

Agile Beyond IT

Case Studies & Proof of Concept

Terrence A. Leary, 703-983-0784, tleary@mitre.org

Virginia Wydler, 860-415-3078, vwydler@mitre.org

Erin M. Schultz, 703-983-3005, eschultz@mitre.org

Sobe Ahmed, 703-983-1331, smahmed@mitre.org

May 13, 2021

The views, opinions and/or findings contained in this report are those of The MITRE Corporation and should not be construed as an official Government position, policy, or decision, unless designated by other documentation.

Approved for Public Release; Distribution Unlimited.
Public Release Case Number 21-1203

©2021 The MITRE Corporation. ALL RIGHTS RESERVED.



MITRE

**SOLVING PROBLEMS
FOR A SAFER WORLD**

What is Agile?

- **For this research, Agile refers to modern development methods that share a common set of values and principles**
 - Traditionally considered as software development processes including specific frameworks such as Scrum, Kanban, SAFe, Extreme Programming (XP), Lean startup, etc.
 - Not to be confused with the term agile acquisition which refers to new procurement methods such as Middle Tier Acquisitions (MTA), Other Transaction Agreements (OTAs), etc.
- **Agile values founded in the, *Manifesto for Agile Software Development, 2001***
 - Individuals and interactions over processes and tools
 - Working software over comprehensive documentation
 - Customer collaboration over contract negotiation
 - Responding to change over following a plan
- **Also includes 12 principles**
- **Our research examines adaptations of Agile beyond IT and software development**

Summary of Research

- **Research Question: Is Agile being applied to domains beyond IT and can it lead to similar successes?**
- **Methodology: Surveyed the landscape for examples with details**
- **Initial Findings:**
 - Agile did not start in IT (PDSA, TPS, Lean)
 - Modern business environment very well suited for Agile (UURVE and VUCA)
 - Found: small pilot efforts, pilots that grew to scale, and large at scale applications
 - Domains identified: Manufacturing, Construction, Health, R&D, Finance
- **How this helps: Documents examples, successes and failures, and provides references**
- **Research Application: Federal Agency Proof of Concepts**
 - #1 Joint DoD Intelligence Program applying Agile to delivery of products
 - #2 Joint DoD ACAT I R&D Program applying Agile to concepts

Findings: Agile Applications Beyond IT, Lessons Learned (1 of 2)

| Domain | Company | Agile Results |
|---------|--------------|--|
| Mfg. | Saab | The use of Agile on the Gripen E program resulted in a fighter jet with 50 times lower development costs compared with the F-35, 10 times lower unit costs compared with the F-35, and the lowest cost per flight hour of any modern fighter jet. |
| Mfg. | WIKI SPEED | Successfully built one prototype to prove concepts using Agile principles. The company is now working on other prototypes: mail delivery vehicle, next generation taxicab, ultra-light racing vehicle, and five-seat sedan for ARPA-E's LiteCar Challenge. |
| Mfg. | Tesla | Shifted products from mechanics to software to skip beta testing and go straight into production. This approach allows enacting product updates and mechanical improvements through delivery of updated software directly to the customer, avoiding extensive recalls to continually improve products. |
| Mfg. | Bosch | Cut development time in half; divided into cross-functional teams leading to increase innovation and improve employee engagement; developed 10 new innovations in one month when it traditionally took six to eight months for each innovation. |
| Mfg. | Shipbuilders | Numerous reports cite excellent quality improvements in shipbuilding and submarine manufacturing by adapting Agile principles. |
| Constr. | Centrus | Met an aggressive schedule, under budget, with no safety issues or deficiencies from oversight and regulatory agencies. They had a significantly higher than average productivity for a nuclear construction project or a typical less complex construction project. |
| Constr. | PCL | PCL Agile now regularly provides offsite modular construction in large warehouses to assemble smaller components and larger built-up assemblies, to overcome site logistical issues. |

Findings: Agile Applications Beyond IT, Lessons Learned (2 of 2)

| Domain | Company | Agile Results |
|---------|------------------------------------|---|
| Constr. | Construction Project Management | Agile has already made its way into the construction domain through software tools and real-time collaboration to improve speed, reduce costs, and increase customer satisfaction. |
| Health | 3M HIS | 3M prioritized its work, instituted stabilized teams, reduced backlog, reduced interruption, and changed its scrum process to improve velocity. |
| Health | Monash Health | So successful four more clinics modeled on the prototype opened near other hospitals. Over a 12-month period patient data showed a 23-46% improvement on several standardized measures following treatment, a significant decrease in the number of clinicians and case managers involved in each case (handoffs), and an increase in clinician job satisfaction. |
| R&D | Broad Institute of MIT and Harvard | Incorporated tailored Agile values into its laboratory environment; utilized flexible sprints and adopted the right tools and techniques to fit each research lab space. |
| R&D | 3M HIS R&D | 3M HIS R&D teams adopted a more efficient use of time for faculty, improved both morale and productivity for student researchers with transparency and accountability, and generated a group identity for a research community and shared knowledge to the benefit of all. |
| R&D | HPE | The HPE solution for Agile R&D allowed all teams to focus on prioritizing the backlog and delivering the most important feature first. This approach used the swarm attribute referenced in <i>The Scrum Fieldbook</i> . |
| Finance | ING | Has been quicker to market, increased employee engagement, and released software every two to three weeks versus five to six times per year. Customer satisfaction and employee engagement scores are all up. |

Findings: Common Characteristics

- **Iterative**
- **Adaptive and flexible**
- **Collaborative, small teams**
- **User/customer focus**
- **Visual progress**
- **Short feedback loop**
- **Trust/psychological safety**
- **Simplify**
- **Change in leadership roles**



Conclusions: Guidance for Implementing Agile

1. Determine if Agile is a good fit
2. Determine the scope of the Agile effort
3. Consult with experts
4. Tailor Agile values and principles to the situation
5. Develop an approach: do not use waterfall to plan Agile
6. Leverage lessons learned: this research, other companies, etc.



Agile might be exactly what your program needs

Agile Beyond IT Applications for Federal Agencies

| Domain | Federal Agencies |
|--|---|
| 4.1.1 Manufacturing: Aircraft | Air Force, Navy, Army, Coast Guard |
| 4.1.2 Manufacturing: Motor Vehicles | Army |
| 4.1.3 Manufacturing: Auto, Power Tools & Agricultural Sensors | Army, Dept of Agriculture |
| 4.1.4 Manufacturing: Shipbuilding / Submarines | Intelligence Community (new technologies), Department of Defense (DoD), Navy |
| 4.2.1 Construction: Uranium Enrichment Plant | Military Construction |
| 4.2.2 Construction: Prefabrication | Military Construction |
| 4.2.3 Construction: Project Management | Military Construction |
| 4.3.1 Health: Big Data | Health and Human Services (HHS), Food and Drug Administration (FDA), Centers for Medicaid & Medicare Services (CMS), Centers for Disease Control and Prevention (CDC), National Institutes of Health (NIH), and Department of Veterans Affairs (VA) |
| 4.3.2 Health: Mental Health | HHS, CMS, VA, DoD |
| 4.4.1 Research and Development Labs/Academic Research | CDC, NIH, Nuclear C2 Research |
| 4.4.2 R&D: Innovation | Defense Advanced Research Projects Agency (DARPA), DoD |
| 4.4.3 R&D: Product Research | DARPA, DoD |
| 4.5.1 Finance: Banking | Department of Treasury |



Proof of Concept #1: Joint DoD Intelligence Program

- **Domain: Products (intelligence reports)**
- **Application: modernize intelligence production process; new data, tools, and methods**
 - Intelligence production reports developed by sharing “flat file” formats
 - Use Agile to execute small scale pilots to drive modernization (e.g., object-based production) across the enterprise
- **Implementation**
 - Iteration on products utilized and adapted a classic Agile Scrum approach
 - Consulting with Experts - ended up being a critical factor in their successes
- **Outcomes**
 - Delivered Pilot Execution Guide to execute pilots for specific Intel products
 - Good news story: implemented Agile; became more innovative and efficient in delivering improved products to the benefit of the Agency and its Users

Proof of Concept #2: Joint DoD ACAT I R&D Program

- **Domain: R&D**
- **Application: use Agile in material solution analysis phase (pre-Milestone A) to prioritize Mission Needs Statement (MNS) ideas**
- **Implementation**
 - Highly tailored approach: adapted for their R&D application, using Agile ceremonies and best practices; not adopting a specific Agile framework
 - Identified and leveraged parallels to research findings on Agile applications in R&D
 - Determined Agile was a good fit; consulted experts; tailored principles & approach
- **Outcomes:**
 - Obtained buy-in from Agency Senior Leadership
 - Inc 0 Preparation completed, including training teams and task leads in 4 weeks
 - Inc 1 Planning Session to populate and prioritize backlog; Inc 1 now underway
 - Opportunity to significantly influence the DoD acquisition process in Material Solution Analysis phase by delivering improved concepts in reduced timelines

Terry Leary

**Center for Acquisition & Management
Sciences (L211)**

O: 703-983-0784

tleary@mitre.org

www.mitre.org

@MITREcorp



MITRE | SOLVING PROBLEMS
FOR A SAFER WORLD™