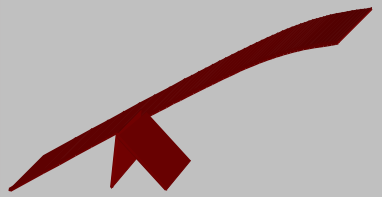
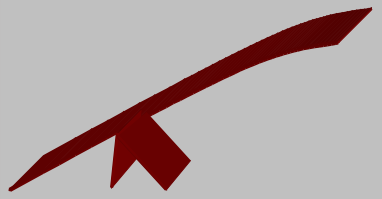


Product Lifecycles



Organizational Behavior

- Life-cycle models model organizational behavior
- Behavior is characterized by products, which may be organized into phases for manageability
- Each phase is usually characterized by one or more major products emerging from the organization during that phase

Management Views of Life-Cycle Products by Life-Cycle Phases

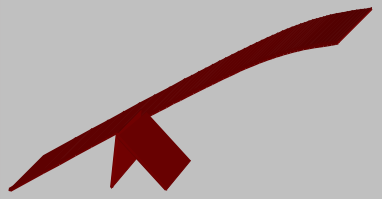
	System Definition	System Development	System Deployment
 Upper Management (Management)			
 Middle Management (Process)			
 Lower Management (Product)			

Lower Management

- Lower Management (Project Management) – Lowest level of management:
  - Each phase of the lifecycle terminates with completion of one of more major products
  - Intermediate products that represent components of the finished product or checkpoints that are associated with progress and productivity (earned value) are also visible to this level of management
  - Project Management is responsible for ensuring the quality of the product through various verification and validation activities

Middle Management

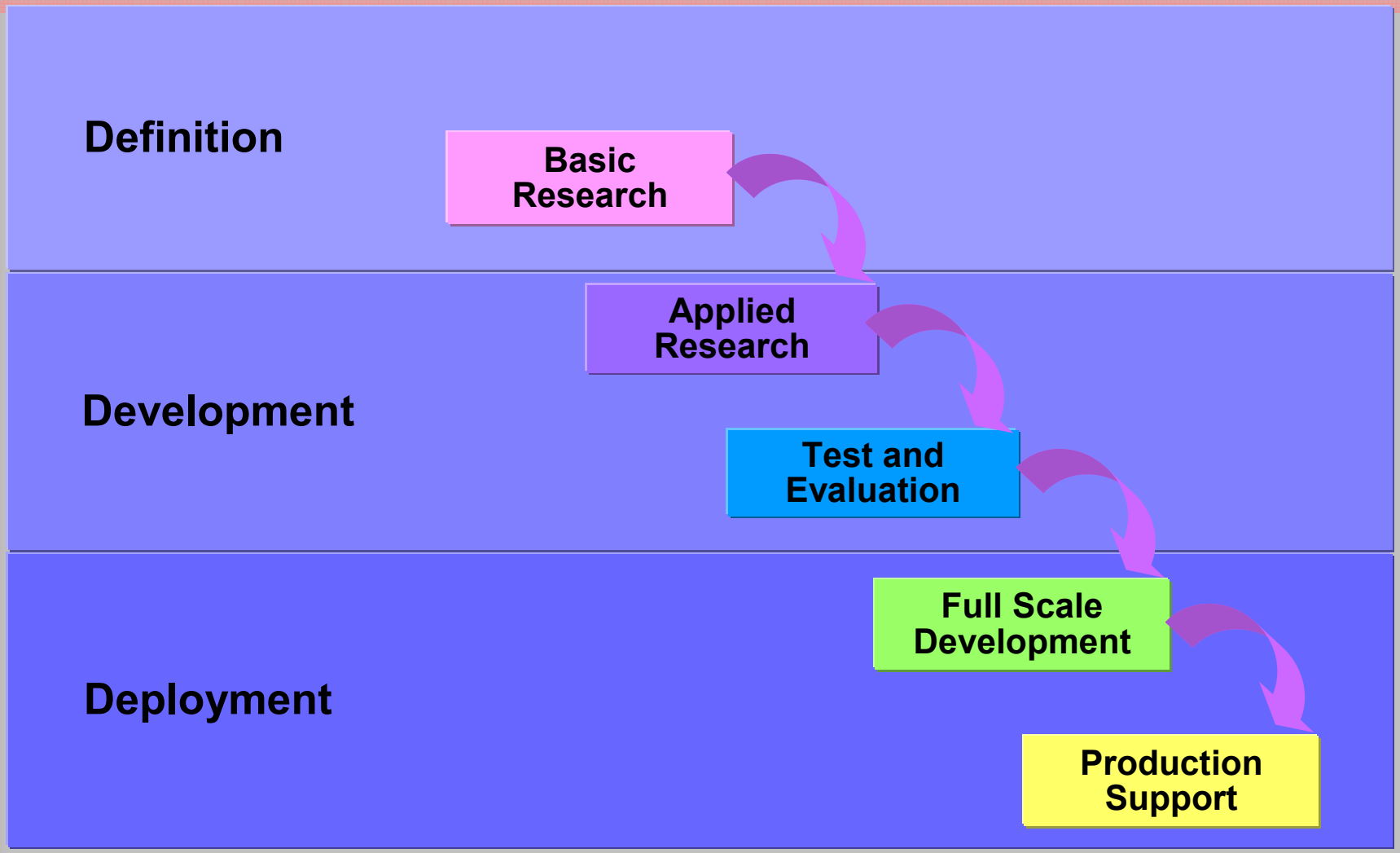
- Middle Management
  - Has less responsibility, visibility and understanding of intermediate products
  - Number of intermediate products shown to middle management is reduced
  - Middle management focus is on process rather than product
  - Middle management is concerned with integrating product-level resources into a high-quality process



Senior Management

- Senior Management
  - Senior Management is normally concerned with integrating the process to achieve an organizational goal or a strategic purpose
  - Senior Management requires even less visibility into intermediate products
  - Senior Management is focused on the coordination and integration of production and acquisition, research, Development,Test and Evaluation, planning, and marketing lifecycles

Research, Development, Test and Evaluation Life-Cycle Model

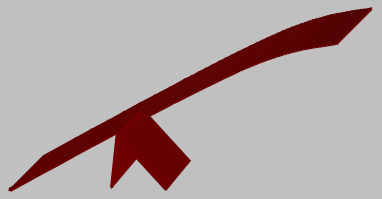


Research, Development, Test and Evaluation Life-Cycle Model - 2

- A well-managed RDT&E program is often thought of as a tool for risk mitigation
- RDT&E lifecycle provides a framework within which to manage research and development
  - The concept of the lifecycle can be defined abstractly
  - 3 major phases can be defined: definition, development, deployment

A Closer Look at the RDT&E Lifecycle

- Definition Phase
  - Basic research is either well defined or non-well defined
  - Well defined research is ***defensive***, undertaken to protect the organization's market position from market competition
  - Non-well defined research is more likely to result in product diversification



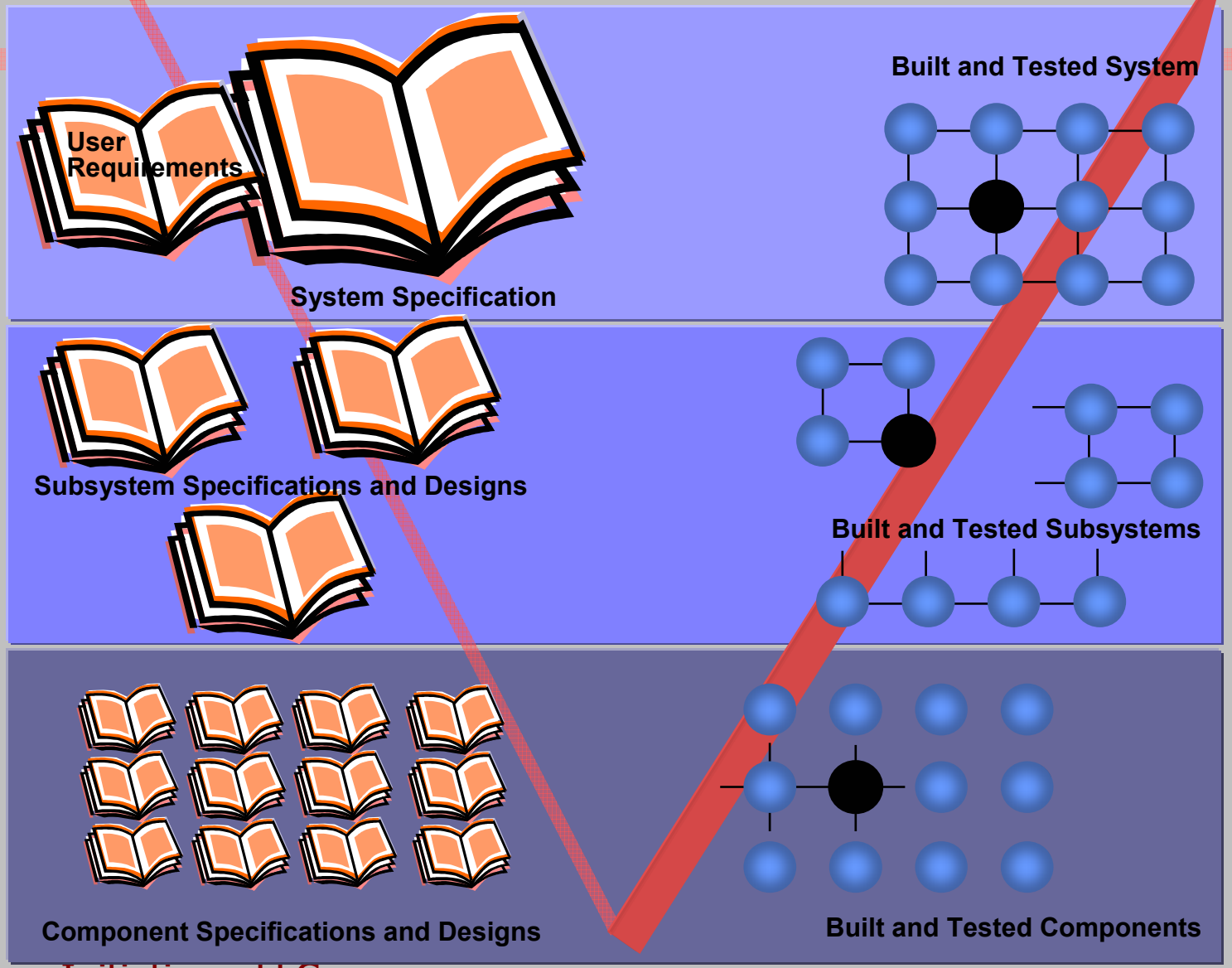
A Closer Look at the RDT&E Lifecycle - 2

- Development Phase
  - Product is designed and built
  - Organizational constraints may be felt and reflect the need for corporate change
  - Business processes may need to be realigned to accommodate new production
  - Product-level insights cause iteration on the requirements phase until an acceptable product is defined and built
    - the development phase may be regarded as the prototyping element of the requirements phase
    - at the end of the development phase, the requirements will be more stable but not frozen

A Closer Look at the RDT&E Lifecycle - 3

- Deployment Phase
  - Test and Evaluation provide the content for the Deployment Phase
  - The goal of this phase is to deploy a useful model of a potential product for the consideration of management
  - The model provides information about the impact potential upon the organization in terms of:
    - start-up costs
    - perturbation of existing functions
    - applicability of existing assets

3 Views of the System

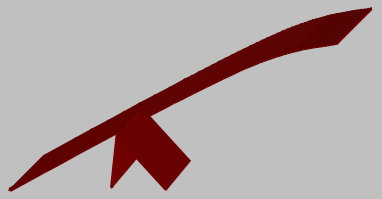


3 Views of the System - 2

- Customer View
  - Associates system requirements with their realization as a delivered system
  - This view is from the perspective of the stakeholders whose consolidated input forms the customer requirements
  - A list of requirements are delivered and a finished product that meets the requirements is expected

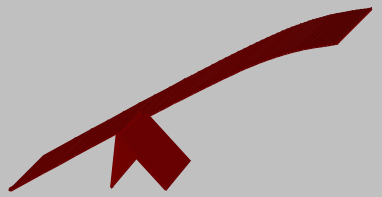
3 Views of the System - 3

- Systems Engineering View
  - This layer represents the architectural model which addresses the decomposition of the system-level specification into systems design and subsystem specifications and designs
  - The architectural model is the perspective of the systems engineer who is interested in:
    - decomposing the whole into manageable parts
    - re-specifying and designing the parts
    - integrating the parts to compose the finished system



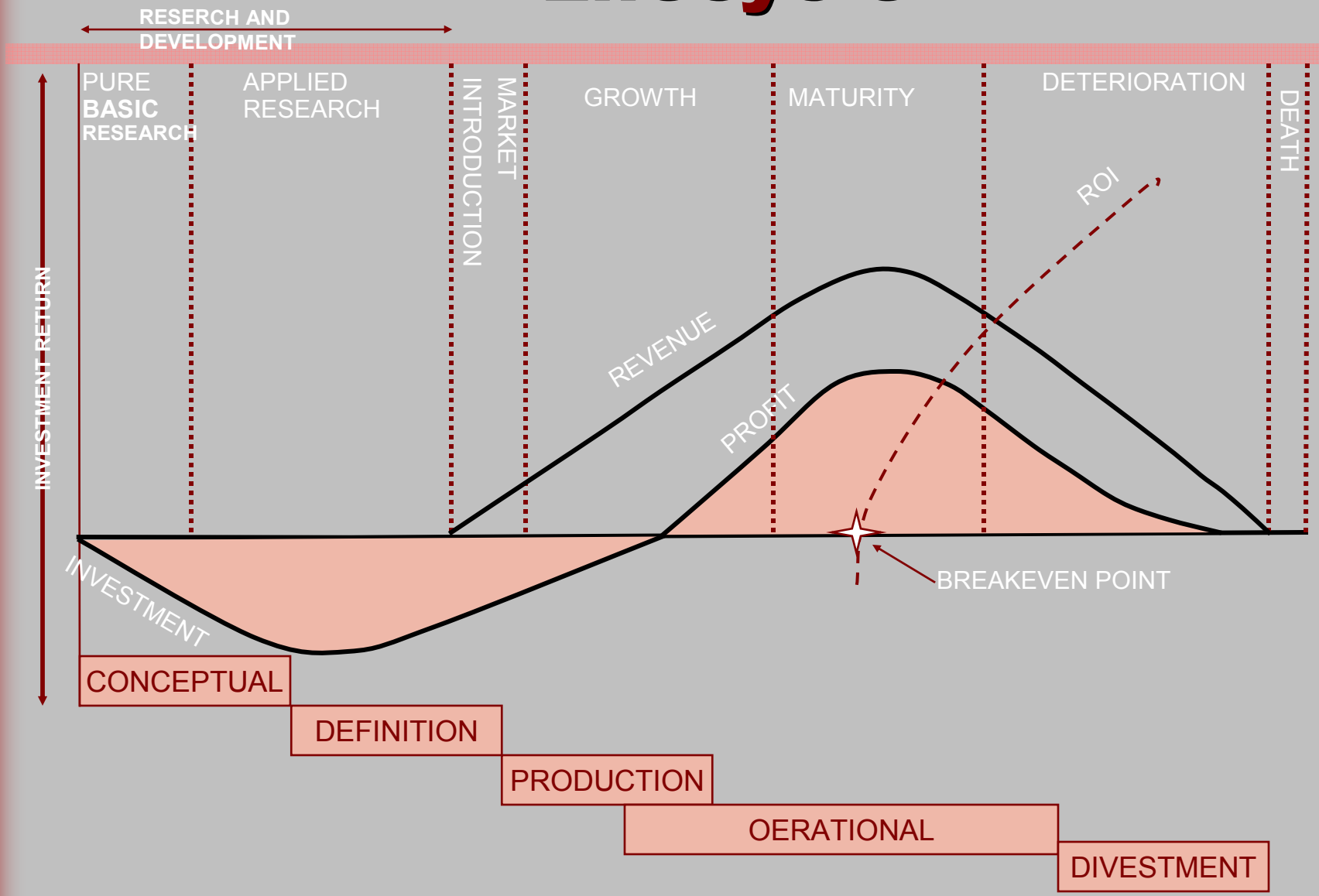
3 Views of the System - 4

- Contractor View
  - The lowest level couples component specifications and designs with fully tested components
  - The implementation model is the perspective of the contractor who is interested in component-level specifications, designs, and products
- The Systems Engineering must therefore:
  - Recognize the product or component as a system
  - Analyze the system requirements
  - Synthesize the system components

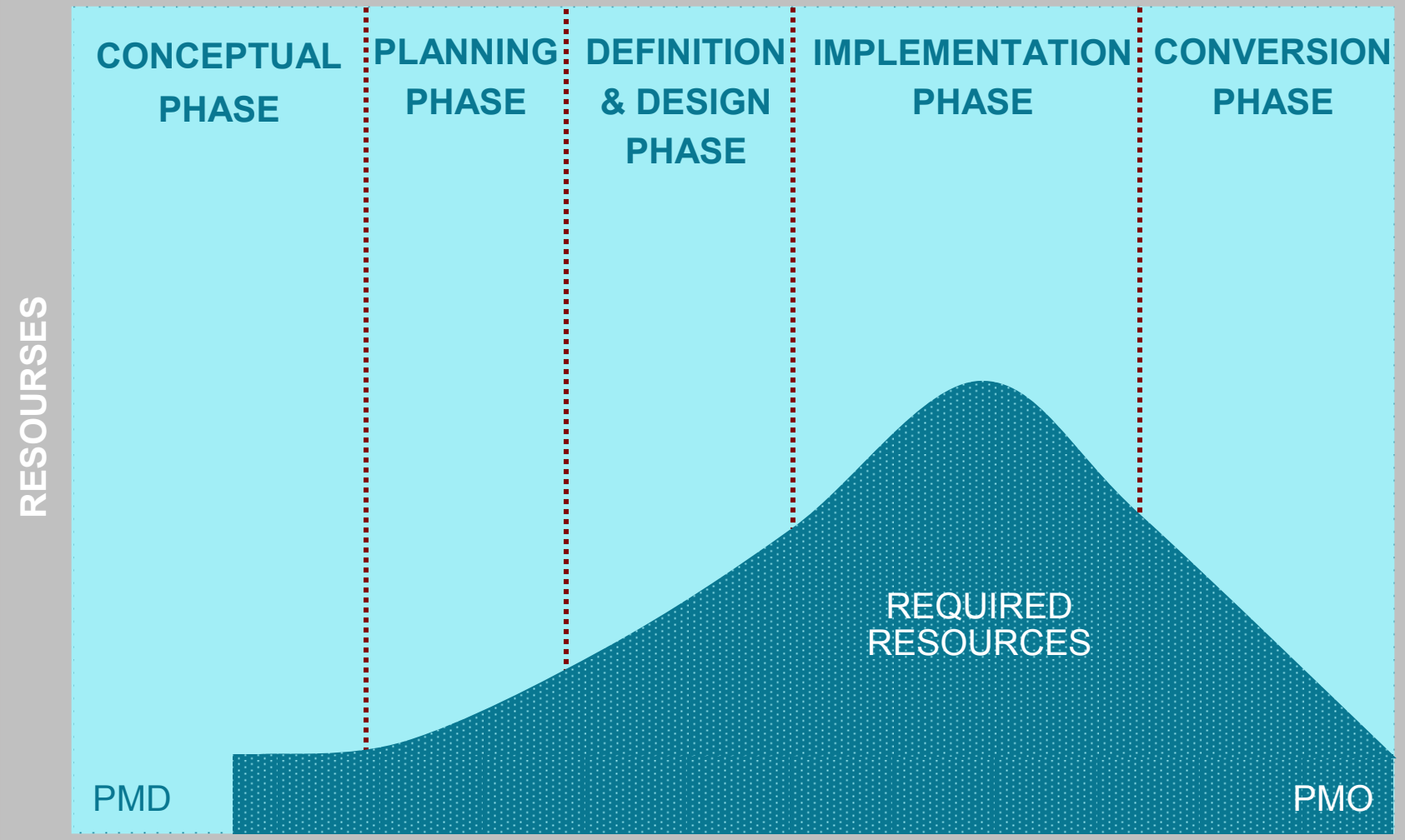


Software / Systems Life-Cycle Models

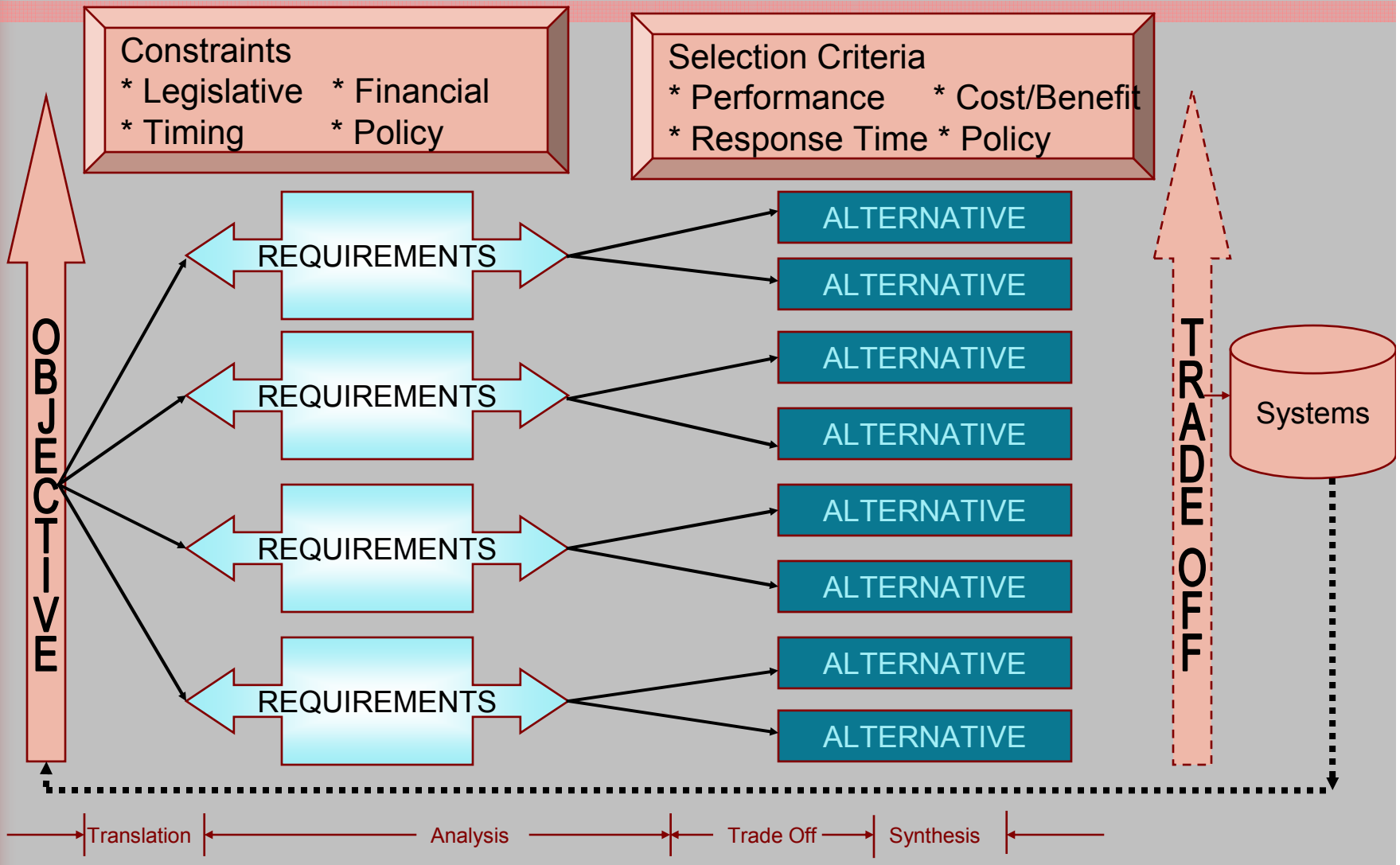
Systems Product Lifecycle

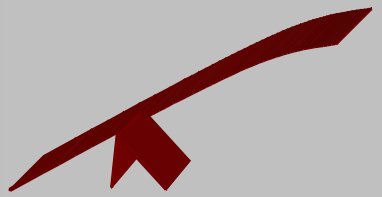


Definition of a Project Lifecycle



The Systems Approach

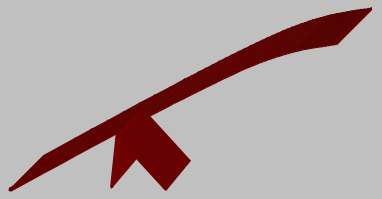




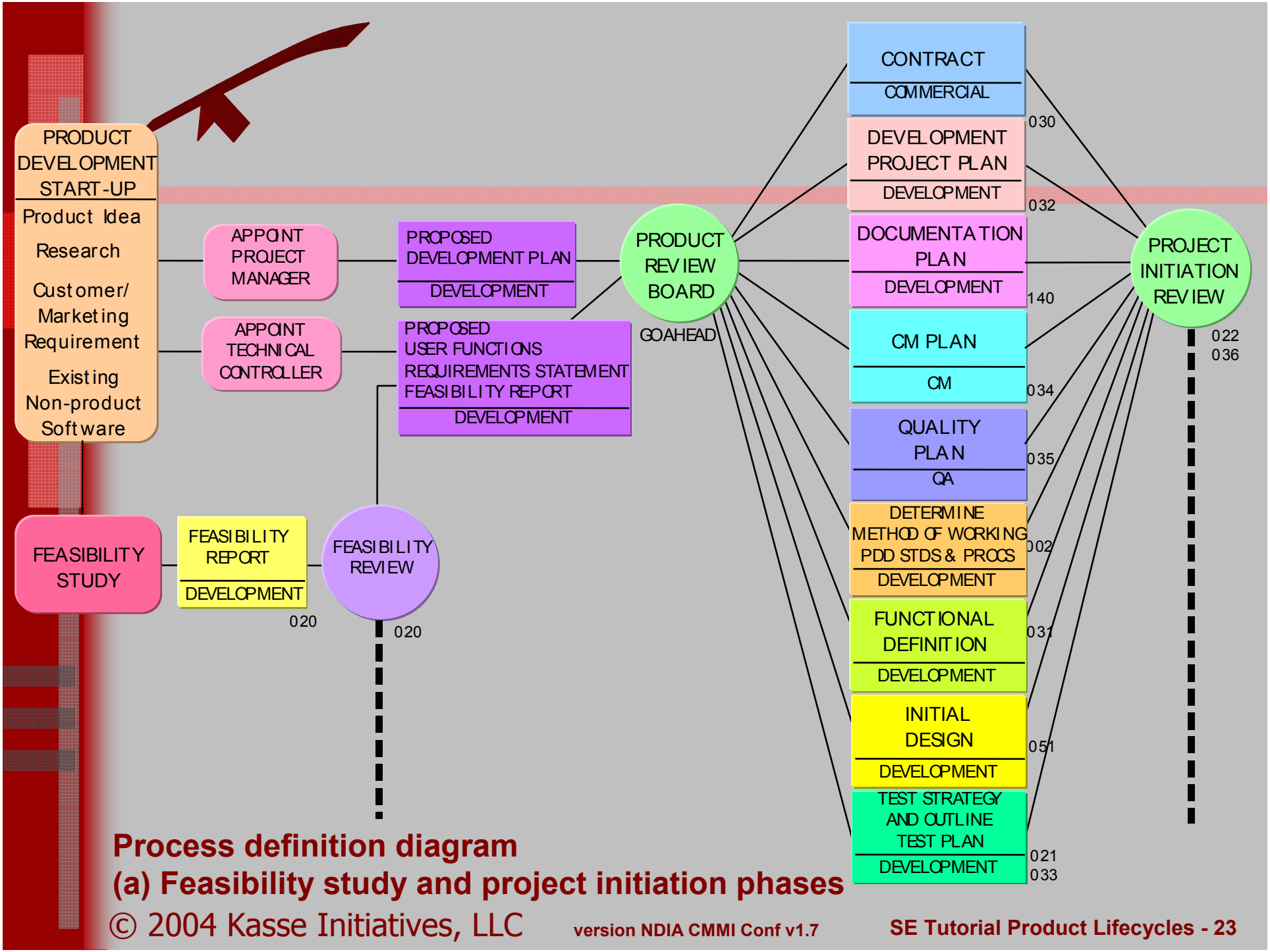
Canoncial Life-Cycle Model

Canonical Life-Cycle Model

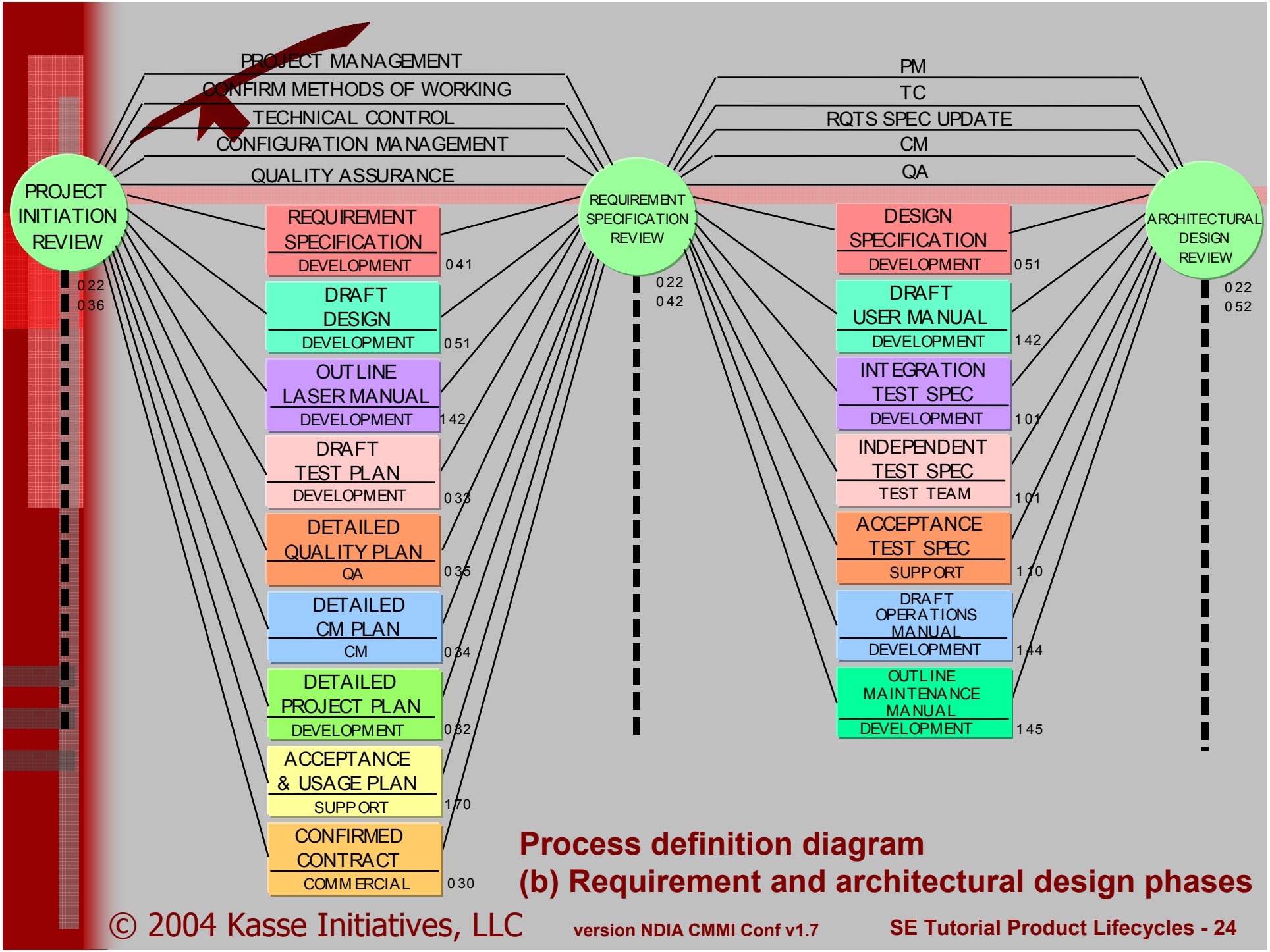
- The canonical life-cycle model is described by the following phases:
  - Feasibility Study
  - Project Initiation
  - Requirements Specification
  - Architectural Design
  - Detailed Design
  - Coding
  - Module Test (Unit Test)
  - Integration and Test
  - Systems Test
  - Acceptance Test
  - Operational Test
  - Operation (In-service and Maintenance)
  - Product Phaseout



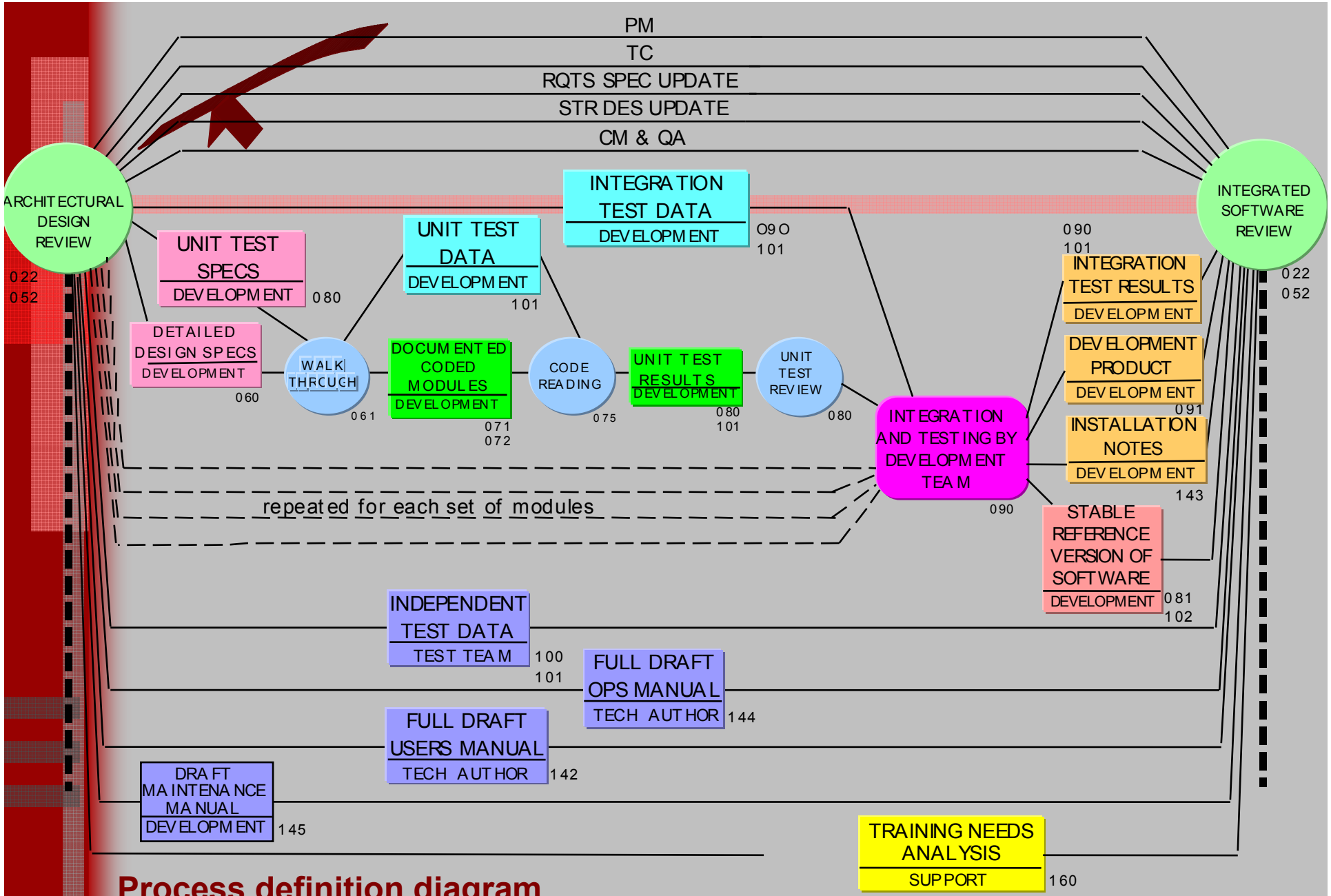
Process Definition Diagrams



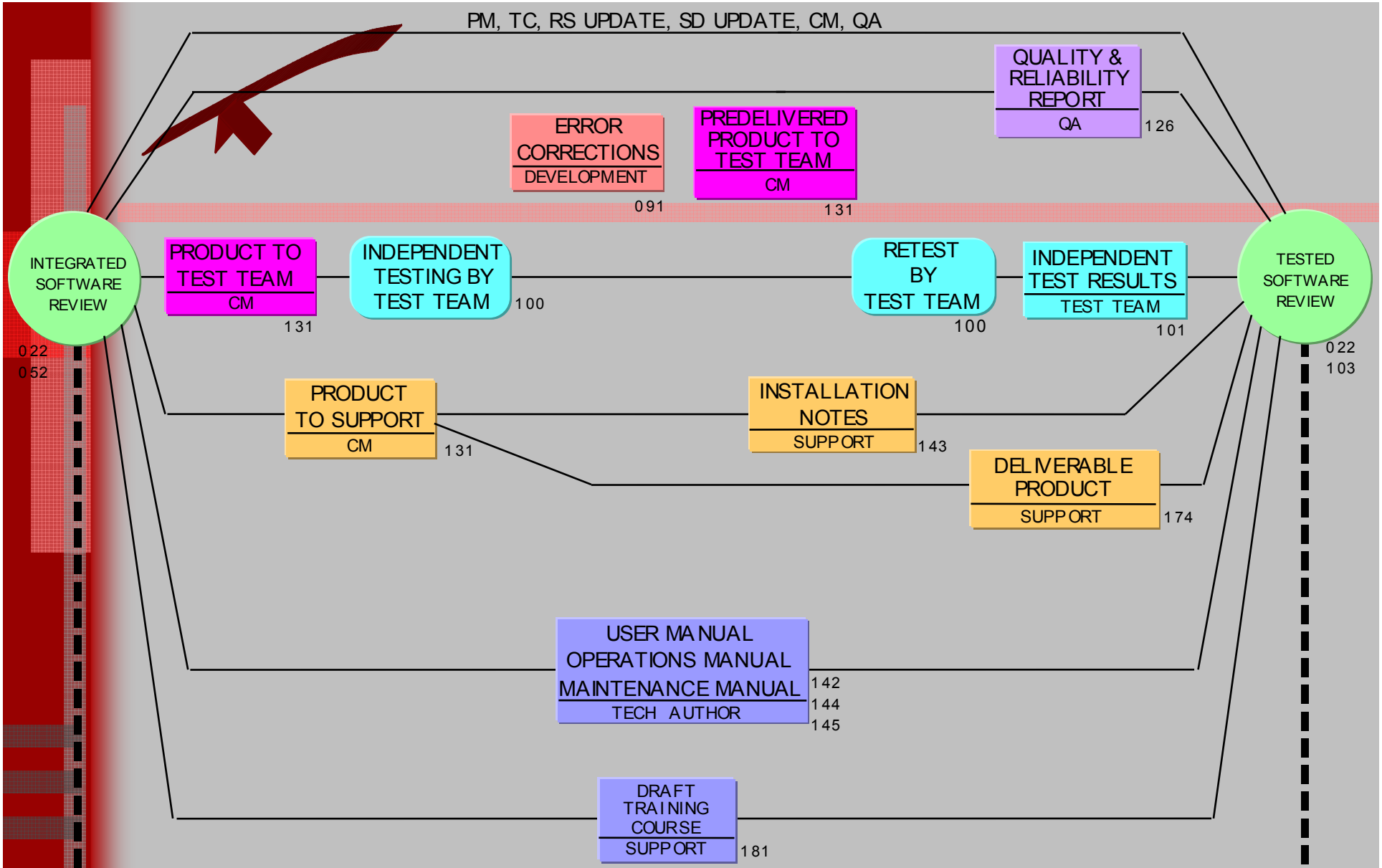
Process definition diagram
(a) Feasibility study and project initiation phases



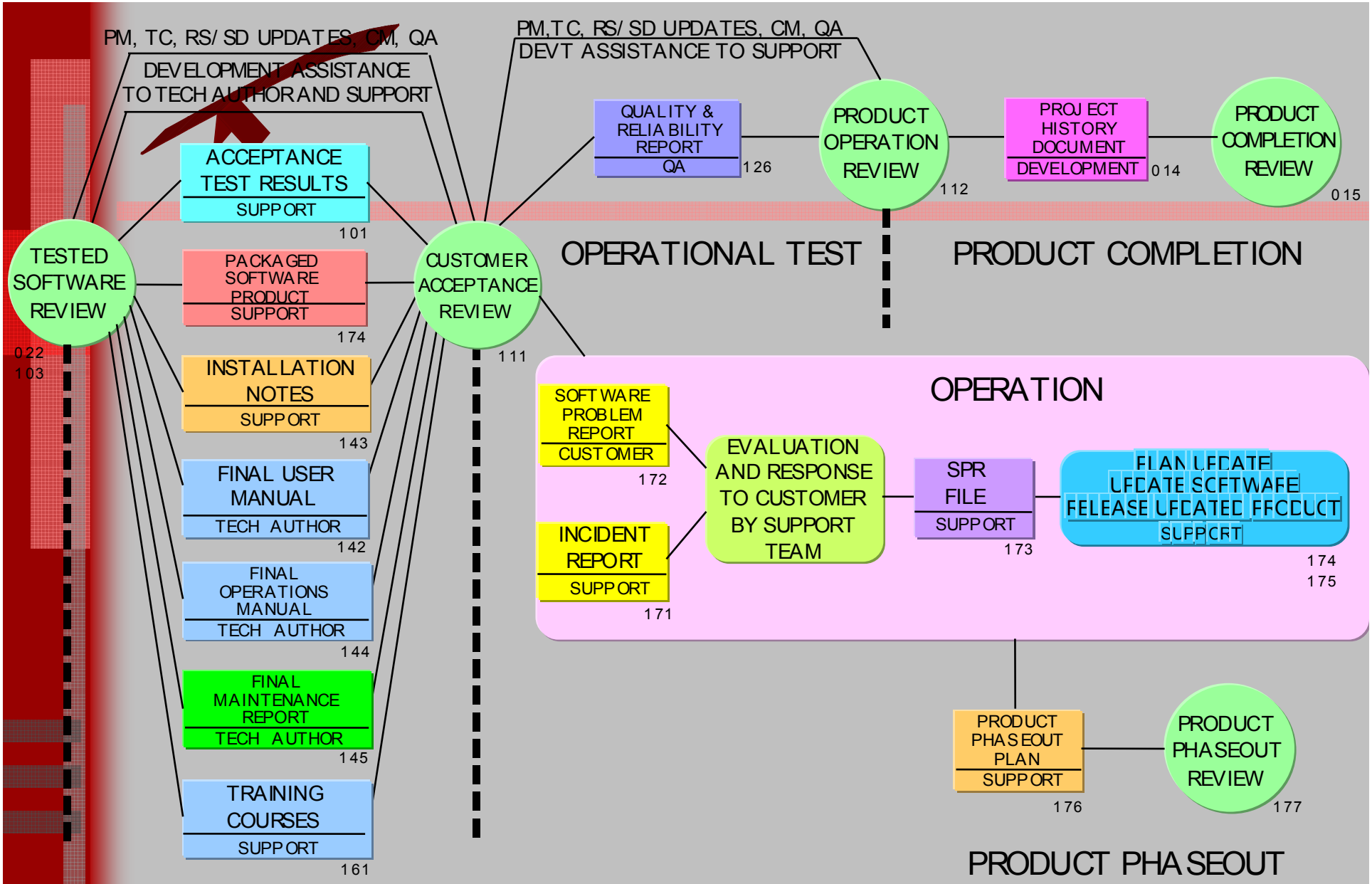
Process definition diagram
(b) Requirement and architectural design phases



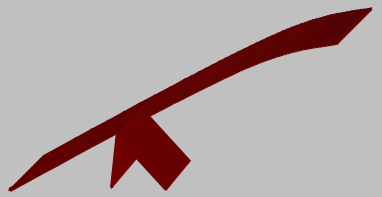
Process definition diagram
(c) Programming and integration phases



Process definition diagram
(d) Integration test phase

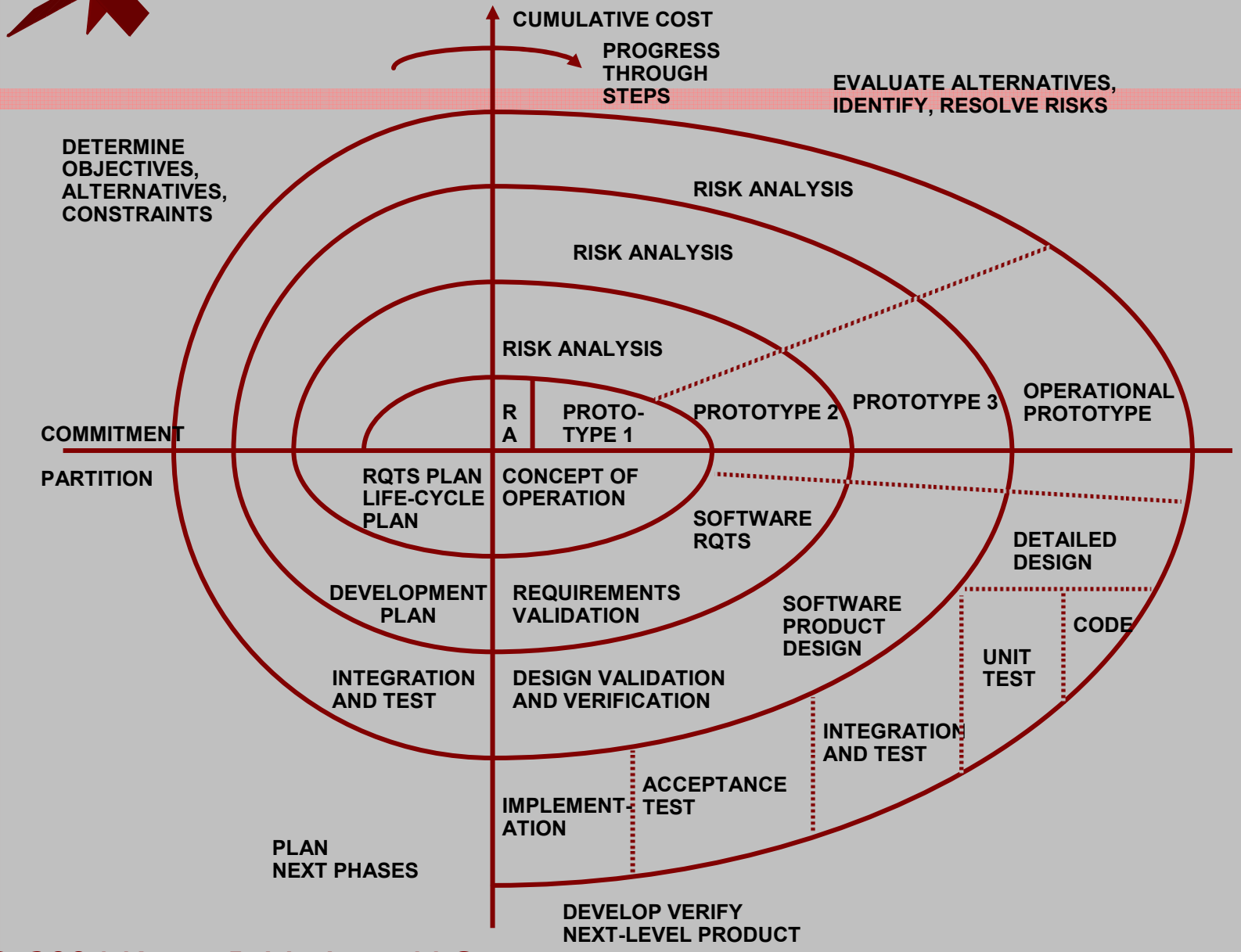


Process definition diagram
(d) Product acceptance and operational phases

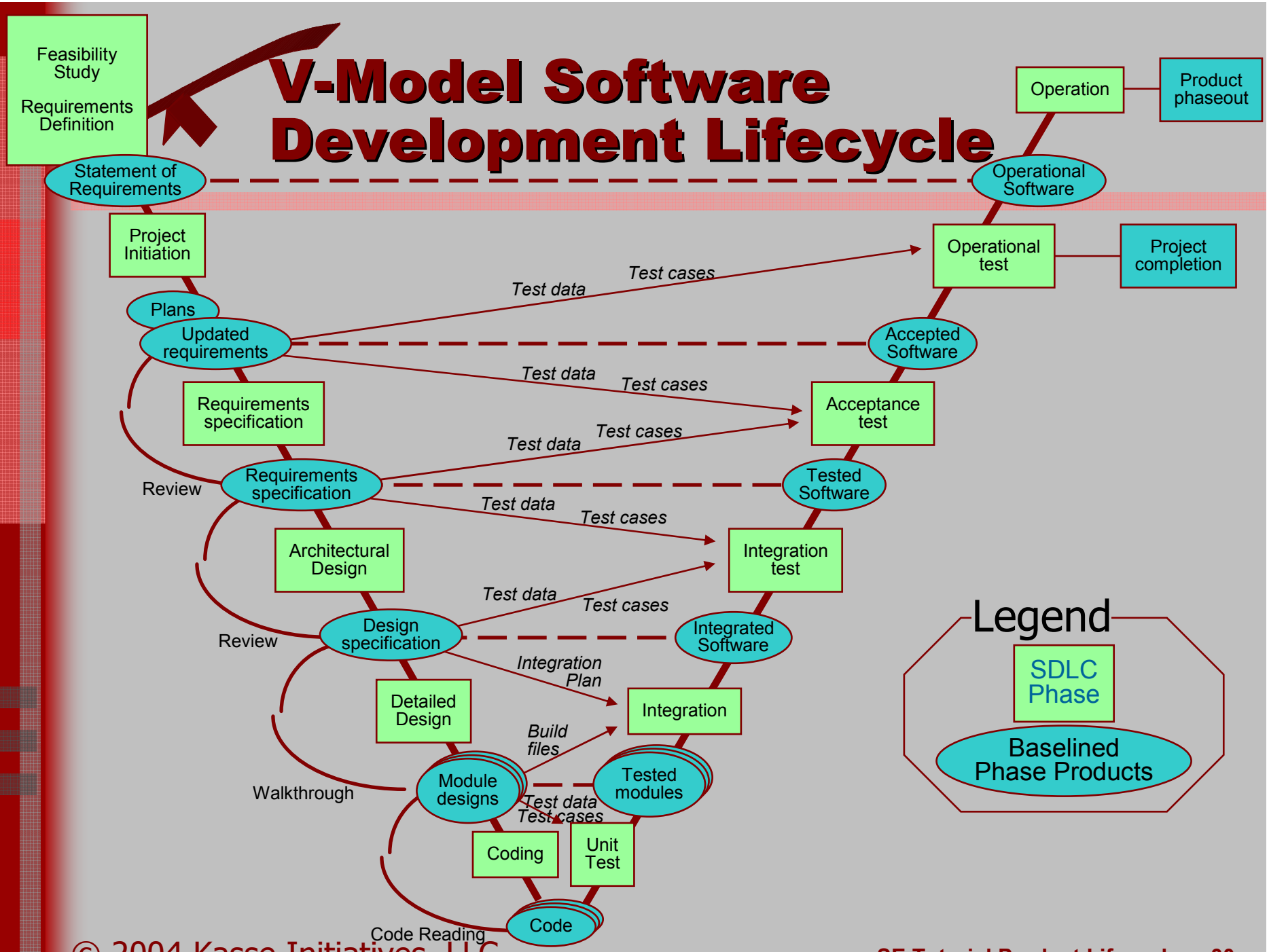


Systems / Software Life-Cycle Models

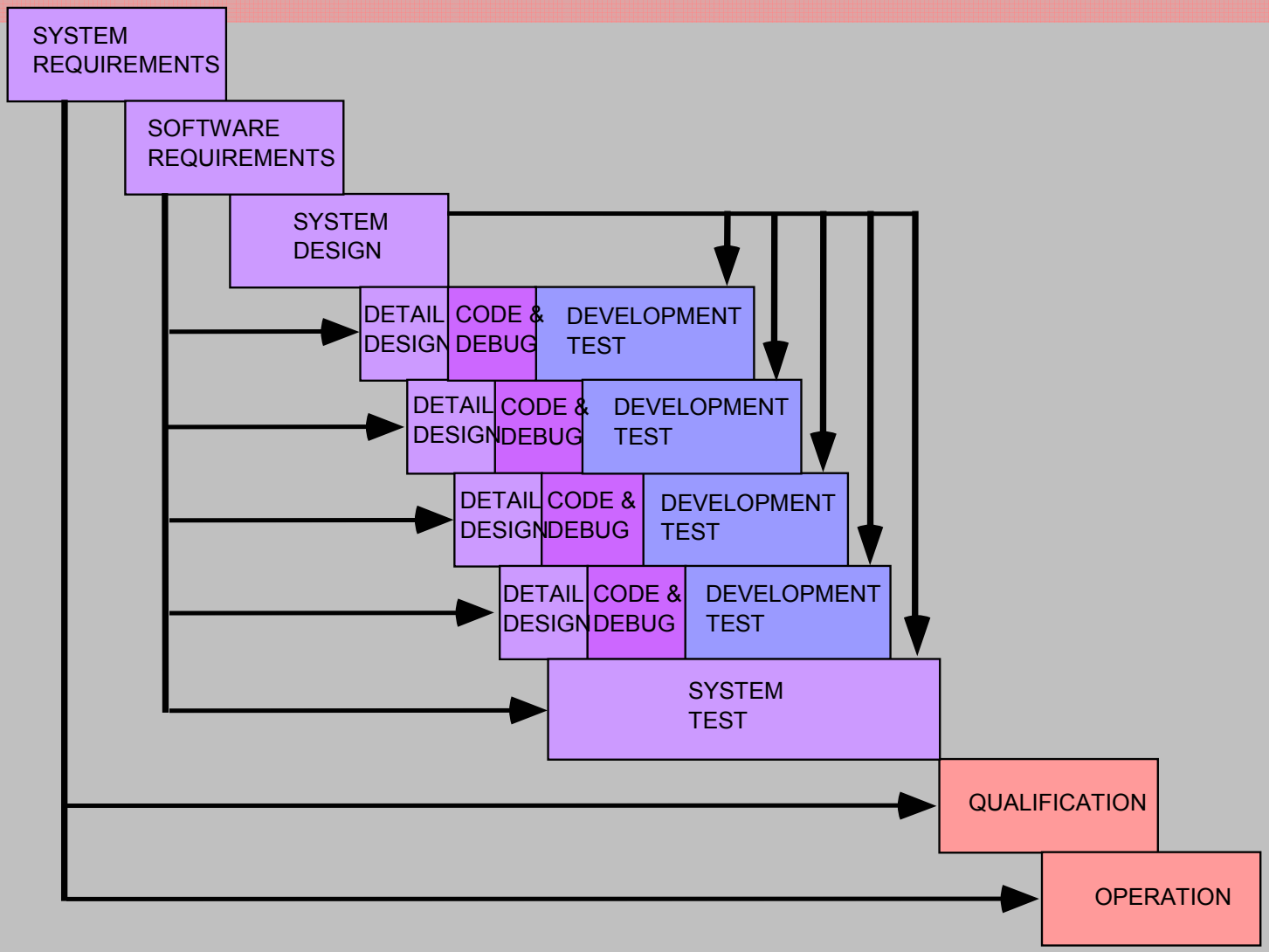
Spiral Model



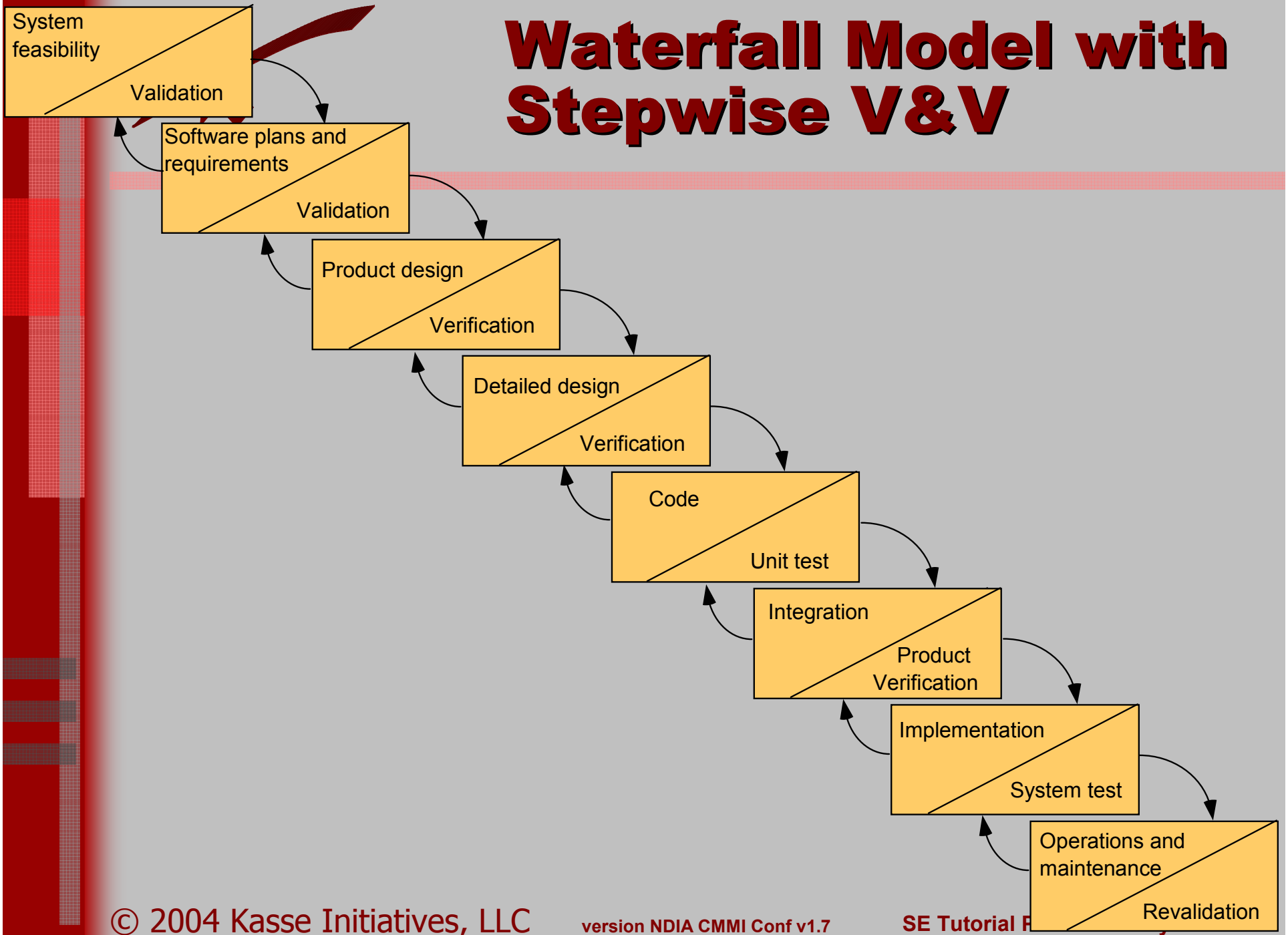
V-Model Software Development Lifecycle



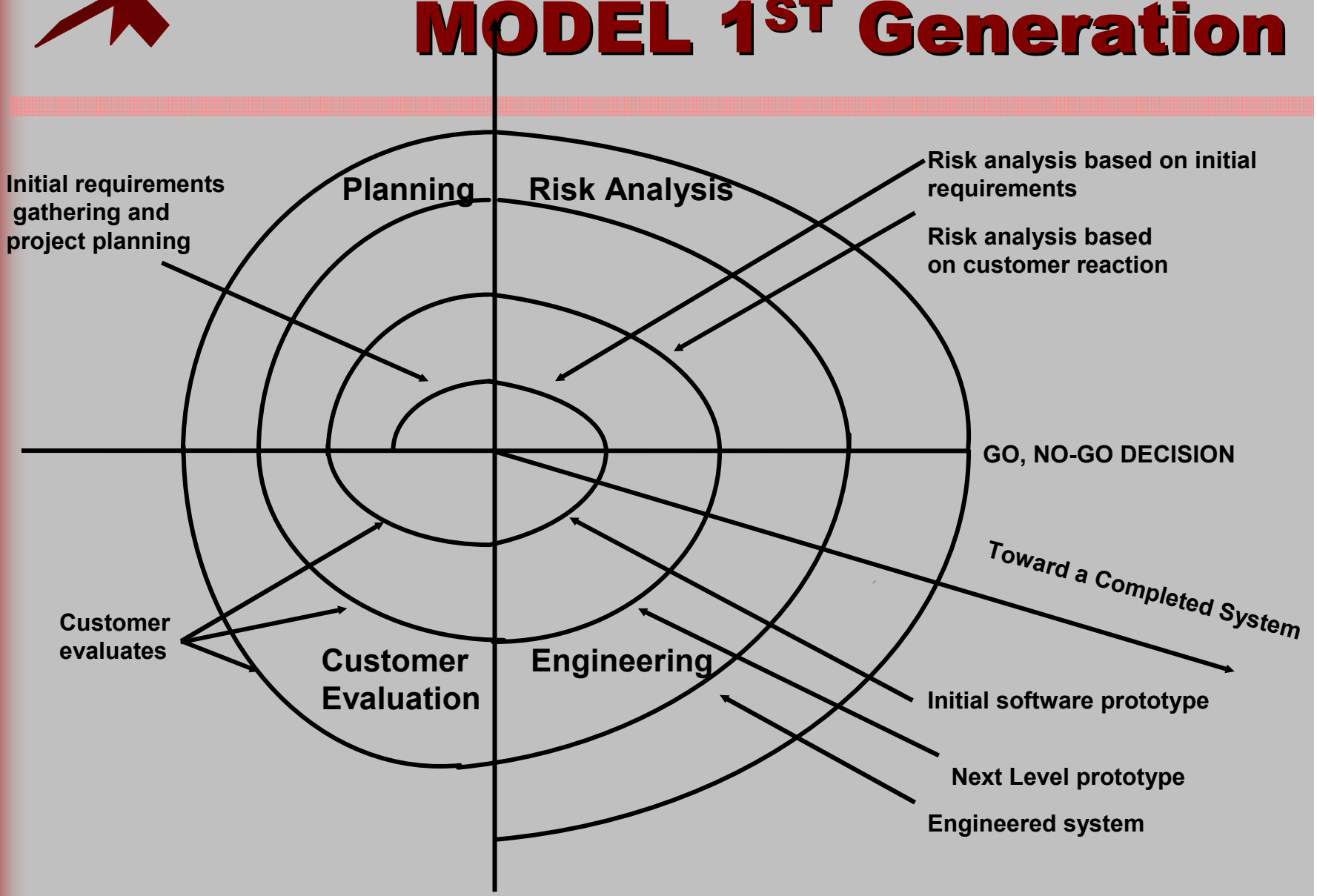
Overlapping Waterfall



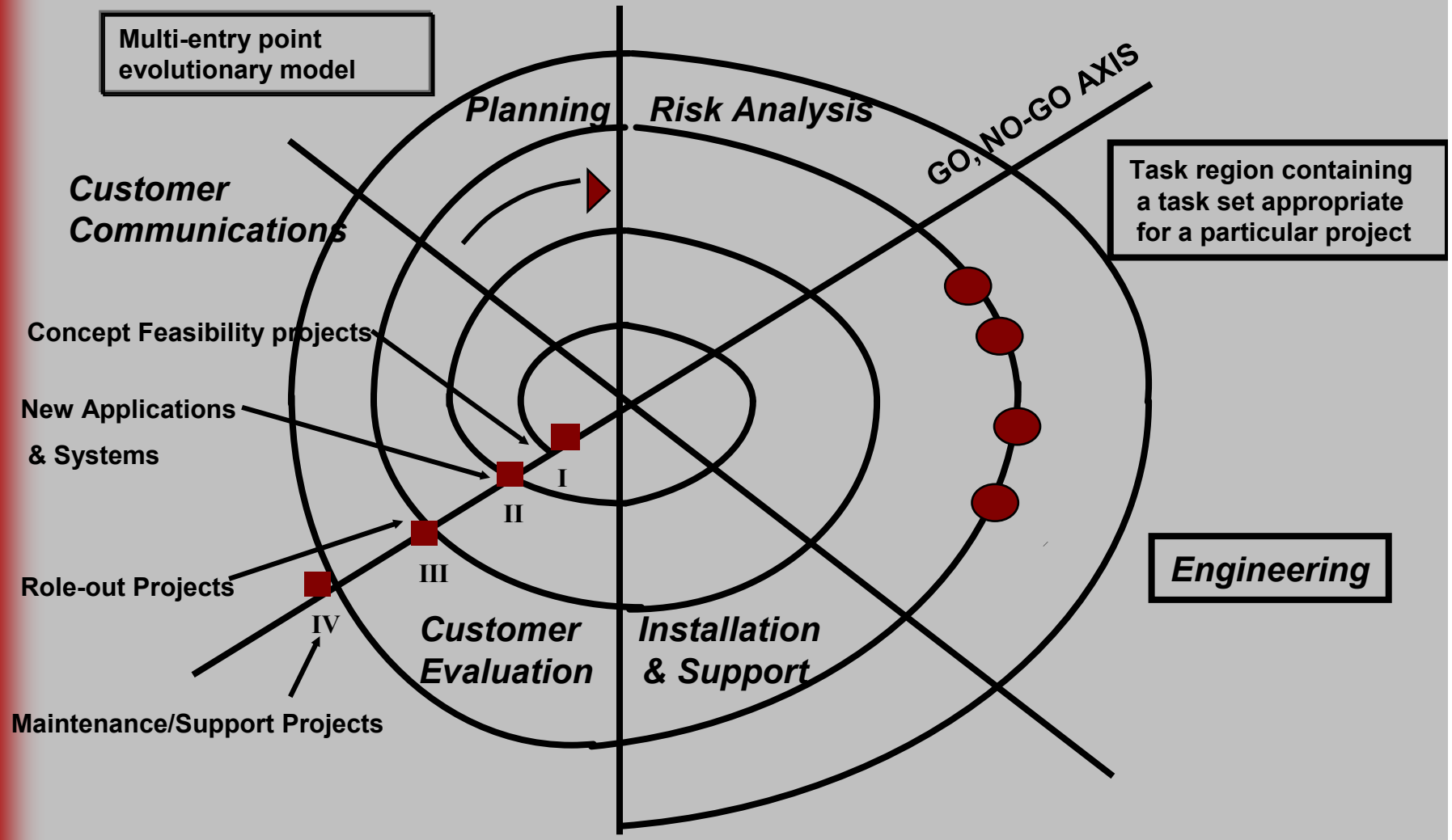
Waterfall Model with Stepwise V&V



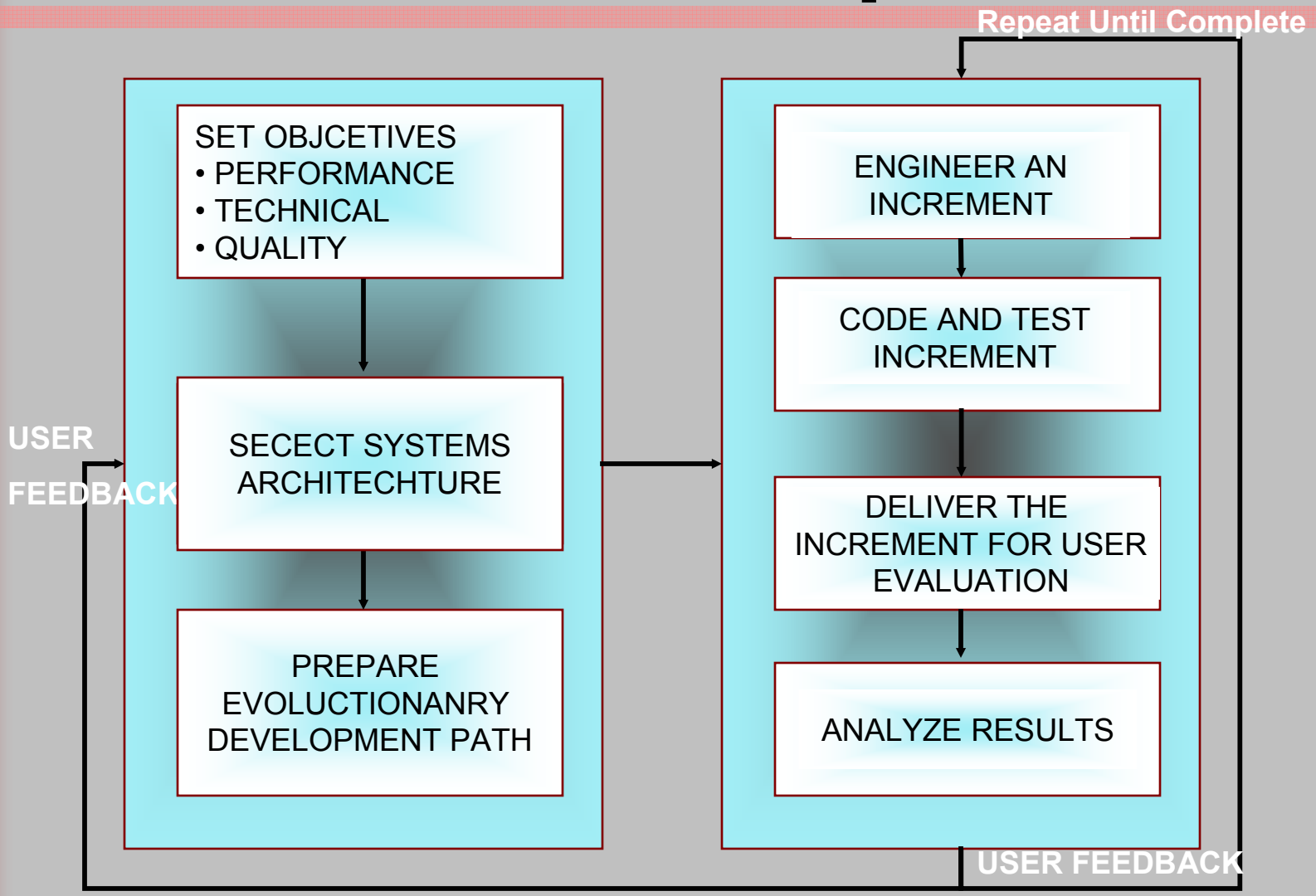
EVOLUTIONARY MODEL 1ST Generation



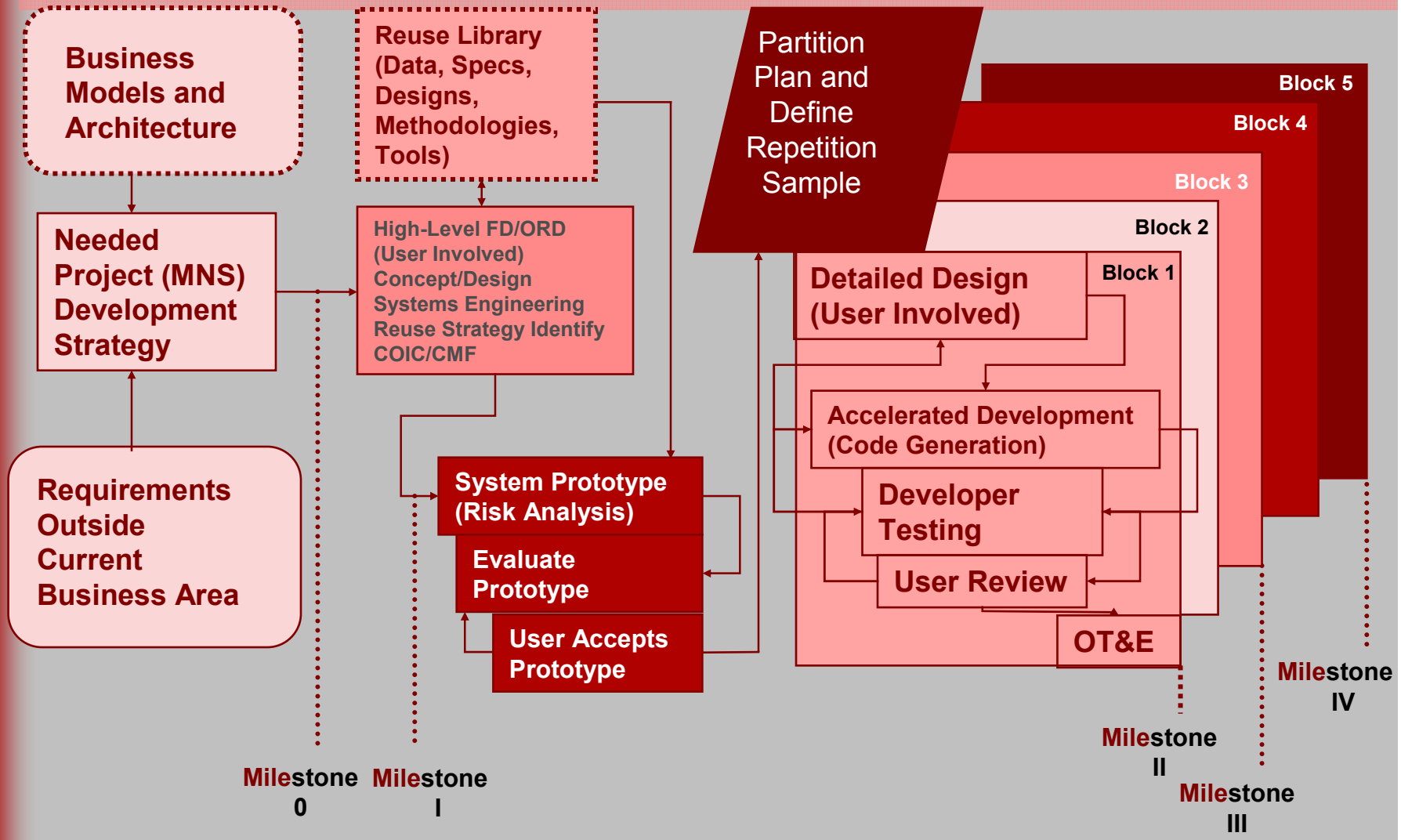
EVOLUTIONARY MODEL 2nd Generation



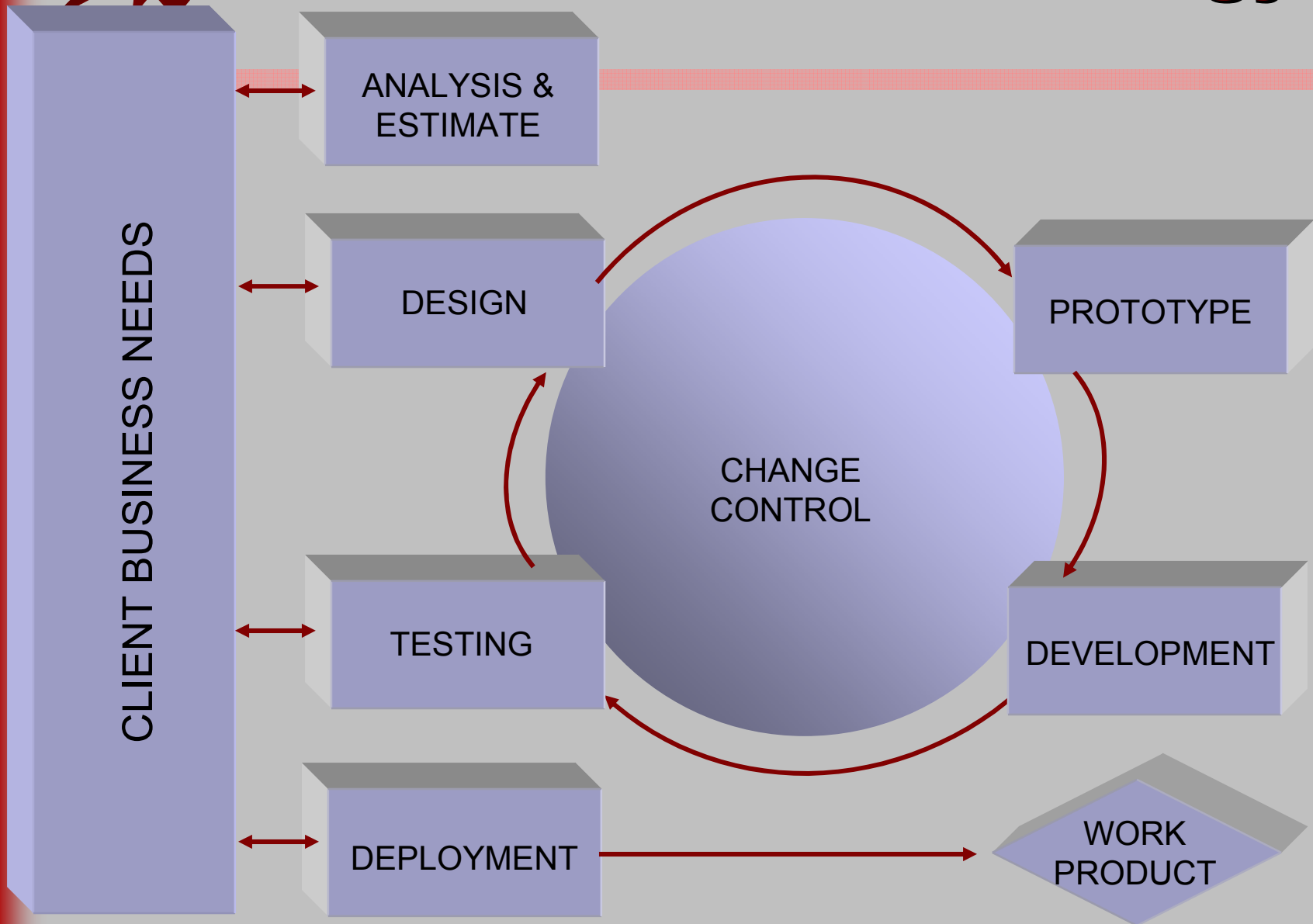
User Involvement in Evolutionary Development



Incremental Development Processes



RADD Methodology



Software Lifecycle Processes (ISO/IEC 12207)

- 17 Processes grouped into three sets:
  - Primary Processes
    - Acquisition
    - Supply
    - Development
    - Operation
    - Maintenance

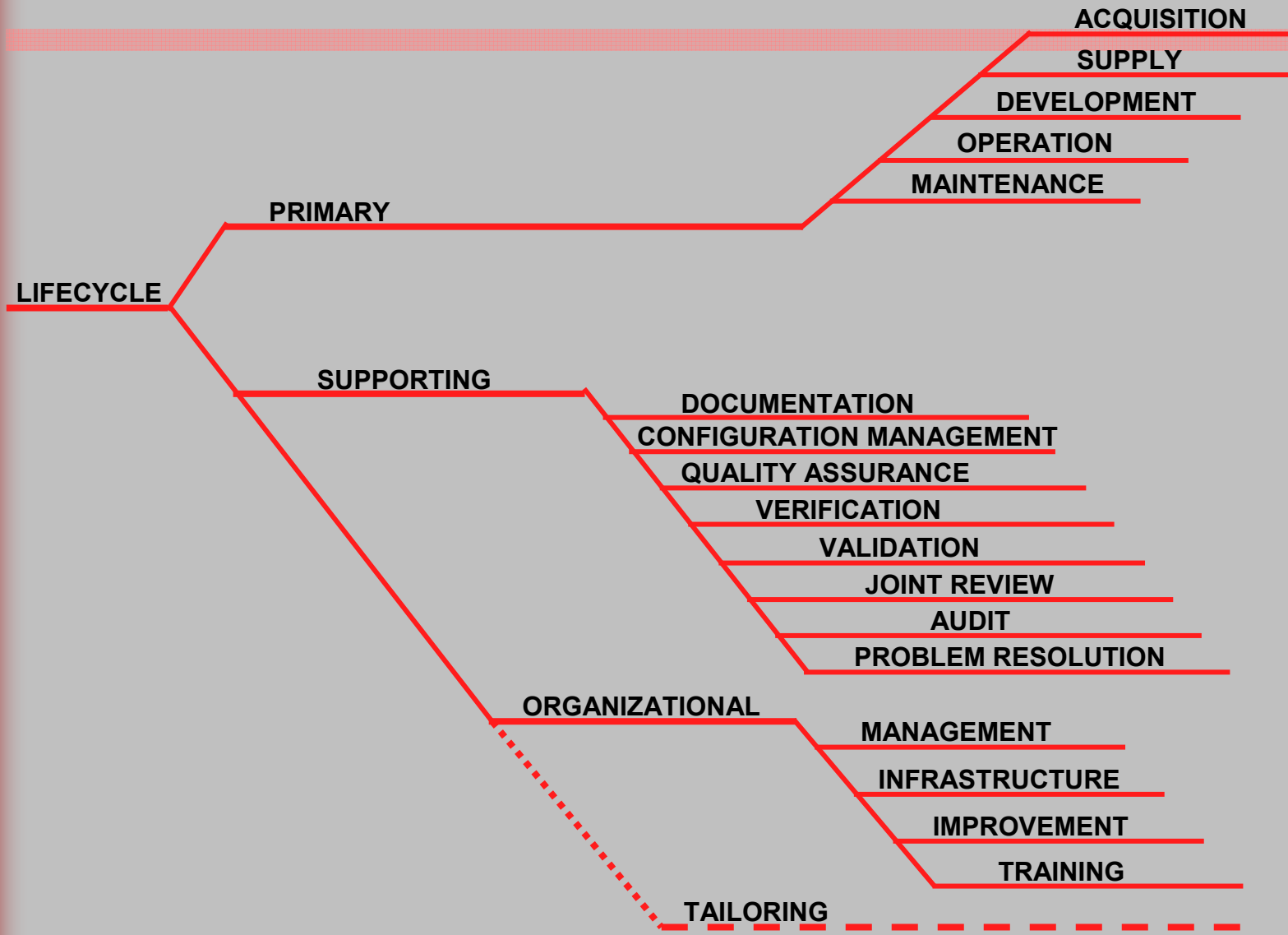
Software Lifecycle Processes (ISO/IEC 12207) - 2

- Support Processes
  - Documentation
  - Configuration Management
  - Quality Assurance
  - Verification
  - Validation
  - Joint Review
  - Audit
  - Problem Resolution

Software Lifecycle Processes (ISO/IEC 12207) - 3

- Organizational Processes
  - Management
  - Infrastructure
  - Improvement
  - Training

The Process Tree (ISO/IEC 12207)



System Lifecycle Processes (ISO/IEC 15288)

- 23 Processes grouped four sets:
  - Agreement Processes
    - Acquisition
    - Supply
  - Enterprise Processes
    - Enterprise Management Process
    - Investment Management Process
    - System Life Cycle Process Management Process
    - Resource Management Process

System Lifecycle Processes (ISO/IEC 15288) - 2

- Project Management Processes
  - Planning Process
  - Assessment Process
  - Control Process
  - Decision Management Process
  - Risk Management Process
  - Configuration Management Process
  - Quality Management Process

System Lifecycle Processes (ISO/IEC 15288) - 3

- Technical Processes
  - Stakeholder Needs Definition Process
  - Requirements Analysis Process
  - Architectural Design Process
  - Implementation Process
  - Integration Process
  - Verification Process
  - Transition Process
  - Validation Process
  - Operations Process
  - Disposal Process

A Concurrent Engineering Life-Cycle Model