Software Engineering

Software Configuration

Software Configuration Items

- Project plan
  - the first document
    - states the purpose of the project
  - feasibility study (requirements analysis)
  - tasks, schedules, resources (requirements definition: customer-oriented description of system's functions and operation)

Software Configuration Items

- Requirements specification
  - precise and detailed description of what functionality is required (analysis)
    - primarily from the point of view of the users
  - ought to be complete and consistent
  - includes information of how to verify
  - serves as the basis of a **contract** for the system development

Software Configuration Items

- *A software requirements specification is a document containing a complete description of what the software will do without describing how it will do it* [Alan Davis]

  but:

  one person's how is another person's what

What’s the Correct Answer?

a) 49134

b) 23678

c) -96754

d) 34567

How can you know the answer unless you’ve defined the question?

Questions We Need to Ask

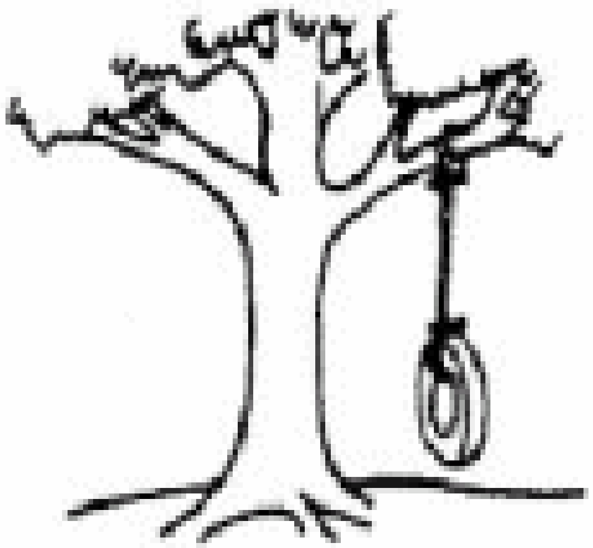
- Why are we doing this task?
- What is this component supposed to do?
- How will we integrate this?
- When can I expect this functionality?
- Where is this request being fulfilled?

What is a Requirement?

- A condition or capability needed by a user to **solve a problem** or achieve an objective
- A condition or capability that must be met or possessed by a system or system component to satisfy a contract, standard, specification, or other formally imposed document

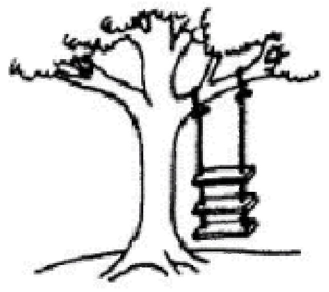
IEEE Standard Glossary of Software Engineering Terminology (1997)

A Simple Example of Requirements Management



What the customer really needs
What IT really needs to deliver

The Communication Challenge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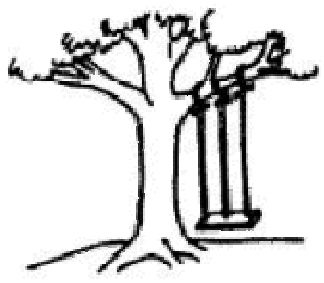
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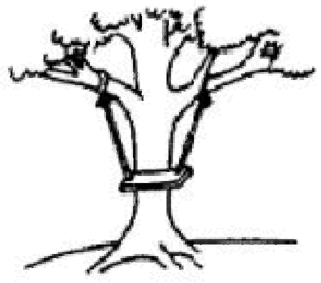
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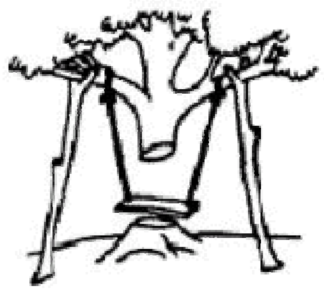
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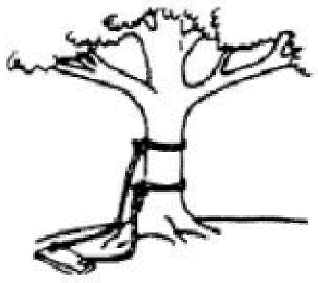
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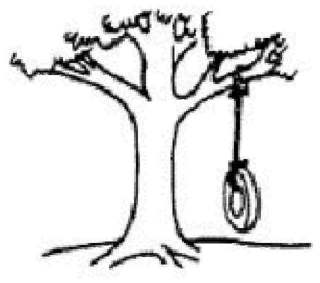
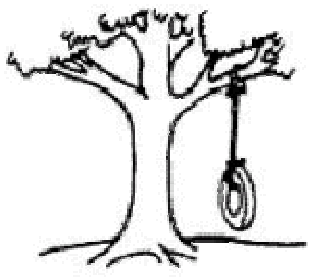

What the business really needs

The Goal of Requirements Management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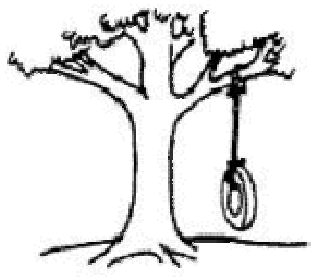
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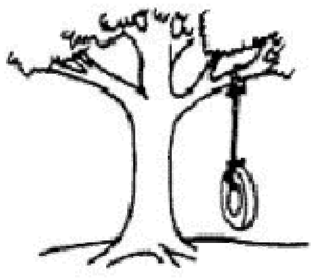
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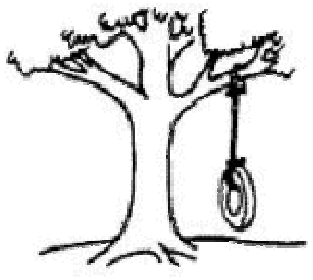
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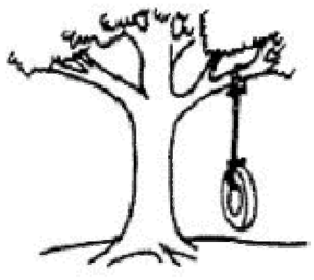
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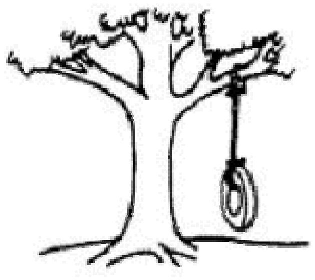

What the business
really needs

Software Configuration Items

- Test plan
  - test methods, approaches, procedures (for acceptance, system, integration, and unit tests)

Software Configuration Items

- Data dictionary
  - data, data structures, definition of terms, variables
  - supports design, coding, maintenance
  - presents a shared repository of system information
  - developed during analysis and design

Software Configuration Items

- Design document
  - details behavior and structure (architecture) of the system
  - details the code components of the system
    - data structures, interfaces, algorithms
- User documents
  - user guides, reference guides
- Source code

Software Configuration

- Planning
  - project plan
- Requirement definition
  - requirements specification
  - test plan
  - data dictionary
  - documents

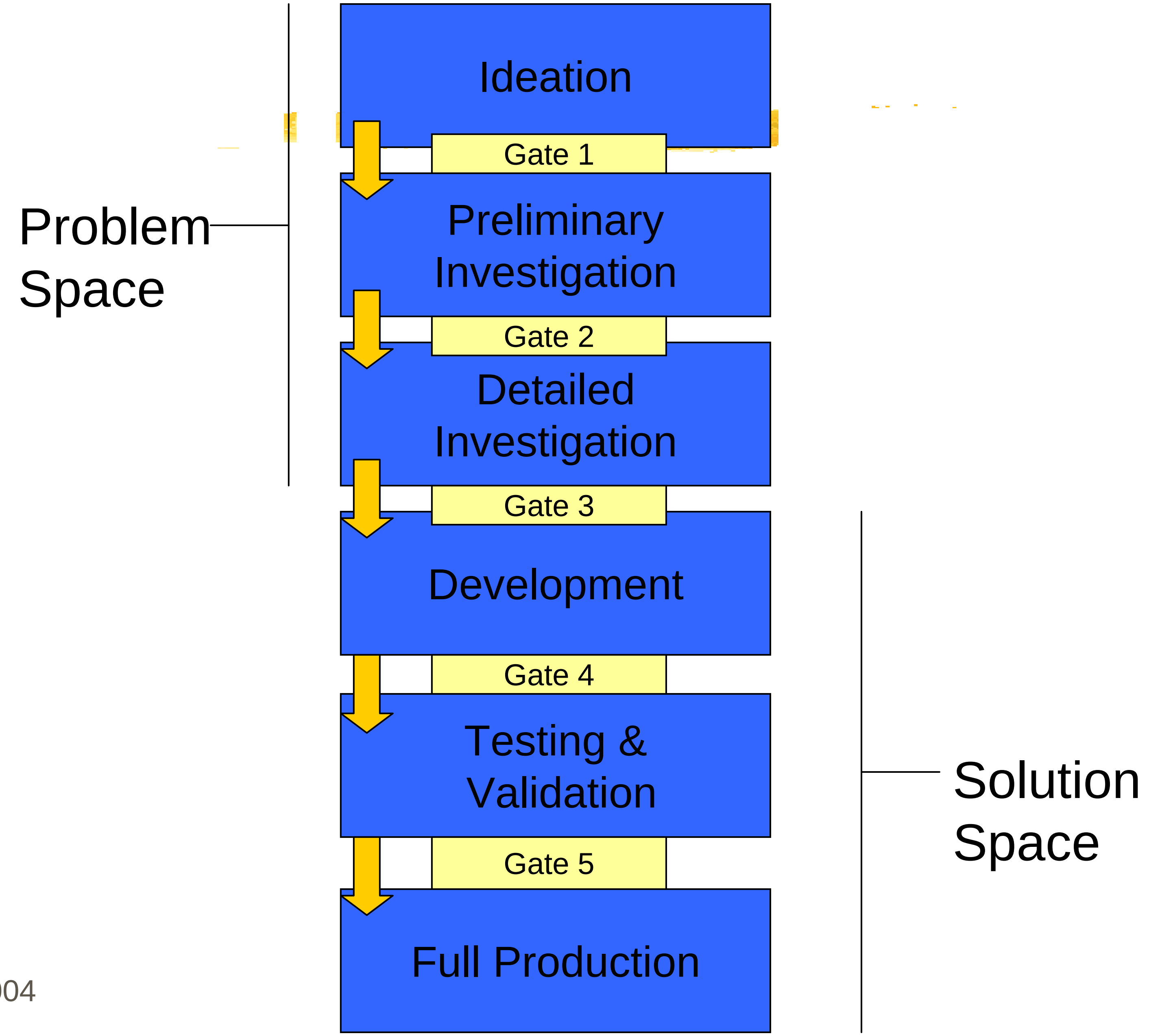
Software Configuration

- Design
  - test plan
- Coding and testing
- Delivery
  - user documents
- Maintenance
  - corrective
  - adaptive
  - perfective
  - preventive

Ideation / Fulfillment Matrix

Interrogations	Deliverable	Plan	Analyze	Design	Build	Test
Why?	**Idea / Need**	Ideation	Preliminary Investigation	Detailed Investigation	Statement of Needs	User Acceptance Test
What?	**Requirement**	Elicitation	Analysis	Decompose/ Derive	Represention of Requirements	Systems Test
How?	**Specification**	Derivation	Tradeoff Analysis	Architect	Specification of Solution	Integration Test
When?	**Task**	Allocation	Estimation / Resourcing	Planning	Management of Plan, Resources, etc.	Project QA
Where?	**Configuration Items**	Solution	Identification	Assignation	Tangible Fulfillment of Need	Unit Test

The Product Development Process



Software Myths

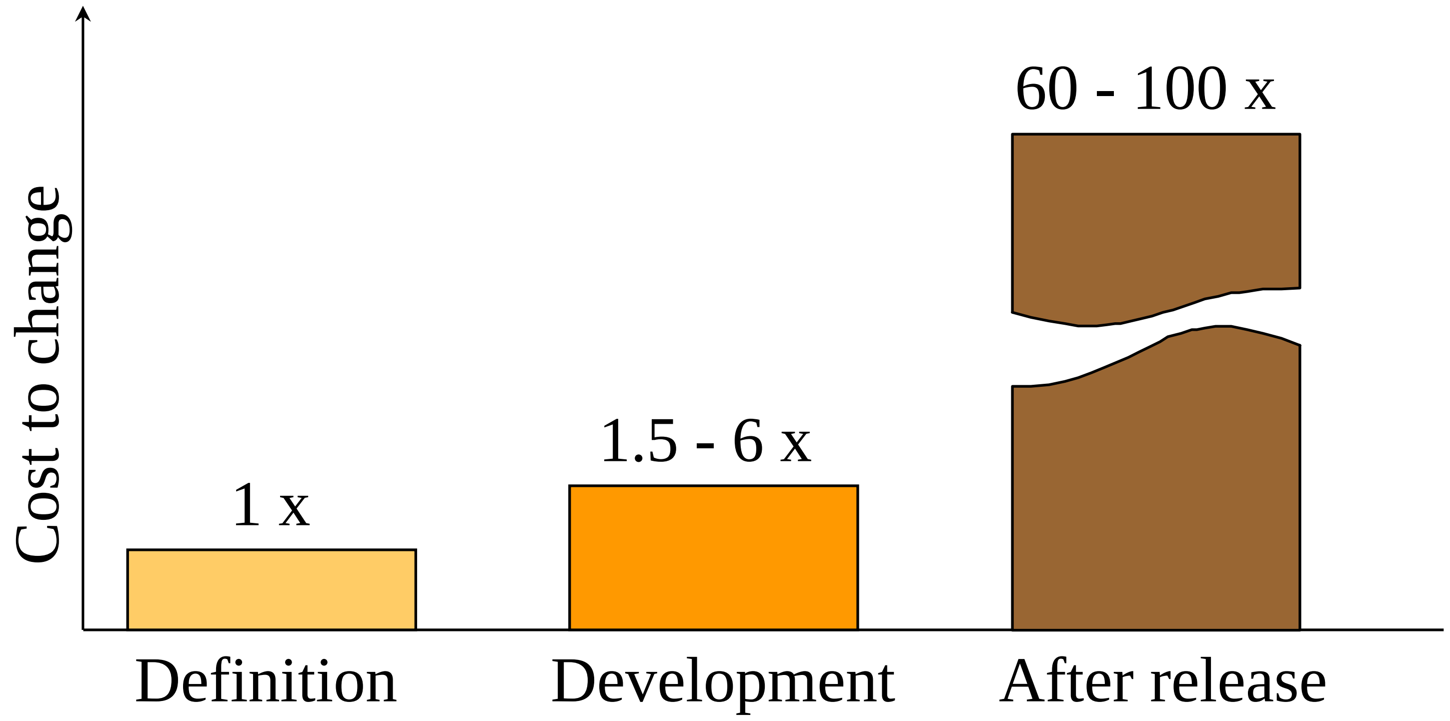
Customer Software Myths

- In order to begin writing programs it is enough to generally state what is wanted (we can fill the details later)
- The truth
  - poor up-front definition is the major cause of failed software efforts
  - thorough communication between customer and developer is needed
  - a formal and detailed statement of function, performance, interfaces, design constraints, and validation criteria is essential

Customer Software Myths

- Software is flexible hence it is easy to change at any stage of software's life
- The truth
  - changes happen as a fact of life
  - late changes are expensive

The Impact of Change



Developer Software Myths

- Job is finished when a program works
- The truth
  - a working program is only one part of a system that includes all elements of a software product
    - recall: what are the additional deliverables?
  - a software life cycle exists: initial work concentrates on planning, subsequent work focuses on development, and ongoing work is required to maintain the software

Developer Software Myths

- The only delivery is a working program
- The truth
  - documentation
    - users
    - maintenance

Manager Software Myths

- When deadline approaches and project gets behind, programmers can be added
- The truth
  - adding manpower to a late software project makes it later
    - training needed
    - integration

Manager Software Myths

- In house tools (state-of-the-art tools) are sufficient
- The truth
  - a fool with a tool is still a fool

Manager Software Myths

- Once software is working, maintenance is minimal and can be done ad hoc
- The truth
  - to the dismay of many managers, over 50% of budget is typically expended on maintenance
  - software maintenance should be organized, planned, and controlled as if it were the largest endeavor within an organization

General Software Myths

- Requirements continually change, but change is easily accommodated since software is malleable
- The truth
  - requirements do change, but the impact of change varies with the type of change and the time at which it is introduced
  - changes requested late in the project may be many times more expensive than the same changes requested earlier in development