Raytheon

Customer Success Is Our Mission

16958: Bringing Focus to an R&D Project Through the Application of Agile Techniques

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About the Author

- Software engineer by training
- Technology development and integration
- Alphatech – DoD Research (DARPA, AFRL, NRL, etc…)
- Raytheon – Integration of large scale radar systems

Overview

- This presentation presents issues that were encountered while executing on an R&D project at Raytheon
  - TRL3-6
- Internally funded, cross-business project
- Technology applicable to multiple products within a business and across businesses
- Discussion will not include project details

Characteristics of R&D Projects

- Significantly less structured environment than an operational development program
  - Vague objectives / requirements
  - Undefined path forward
  - Problem space may not be well understood
- Progress
  - How do you know where you are?
- Completion
  - How do you know when you're done?
- Resource contention
  - Sometimes R&D can take a back seat to "crisis of the day"
- Broad set of stakeholders
  - Many different programs potentially benefit from our technology development

Characteristics of R&D Personnel

- Work is a journey, not a destination
  - Curious, exploratory behavior results in innovation
  - Outcomes vs creativity
- May be Highly Competitive
  - Not always adjusted to team-based work
- May want to do their own thing
  - Used to charting their own course
- Willing to take risks
- Analytical, Objective

Why Agile?

- Responsive to change
- Focused on outcomes/results
- Improved visibility
- Long-term planning de-emphasized
- Greater team empowerment

Agile Principles (from the *Agile Manifesto)*

- Customer satisfaction by rapid delivery of useful software
- Welcome changing requirements, even late in development
- Working software is delivered frequently (weeks rather than months)
- Close, daily cooperation between business people and developers
- Projects are built around motivated individuals, who should be trusted
- Face-to-face conversation is the best form of communication (co-location)
- Working software is the principal measure of progress
- Sustainable development, able to maintain a constant pace
- Continuous attention to technical excellence and good design
- Simplicity—the art of maximizing the amount of work not done—is essential
- Self-organizing teams
- Regular adaptation to changing circumstances

Agile to R&D Mapping

- What fits
  - The “people” elements: communication, collaboration, small tight high performing teams
  - Acceptance of change
  - Lean management
  - Periodic self-reflection
  - Regular team interactions
  - Co-location

- What is out
  - Working software as the measure of success
  - Working product every sprint, integration/test focus
  - Definitive goals
  - Customer demos/involvement

Team issues

- Poor team dynamics
- People unaware of other's work
- Ideas vs comprehensive results
- Lack of shared vision
- Lack of broader business tie-in

Our Current Process Adaptation

- The overall project is mapped to the Agile/Scrum “product” concept
- Project manager executes the product owner role
  - Helps prioritize what items get worked during a sprint
- Two-week “sprints”
  - Acceptable outcome is to draw a conclusion, rather than build a finished product
  - “This is a bad idea” is an acceptable outcome/conclusion
  - Results are captured in sprint outbrief packages
- Sprint planning is a team sport
  - Team brainstorms areas of investigation which become the “product backlog”
  - Product backlog can be added to by anyone at any time

Challenges

- Can be hard to stick to a strict sprint schedule
  - Not all good ideas come to fruition inside of a time box (can still document where we are)
- Some personnel used to being told what to do
  - Conflicts with the concept of self-organizing, self-directed teams
- Process enforcement required
  - Easy to slip back into old habits

“Results” to Date

- Significant progress made over the course of just a few months
  - More than half of the ideas that were put forth during the first brainstorm session were addressed throughout the year
- Team growth was assisted by new process
  - Added several new team members in the last 3-4 months
  - Were able to come up to speed very quickly because the infrastructure that was created by the process
- Communication has improved among the team members
  - People aware of others’ activities

Conclusions

- Agile/Scrum in its purest form does not directly apply to software
- Adaptations to the process can allow for agile/scrum-like behaviors & values to be applied in a non-production environment
  - Need to establish an effective baseline for team “pace”
  - Need to define what constitutes success

- Future
  - Considering mapping researching areas to Scrum “product” concept rather than the entire project (multiple product owners)
  - Add Scrum master to ensure process is adhered to