Systems Development Life-Cycles

16 October 2003

IE 590 – Requirements Engineering

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A bit about me …

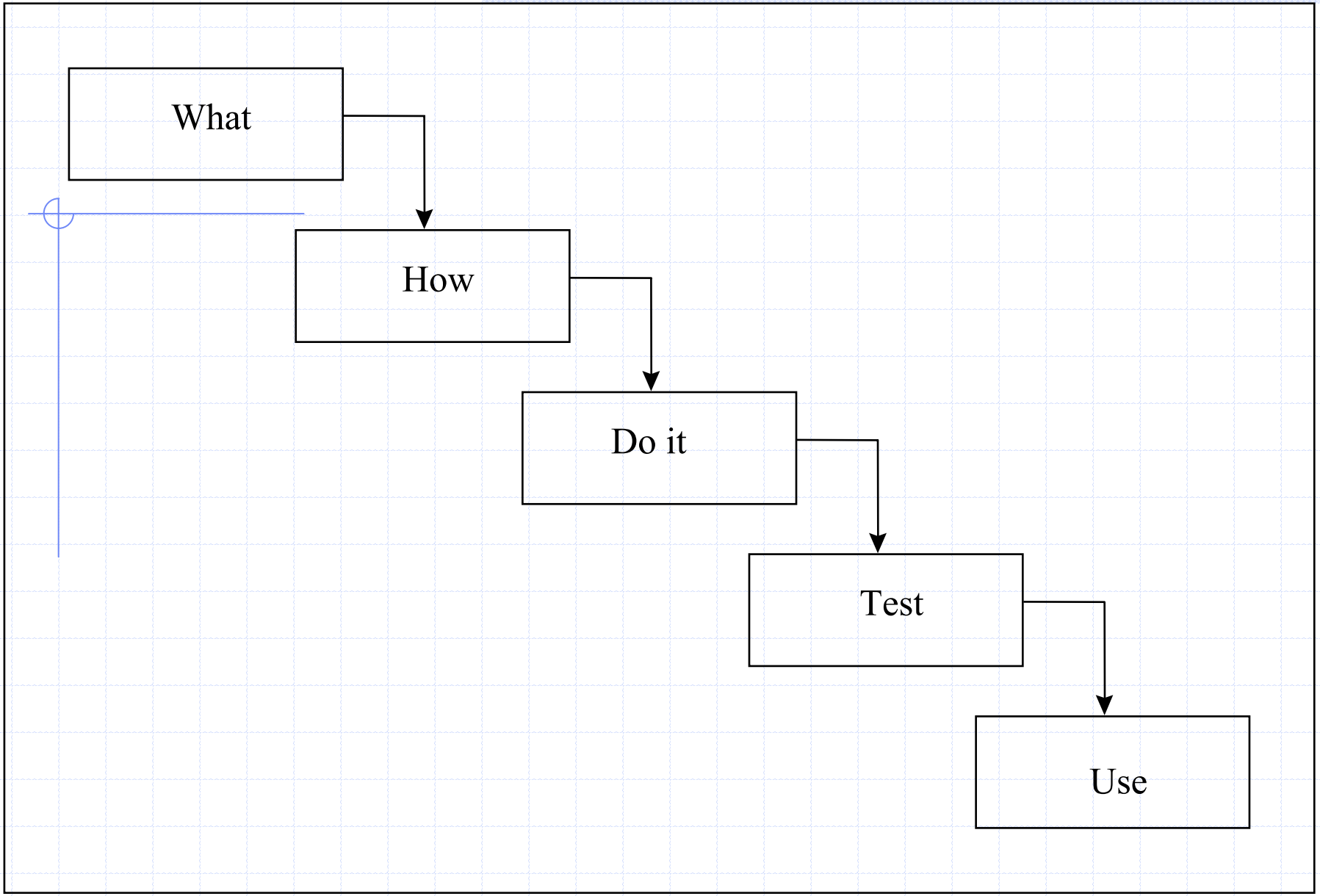
Dr. Regina M. Gonzales is a respected leader in the area of Requirements Engineering. Her focus is on using modeling as a way to formalize requirements. She has been the Chair of the INCOSE Requirements Working Group for 2001 and 2002 and the NM Enchantment Chapter President. She is an active member of the IEEE Requirements Community and the IEEE Engineering of Computer Based Systems. Currently, Dr. Gonzales is a Principal Member of the Technical Staff at Sandia National Laboratories. At Sandia, she is performing modeling of the Nuclear Weapons Complex Technical Practices. Dr. Gonzales is also a College Assistant Professor at New Mexico State University (NMSU). She teaches in the area of Large-Scale Systems Engineering, Requirements Engineering and Software Systems Engineering.

Before joining Sandia, Dr. Gonzales functioned as Deputy Director of Advanced Technology developing Computer-based Systems in the area of Flight Safety. She has also functioned as a Project Manager and Systems Engineer in diverse areas including E-Business Applications in the Insurance Industry, Point of Sale Systems, and MRI Medical Systems. Dr. Gonzales has consulted in other areas including Transportation and Home Automation. She began her career at Sandia designing and implementing embedded Telemetry Systems.

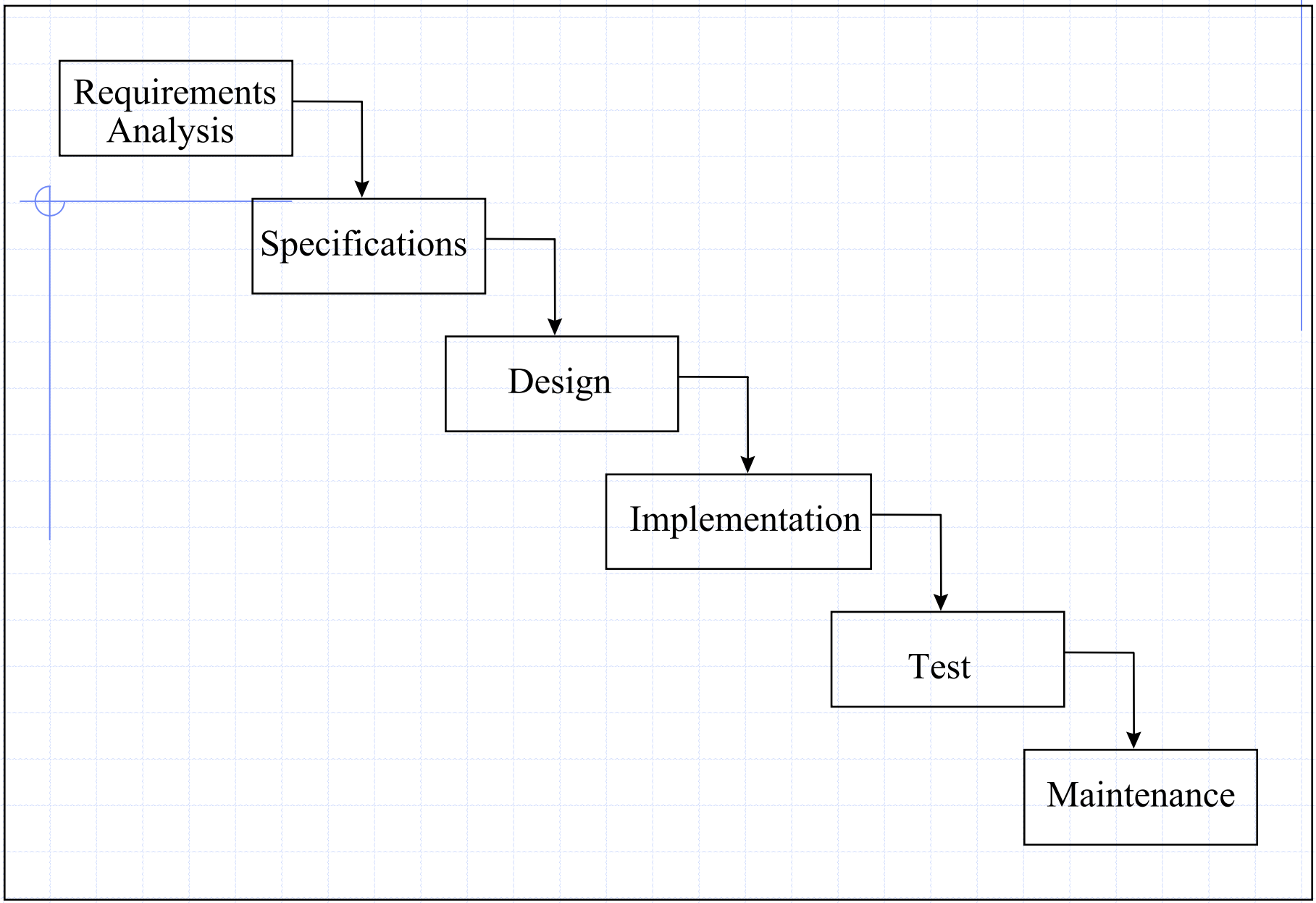
She has a Ph.D. in Computer Engineering with a specialty in Requirements Engineering from New Mexico State University, an MS in Computer Science from University of Colorado, an MS in Electrical and Computer Engineering from University of Arizona, B.S. in Electrical and Computer Engineering from New Mexico State University.

System Development Life Cycle

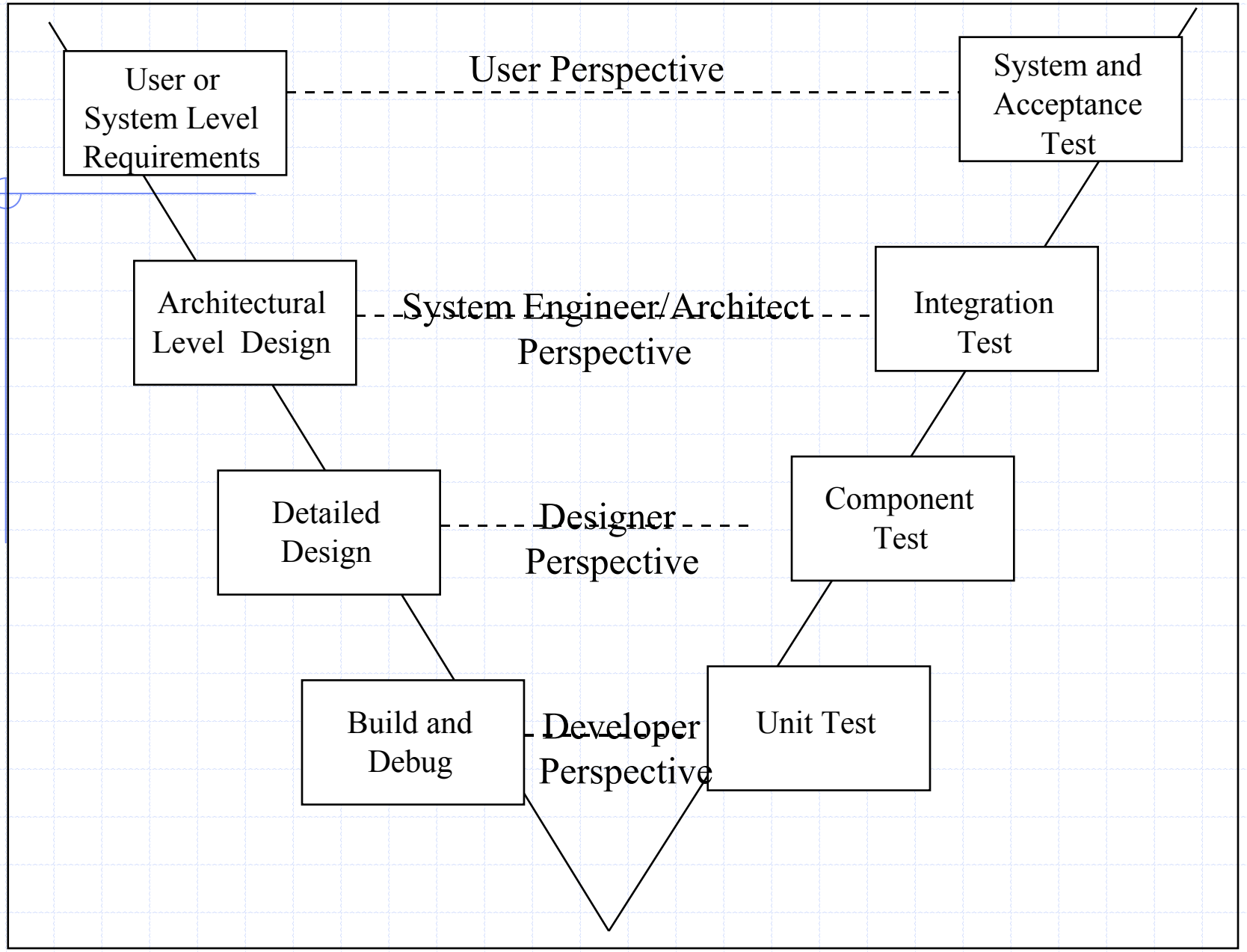
- Fundamentally at some granularity you take a set of steps to develop software
- We started with a linear approach and moved to a more dynamic approach to illustrating life cycle



A simple problem-solving paradigm (Blum, 1992)



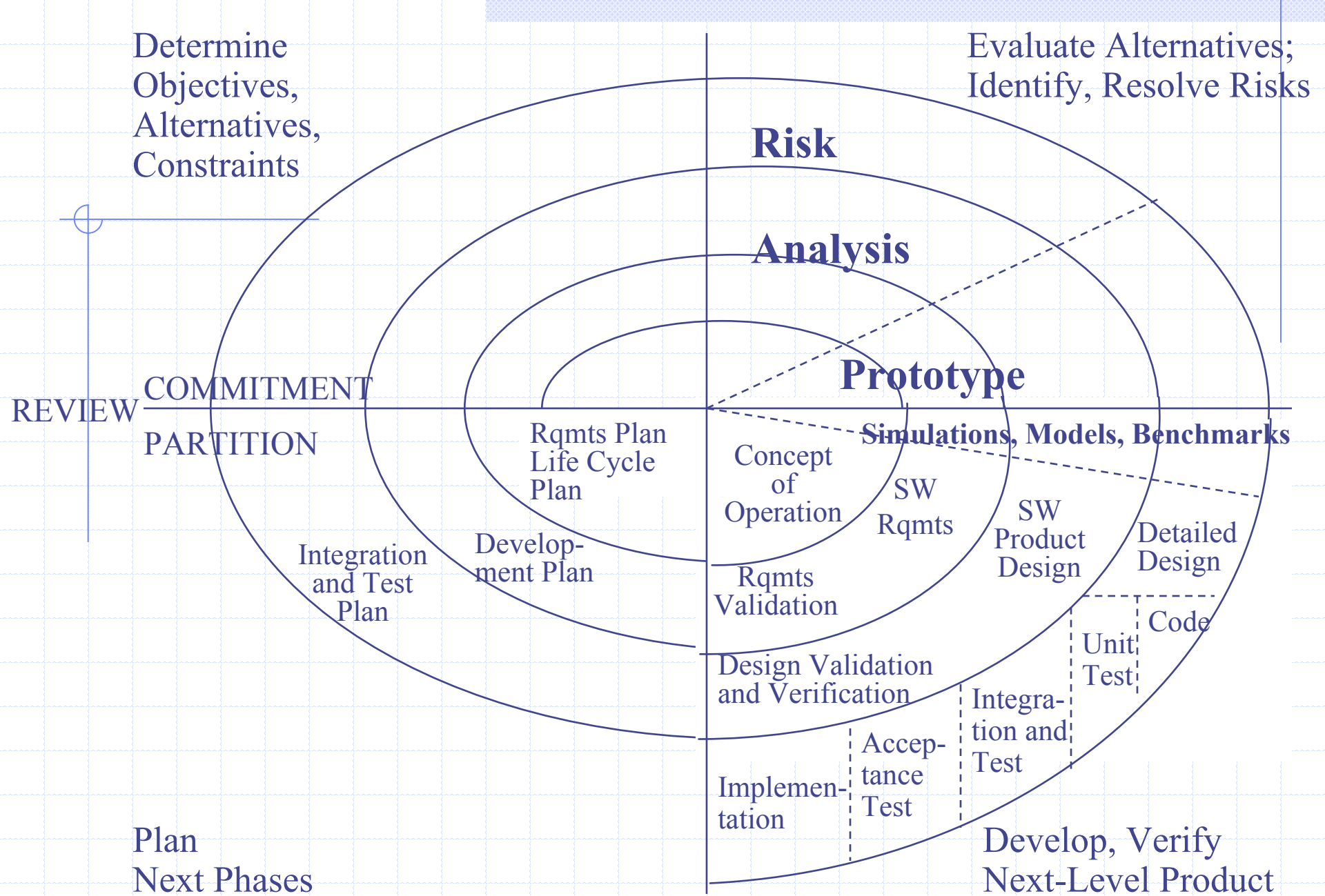
Waterfall model due to Royce (Sage and Palmer, 1990)



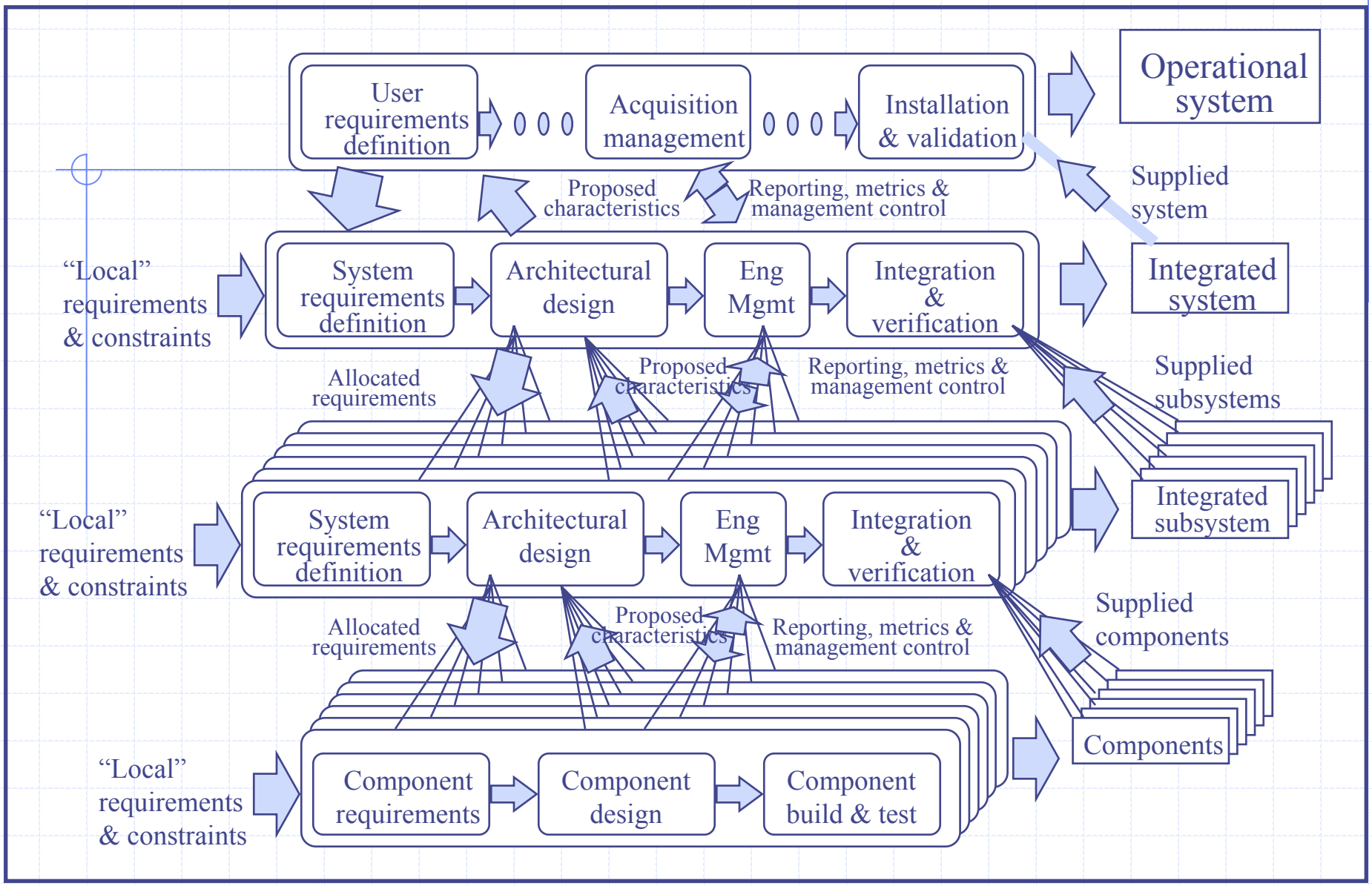
'Vee' Development Model

Dynamic Approaches

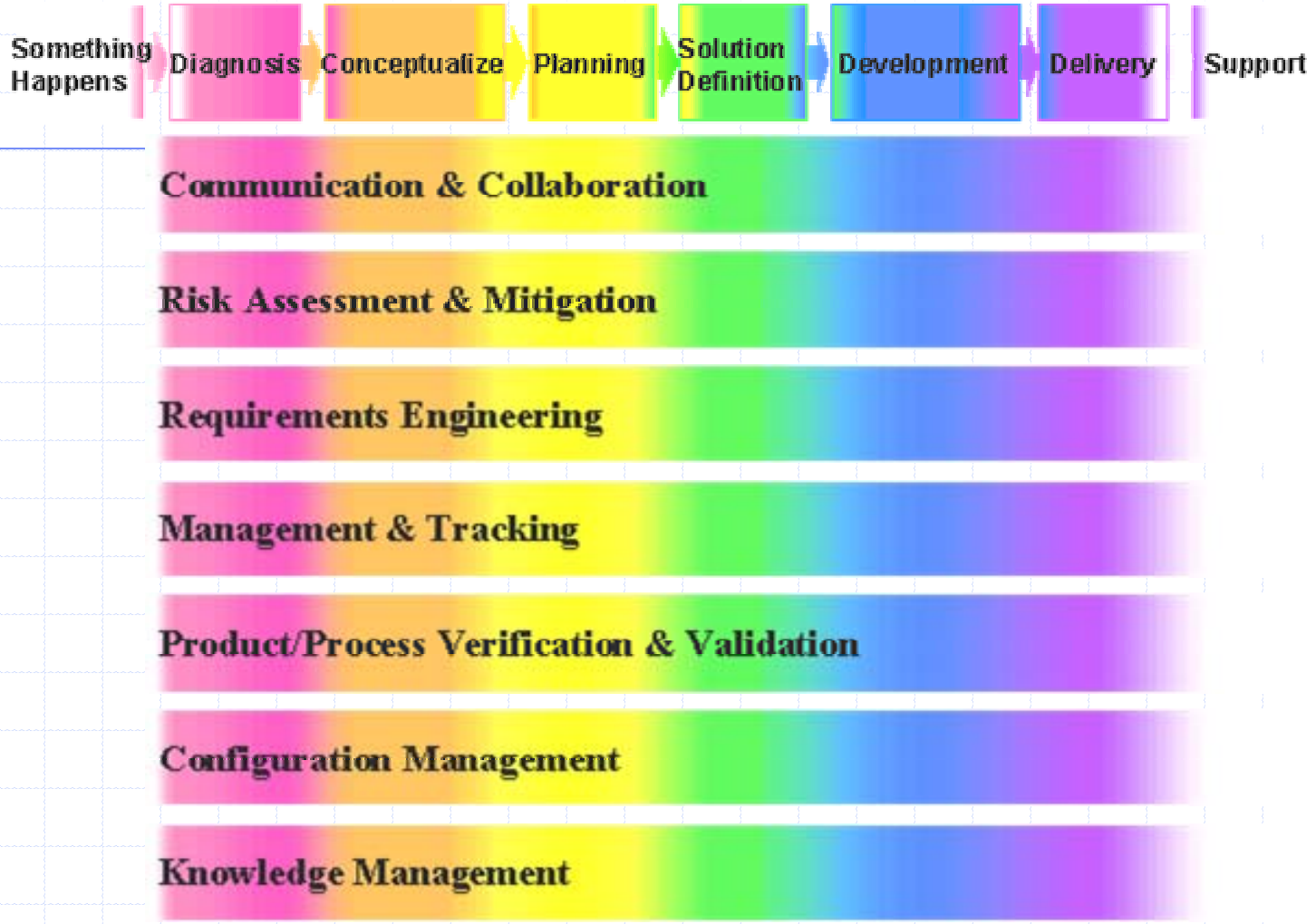
- The lifecycle steps can be taken in the context of a development paradigm
- There are many development paradigms
  - Spiral – risk is driver
  - Iterative – currently based on use-cases or features
  - Fractal/recursive – subsystem based
- Each optimize on different project goals



Spiral Model of the Software Process (Boehm, 1987)



DERA Fractal Model

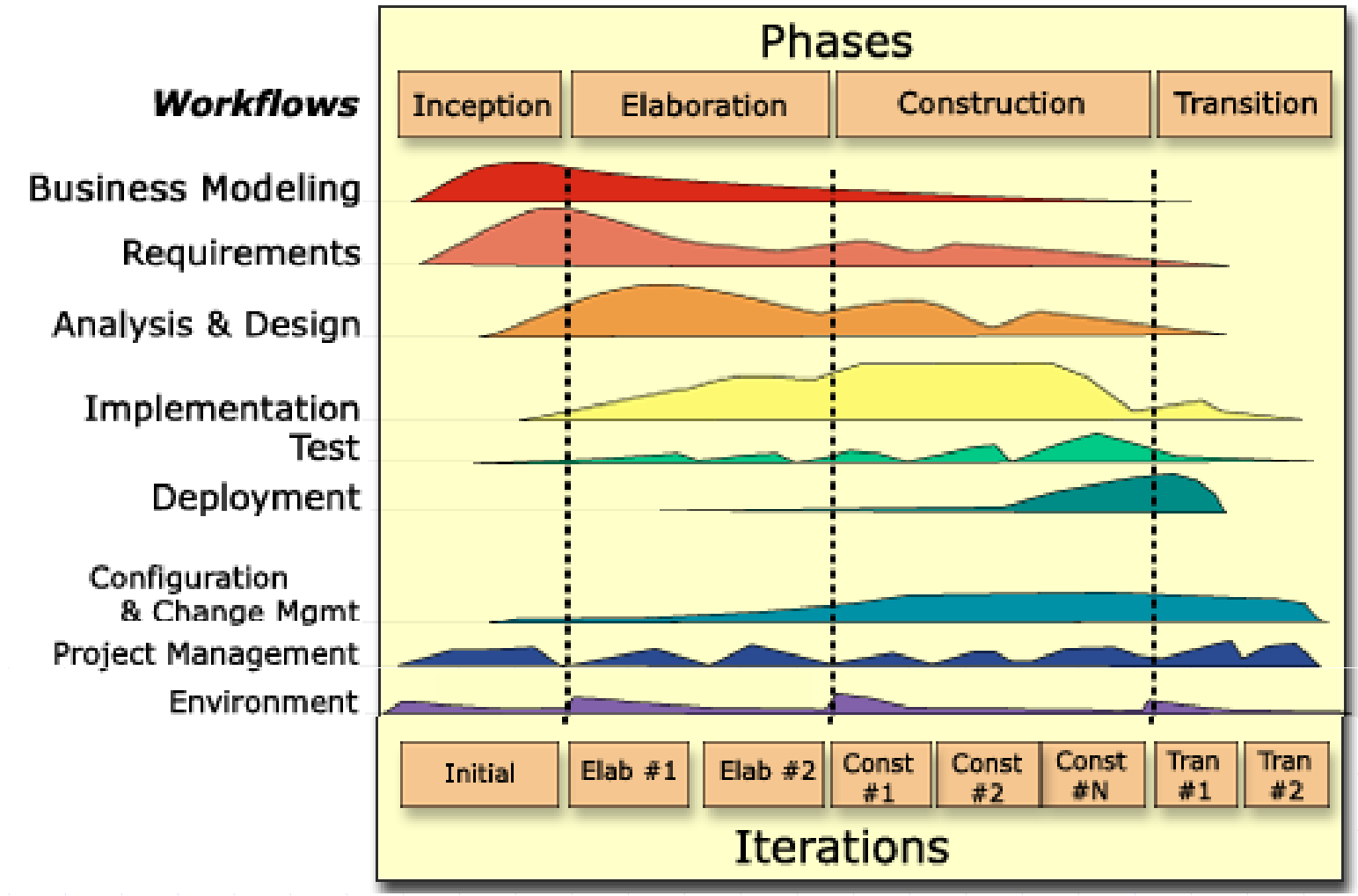


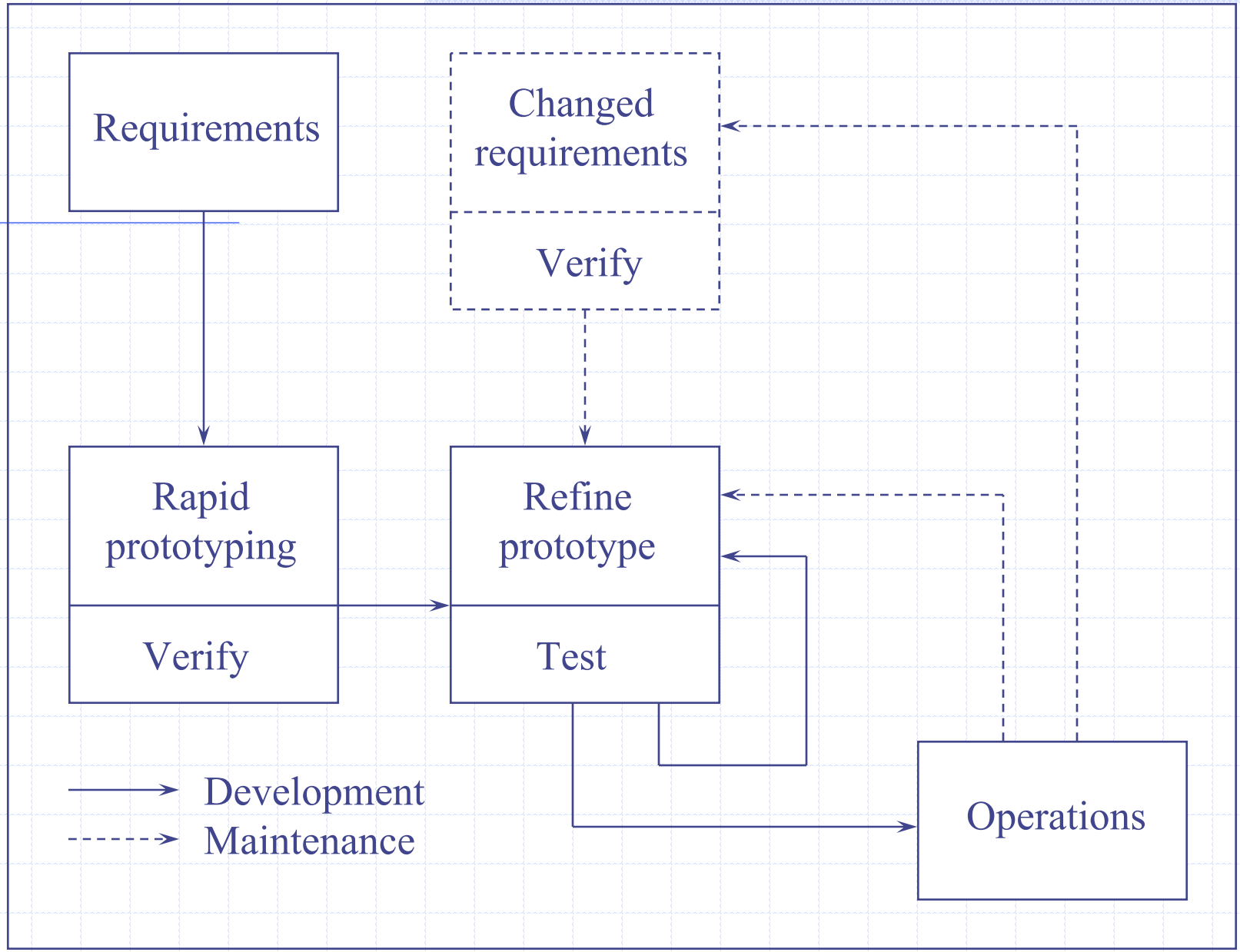
Sandia National Laboratories Life-cycle Engineering Model

Development Methodologies

- Incremental
  - Requirements are well understood
- Evolutionary
  - Requirements are not well understood
- Experimental
  - Similar to prototyping

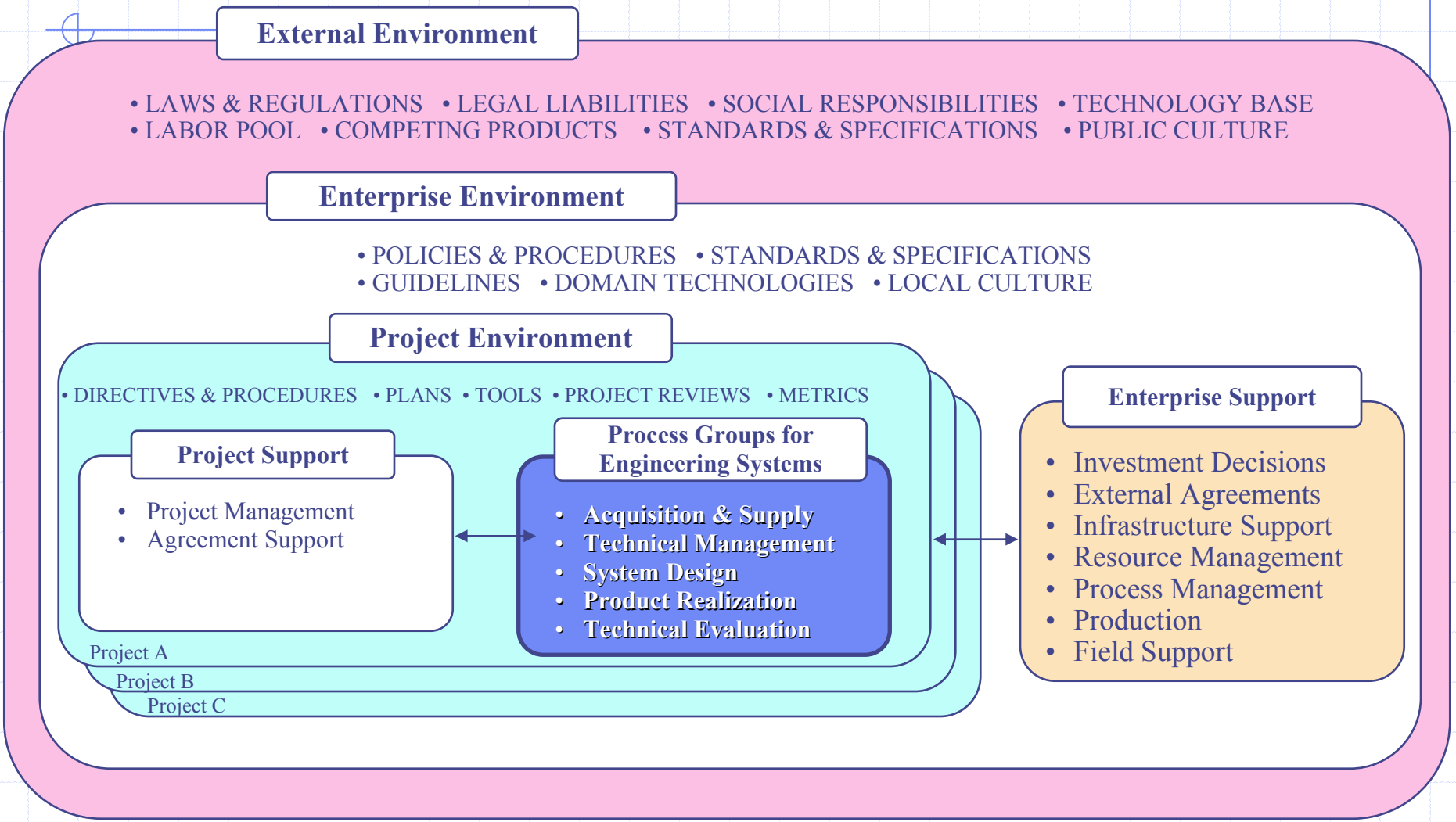
Rational Unified Process



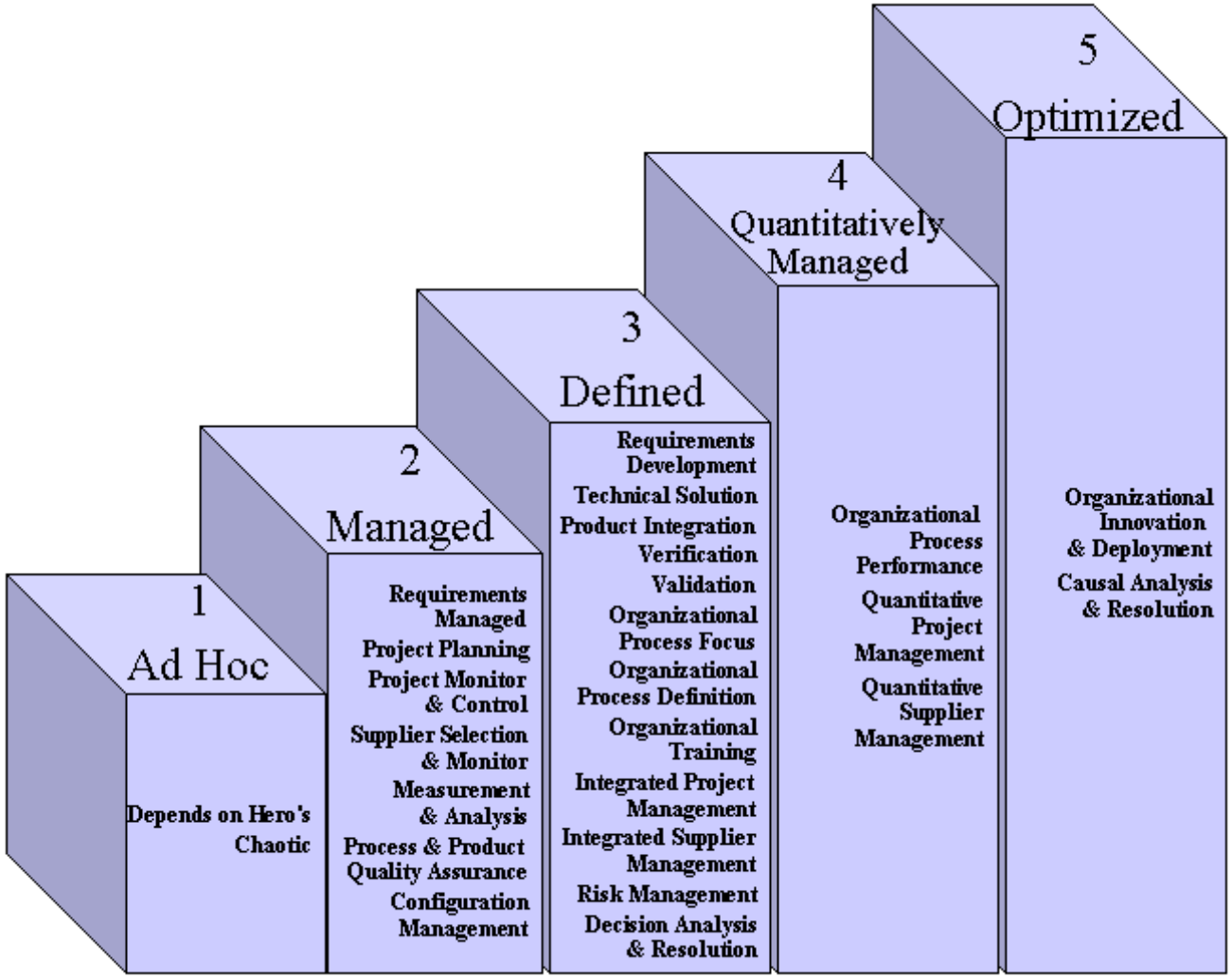


Experimental Development (Schach, 1990)

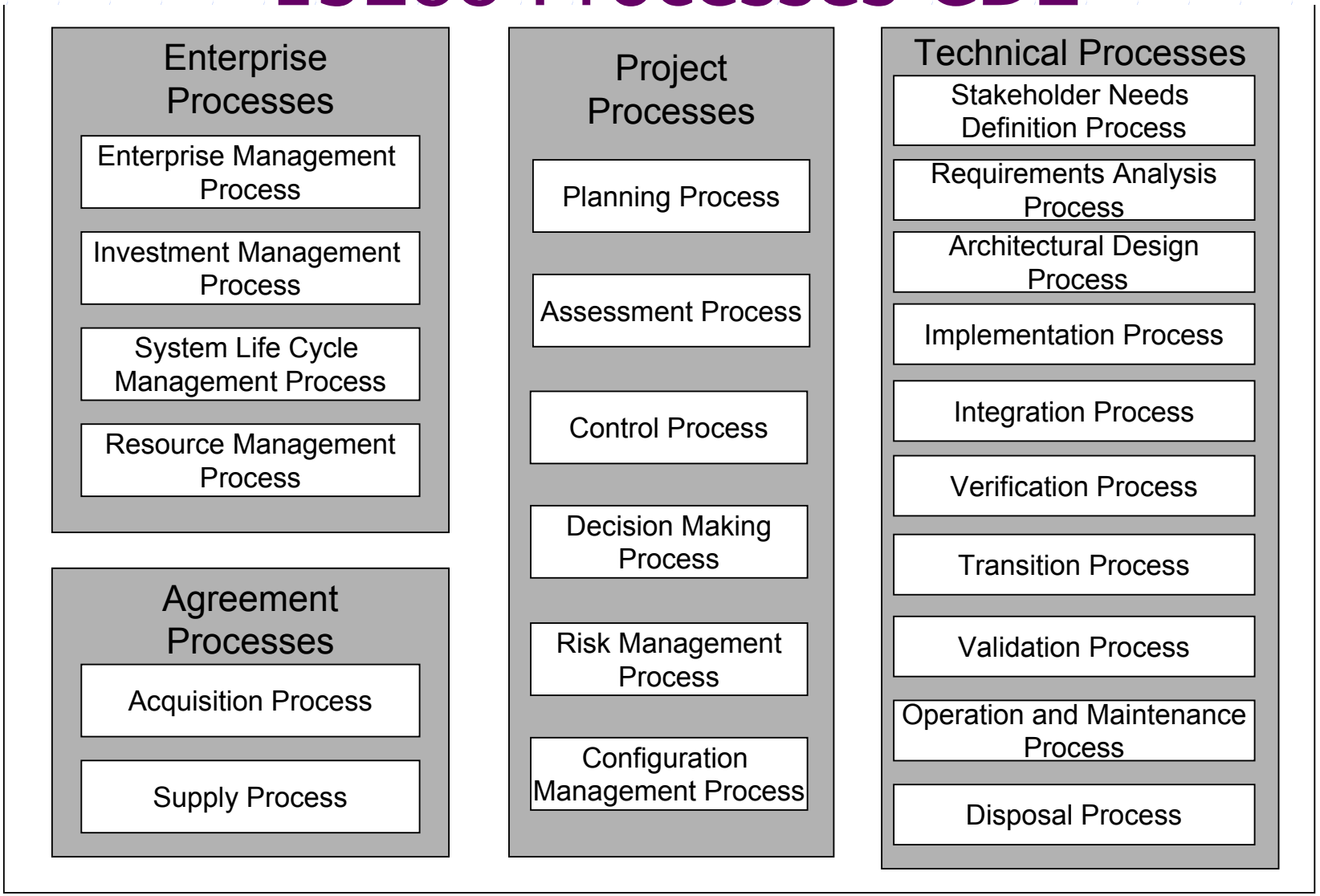
Project Environment



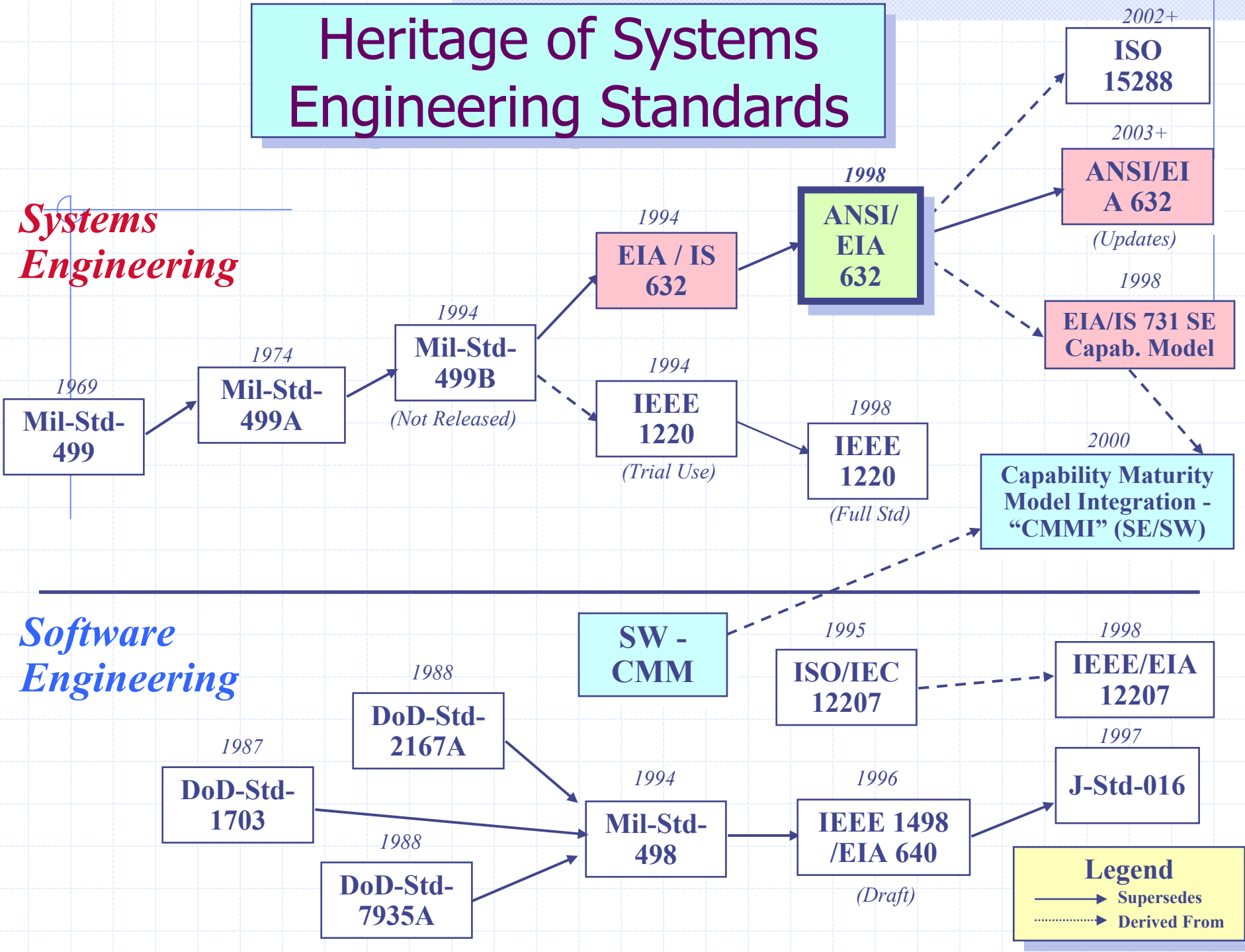
CMMI Key Processes



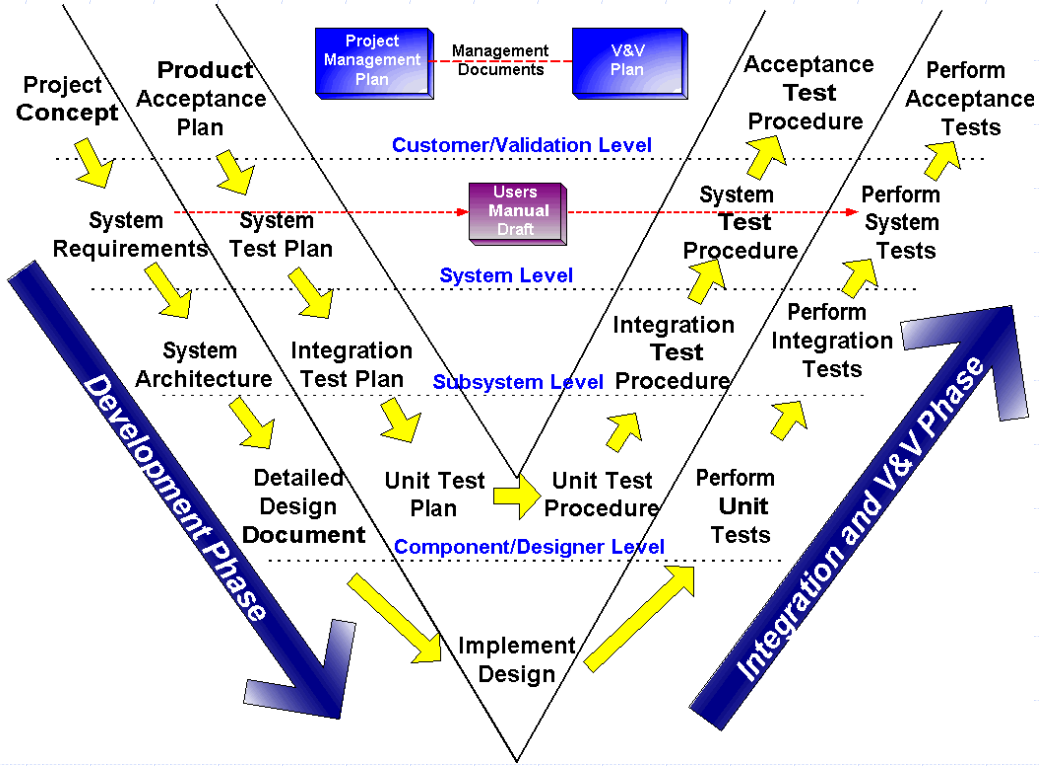
15288 Processes CD2



Heritage of Systems Engineering Standards



Enriched "Vee" Development Processes



Project Management

Subcontractor/Supplier Management

Configuration & Change Management

Risk Management

Quality Assurance and Metrics

Organizational Training

Integrated Product and Process Teams

Product and Process Infrastructure