An Application of Agile Principles to the Systems Engineering Process

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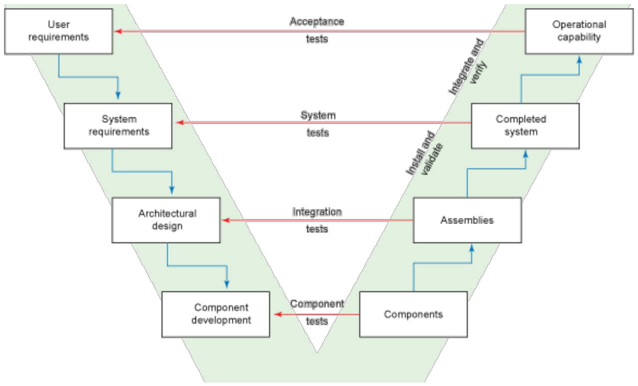
erview & Purpose

To illustrate the benefits of applying agile principles to the Systems Engineering Process

- Systems Engineering Processes and Challenges
- Agile Overview
- Framework for Implementing Agile Principles into Systems Engineering Process
- Case Study Demonstrating Proposed Method

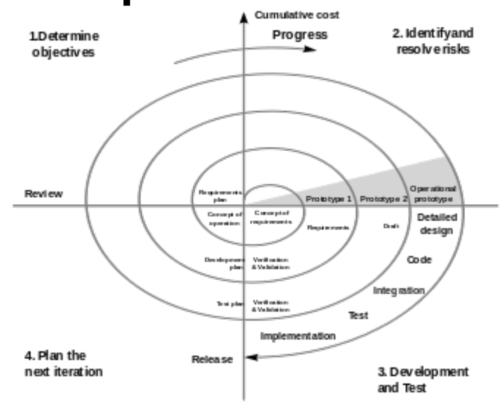
tems Engineering Models

V-Model



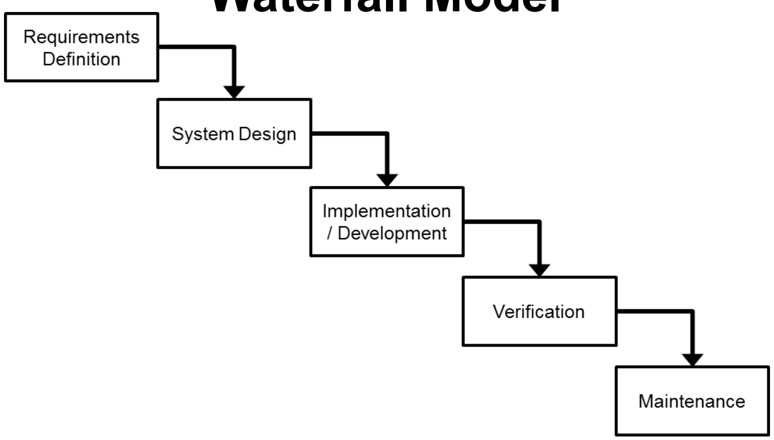
Detailed process control
Formal deliverables
Gate reviews

Spiral Model



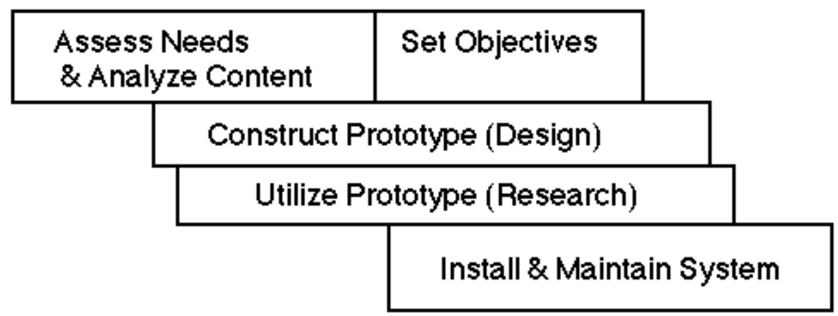
Prototypes
Activities
Artifacts

Waterfall Model



Sequential design process
Documentation

Prototyping Model



Improve speed
Mass production applications
Detect design flaws

allenges of Traditional Systems Engineering Processes

lementation of the Systems Engineering Processes presents llenges depending upon the implementation model:

- Lack of up front information
- Cost vs. benefit of formal documentation
- Responding to change
- Requirements driven
- Lack of focus on customer satisfaction

nciples behind the Agile Manifesto

stomer satisfaction

rly and continuous delivery

anging requirements

formance to shorter timescale

rk together throughout the project

aring information

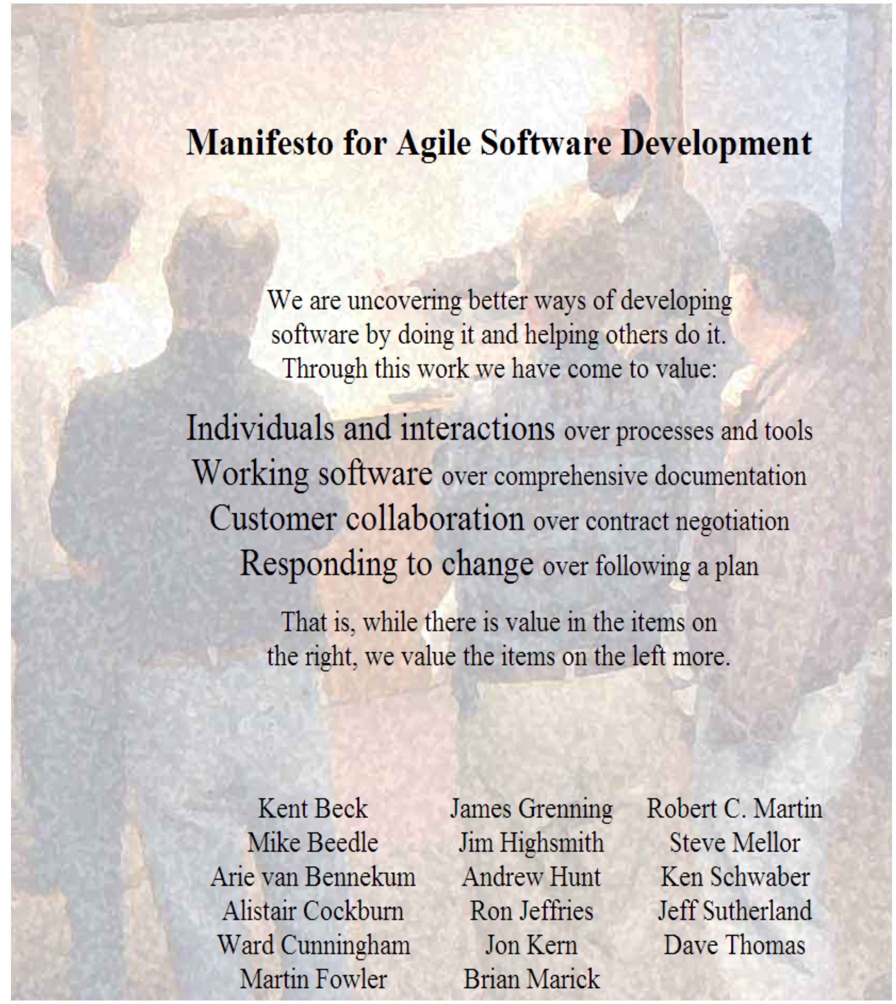
stainable development

ducing unnecessary work

nplicity

f-organizing teams

ssons learned



ttp://agilemanifesto.org/principles.html

aditional vs. Agile

	Traditional	Agile
Fixed	**Requirements**	**Resources** **Time**
	Plan Driven	Value Driven
Estimated	**Resources** **Time**	**Features**

allenges to Agile Adoption

Teams had difficulty collaborating closely

Procurement practices may not support Agile projects

Teams had difficulty transitioning to self-directed work

Customers did not trust iterative solutions

Staff had difficulty committing to more timely and frequent input

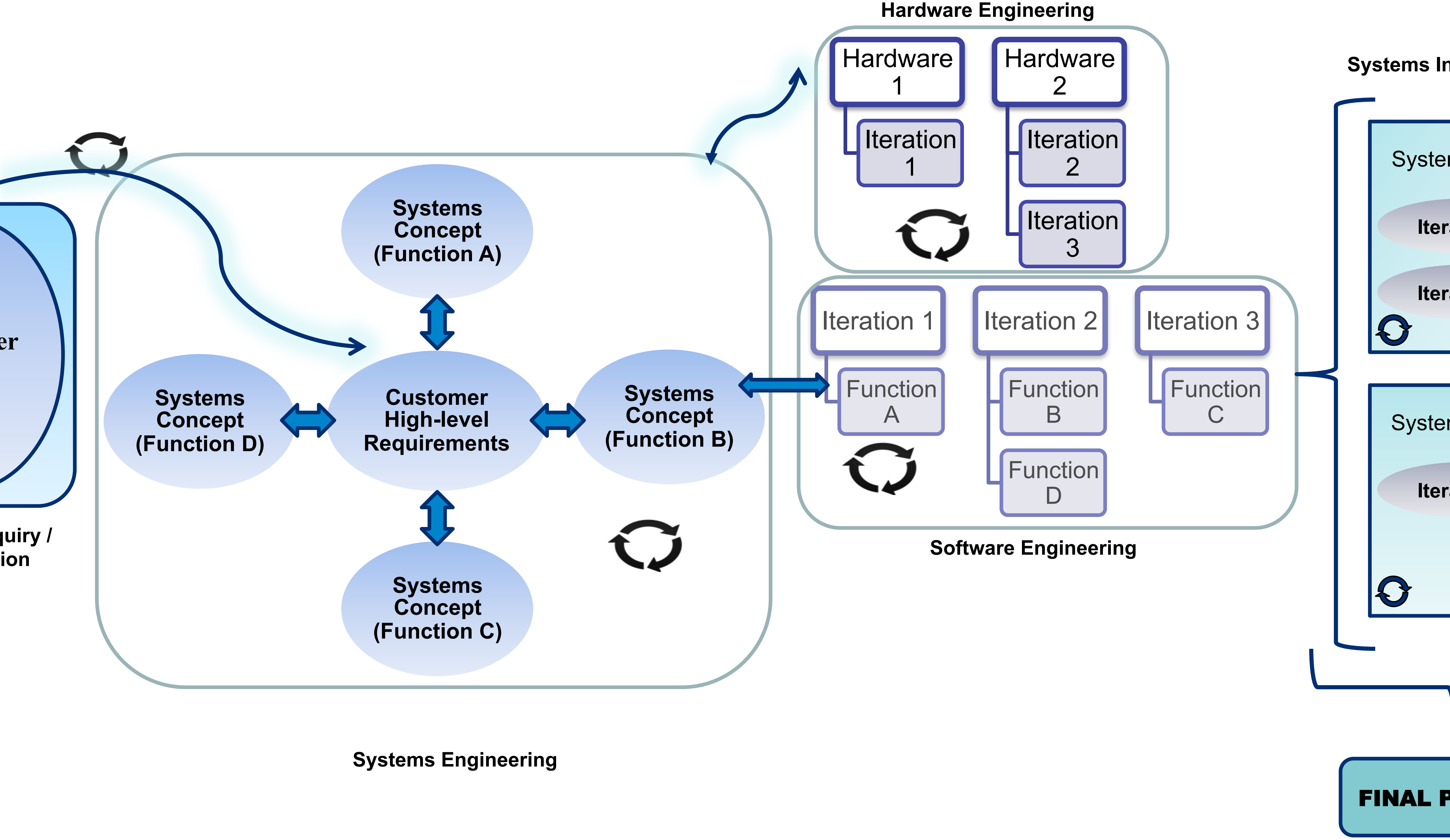
Teams had difficulty managing iterative requirements

Agencies had trouble committing staff

8. Compliance reviews were difficult to execute within an iteration timeframe
9. Timely adoption of new tools was difficult
10. Federal reporting practices do not align with Agile
11. Technical environments were difficult to establish and maintain
12. Traditional artifact reviews do not align with Agile
13. Agile guidance was not clear
14. Traditional status tracking does not align with Agile

Effective Practices and Federal Challenges in Applying Agile Methods

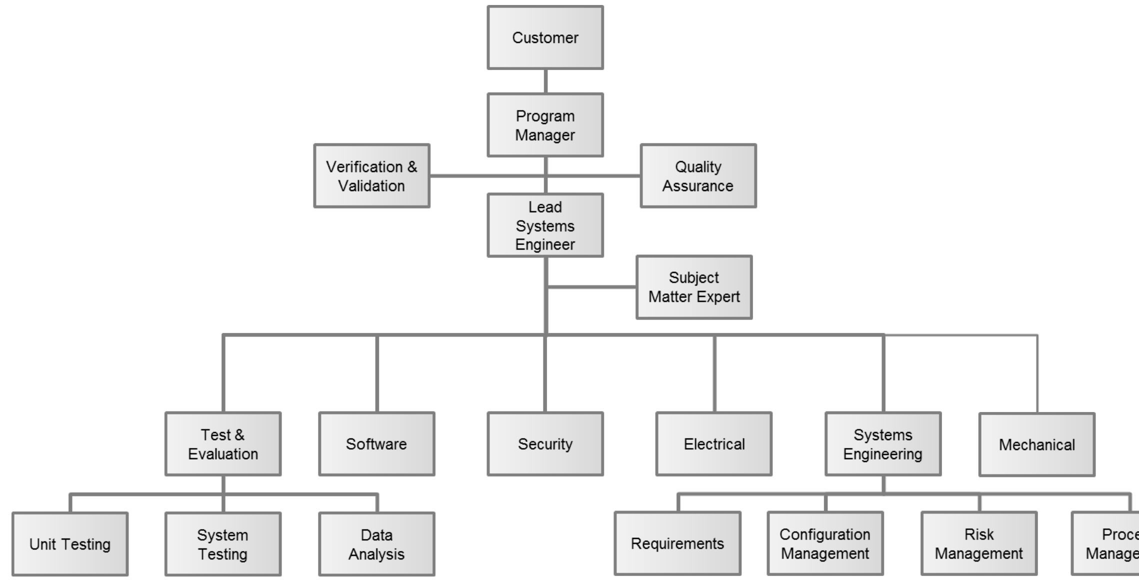
plication of Agile Principles



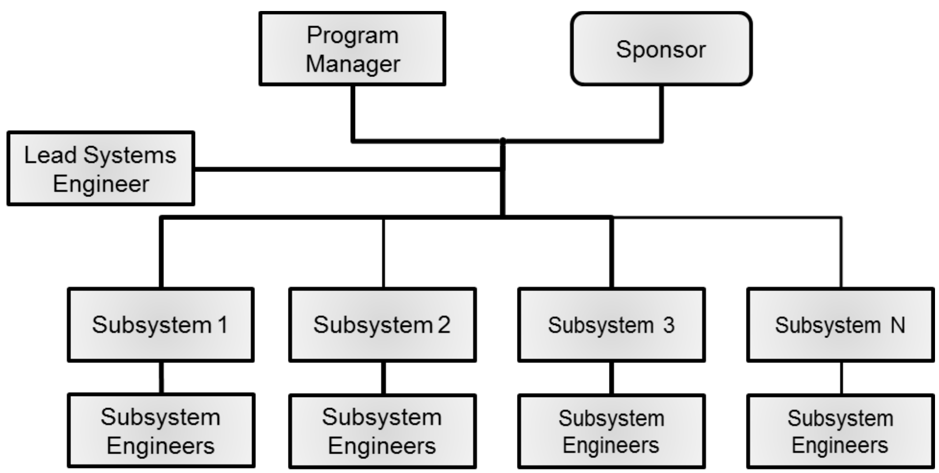
Z. Malik, *Agile Principles to SE in the Commercial Environment* (2013)

ile Application Team Structure

- all Cohesive team
- o-system leads
- rmission to make quick decisions
- cess to sponsor
- ttened organization
- lity to bring in experts
- gram manager reports directly to customer in rge of program
- gram deputies co-located



Traditional Team Structure

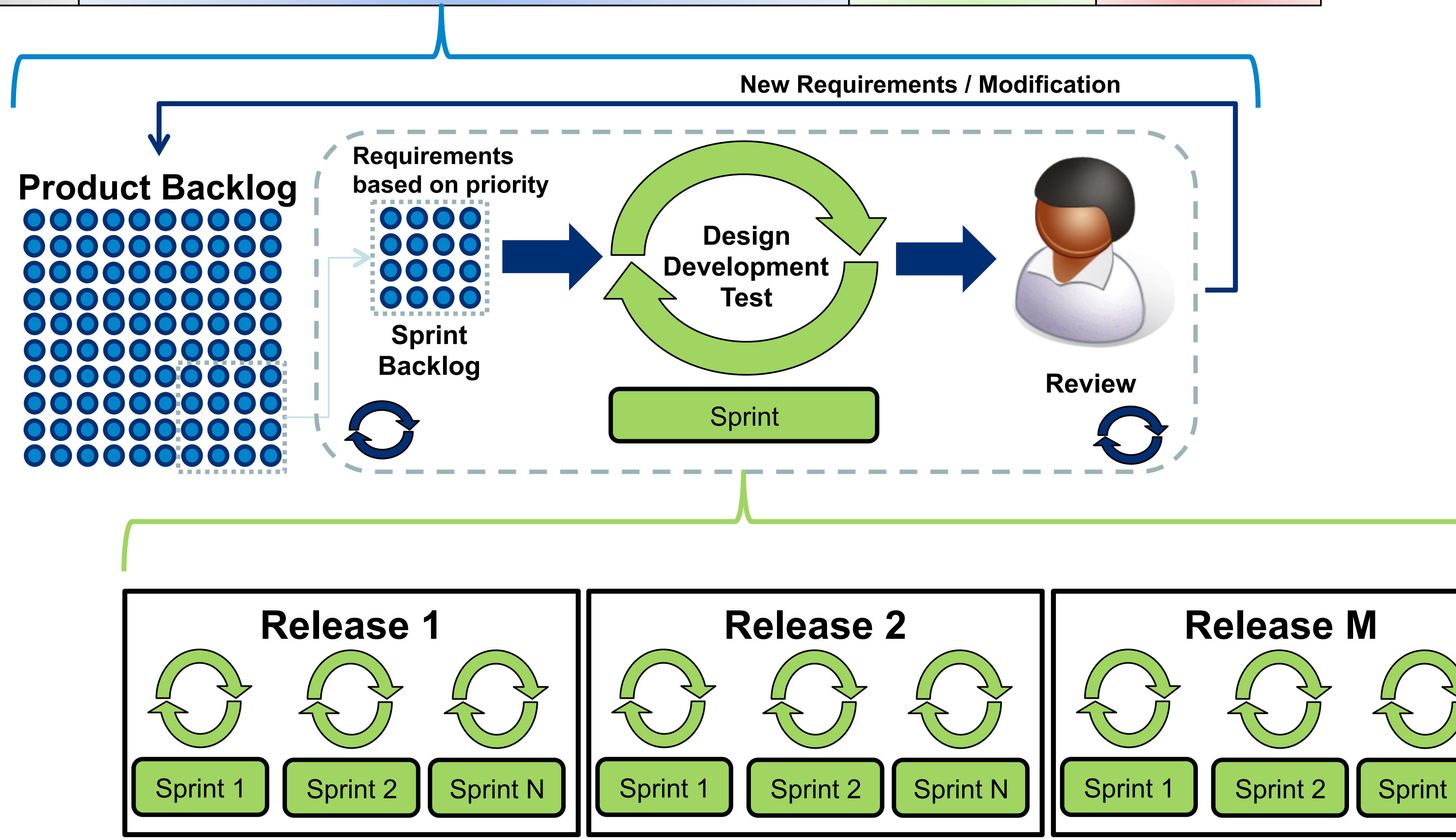


Modified Team Structure

amework for Agile Application

Concept Stage	Development Stage	Production Stage	Utilization Stage Support Stage	Retirement
Planning	Requirements, Design, Development, Integration & Test		Operations & Maintenance	Disposal

INC
Pro

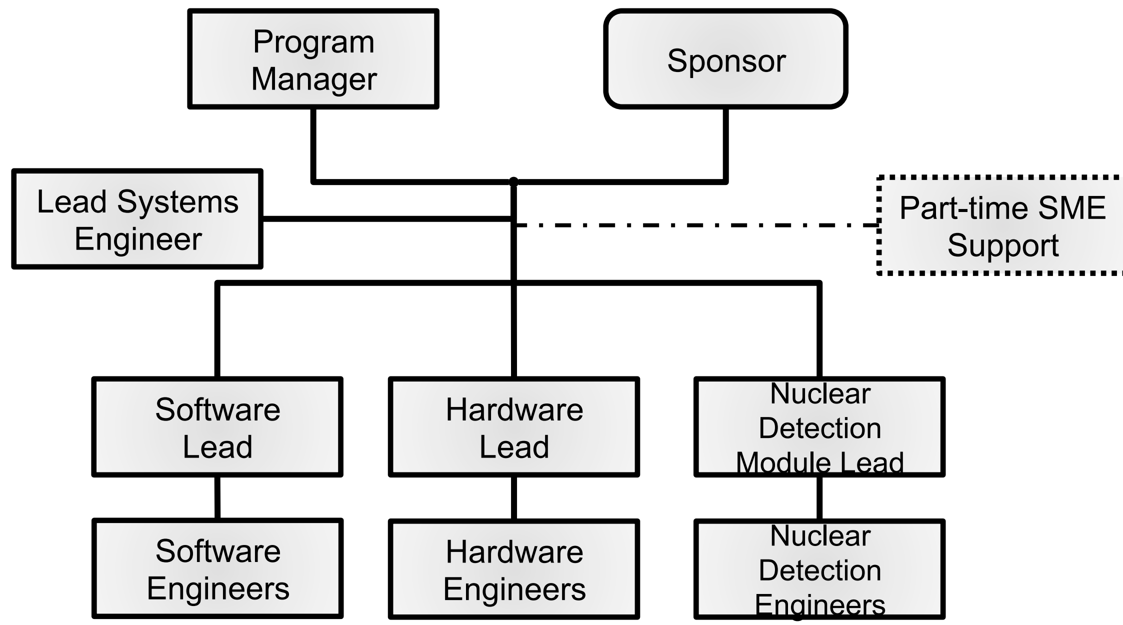


man Portable Radiation Detection System Case Study

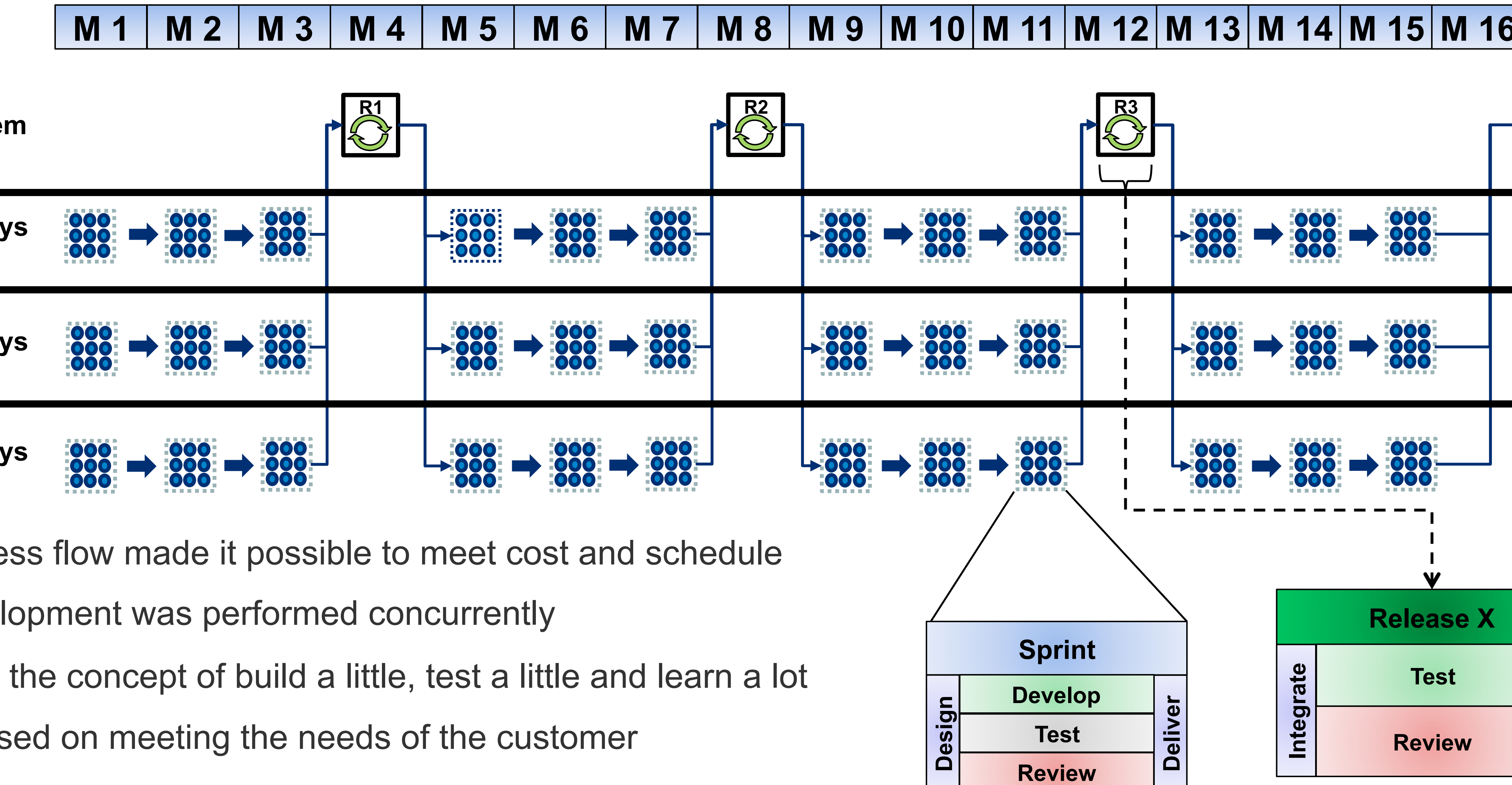
- epartment of Homeland Security program
- veloped for Transportation Security Administration, Coast Guard, and Customs and Border Protectio
- veloped for secondary screening
- monstrates the application of agile systems engineering for a mixed hardware and software project
- sign and develop a fully functional radiation detection system

RDS Team Structure

- all Cohesive team
- o-system leads
- rmission to make quick decisions
- cess to sponsor
- ttened organization
- lity to bring in experts
- ndor program manager reported directly to head of the program



RDS Process



ess flow made it possible to meet cost and schedule

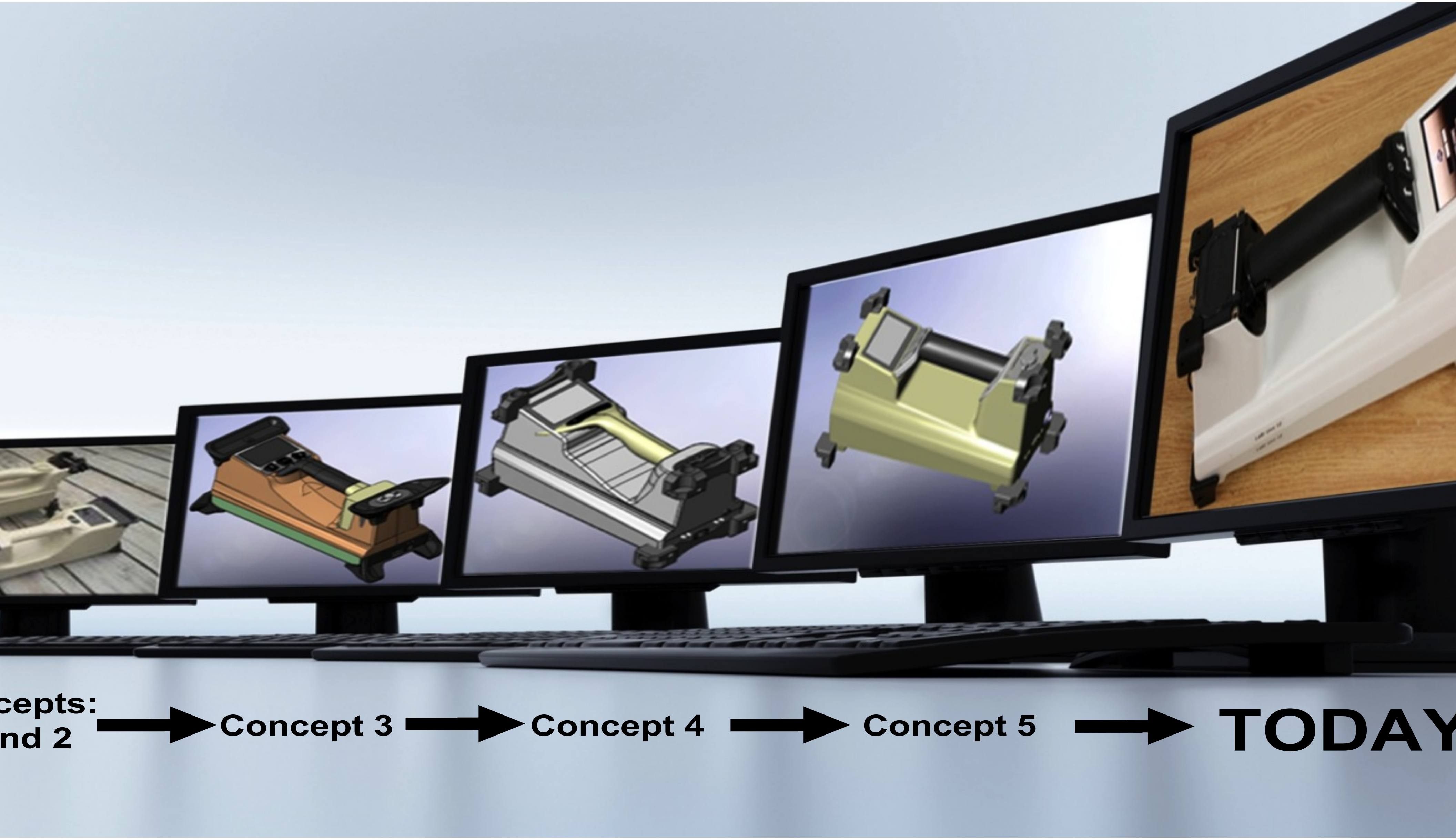
lopment was performed concurrently

the concept of build a little, test a little and learn a lot

sed on meeting the needs of the customer

nized documentation

PRDS Product Concepts



plication & Lessons Learned

- ing Agile Principles to the systems engineering lifecycle process
  - Small teams with direct link to sponsor
  - Give authority to make decisions
  - Allow outside help as needed
  - Co-locate leaders
  - Use interactive design reviews
  - Tailor out irrelevant processes
  - Test and analyze as fast as possible

Questions?

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