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Requirements Management Webinar

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NDIA (National Defense Industrial Association)

Top 5 SE Issues - 2006

- Key systems engineering practices known to be effective are not consistently applied across all phases of the program life cycle.
- Insufficient systems engineering is applied early in the program life cycle, compromising the foundation for initial requirements and architecture development.
- Requirements are not always well-managed, including the effective translation from capabilities statements into executable requirements to achieve successful acquisition programs.
- The quantity and quality of systems engineering expertise is insufficient to meet the demands of the government and the defense industry.
- Collaborative environments, including SE tools, are inadequate to effectively execute SE at the joint capability, system of systems (SoS), and system levels.

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Fred Brooks, *No Silver Bullet*

"The hardest single part of building a software system is deciding precisely what to build. No other part of the conceptual work is so difficult as establishing the detailed technical requirements.... No other part of the work so cripples the resulting system if done wrong. No other part is more difficult to rectify later."

[IEEE Computer, 1987]

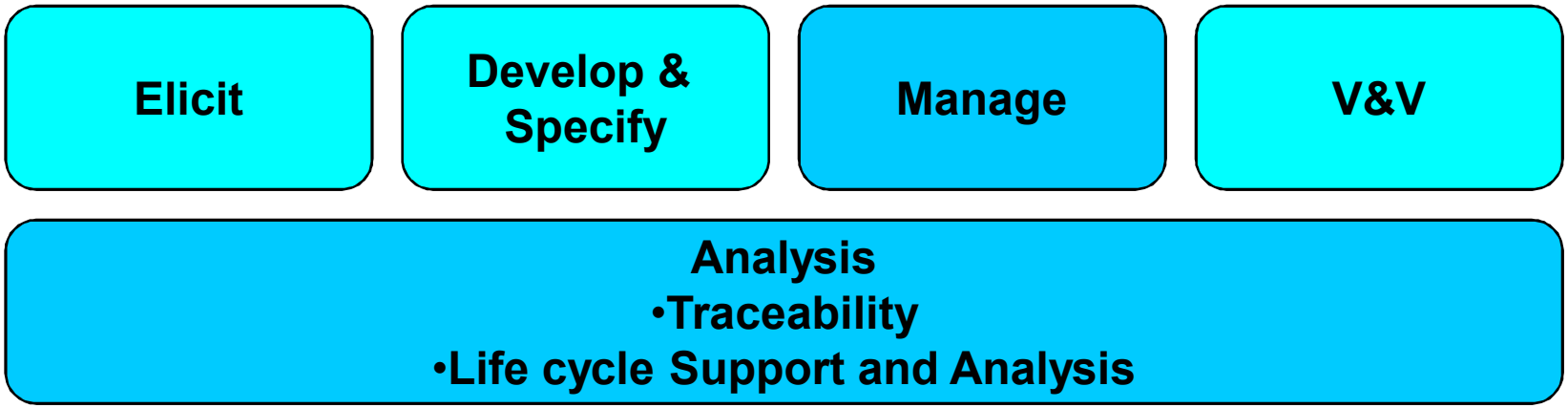
What Are Requirements?

- **Precise statement of what, how well, and under what conditions something must be done**
- **The three Cs:**
  - Capabilities → Behavioral Requirements
  - Characteristic → Non-behavioral Requirements
  - Constraints → Constraints
- **Requirements & constraints = problem space**
- **Design ≡ decisions = solution space**

Goals for Requirements Engineering Capability

- **Transform the way Requirements Engineering is performed**
  - Consistent, tractable, solid method…
  - Produce and manage requirements documents, e.g. SRS, in a tool
  - Enable assessment of the impact of requirements changes
  - Analyze changes prior to making the changes
  - Don't lose requirements – have access to them (and their relationships) for impact assessment
- **Verify that Requirements are Met**
  - Demonstrate how component requirements satisfy or derive from system requirements
  - Provide access to the traceability from customer requirements to system and component requirements
  - Provide evidence that there are verification activities that prove all requirements

Requirements Management

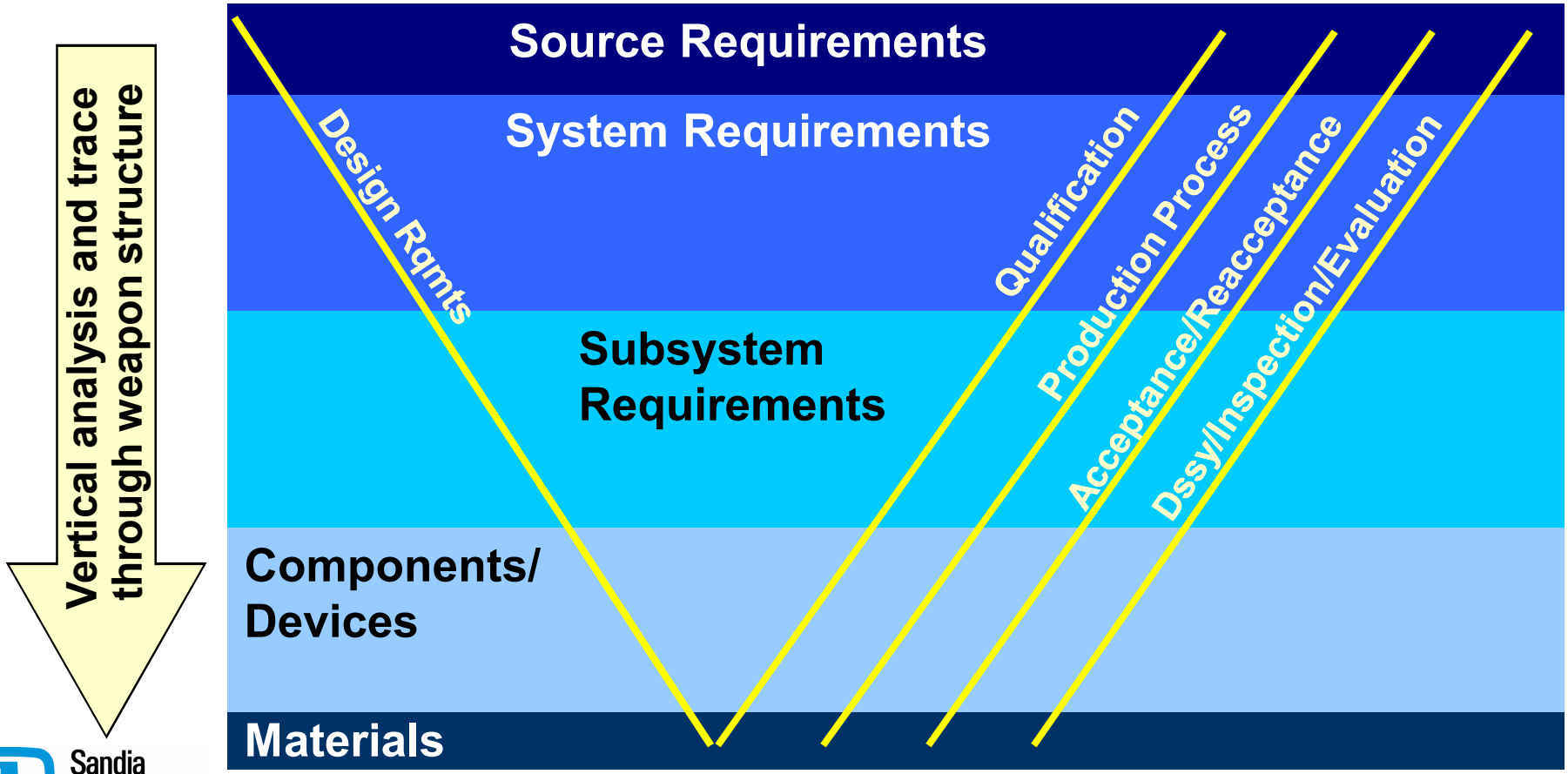


Requirements management is managing the life cycle of the requirement including traceability, CM, and enabling technical management (i.e. cost, risk, trades…)

Requirements Management Objectives

- **Transition to the operational life of a requirement**
  - After initial requirements are defined, they do not have to be complete or official
- **Manage all levels of Requirements**
  - A tool becomes necessary
- **Perform Requirements Engineering, not just bookkeeping**
  - Input requirements at all levels based on defined schema
  - Assign attributes that allow managing requirements and interface with technical management
  - Trace requirements

Requirements Management Vision



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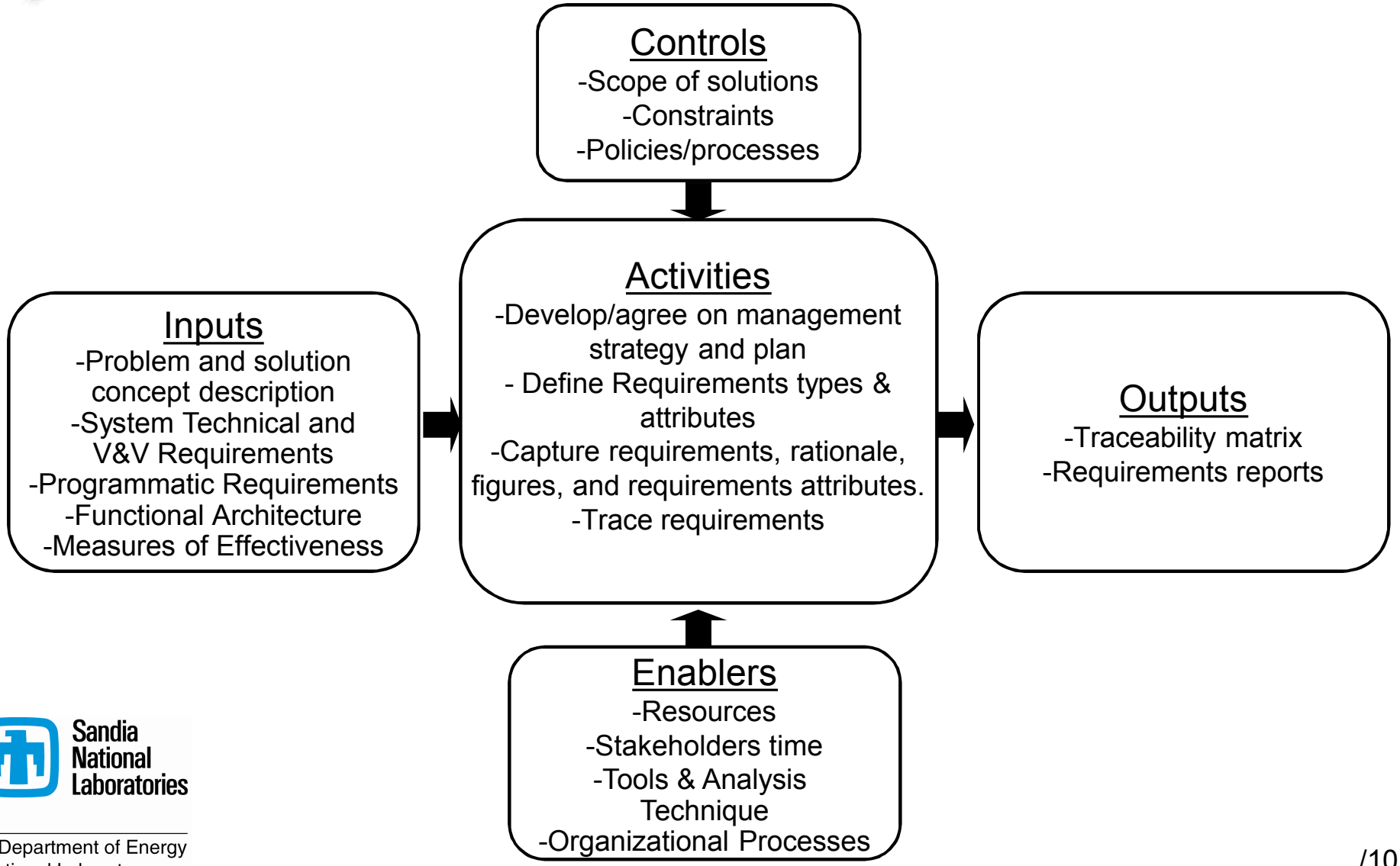
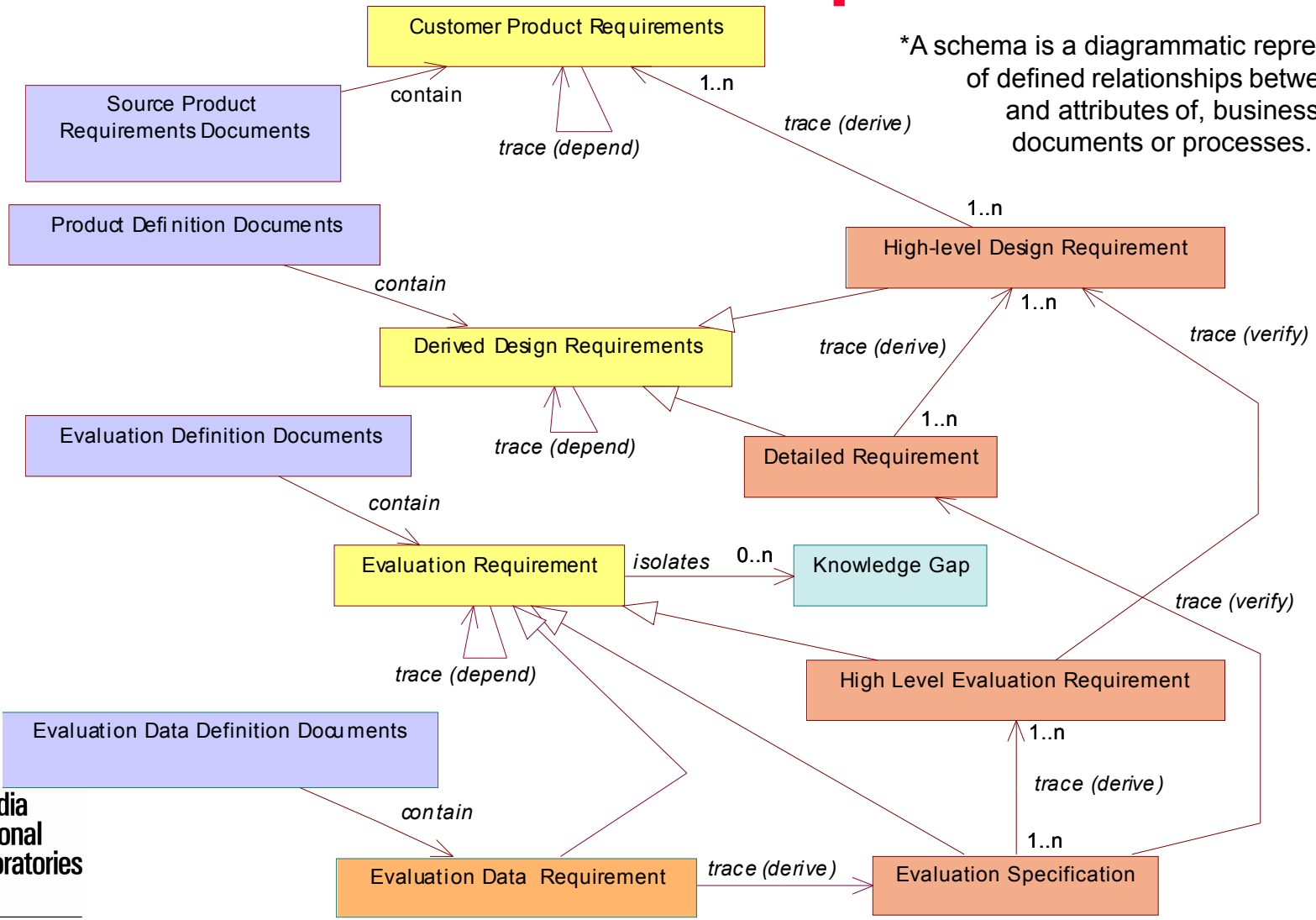
Steps in Requirements Management

- **Define Management Approach**
  - Types of requirements
  - Deciding on attributes
  - Deciding on allowable traceability
- **Get requirements into a tool for management**
  - Picking a tool
  - Create requirements in tool
  - Input requirement from document
- **Manage over the operational life of a requirement**
  - Assigning attributes
  - Requirements Engineering

Manage Requirements



Requirements Schema* Example



*A schema is a diagrammatic representation of defined relationships between, and attributes of, business documents or processes.

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Examples Of Attributes

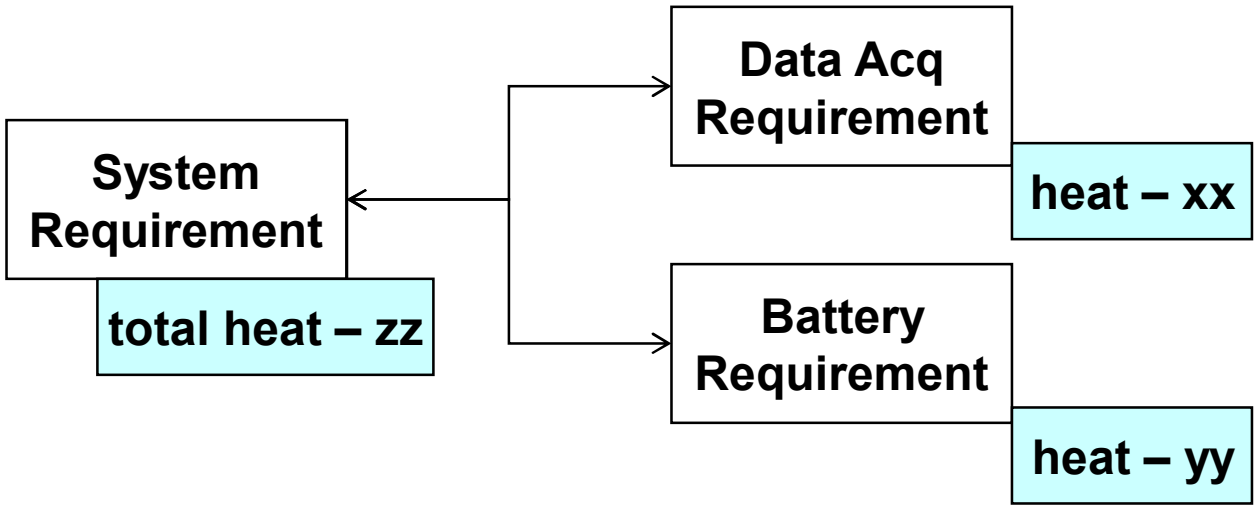
- **Rationale**
- **Priority**
  - High, Medium, Low
- **Stability**
  - How subject to change is this requirement
- **Difficulty**
  - High, Medium, Low
- **Risk**
  - High, Medium, Low
- **Revision**
- **Author**
- **Current Status**
  - TBD - Not defined yet
  - TBR - Preliminary value not reviewed yet
  - Defined - Final value
  - Approved - Review by team
  - Verified - By inspection, analysis, demonstration, or test
  - Deleted - Requirement no longer applies to system

Status Attribute

Proposed	Used to describe requirements that are under discussion but have not yet been reviewed and accepted by the "official channel," such as a working group consisting of representatives from the project team, product management and user or customer community.
Approved	Requirements that are deemed useful and feasible and have been approved for implementation by the official channel.
Incorporated	Requirements incorporated into the product baseline at a specific point in time.

Behavorial Analysis

- **Requirements completely developed, analyzed and managed in a tool**
  - Analysis from system level to component and back again



Behavioral analysis

Trends in Requirements Management

- **More powerful tools**
- **Tools that allow modeling and facilitation of the Requirements Management Process in the context of Organizational Processes**
- **Managing Product Families and reusing requirements**
  - Requires the ability to map to architectures
- **Incorporation into database of design, implementation, and test artifacts for traceability to requirements**

Summary

- **Requirements Management enables and facilitates the Systems Engineering effort**
- **Deciding on how you will manage requirements to enable the Systems Engineering effort is critical**
  - Need to define schema to match the business
  - Need to define Requirements Types, Attributes and Traceability
- **There are many Requirements Management tools**
  - Using a tool is almost a necessity given the complexity of systems