



Part Three : V and V For Victory

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About Me

- Matt Hirschfield MIfSE ASEP



1998

2001

2013

2021

Agenda

This edition of our Ctrl-Alt-Engineering series explores Verification and Validation.

Verification and Validation Overview

Verification Key Principles

Verification Processes/Methods

Validation Key Principles

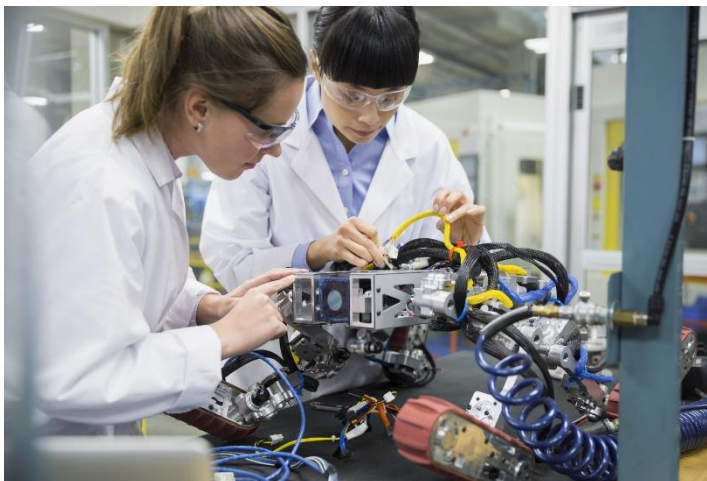
Validation Processes/Methods

Benefits of Verification and
Validation

Verification and Validation - Overview

Verification

Checking that the system design is correctly aligned to the stakeholder requirement characteristics

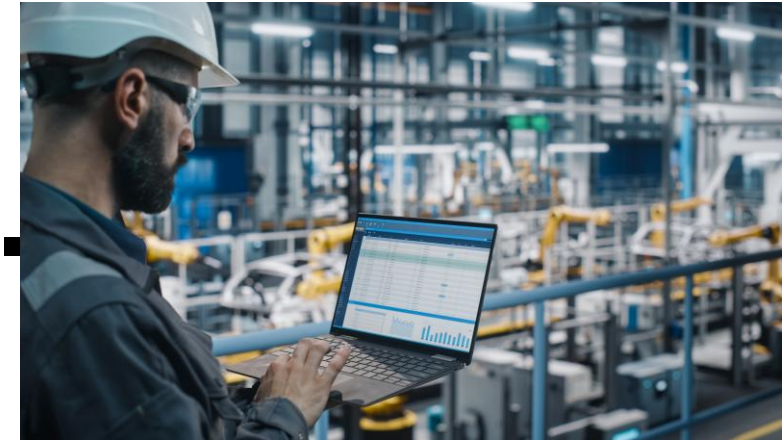


Validation

Checking that the system has been built correctly and meets the stakeholder's needs in its intended operational environment

Verification Key Principles

- Why do we verify
 - People
 - Customers!
 - Peers
 - Users



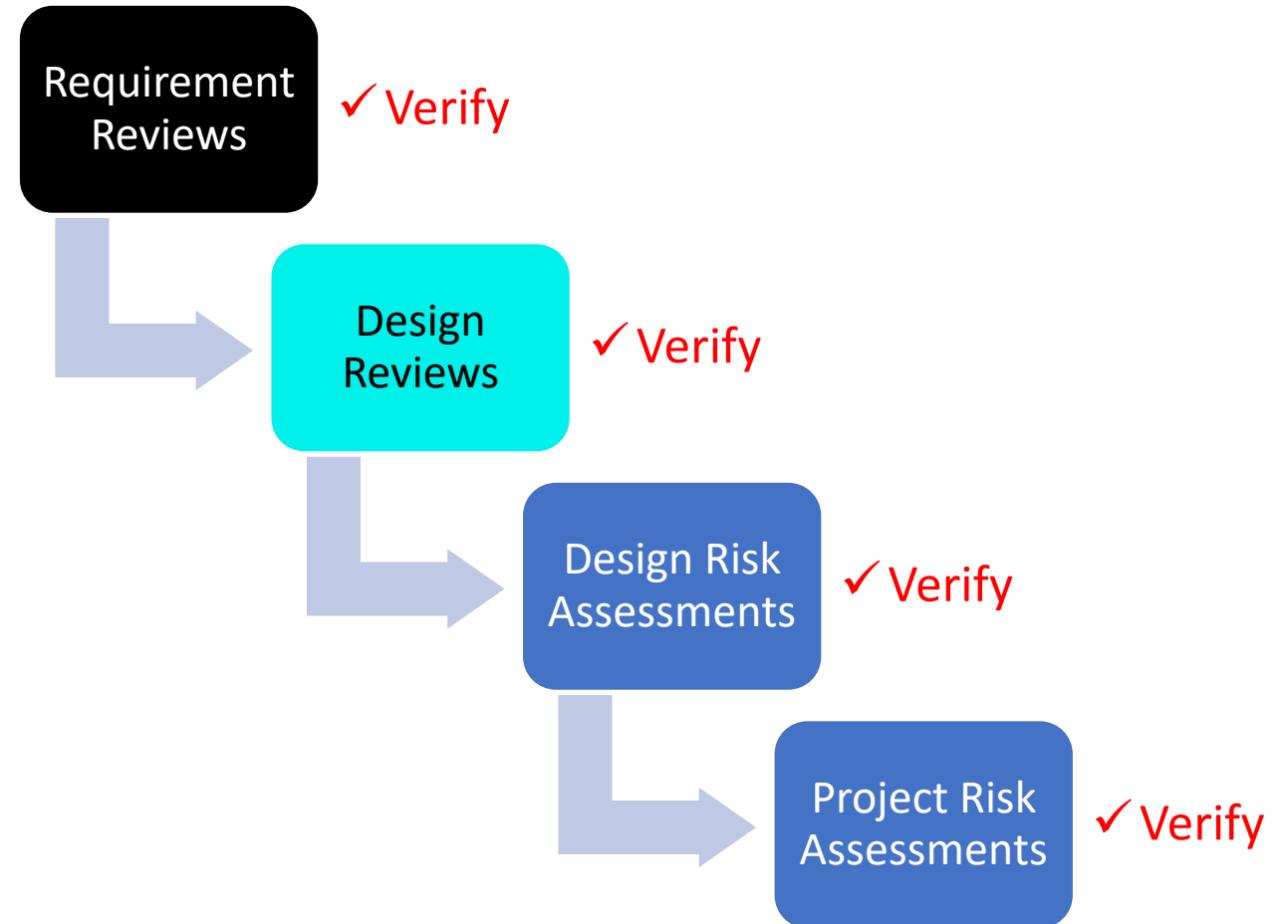
Verification Key Principles

- Another reason we verify
 - Project Governance
 - Opportunity to Share
 - Progress
 - Challenges
 - Risks
 - Success
 - Good Verification, builds Confidence in the delivery team
 - Happy Customers!



Verification Key Principles

- When do we Verify
- Throughout the project/product lifecycle
 - Requirement Reviews
 - Design Reviews
 - Design Risk Assessment
 - Project Risk Assessment



Verification Key Principles

- How do we verify?

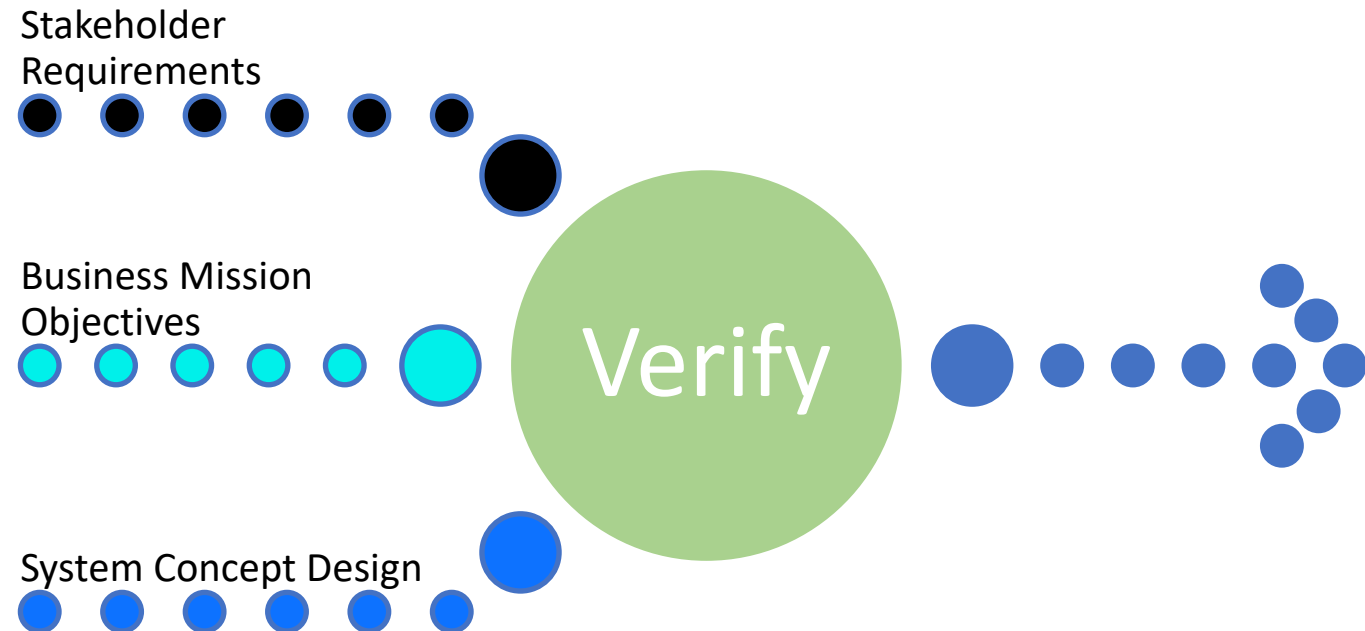
2P –
Process

Verification Processes and Methods

- Planning for Verification
 - Developing a Verification Strategy
 - When and What to verify
 - The plan should be reviewed and tailored to suit the project complexity, budget and scope
- Performing Verification
 - Checking Required Inputs are complete
 - Verification Objectives
 - Verification Criteria
 - What counts as Good, Bad and in between
- Managing the Results
 - Reporting the results
 - Managing exceptions

Verification Key Principles

- Inputs
 - Verification Criteria
 - Scope, Constraints, Schedule
 - Initial Stakeholder Requirements
 - Business Mission Objects
 - Lifecycle Concepts
 - System Concept Design
 - Scope
 - Interface Definition
 - Architecture Definition
 - Initial Requirement Verification Traceability Matrix RVTM



Verification Key Principles

- Activities
 - Verification Methods
 - Inspection and Review
 - Analysis and Modelling
 - Demonstration or Prototyping
 - Testing and Evaluation
 - Formal Verification
 - Execute and Record Verification Activities
 - Carry out the chosen verification method(s) systematically.
 - For each requirement, document outcomes as pass, fail, or not applicable.
 - Any discrepancies or failures must be logged for corrective action.



Verification Key Principles

- Output
 - Verified System Design
 - Supporting Documentation
 - Verification Procedure, Strategy, Constraints
 - Final RVTM that shows traceability from Stakeholder needs to design documentation
 - Verification Reports
 - Verification Records



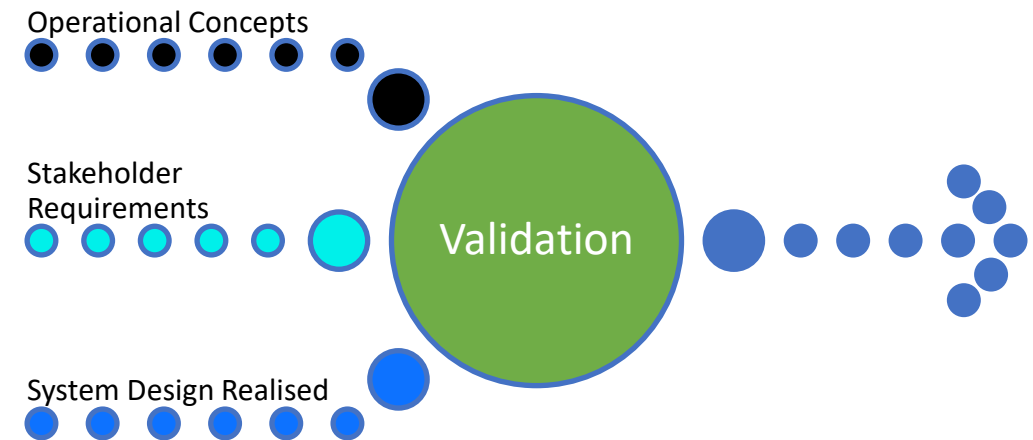
Validation Key Principles

- Why do we validate?
 - People - (Again!)
 - Validation is the final opportunity to ensure the project has successfully satisfied the needs of the stakeholder and Business Mission Objectives

1P –
People

Validation Key Principles

- When do we start to Validate?
 - As soon as possible –
 - Once the Operational Concepts and Stakeholder Requirements are known, validation planning can begin.
 - Actual validation or testing of system elements and wider system, can only begin once the system is in its intended operational state and environment.



Validation Key Principles

- Where do we start?
- By Following the Validation Process
- Formulate the Validation Strategy – Tailored to meet the project
- The Validation strategy feeds into the Validation Test Plan(s)
- Test Plans should
 - Identify the Stakeholders
 - Identify Validation Constraints
 - The Validation Objectives
 - The Validation Scope
 - Associated Risks
 - The Schedule
 - Be tailored to the suit the project complexity and constraints

2P –
Process

Validation Key Principles

- Validation Process

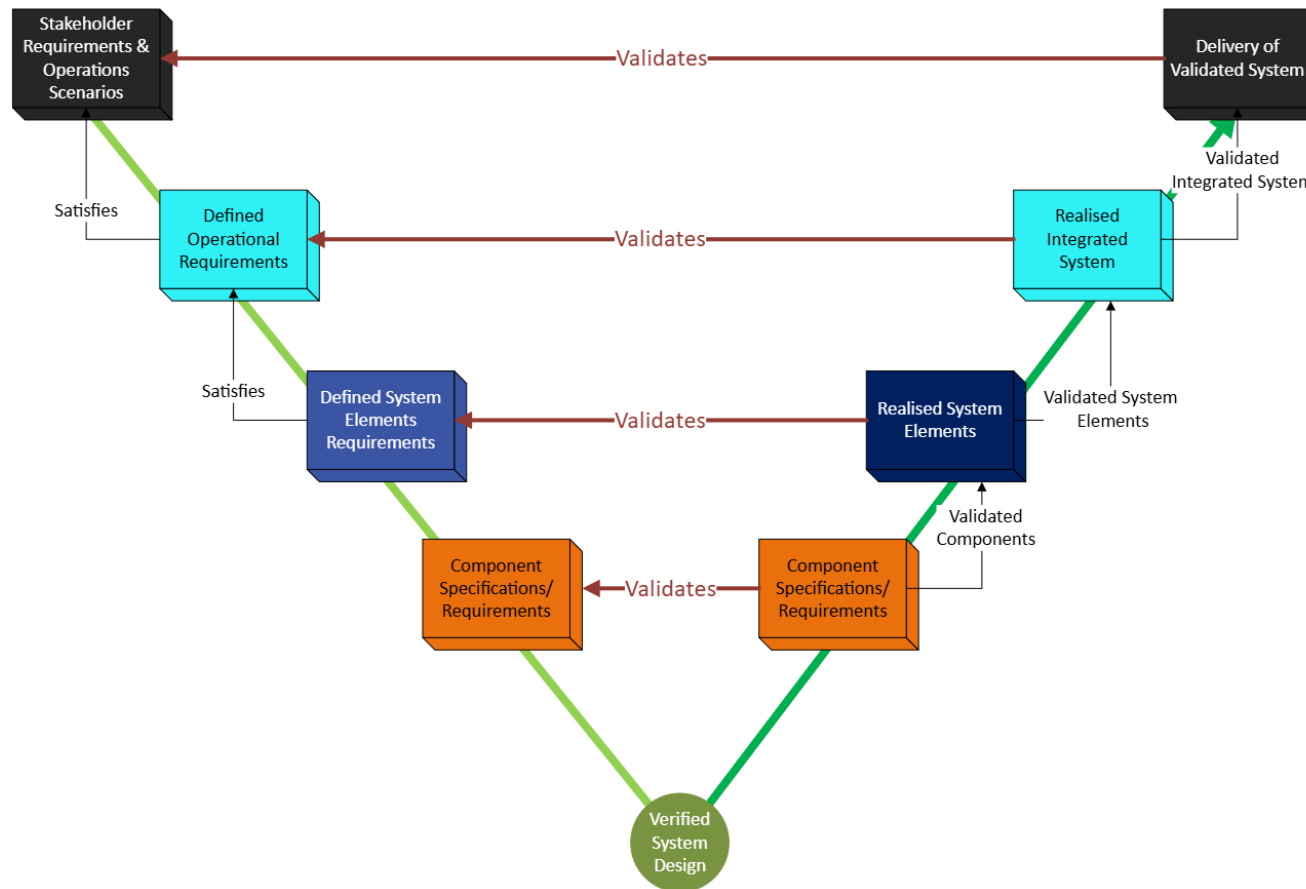
Inputs
<ul style="list-style-type: none">Life Cycle ConceptsStakeholder NeedsRVTMValidation CriteriaSystem/System Element

Activities
<ul style="list-style-type: none">PreparePerformManage

Outputs
<ul style="list-style-type: none">Validated System – Documented Evidence that the System has been successfully ValidatedValidation StrategyValidation enabling System Requirements – requirements outside of the system boundaries that are enablers for System ValidationValidation Constraints – Schedule, Resources, BudgetValidation Procedures – Document EvidenceValidated Requirements – traceability from test results, through System requirements back to Stakeholder/Business RequirementsValidation Report – An account prepared for stakeholders that shares the Validation status of the system against the stakeholder requirementsValidation Record – Validation data

Validation Key Principles

- Validation levels decomposed to align with system layers



Verification and Validation Summary



<https://www.engineeringforhumans.com/category/case-studies/>

3P – Products

IBM Engineering Lifecycle Management is the most comprehensive solution to work consistent across engineering domains



Engineering Requirements Management DOORS Next

Capture and structure requirements;
Version, baseline and exchange



Engineering Systems Design Rhapsody

Model and execute software- and
system architecture and behaviour



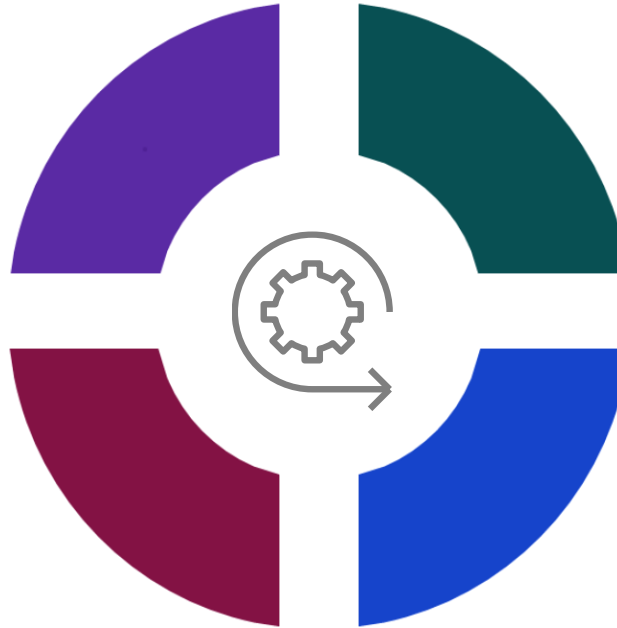
Engineering Test Management

Plan, execute and automate tests.
Manage plans, suites & environments

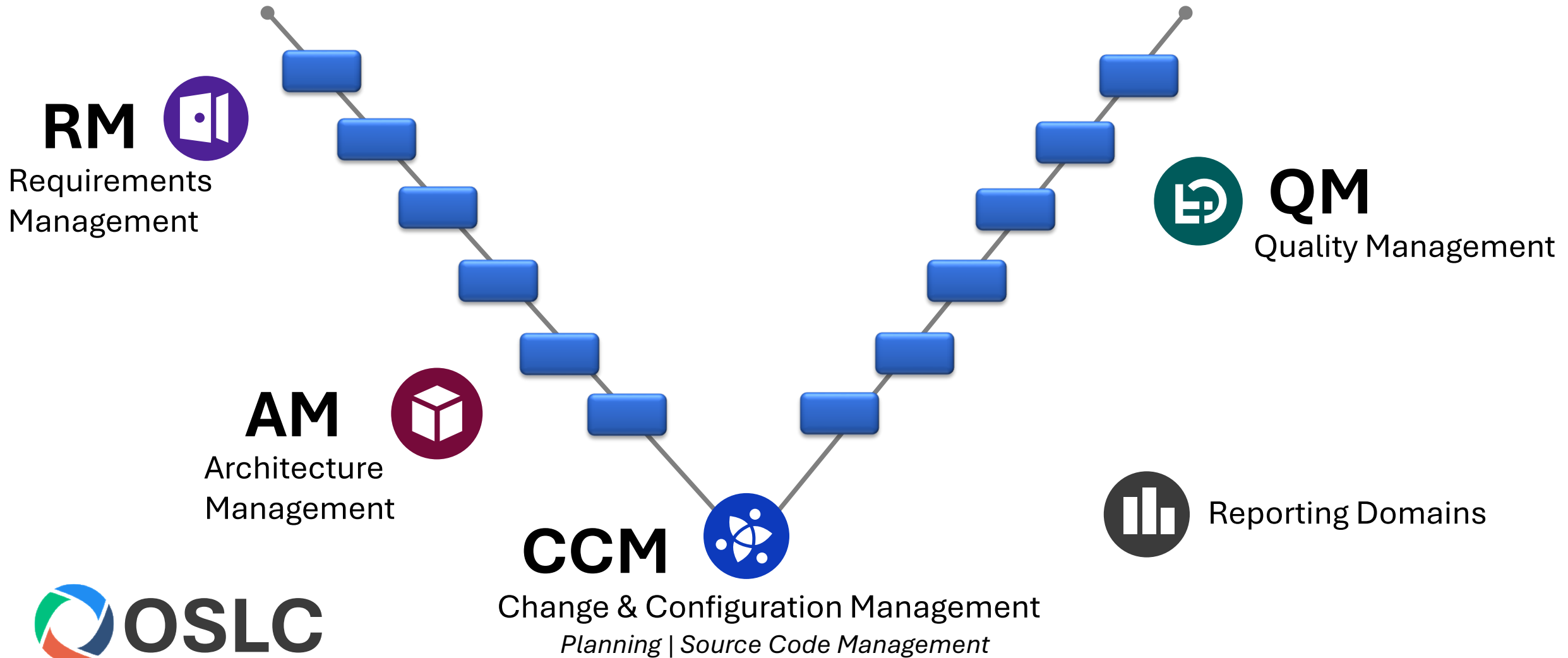


Engineering Workflow Management

Plan and assign tasks, manage code
changes, track risks and reviews



IBM Engineering Lifecycle Management (ELM) is preparing for the future by building an open linked data set



References

1. <https://www.ibm.com/docs/en/engineering-lifecycle-management-suite/test-management/7.1.0?topic=testing-getting-started-managing-test-effort>
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4. <https://www.medicaldesignandoutsourcing.com/top-10-vv-fails-dont-let-these-common-mistakes-derail-your-verification-and-validation-program/>
5. <http://sysengr.engr.arizona.edu/publishedPapers/FamousFailures.pdf>