

Rocky Mountains Chapter

Northern Front Range Sub-Chapter



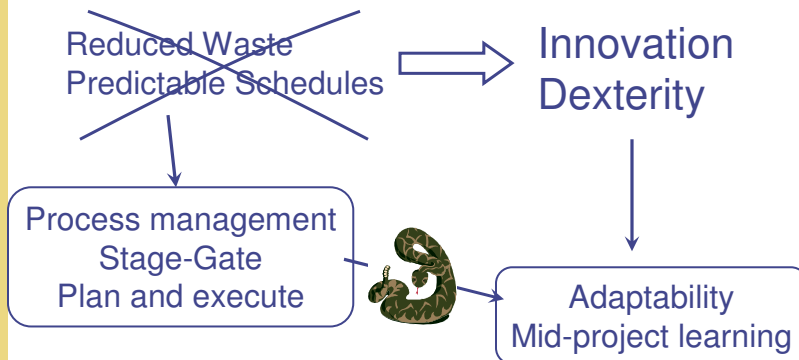
Flexible Hardware Development Learning from Agile Software

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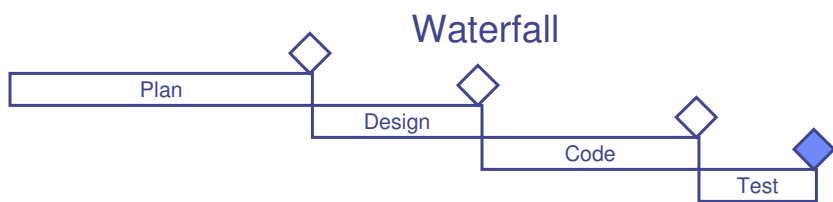
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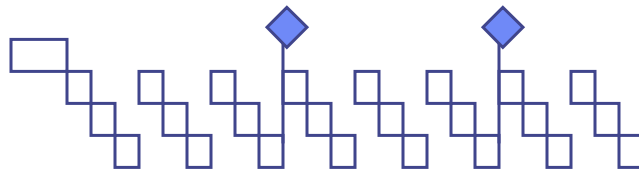
New Reality



Agile Software Development



Agile (XP, SCRUM, Crystal, FDD, Kanban?)



Agile Software Principles

Object-oriented coding	Limit impact of changes
Planning paradigm	Delay decisions until iteration starts
Short iterations	Fast feedback and accelerated learning
Emergent process	Shape process to meet project needs
Teams and people	People factors outweigh process and tools
Implementing Agile	Organizational change

Questions? Comments?



Flexible Hardware Development

IS NOT:

- ◆ Developing flexible hardware
- ◆ Full vs. light Stage Gate

IS:

- ◆ Developing hardware flexibly
- ◆ Mid stream learning

“Flexible” Stage Gate

Reinertsen Lean

Cost-focused Lean

Smith FPD

Toyota

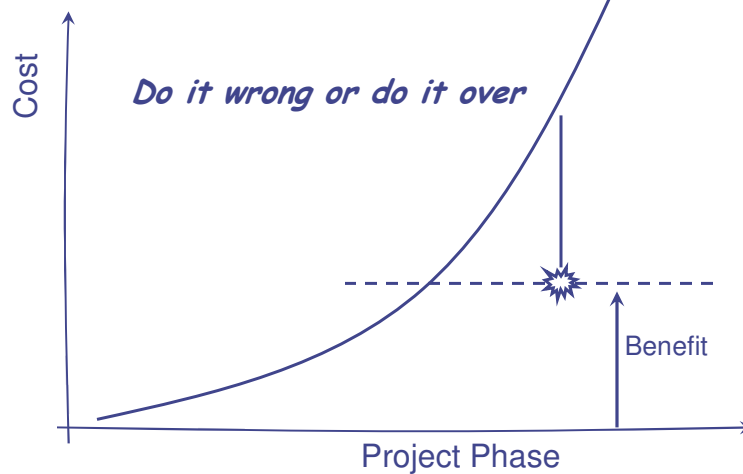
Goldratt TOC

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Planning Trap

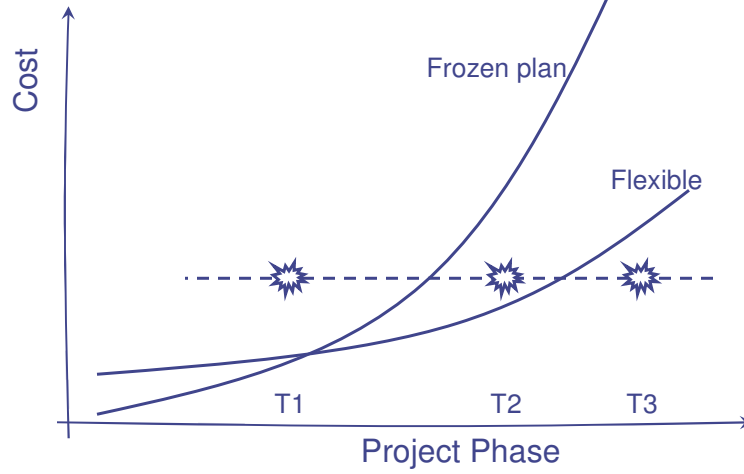


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Flexible Approach



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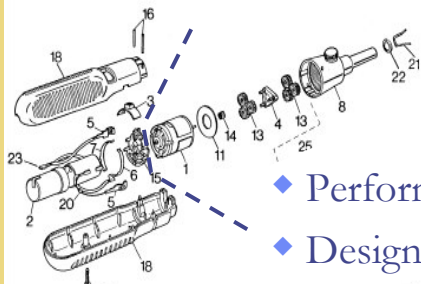


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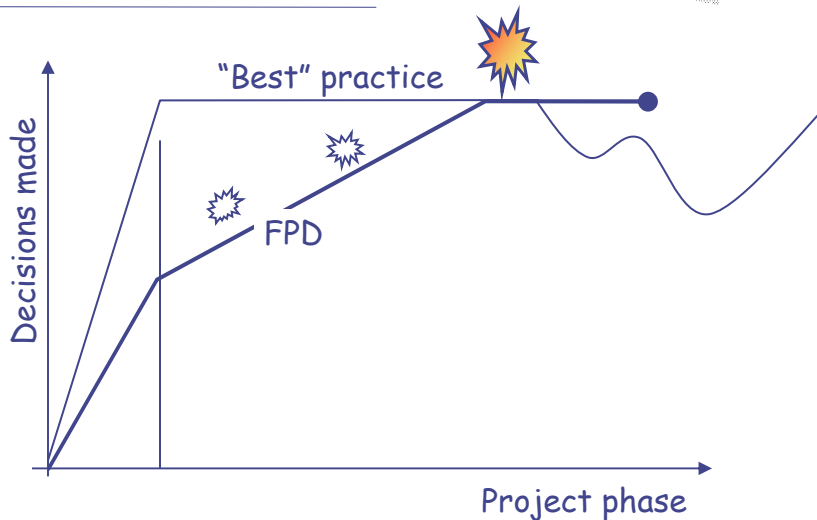
Modular Architecture



- ◆ Performance, cost, etc.
- ◆ Design flexibility
 - “Fence in” change
 - Align w/organizational boundaries

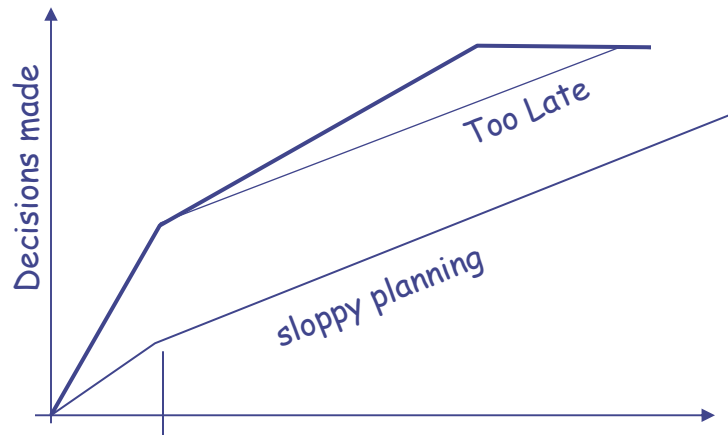
Hardware, firmware boundaries

Delayed Decisions



Last Responsible Moment

Planning
paradigm



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Accelerated Learning

Fast
feedback

- ◆ Front-loaded prototyping
 - Many, not few
 - Low cost, quick builds
 - Frequent customer review
- ◆ Early experimentation
 - Speculate-try-adapt
 - Seek out disconfirming evidence
- ◆ Learning, not verification!

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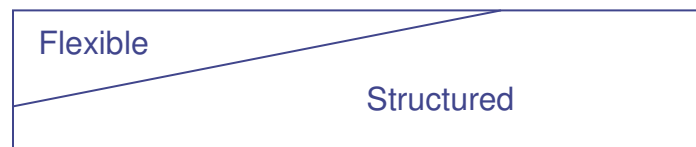
Balanced Process

Structure	Flexibility
<ul style="list-style-type: none">• Little effort wasted exploring unimportant design alternatives• Little investment in unused flexible features• Easy to manage development resources• Close control over design changes• Few mid-project changes• Coordinating across functional groups requires little effort• Simple management oversight of projects	<ul style="list-style-type: none">• Reduced cost of necessary changes• Reduced chance of 11th hour crises• Process supports innovation, learning• Product releases meet current requirements• Development effort adapts to changing market requirements• Ability to explore & learn without “sacrificial” product releases• Can avoid schedule delays by trimming project scope



Process Keys


- ◆ Exploration – develop and try
- ◆ Barely sufficient standardization
- ◆ Overbooked resources, long queues paralyze flexibility
- ◆ Shift from flexible to structured over project life.






Questions? Comments?

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Project Management



Emergent
process

Structured	Flexible
Detailed specifications	High level definition
Frozen plan	Add uncertainty plan
Risk management	Uncertainty burn-down
Documentation, reporting	Communication, troubleshooting
Process compliance	Retrospectives & adaptation

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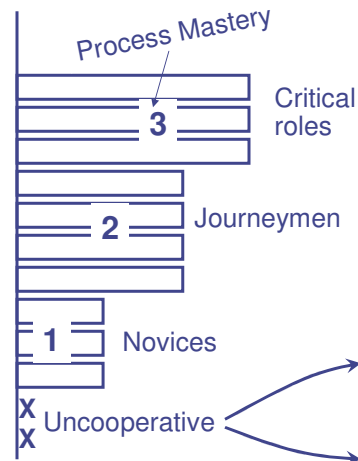
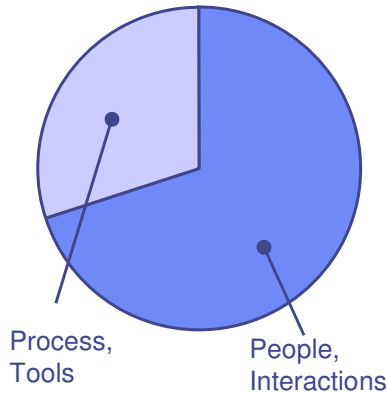


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Get the Right Team

Teams & people

Performance Impact



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Communication

Teams & people

- ◆ Co-located – 30 ft.
- ◆ Social skills – respect & support
- ◆ Fluid communications – daily (?) stand-ups
- ◆ Dedicated people – full time
- ◆ Generalists – multiple roles

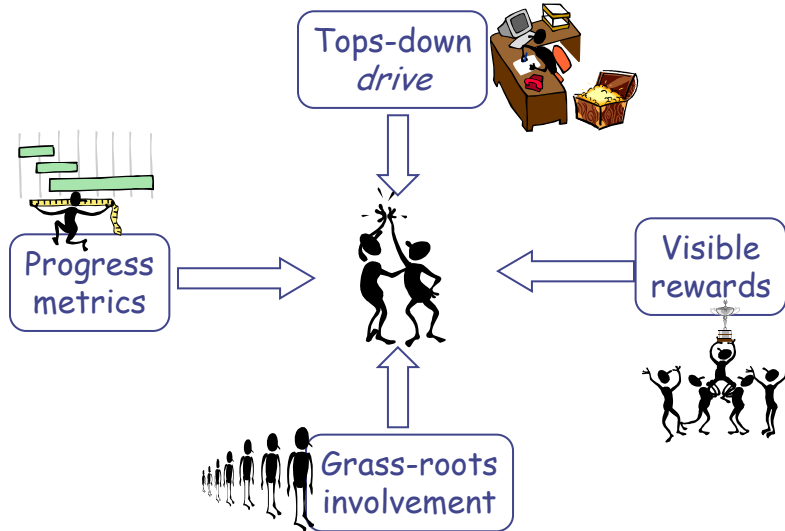
- ◆ Partially co-located?
 - Team focus on communication processes
 - Email, file sharing not sufficient!
 - In-person meetings: planning, kickoff, status
 - Frequent virtual meetings

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Implementing Flexibility

Org
change



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Program Design

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change

- ◆ Initiative — Tops down or bottom up?
- ◆ Pilot — Important, not critical
- ◆ Package — Piecemeal or complete?
- ◆ Goals — Modest or ambitious
- ◆ Visibility — Exposed or sheltered



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