Applying Agile Development Techniques to Improve Program, Portfolio & Enterprise Management

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DEPARTMENT OF ENERGY (DOE)
Manhattan Project
NNSA Mission

• Maintaining the safety, security & effectiveness of the nuclear deterrent
• Preventing, countering & responding to proliferation and terrorism threats
• Providing operational support for naval nuclear propulsion plants
NNSA SAFETY, INFRASTRUCTURE & OPERATIONS

A VAST AND COMPLEX ENTERPRISE

THE CHALLENGE: AGING & DECLINING INFRASTRUCTURE

AGE OF FACILITIES
- 30% 60+ years
- 24% 40-60 years

EXCESS FACILITIES
- 12%

CONDITION OF FACILITIES
- 21% Inadequate
- 41% Substandard

Vision
Safely operate and modernize our enterprise to meet demands now and in the future.

Mission
Maintain, Operate, and Modernize NNSA Infrastructure in a safe, secure, and cost-effective manner to enable program results.

15.2 MILLION FT² OF HAZMAT
ENOUGH TO FILL ~15 WASHINGTON MONUMENTS

9.1 Trillion BTUs
ANNUAL ENERGY CONSUMPTION
enough to power ~250,000 homes for one year

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Legacy Infrastructure

- More than 6,000 facilities located on 2,160 square miles in seven states
- Safely operating & modernizing this nuclear security enterprise with over $50 billion in real property assets
Challenges

**NNSA infrastructure is too big, too old & too brittle**
- Facilities & systems are well beyond end-of-life
- Block obsolescence limits maintenance & repair options
- Excess facilities pose unacceptable risks

**Failures are increasing in frequency, severity & unpredictability**
- Multiple Fire Suppression Breaks
- Multiple HVAC failures resulted in program delays
- Multiple roof leaks/failures
- Electrical Distribution Panel fire at Y-12

**Outdated processes & tools**
- 70 year old infrastructure management methodology
- Analytical methods & performance measures based on financial surrogates & do not capture relative importance or physical condition of facilities

**Infrastructure risks become safety & program risks**
Tackling the Challenges

- Garnering sustained, strategic infrastructure investments
  - Prioritizing investments for recapitalization & disposition
  - Right-sizing NNSA capabilities & infrastructure
  - Enhancing transparency of excess facilities & general purpose infrastructure

- Revolutionizing NNSA infrastructure management
  - Advancing infrastructure investment decision making
  - Improving infrastructure management tools
  - Accelerating recapitalization activities
  - Repurposing, reusing, deactivating, or disposing of facilities
  - Increasing purchasing power

- Applying Agile best practices to our Program Management Process
Agile in Program Management

• Adopting Agile techniques enables NNSA to make the best use of Federal resources

• In the past year, NNSA has

  • Applied Agile techniques to deploy innovative, revolutionary processes & management tools to facilitate a data-driven process & enable risk-informed investment decisions

  • Adapted best practices of Agile to improve NNSA’s management of its infrastructure portfolio at an enterprise level

  • Created a standardized, predictable, repeatable, & transparent process & developed a common vocabulary to improve communication between stakeholders
Program Management Plan

• Defines program management requirements to enable program results

• Establishes & defines standardized Work Breakdown Structure

• Standardized planning process

• Programming & Budgeting

• Execution:
  • Describes process work flows
  • Establishes Monthly Performance Requirements

Program Management Plan
September 2015

Safe Operations
Effective Infrastructure
Enterprise Services
Planning

- Master Asset Plan (MAP): An integrated, long-term infrastructure strategic plan driven by programmatic requirements
- A 25-year & beyond vision
- Annual 2-3 day MAP Deep Dives by each site to fully understand program needs, infrastructure gaps & roadmap to addressing short-term gaps & achieving the long-term vision
- Partnering with sites & programs to develop effective solutions to complex challenges
- The MAP will drive annual programming & budgeting priorities & decisions
Programming & Budgeting

- A predictable, transparent & repeatable process to assign funding to projects
- A data-driven, risk-informed methodology to prioritize requirements (MDI, BUILDER, G2)
- Meaningful metrics to convey what can/cannot be achieved at different funding levels & associated risks
Infrastructure Tools

- New data-driven, risk-informed tools are needed
- Enterprise Risk Management (ERM)
- Mission Dependency Index (MDI)
- BUILDER
- Recapitalization Project Prioritization
Enterprise Risk Management (ERM)
Mission Dependency Index (MDI)

- Measures a facilities importance by pairing the impact of the loss of the asset with the difficulty of replacing the asset’s functionality
- Formula adjusts the basic score to reflect how interconnected the asset is with other assets

$$MDI = \beta_1 \left( \gamma_1 \left( \frac{\sum_{i=1}^{N-5} \alpha_i C_i}{\sum_{i=1}^{N} \alpha_i} \right) + \gamma_2 \frac{\sum_{i=1}^{N} S_i}{N} + \gamma_3 \ln(N+1) \right) - \beta_2$$

- Enables new, groundbreaking ways for NNSA to visualize the interconnection of facilities

Node Analysis Example
• The U.S. Army Corps of Engineer’s Knowledge Based Condition Assessment software, BUILDER, which provides facility condition assessments for NNSA assets

• BUILDER Compares inspection data against known failure curves to predict system wear & identify the optimal time to make critical investments
Infrastructure Data

- Integrating infrastructure data from previously disparate sources
- Allows NNSA to communicate infrastructure data to stakeholders in new and more meaningful ways
Infrastructure Planning

- Asset lifecycle planning
- Risk-informed prioritization process

Program = \alpha_1 \ln \left( 1 + \frac{MDI}{100} \right) \left( \frac{\text{Program RR}}{\text{TEC}} \right) - \alpha_2
Scope/Metric Reports
G2 Program Management System

- The “National Nuclear Security Administration (NNSA) Program Management Information System, Generation 2” is a custom-developed system to integrate & highlight data at the Enterprise/Program level
- Manages over $2B annually
- Currently ~900 users, tracks ~19,000 actions per month
- Electronic change control, business rules & automatic notifications
- Encrypted access control, internal permissions & failover/backup/recovery
- Enterprise Risk Management questions & formulas for prioritizing projects
- Agile development with new features released every 8 weeks
- Project Management Institute (PMI) Award
- Association for Enterprise Information’s (AFEI) Excellence in Enterprise Information Award
Program Management Improvement Team (PMIT)

• **Purpose**
  - Enhance program, portfolio & project performance by sharing best practices for planning, executing & controlling scope, schedule, costs, risks & opportunities

• **Process**
  - PMIT comprised of private industry experts
  - Share leading-edge practices between sites & from industry
  - Recognition for best practices
  - No-fault, non-attribution, safe forum for discussion; no rating of performance
  - Quarterly meetings for 2-3 days
Final Thoughts

• Agile techniques can be applied outside of IT development – find what works for you

• Failure is always a possibility – you have to learn to walk the walk & take risks

• Passion drives success – work on something you care about & surround yourself with similarly motivated team members

• Don’t let Perfect be the enemy of Good – something is better than nothing