Using CMMI to Balance Agile and Plan-driven Methods

Richard Turner
The George Washington University
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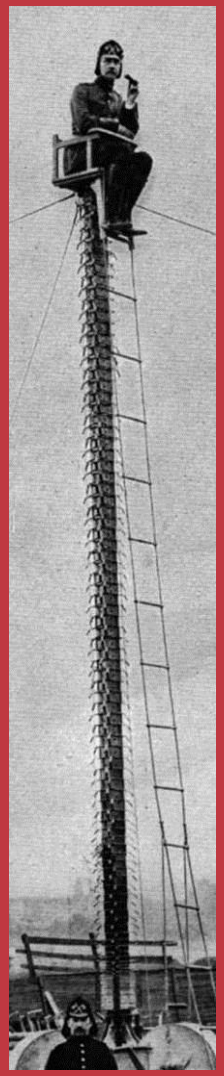
Background

- Success in any endeavor requires both agility and discipline
- Two approaches to software development
  - Plan-driven (SW-CMM, document-based, strong process)
  - Agile (XP, tacit knowledge, light process)
- Agile and plan-driven proponents are believers
- Both have strengths and weaknesses – balance is needed

WARNING!
Generalizations
Ahead…

Some Observations on Balancing

- Neither agile nor plan-driven methods provide a silver bullet
- Agile and plan-driven methods have home grounds where each clearly dominates
- Future developments will need both agility and discipline
- Some balanced methods are emerging

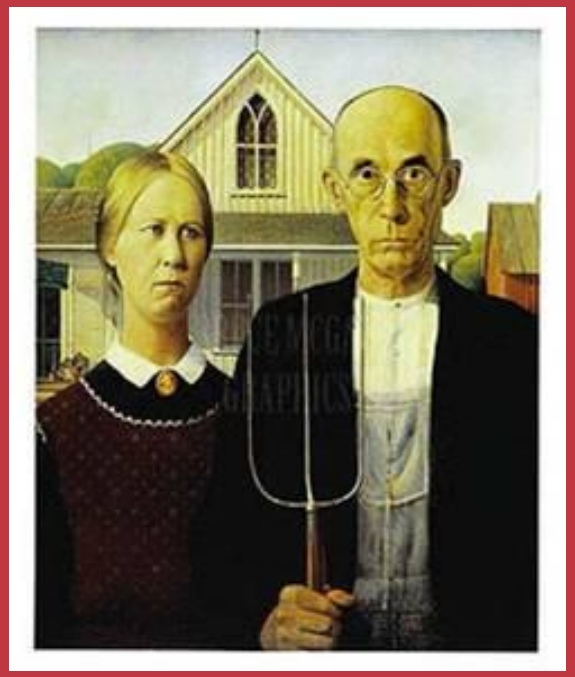


- It is better to build your method up than to tailor it down
- Methods are important, but potential silver bullets are more likely to be found in areas dealing with
  - People
  - Values
  - Communications
  - Expectations management

1. No Silver Bullet

- Brooks' werewolf concerns
  - Complexity, conformity, changeability, invisibility
- Agile methods
  - On target for changeability and invisibility
  - Miss on complexity and conformity
- Plan-driven methods
  - On target for conformity and invisibility
  - Miss on complexity and changeability
- Bullets can lose their efficacy as "wolves" evolve

2. Home Grounds Exist



- Agile and plan-driven methods have definite home grounds
  - Environment where they are most likely to succeed
  - Extremes are rarely populated
- Five dimensions can help illustrate a project's or organization's home ground relationship
  - Size, Criticality, Dynamism, Personnel, Culture

3. Future Applications Need Both

- Historically
  - Many small, non-critical, well-skilled, agile culture, rapidly evolving projects
  - Many large, critical, mixed-skill, ordered culture, stable projects
- In the future
  - Large projects are no longer stable
  - Maintenance of extensive process and product plans will become too expensive
  - Complexity and conformity werewolves are waiting for agile projects
  - Attributes of both approaches will be needed

4. Balanced Methods are Emerging

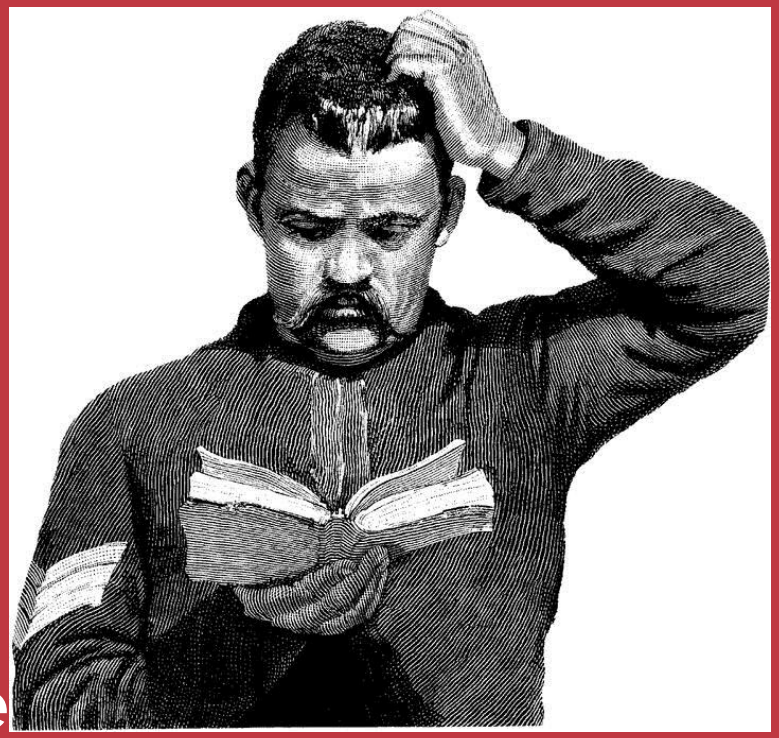
- Agile methods
  - Crystal Orange
  - DSDM
  - FDD
  - Lean Development
- Plan-Driven methods
  - Rational Unified Process
  - CMMI
- Hybrid
  - Boehm-Turner Risk-based
  - Manzo (AgileTek) Code Science/Agile Plus

5. Build up – Don't Tailor Down

- Plan-driven methods traditionally
  - Have over defined processes
  - Advocate (or require) tailoring
  - Are rarely tailored well
- Agilists traditionally
  - Begin with the minimum
  - Add as needed (and justified by cost-benefit)
  - Have multiple core sets

6. Methods aren't always the answer

- Agile movement has echoed a long line of warning calls
- Success of agile may be due as much to people factors as to technology
- Valuing people over processes is the most important factor in the agile manifesto



I know I saw something about that in the process somewhere…

People

- Development is “of the people, by the people, for the people”
- Separation of concerns is increasingly harmful

Values

- Reconciling values is a critical people-oriented task
- Stakeholders value different things
- Software engineering is usually value-neutral
- Process improvement and plan-driven methods are inwardly-focused
  - Aimed at productivity improvement
  - Not higher value to customer
- Agilists attention to prioritization and negotiation are promising

Communications

- Face it, most engineers can't talk, much less write
- IKIWISI and management-by-rock reign
- Rapid change increases need for solid communication
- Few sources of guidance
  - Alistair Cockburn's *Agile Software Development* is a good starting place

Expectations Management

Developers seem to like Sisyphean tasks…

- Differences between successful and troubled projects is often expectations management
- SW developers have problems with EM
  - Strong desire to please
  - Avoid confrontation
  - Little confidence in prediction
  - Over confidence in abilities
- Most significant common factor in successful plan-driven/agile teams
- EM means not setting up unrealistic expectations
  - Process mastery
  - Preparation
  - Courage

So… How does CMMI help balance?

- Flexibility
- Broader engineering and management scope
- Addresses people aspects
- High maturity

Flexibility

- Goals and practices are more flexible in CMMI
  - Need to span differences led to more general language
  - Alternative practices provide an entry point for innovative approaches
- Continuous representation provides more flexibility in deciding what PI should address

Broader Engineering and Management Scope

- Supports agile technical/management approaches
  - Product Integration PA can support continuous integration
  - Engineering and Support Pas (e.g. VAL, CM) are compatible with test-driven design and automated tools
- Agile methods are often both iterative and concurrent
  - Recursion of engineering PAs (e.g. RD, TS) supports iterative development
  - Broader scope allows multiple disciplines and approaches for different components
    - *Agile for emerging or rapidly evolving components*
    - *Plan-driven for well-understood or regulated components*

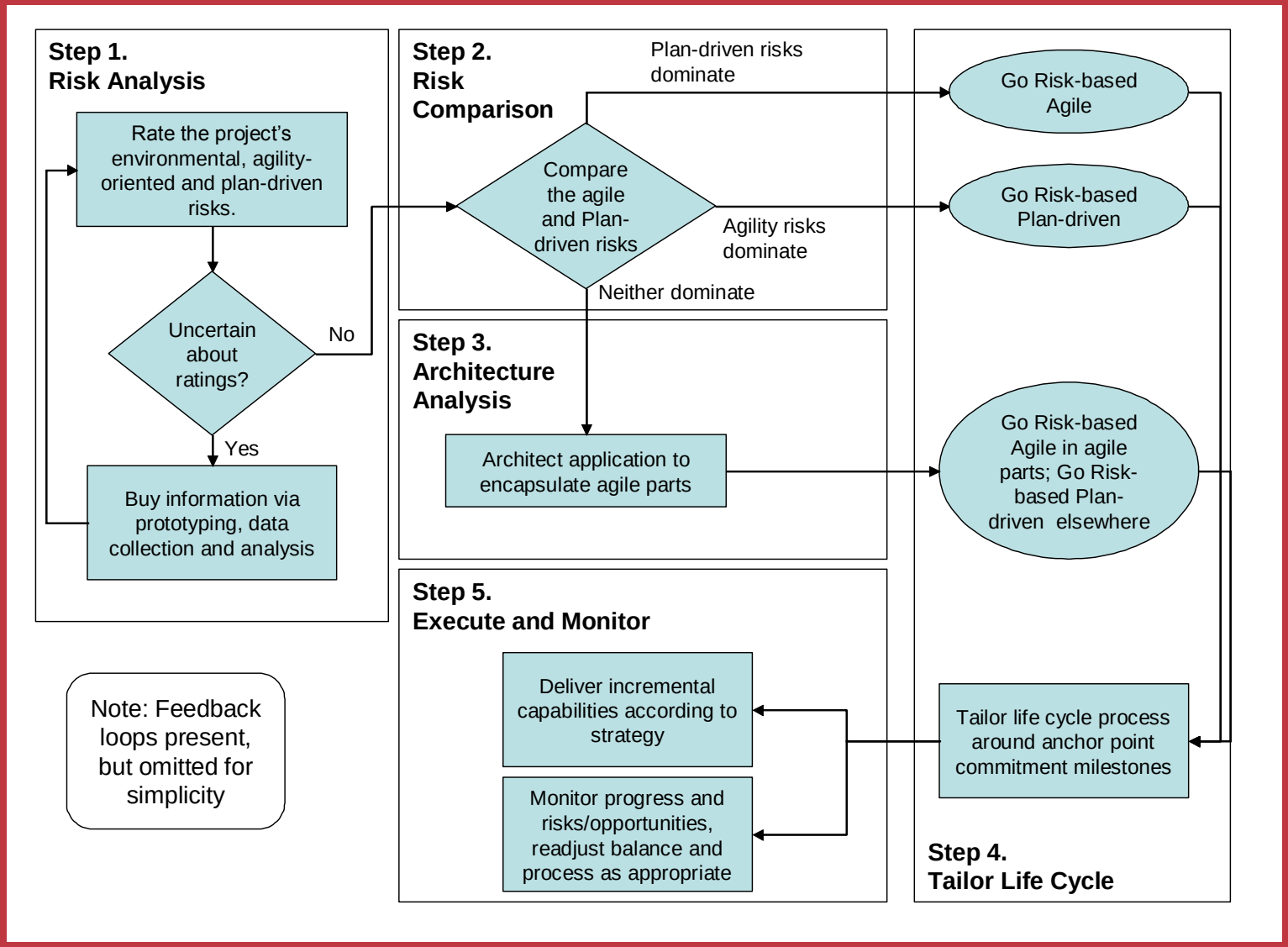
Addresses People Aspects

- Values
  - Effective SE (e.g. trade studies) cannot be value neutral (DAR)
- Communication
  - IPPD, shared vision, and stakeholder concerns make for more effective communications (IPM, PP)
- Expectation Management
  - Emphasis on measurement produces good data that enables effective expectation management (MA)

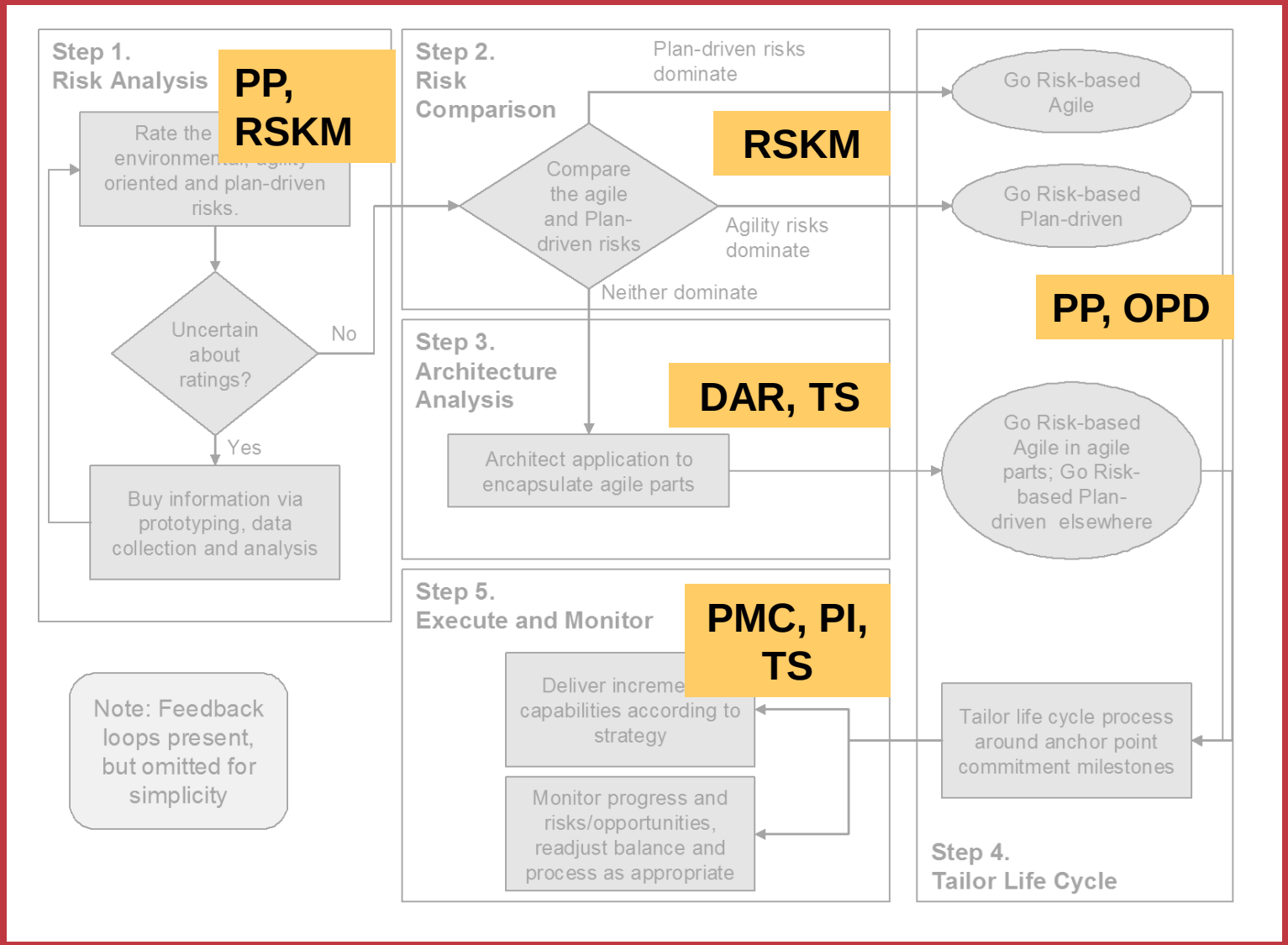
High Maturity

- Innovation at level 5 argues for agile approaches
- Having both agile and plan-driven standard processes allows marketplace agility
- Application of Lean and Six Sigma techniques at high maturity levels eliminates non-value added processes and results in more agile tailor-up rather than tailor-down approaches

A Risk-based Balancing Process



How CMMI Supports the Process



Conclusions

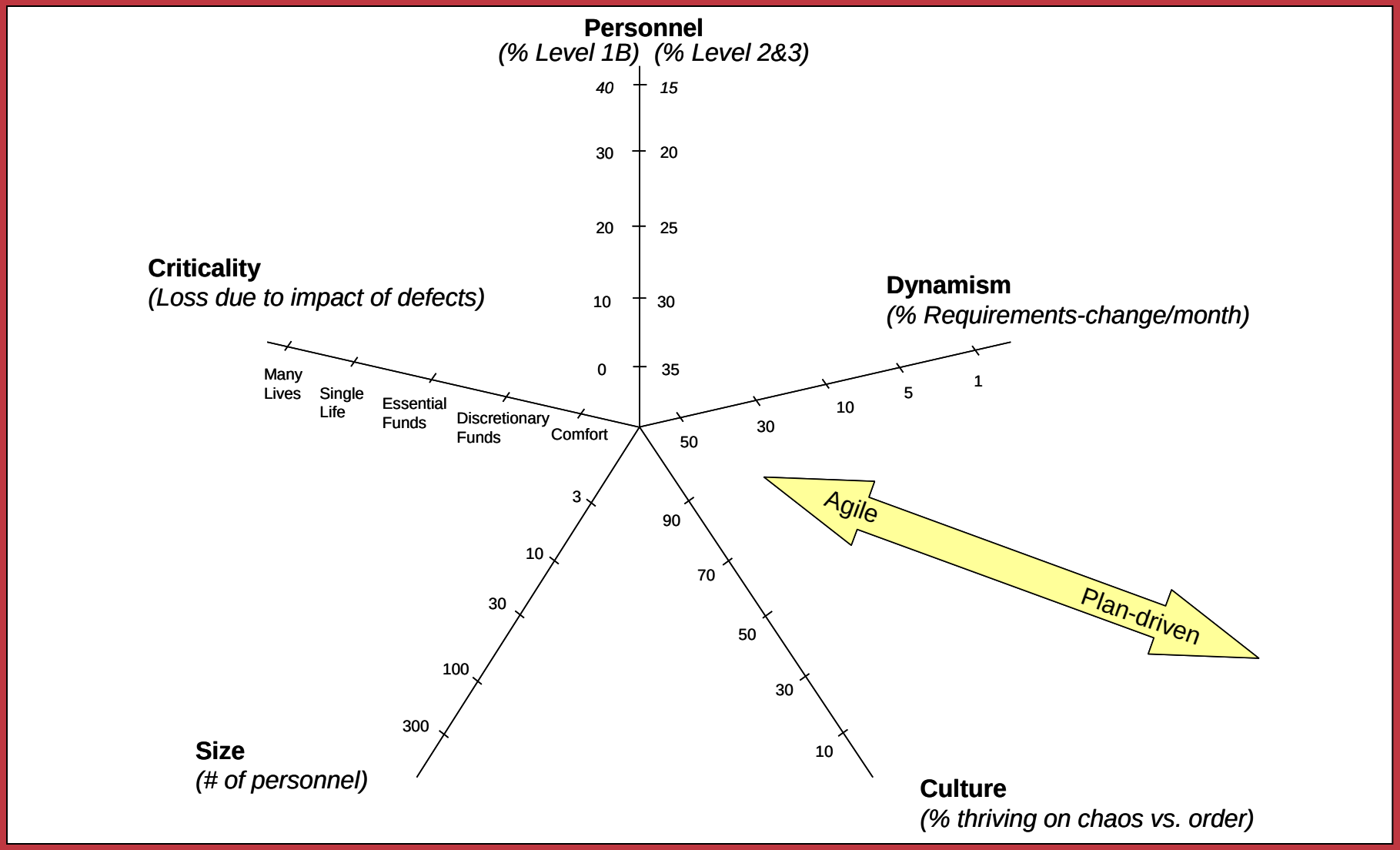
- Plan-driven and agile methods both aim to
  - Satisfy customers
  - Meet cost and schedule parameters
- Home grounds exist, but the opportunity for integration is expanding
- CMMI supports balancing methods
  - Flexible application of the model allows both plan-driven and agile methods
  - PA support to risk-based balancing process
- For more on the risk-based process, see
  - Boehm/Turner, *Balancing Agility and Discipline: A Guide for the Perplexed,* Addison Wesley, Boston, 2003.

Contact Information

Rich Turner
703.602.0851 x124
Rich.Turner.CTR@osd.mil

Back-up

Five Critical Dimensions



Summary of Home Grounds

Characteristics	Agile	Disciplined
Application		
Primary Goals	Rapid value; responding to change	Predictability, stability, high assurance
Size	Smaller teams and projects	Larger teams and projects
Environment	Turbulent; high change; project-focused	Stable; low-change; project/organization focused
Management		
Customer Relations	Dedicated on-site customers; focused on prioritized increments	As-needed customer interactions; focused on contract provisions
Planning/Control	Internalized plans; qualitative control	Documented plans, quantitative control
Communications	Tacit interpersonal knowledge	Explicit documented knowledge
Technical		
Requirements	Prioritized informal stories and test cases; undergoing unforseeable change	Formalized project, capability, interface, quality, forseeable evolution requirements
Development	Simple design; short increment; refactoring assumed inexpensive	Extensive design; longer increments; refactoring assumed expensive
Test	Executable test cases define requirements, testing	Documented test plans and procedures
Personnel		
Customers	Dedicated, collocated CRACK* performers	CRACK* performers, not always collocated
Developers	At least 30% full-time Cockburn level 2 and 3 experts; no Level 1B or -1 personnel**	50% Cockburn Level 3s early; 10% throughout; 30% Level 0's workable; no Level -1s**
Culture	Comfort and empowerment via many degrees of freedom (thriving on chaos)	Comfort and empowerment via framework of policies and procedures (thriving on order)

* Collaborative, Representative, Authorized, Committed, Knowledgeable
** These numbers will particularly vary with the complexity of the application