Panel: Experiences with Agile for Systems Engineering in the Defense Industry

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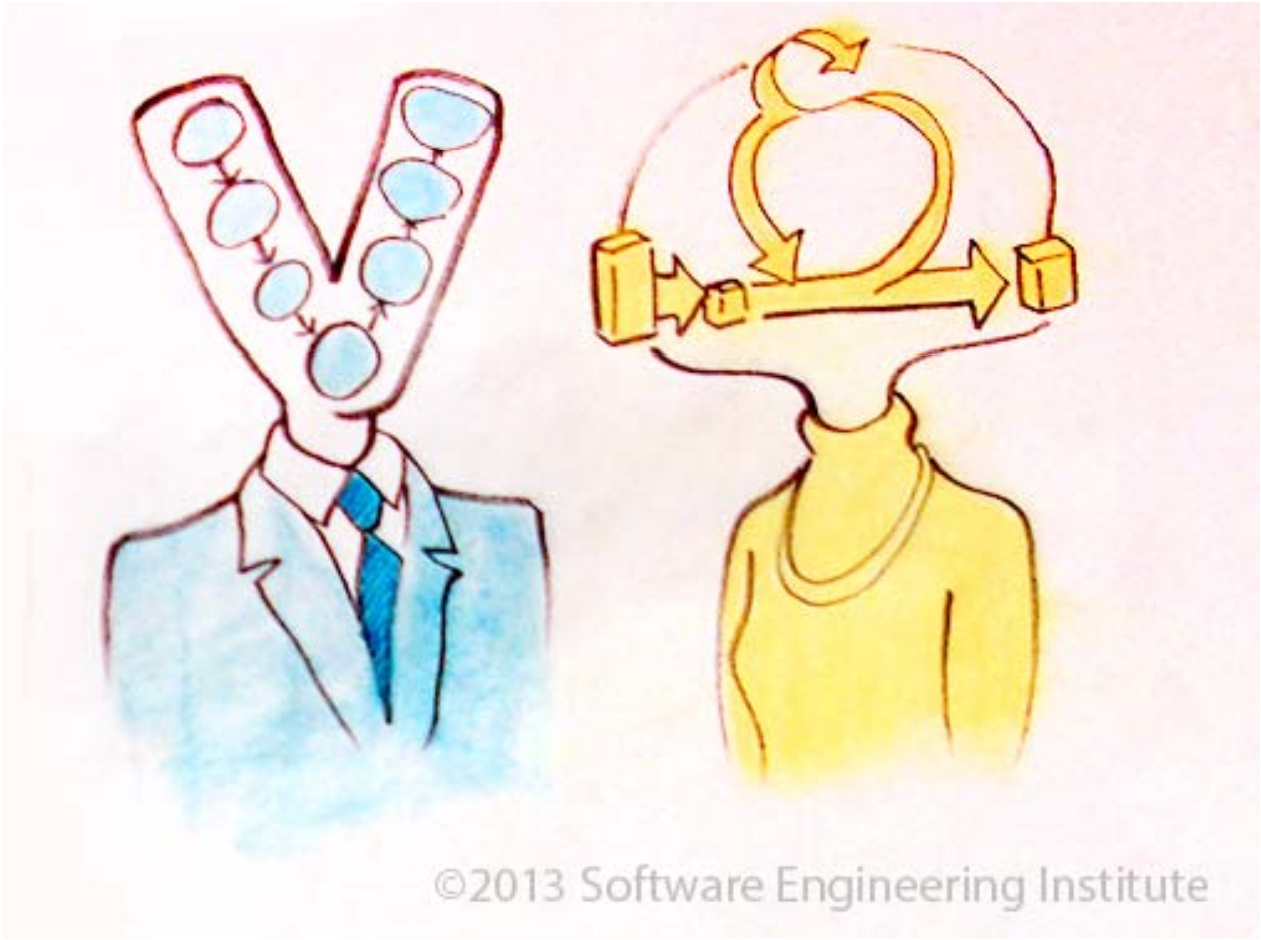
Agile and Systems Engineering?



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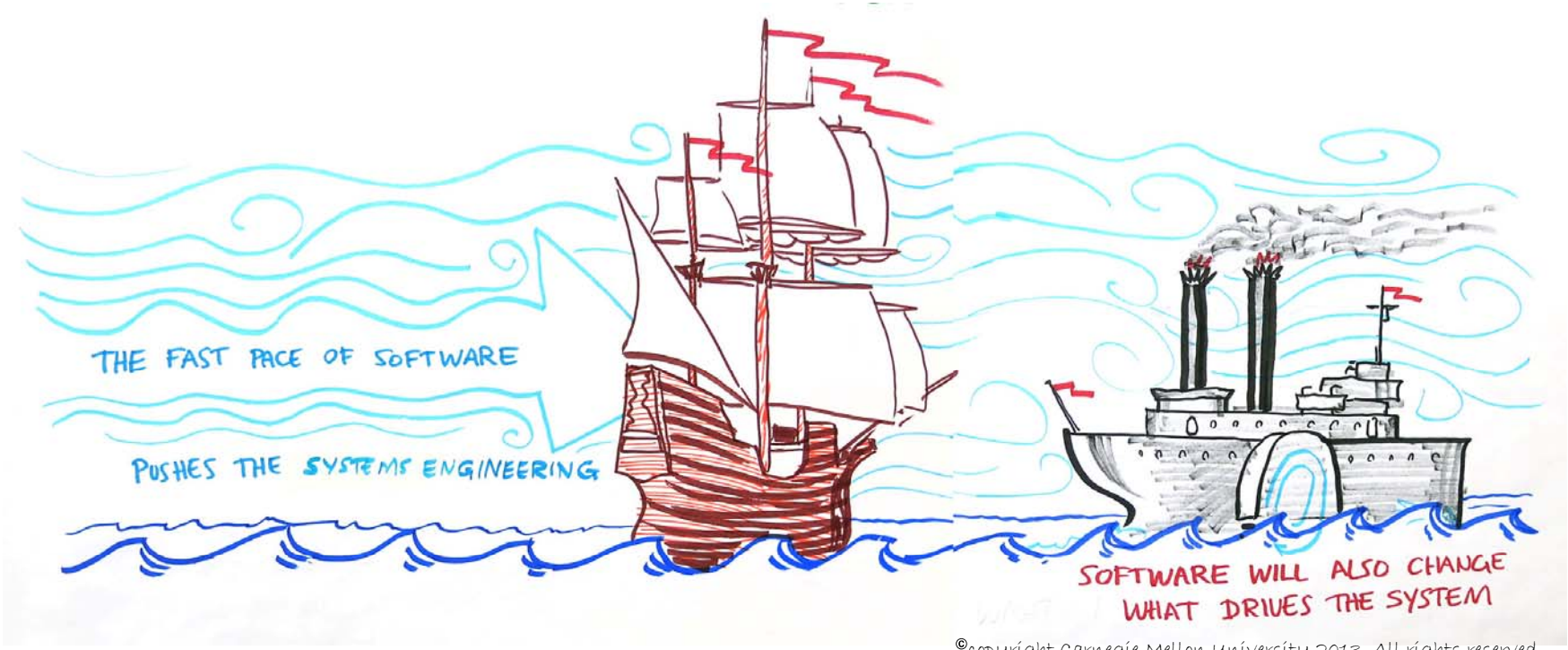
Agile & Systems Engineering: Software Drivers for Systems Engineering



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Agile Teams/Systems Engineering Communication Challenges

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Panel Discussion

Diverse set of panelists – Government, Industry, academia, and FFRDCs

Diverse experience and views of Agile within the government

Touch on challenges, successes, what works and what doesn't

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Introductions

Brian Gallagher – CACI

Eileen Wrubel – SEI

Carmen Graver – USMC

Rich Turner – Stevens Institute

Peter Christensen – Mitre

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Experiences with Agile for Systems Engineering in the Defense Industry

Brian Gallagher
Senior Vice President, Operational Excellence

October 30, 2013

INFORMATION DEPLOYED. SOLUTIONS ADVANCED. MISSIONS ACCOMPLISHED.

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One Example

- **Wanted to increase delivered capability over time**
- **Productivity Numbers:**
  - Moved from Iterative Development to Agile

Period	PRs/CRs Delivered	Months	PRs/CRs per Month
09/01/2008 – 01/19/2011	532	28 months	532/28 = 19/Month
01/20/2011 – 12/09/2011	710	12 months	710/12 = 59/month

- **Additional Benefits:**
  - Reduced Wasted Development Effort
    - Did not build things the customer did not need
  - Reduced Rework
    - Got it right the first time more often
    - Lower bug rates
  - Customer Satisfaction Increased
  - Development Team Satisfaction Increased

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The Trouble with Terminology

- **"Agile Systems Engineering" or "Engineering Agile Systems"?**
- **Do we want "Agile" or "agility"?**
- **When we stick the term "Agile" in front of everything, it means nothing:**
  - Agile Systems Engineering
  - Agile Earned Value
  - Agile Project Management
  - Agile Architecture

"I have only made this letter longer because I have not had the time to make it shorter."

- Blaise Pascal, The Provincial Letters, 1657

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Disciplined Agility

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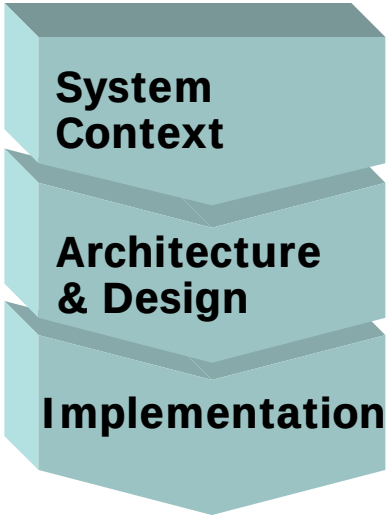
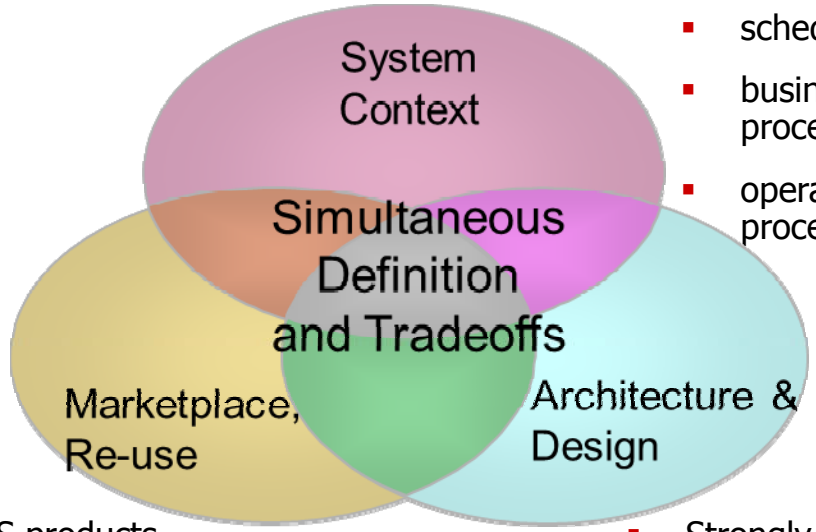
Which Approach is Better?

Traditional Approach



Evolutionary Approaches

- requirements
- cost
- schedule
- business processes
- operational procedures, etc.



- COTS products
- NDI

- Strongly influenced by products and standards

Known Rqmnts

Buy, Re-use, Build, Integrate, Refresh

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Choosing the Systems Engineering Approach

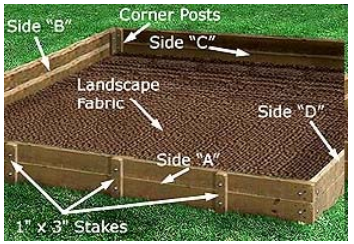
- **"Dial in" the appropriate amount of agility based on program characteristics, customer, team capabilities, and risk**
- **Example:**
  - Quick reaction capability drops in an evolving operational environment versus deploying a highly reliable infrastructure

Building Sandcastles

Development Method

Plan Driven — **Agile**

Building Sandboxes



Development Method

Plan Driven — **Agile**

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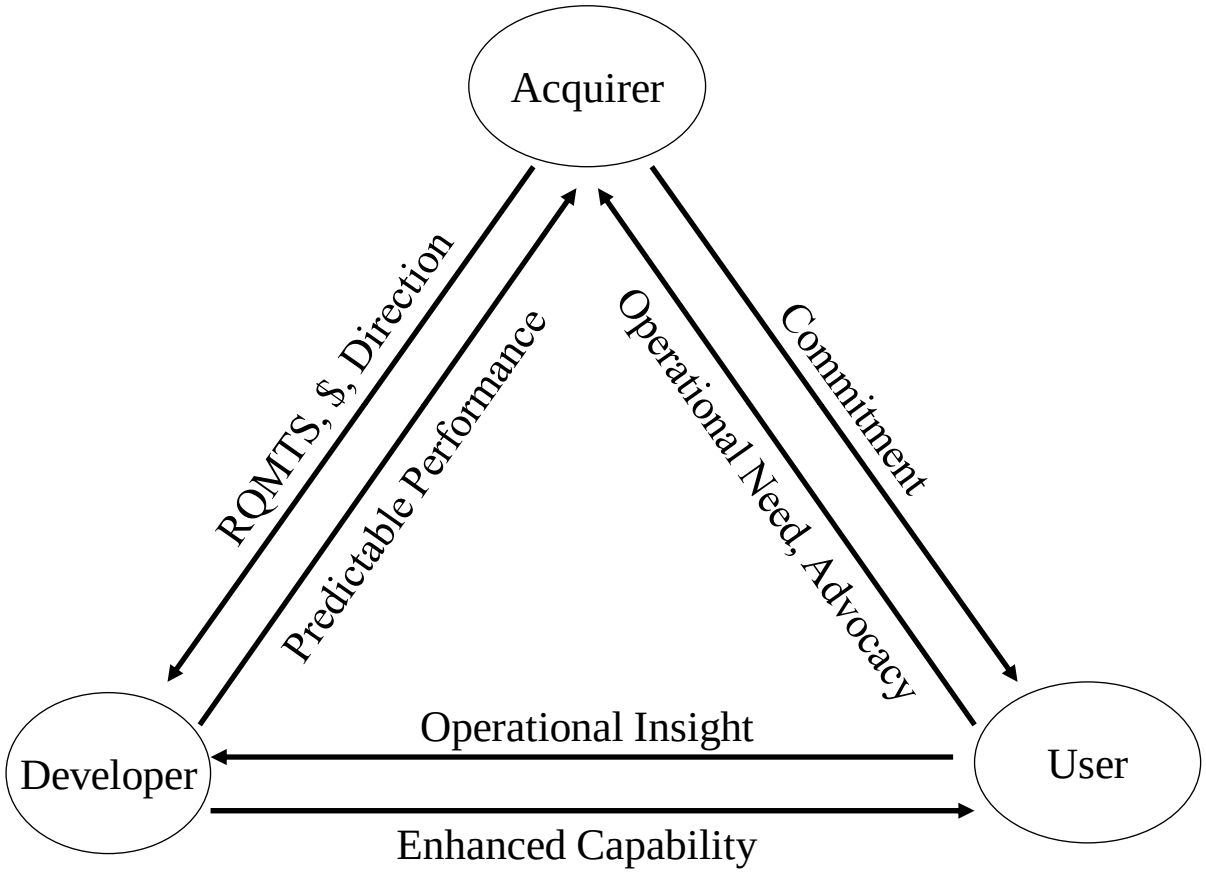
What Does Agility Mean in this Context?



Is it enough to require developers to "Go Agile"?

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Software and Systems Engineering for DoD using Agile

Eileen Wrubel
Senior Engineer
Software Engineering Institute
Carnegie Mellon University

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Agile software/Systems engineering in the DoD

Lots of historical tension between these disciplines even when you don't have Agile in the mix

Our research effort: how are Agile software teams interacting with systems engineering teams on DoD programs?

- What works?
- What crashes & burns?
- What environments are set up for success?

Tech Note "Agile Software Teams: How They Engage with Systems Engineering on DoD Acquisition Programs" (working title) in internal review at SEI.

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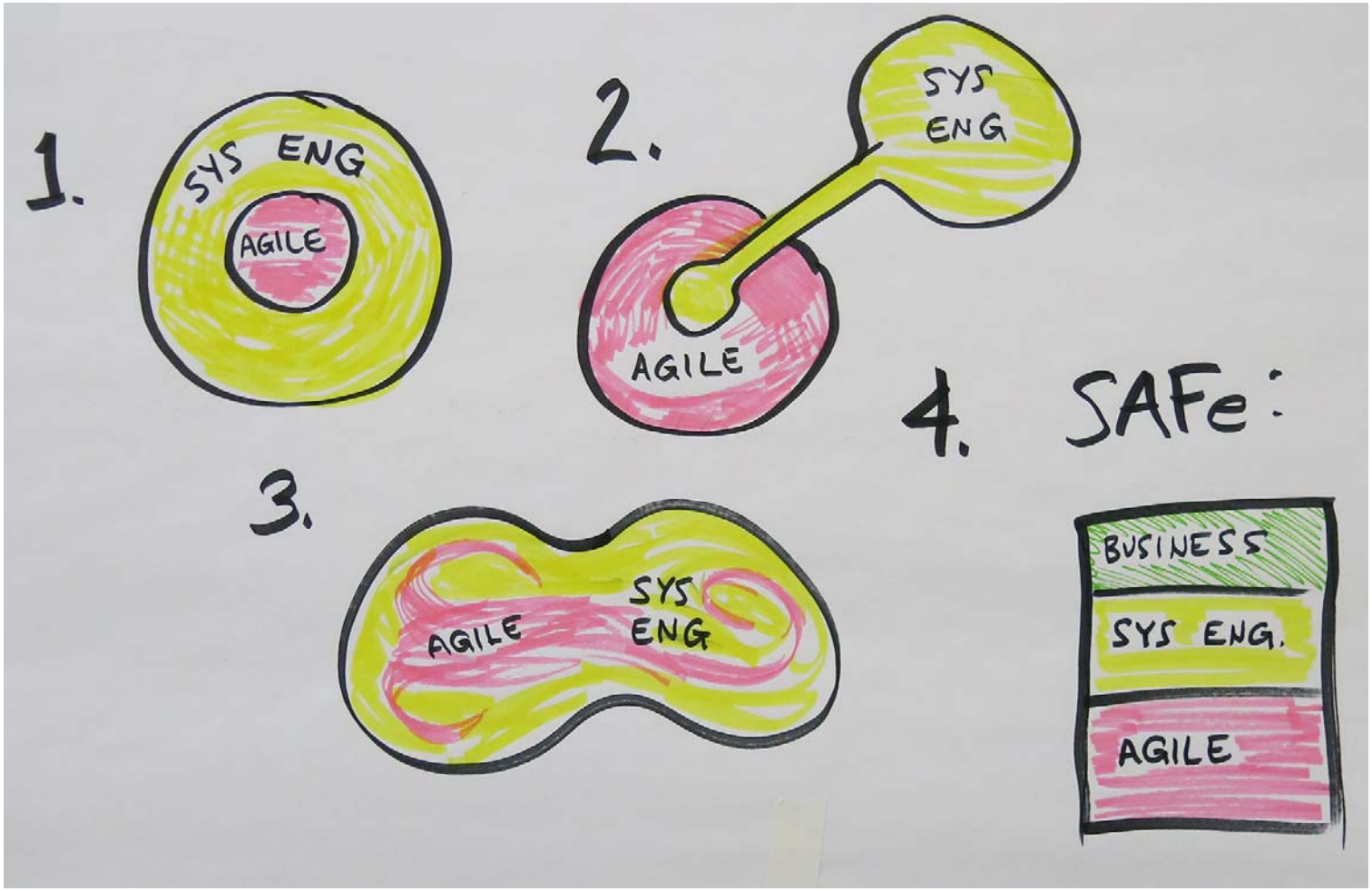
Interaction cases we envisioned



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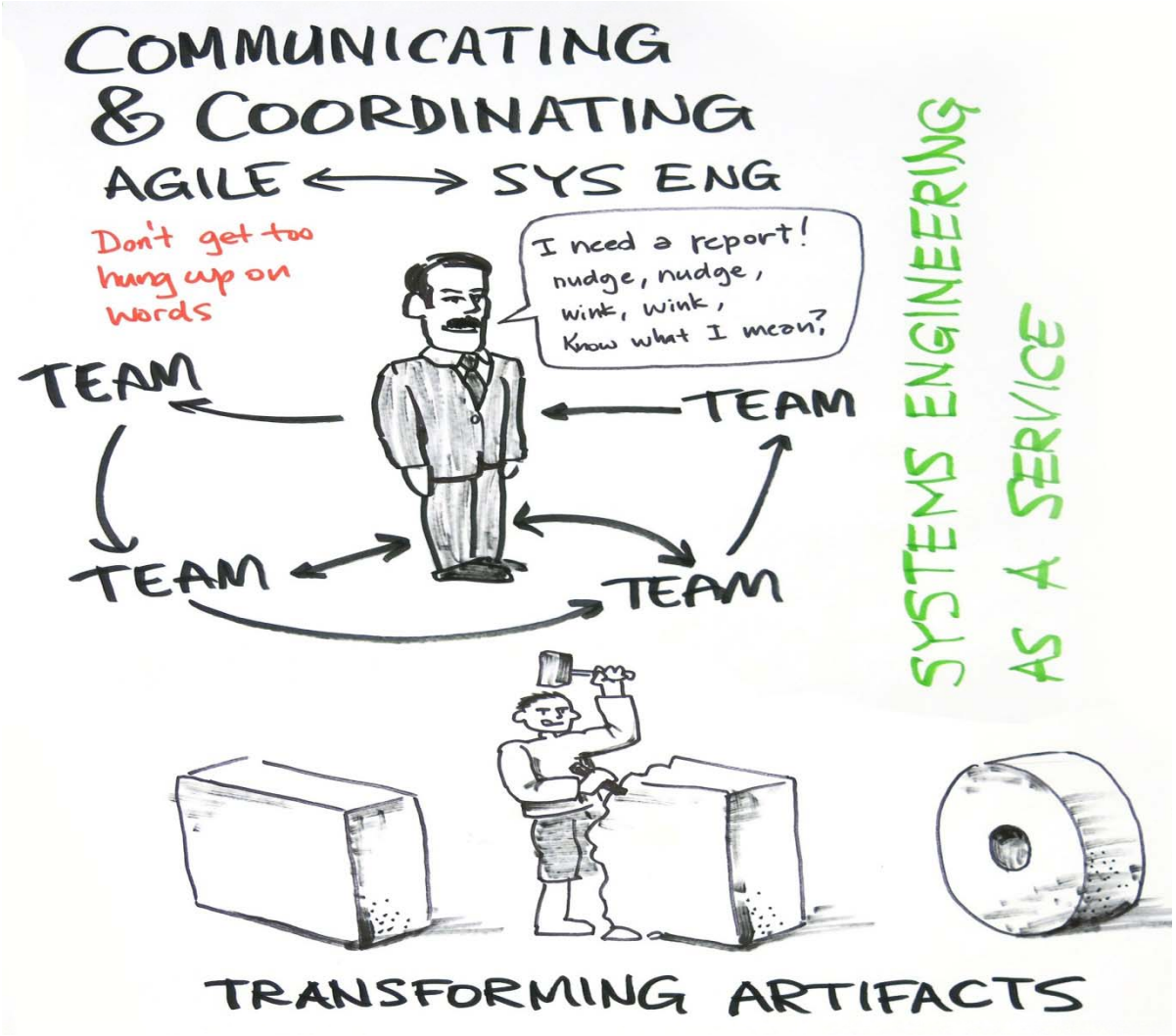
Thinking about systems engineering & Agile



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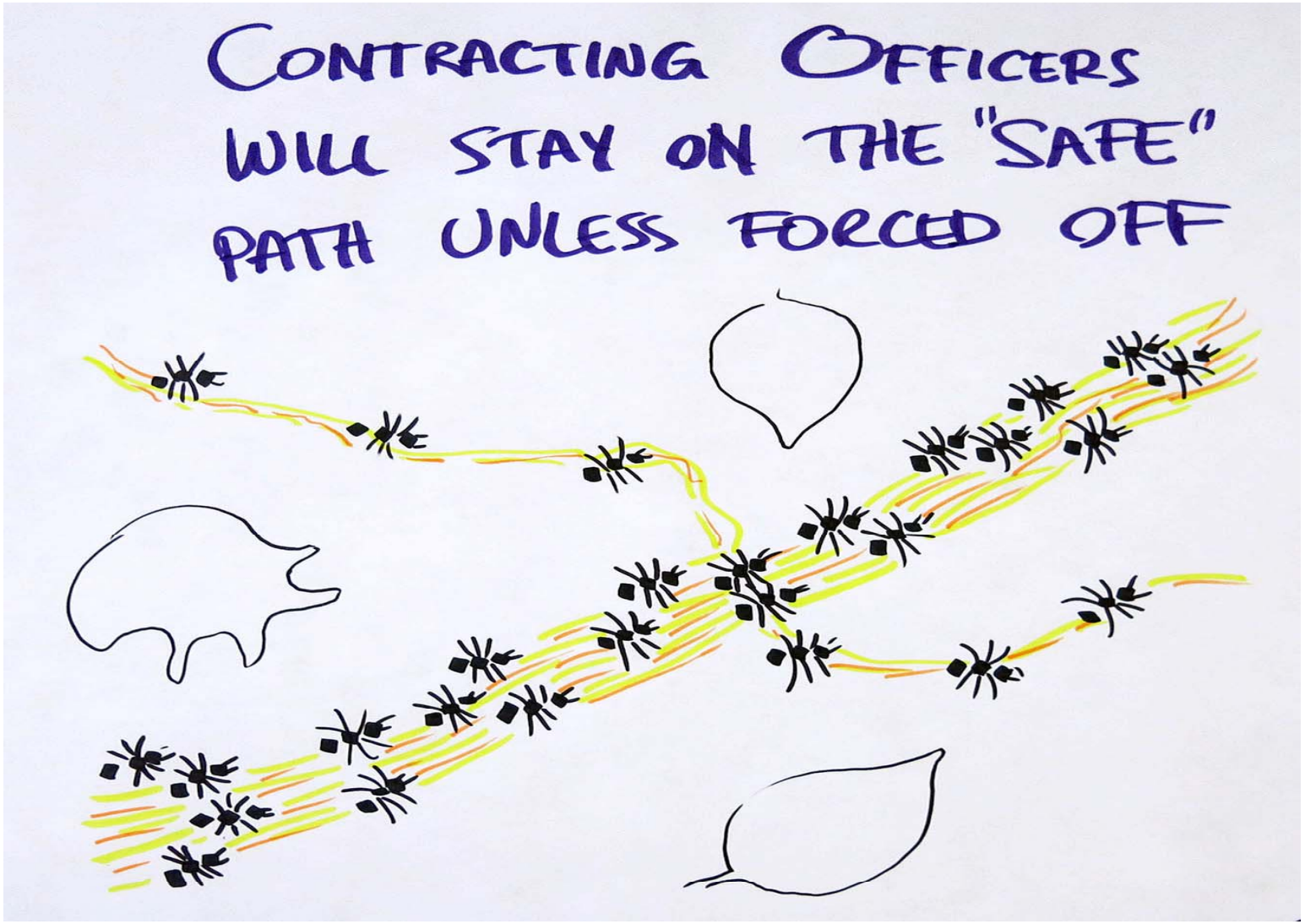
Do contract vehicles matter?



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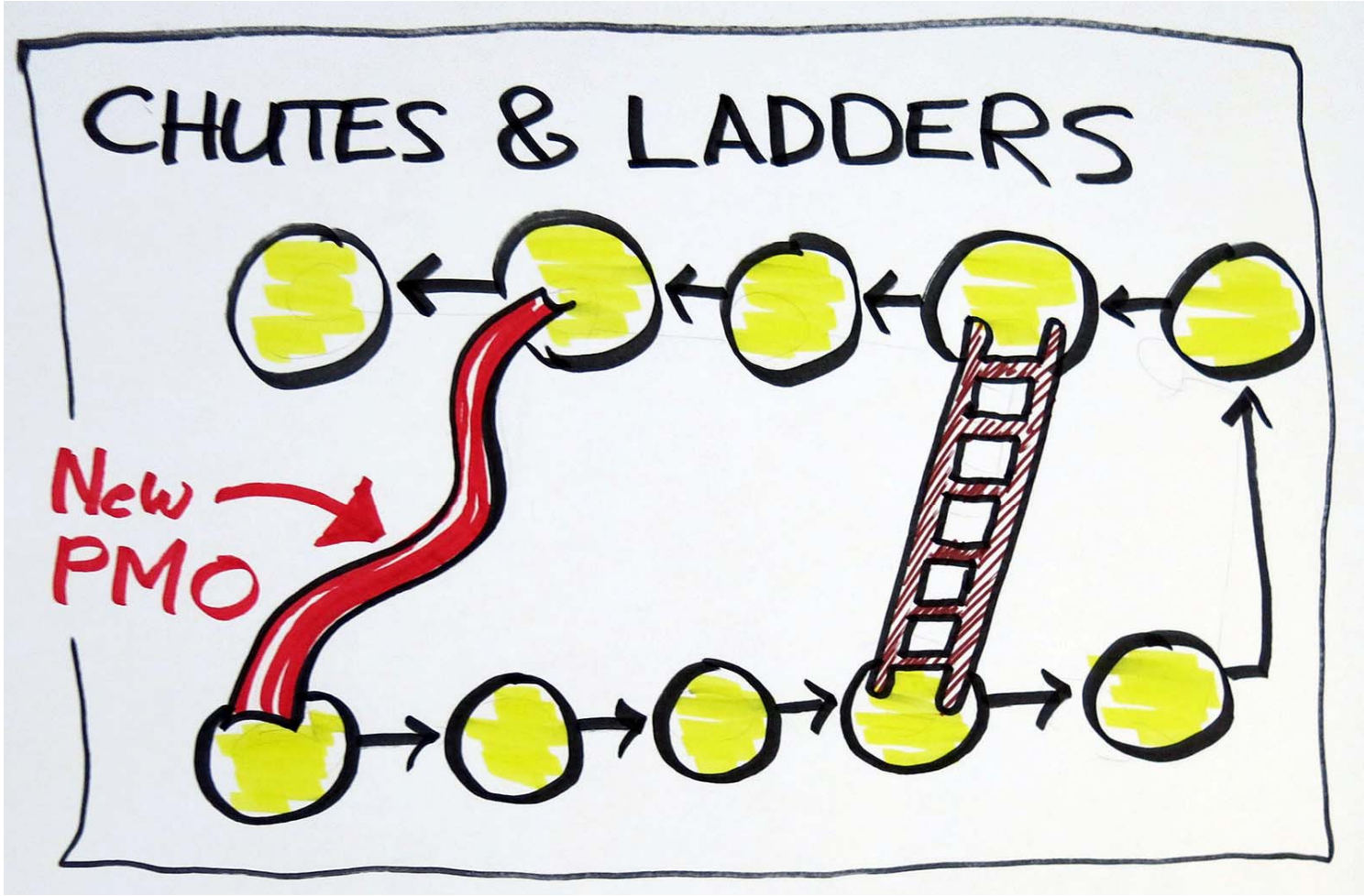
Training and awareness at the PMO matters. A LOT.



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United States Marine Corps

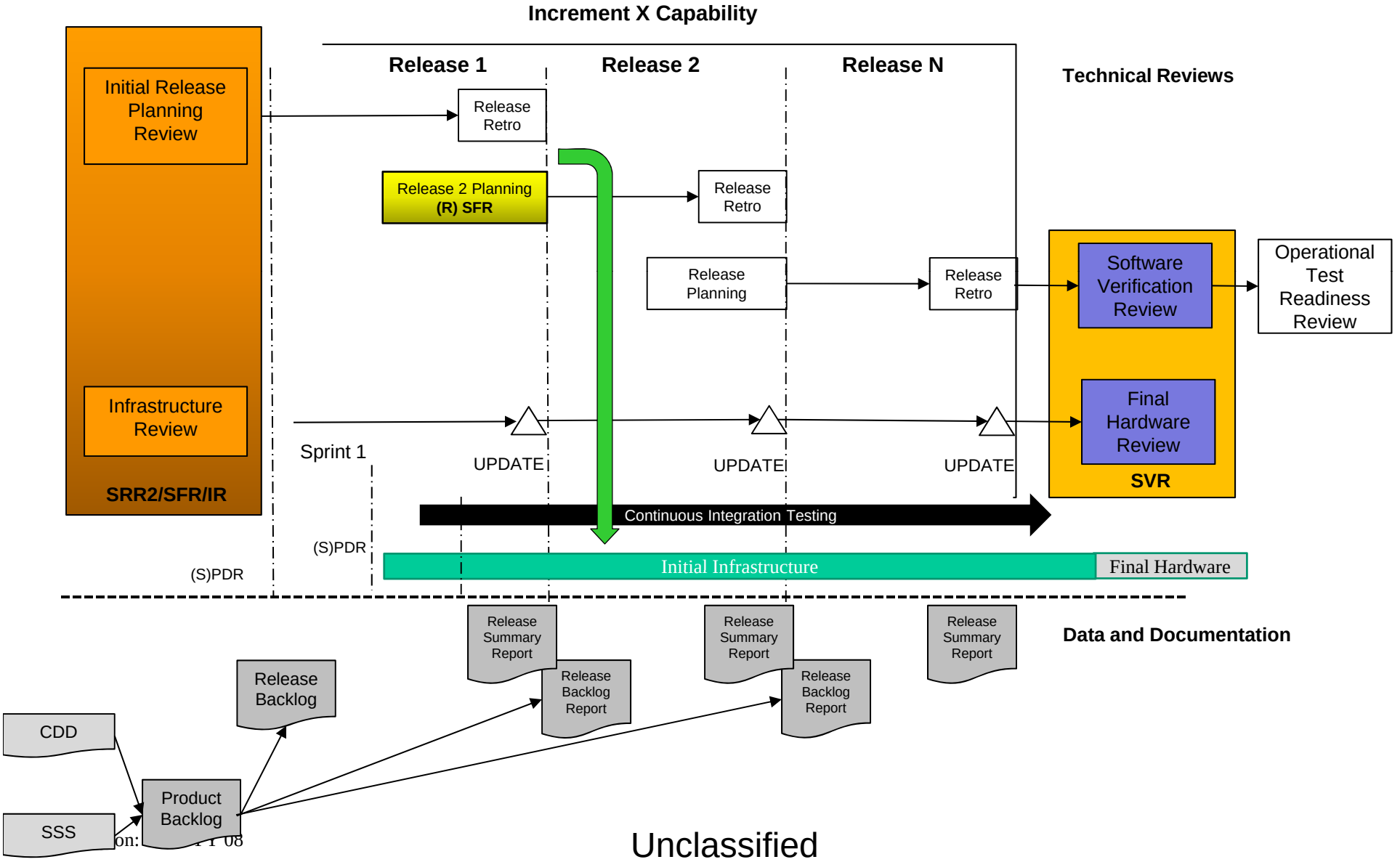
Agile and Systems Engineering "Marriage"

Carmen Graver

MARINE CORPS SYSTEMS COMMAND

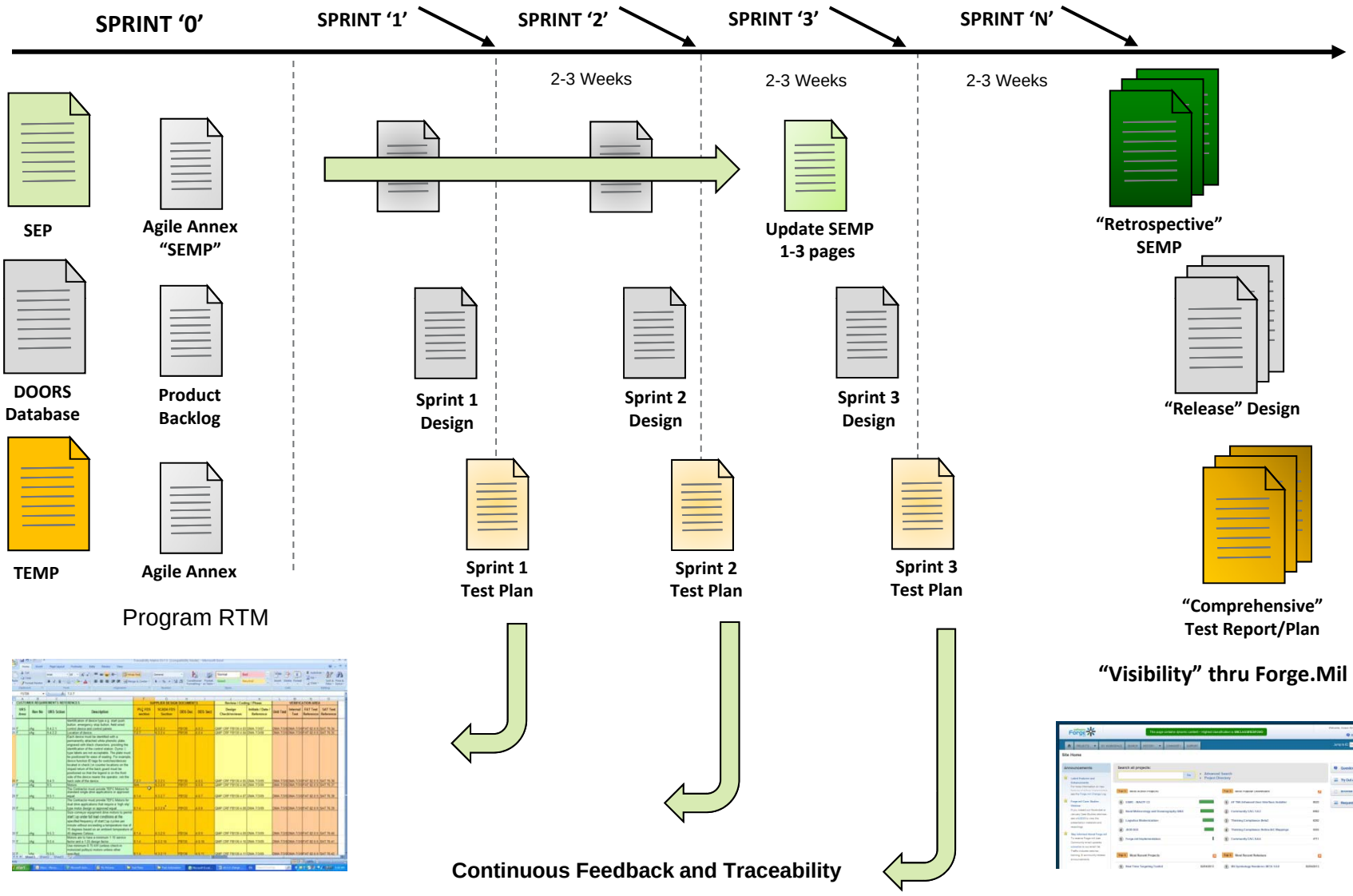
EQUIPPING THE WARFIGHTER TO WIN

MC-Agile Development Process



Unclassified

MC-Agile Supporting Documentation



Successful Marriage Lessons Learned

- Training at all levels is **absolutely vital**
- It's okay to **raise issues**
- It's okay to **change your process**
- Involve **all** disciplines up front and early
- Develop a **common** program vision
- "Technical reviews" need to be **collaborative** conversations
- All documentation must be **value added**
- Ensure that **all** team members have access to collaborative tools and environments
- **Share** lessons across programs

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Lean-Agile Systems Engineering in Defense Panel

Richard Turner

Stevens Institute rturner@stevens.edu

NDIA SE Conference
October 30, 2013
Alexandria, VA

www.SERCuarc.org

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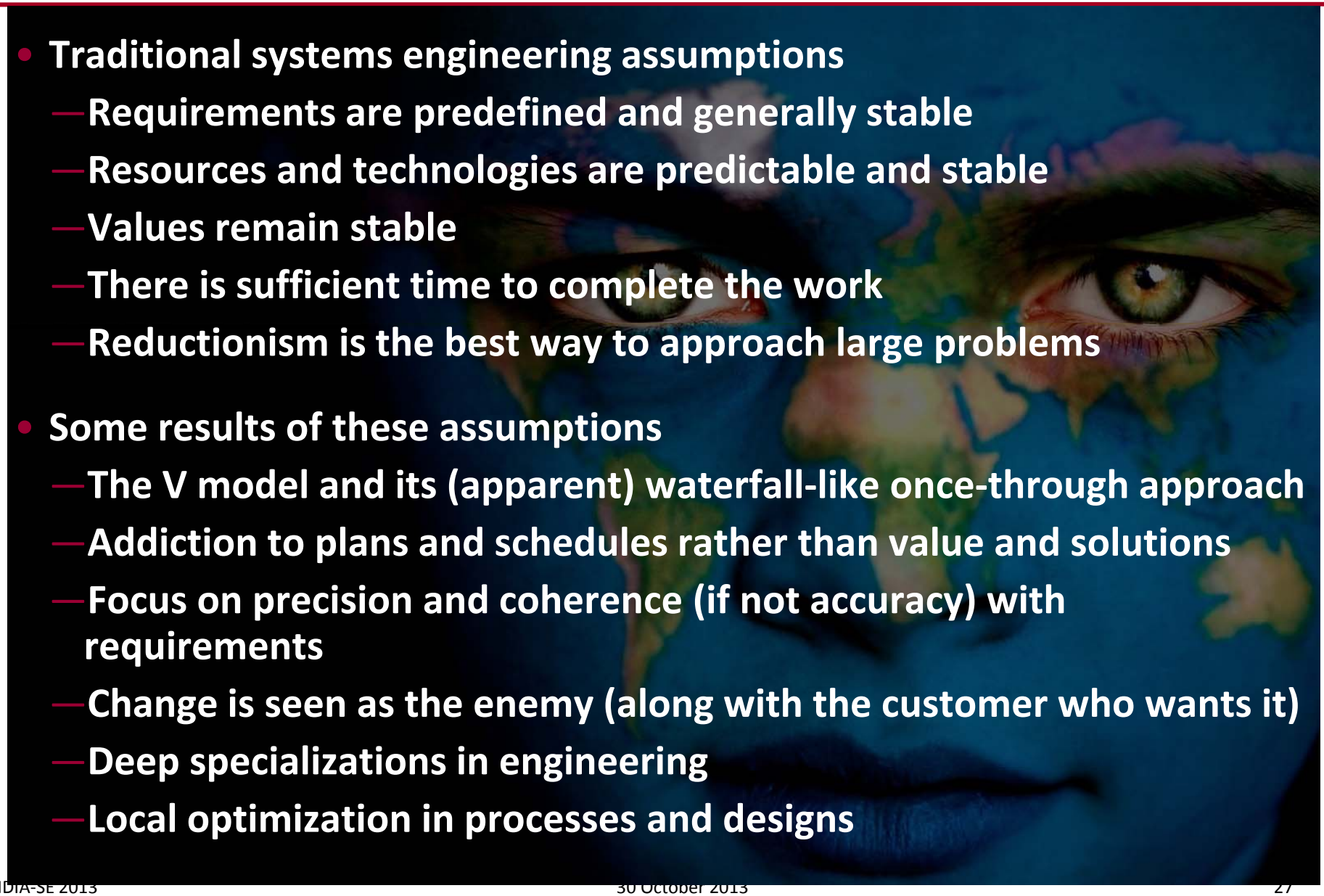
The World is Changed



- Traditional systems engineering assumptions
  - Requirements are predefined and generally stable
  - Resources and technologies are predictable and stable
  - Values remain stable
  - There is sufficient time to complete the work
  - Reductionism is the best way to approach large problems
- Some results of these assumptions
  - The V model and its (apparent) waterfall-like once-through approach
  - Addiction to plans and schedules rather than value and solutions
  - Focus on precision and coherence (if not accuracy) with requirements
  - Change is seen as the enemy (along with the customer who wants it)
  - Deep specializations in engineering
  - Local optimization in processes and designs

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The World as Changed

- That was so 20th Century! In the 21st Century:
  - System contexts have multiplied, and change in customer needs and developer solution technologies has accelerated.
  - Requirements are less tangible, more evolving, and sometimes emergent
  - Systems are both complex and constantly adapting
- Given the actual terrain has changed, we need some new mapping tools and techniques
- Need proof of the change?
  - The venerable PMI has "adapted" (finally)
  - V5 of the Guide to the PMBOK provides for both predictive (plan-driven) and adaptive (agile) project lifecycles!

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A (Very) Few Lean and Agile Pioneers

- Fighter pilots
- Designers
- Psychologists
- Manufacturers
- Researchers
- Software developers
- Product developers and entrepreneurs
- Systems engineers (?)

"Fundamental things apply"

- Stakeholder **Value-based** Evolution
- **Incremental** Commitment and Accountability
- **Concurrent Multi-discipline** Engineering
- **Evidence- and Risk-based** Decisions

- Value, Flow
- Agility, Response-ability

Adapted from *The Incremental Commitment Spiral Model*
Boehm, Lane, Koolmanojwong, and Turner

Sticking Points

- Large-scale budgeting and estimation
- Long-lead items
- Operational systems of independently evolving systems
- Highly regulated domains (e.g. defense, financial, health)
- Command and control environments (low trust, bureaucratic)

Answers?

- There is still no Silver Bullet
- ICSM principles
- Service orientation is promising
- Trust is a key ingredient and often difficult to find

- "Maybe…" is better than "Hell, No!"
- Patience, but not abdication
- Creativity and Collaboration can be better than Command & Control
- Santayana was half right – it's only the mistakes that you don't want to repeat, not the successes

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Questions?