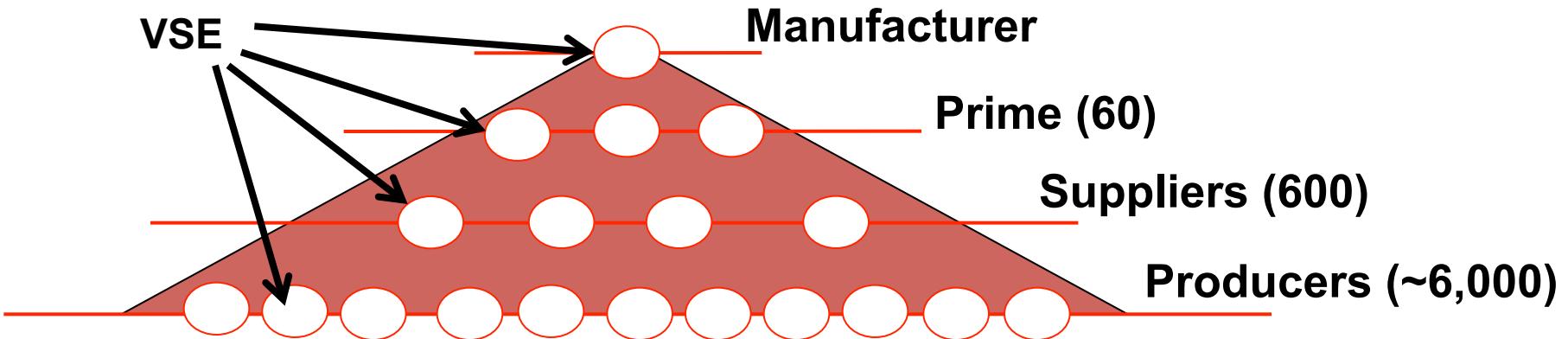
# Content

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**VSEs** = Very Small Entities are enterprises, projects or departments having up to 25 people.

**ISO/IEC JTC 1/SC7** = International Organization for Standardization/  
International Electrotechnical Commission Joint Technical Committee 1/  
Sub Committee 7.

# The Importance of VSEs



A software defect from one of the producers went into a product and resulted in a loss of over \$200 million by the manufacturer

(Adapted from: Shintani, Small Settings Workshop, Software Engineering Institute, 2006)

# Context

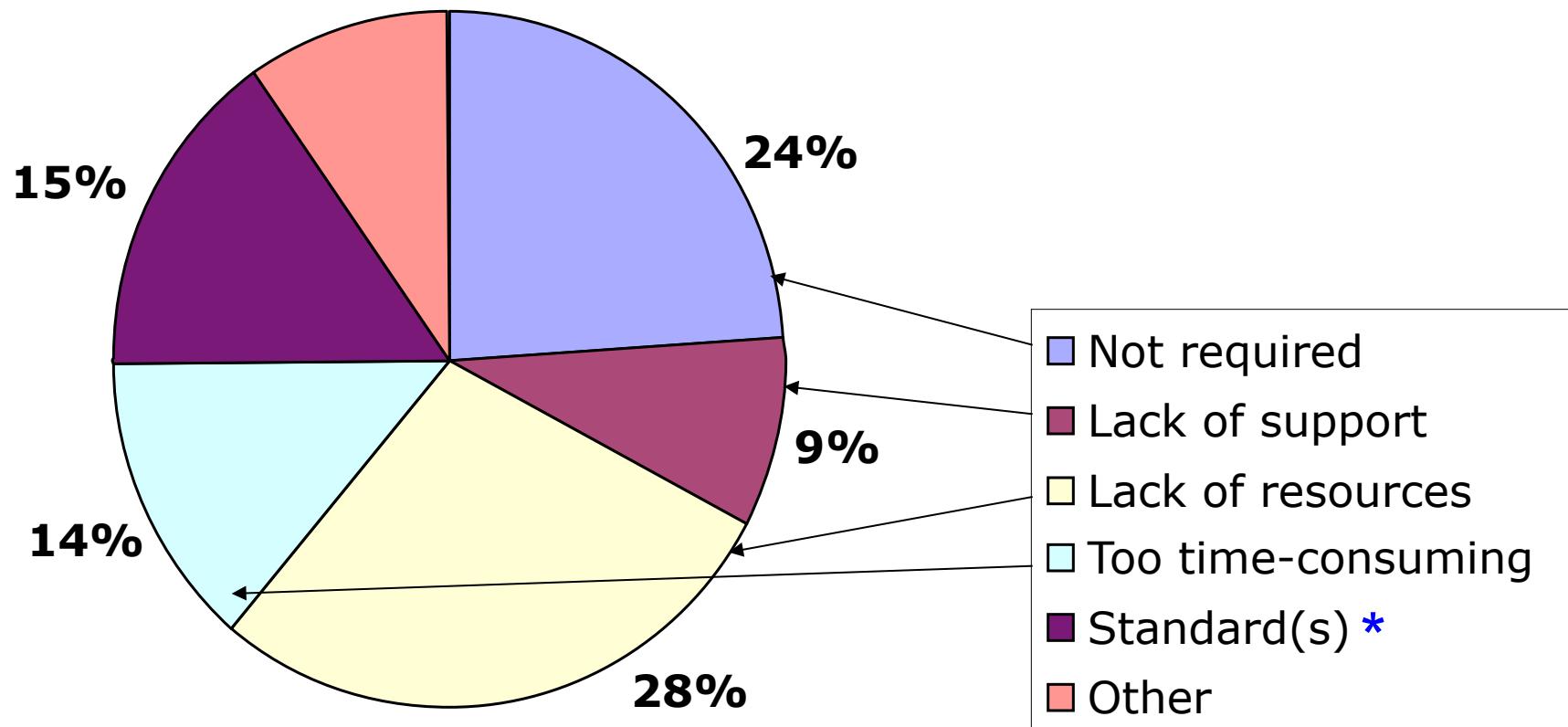
- Systems Engineering concepts have been adopted and adapted by most industries in various domains for development products and services.
- Most of VSEs cannot afford the resources, in terms of number of employees, cost and time, nor do they see a net benefit in establishing system life cycle processes
  - Difficulties to implement standards: no resources
  - Methodologies are not always written, shared.
  - Processes are often improvised.

# Context

- VSEs are implied involved in schemes such as Extended Enterprise, Groups of Enterprises, Innovation Platforms
  - Integration into the Systems Engineering process customers sometimes with risks associated
  - Passage of a statute of supplier to systems engineering
  - New relationships with contractors and / or partners
- The consequence can be profound cultural changes
  - New methodologies
  - New tools or workshops
  - New risk-taking
  - New actors in a global context

# Context

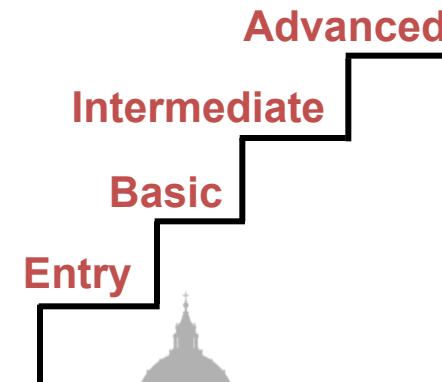
## Why don't VSEs use Standards?



\* Difficult, Bureaucratic, not enough guidance.

# Development of International Standards for VSEs

- **Four Profiles within the Generic Profile Group**
  - **Entry** - Targets VSEs typically developing 6 person-month projects or start-ups;
  - **Basic** - Targets VSEs developing only one project at a time;
  - **Intermediate** – Targets VSEs developing multiple projects within the organizational context;
  - **Advanced** – Targets VSEs which want to sustain and grow as an independent competitive software development business.



## 29110 Overview (TR 29110-1)

For VSEs

## 29110 Profiles (IS)

Framework and Taxonomy (IS 29110-2)

Specifications of VSE Profiles (IS 29110-4)

Specification - VSE Profile Group m  
(IS 29110-4-m)

For Standard  
producers, tool  
vendors, methodology  
vendors

List the Requirements  
i.e. 'What to do'

## 29110 Guides (TR)

Assessment Guide (TR 29110-3)

For Assessors  
and VSEs

Management and Engineering Guide (TR 29110-5)

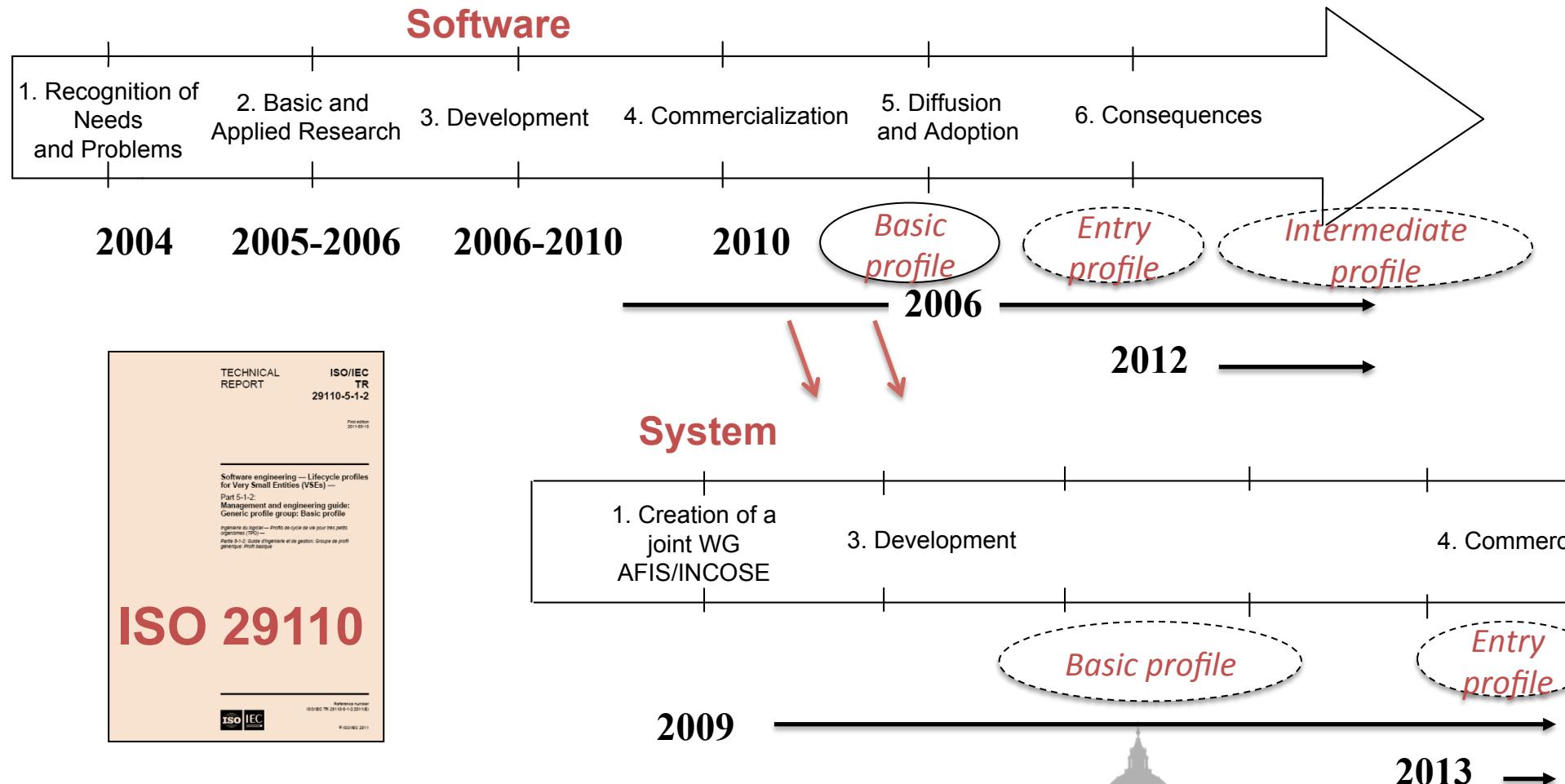
Management and  
Engineering Guide  
VSE Profile m-n  
(TR 29110-5-m-n)

For VSEs

'How to do'

# Development of International Standards for VSEs

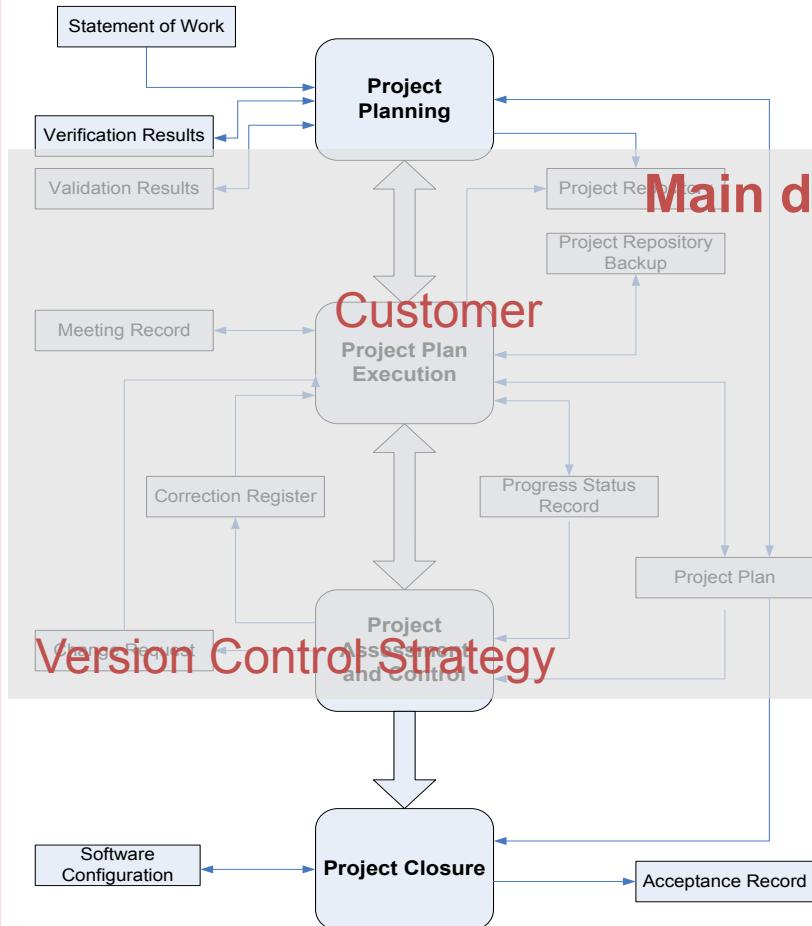
(adapted from Rogers, 2003)



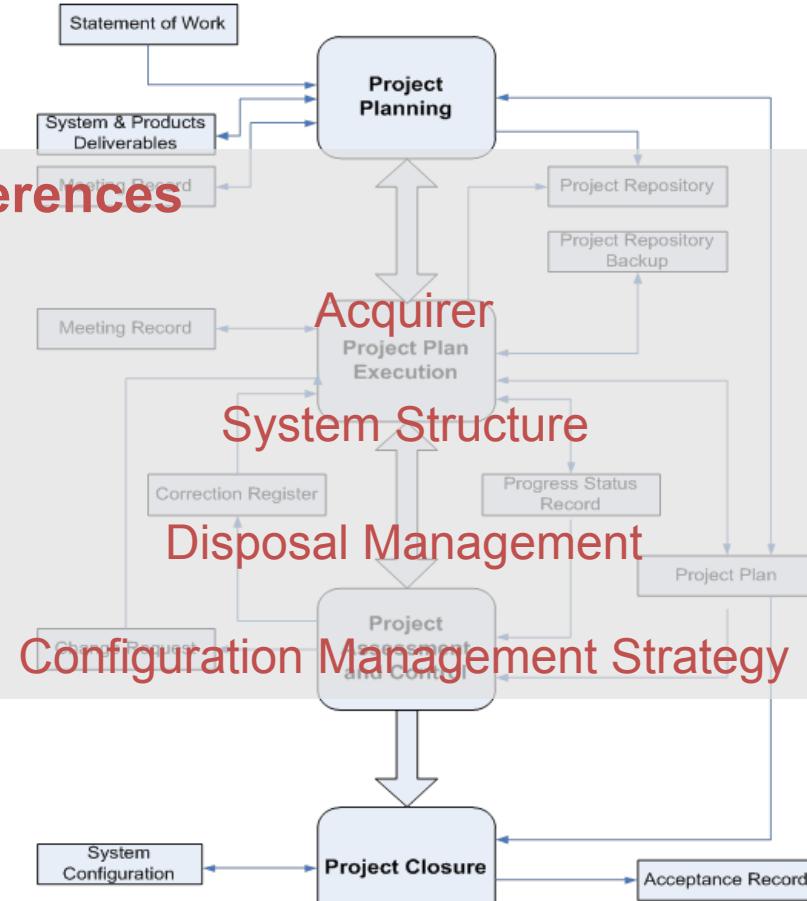
# Project Management



# Software Project Management Process



## System Project Management Process



# Main differences

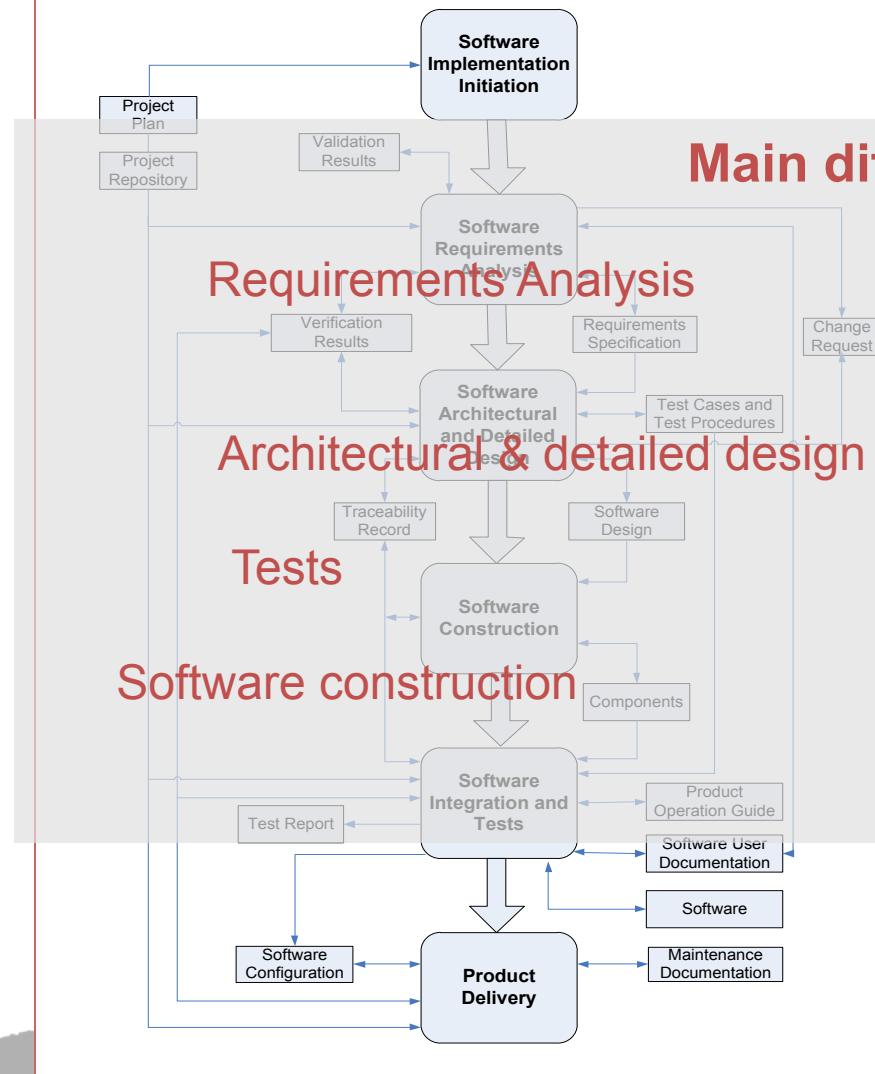
# Version Control Strategy

# Configuration Management Strategy

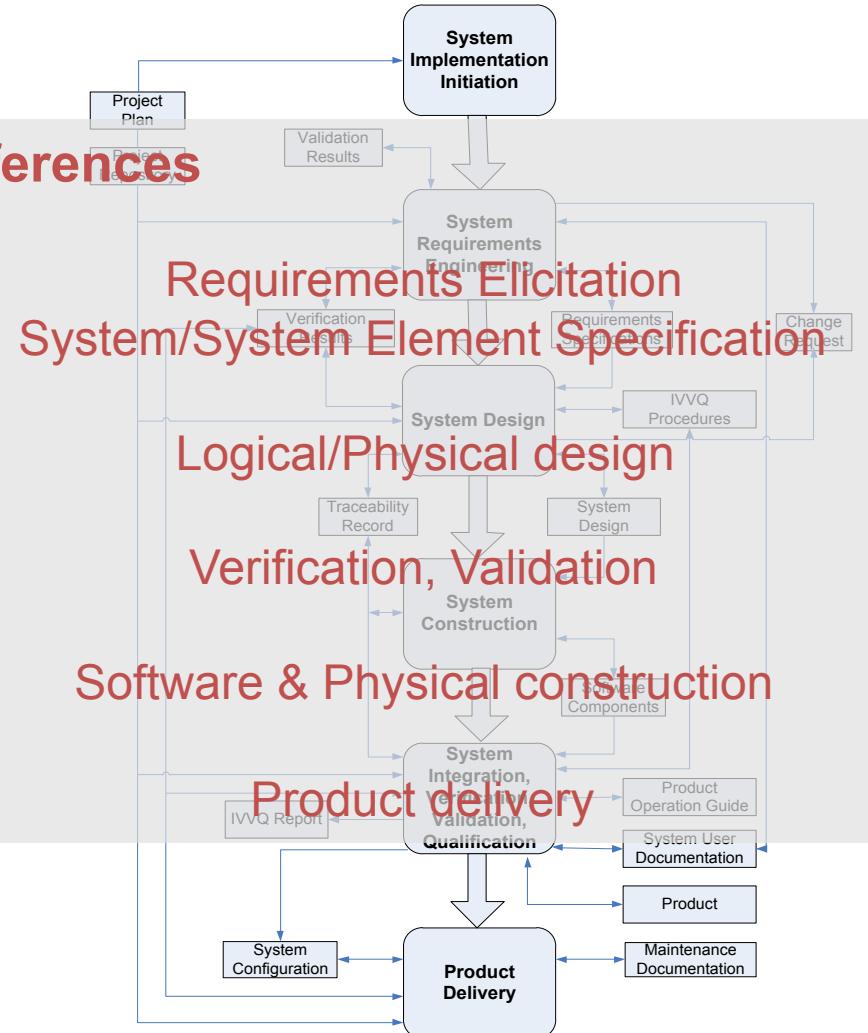
# Implementation process



## **Software Implementation Process**



## System Implementation Process



# Main differences

```

graph TD
    RA[Requirements Analysis] --> VR[Verification Results]
    RA --> RS[Requirements Specification]
    RA --> SAD[Software Architectural and Detailed Design]
    VR --> SAD
    RS --> SAD
    SAD --> TC[Test Cases and Test Procedures]
    TC --> VR
    TC --> CR[Change Requests]
    CR --> RA
  
```

The diagram illustrates a sequential process for software development. It begins with 'Requirements Analysis' at the top, which branches into three main activities: 'Verification Results', 'Requirements Specification', and 'Software Architectural and Detailed Design'. 'Verification Results' feeds into 'Software Architectural and Detailed Design'. 'Requirements Specification' also feeds into 'Software Architectural and Detailed Design'. 'Software Architectural and Detailed Design' then leads to 'Test Cases and Test Procedures'. 'Test Cases and Test Procedures' provides feedback to both 'Verification Results' and 'Requirements Specification'. Finally, 'Change Requests' from the 'Test Cases and Test Procedures' step are fed back into 'Requirements Analysis'.

The diagram illustrates a relationship between two main components: 'Tests' and 'Software construction'. The word 'Tests' is written in red text at the top left. The words 'Software construction' are written in red text at the bottom left. A double-headed horizontal arrow connects these two components, indicating a bidirectional relationship or interaction between them.

```
graph TD; Engineering[Engineering] --> RequirementsElicitation[Requirements Elicitation]; Engineering --> SystemElement[System/System Element Specification]; Engineering --> VerificationIssues[Verification Issues]; Engineering --> RequirementsSpecifications[Requirements Specifications]; Engineering --> ChangeRequests[Change Requests];
```

## Logical/Physical design

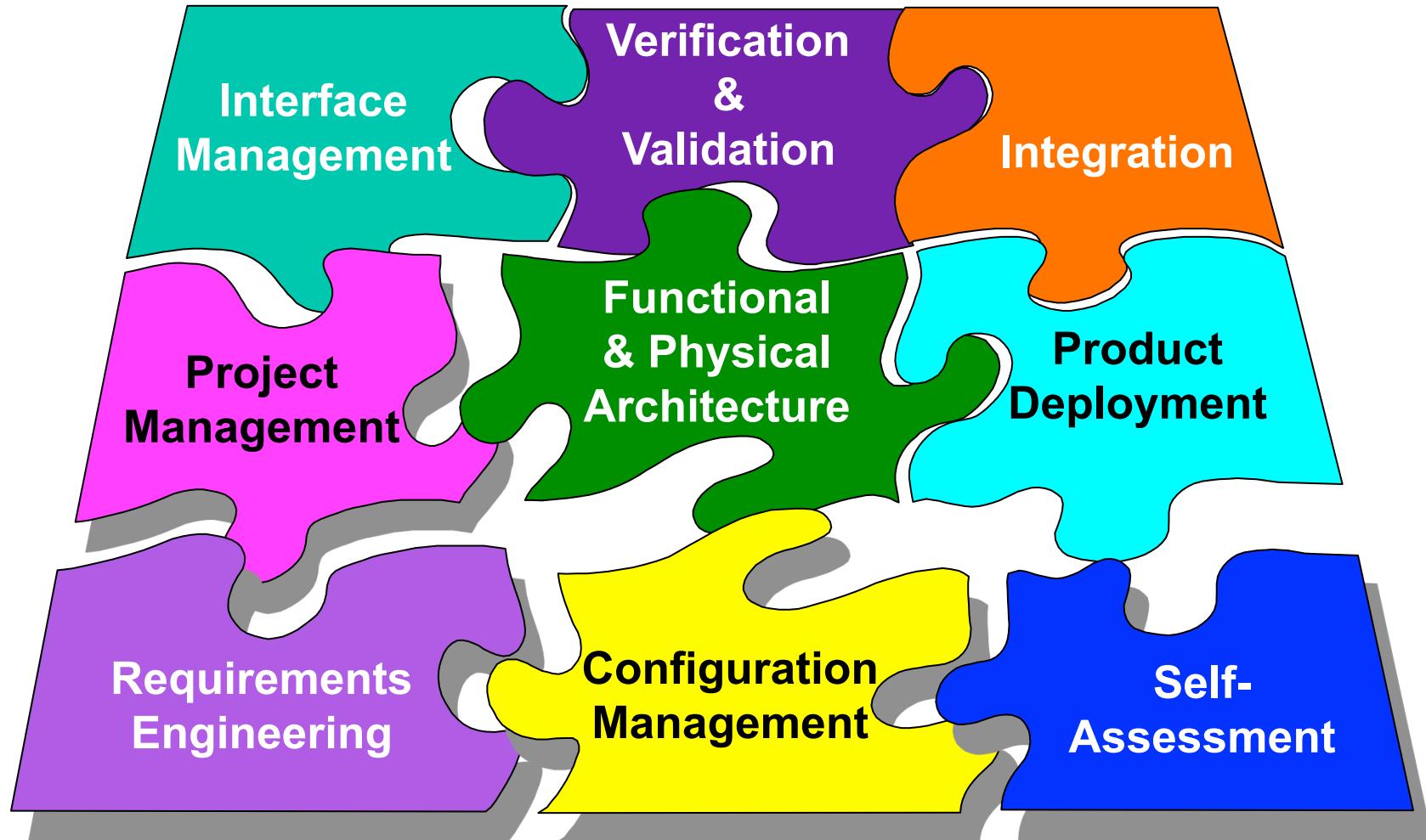
## Verification, Validation

# Software & Physical construction

# Product delivery

Integration,  
Verification  
Validation.

# Deployment packages



# ISO/JTC1/WG24 – Jeju Korea



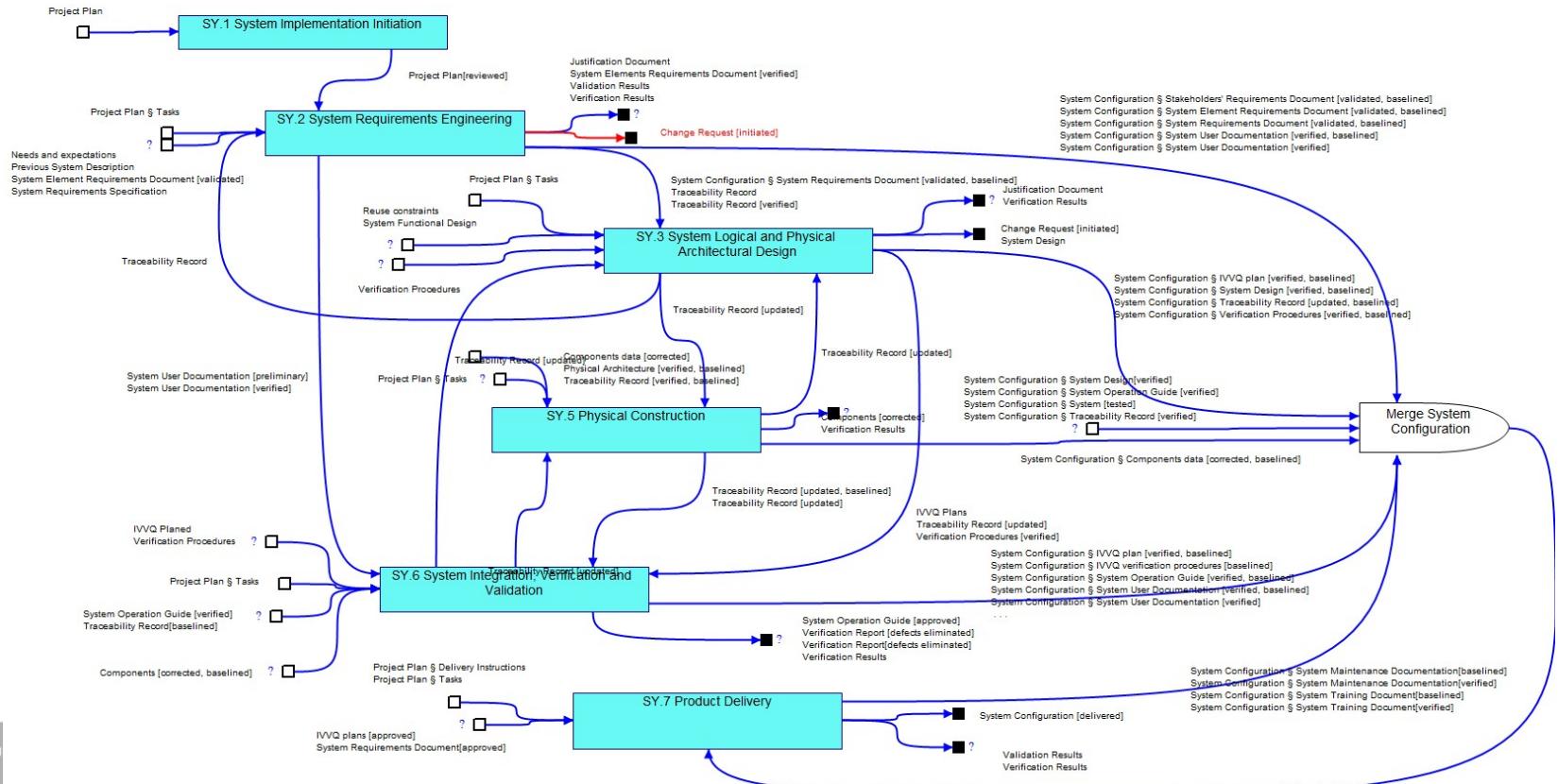
- SE basic profile
  - 336 comments : Japan, USA, France, Brazil, Canada, Australia, Germany
  - Next revision available mid-August for review
- In parallel establishment of a big picture in order to harmonize the SE profiles group

	Entry	Basic	Intermediate	Advanced
PM.1.3 Define the System Breakdown Structure that represents the relationship between the system and its system elements	Informal	System Element PBS	System decomposition SBS	System decomposition SBS

# What is suitable for VSEs?

- Make it simple ! Use process modeling to focus on the target: VSEs

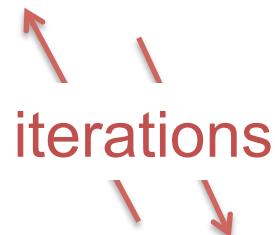
Process: System Implementation



# Conclusion: next steps

- ISO/JTC1/WG24: update the part 5 of the “SE basic profile”

iterations



- SE for VSMEs WG

- Develop mapping between profiles, simplify processes if necessary (Oct 2012) for review at ISO WG24 meeting (12-16 Nov)
- Develop deployment packages (End 2012)
- Develop intermediate profile (2013- ) in parallel with Software

ISO Stage ID	Document Type	Exit (Ballot Completed)
.60		
10	NWI	Combined
20	WD	2011-11
30	PDTR	2012-05
40	DTR.1	2012-11
40	DTR.2	2013-05
60	TR	2013-09