Agile Development and Assessment
Examples from Practices

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Challenges, Discipline, and Methods

• **Requirements Management**
  • Early and Continuous Engagement of the User (Section 804)
  • Requirement priority and traceable with clear linkage (SECDEF Report)

• **Development Methodology**
  • Allocation and Planning
  • Acquisition and Test Cycles

• **Assessment and Testing**
  • Integrated Testing
  • Risk Reduction, Letter of Observations
  • Return on Investment
Bottomline Upfront

• **Current Products; requirements, architectures, priority lists, and criterion can be improved upon.**
  – Priorities, business processes, sprint capabilities, and measures of effectiveness and suitability trace-able and integrated as value-based, mission-driven gains.

• **User/Sponsor Engagement should be persistent.**
  – Better understanding of user expectations
  – Established set of critical operational activities-to-tasks necessary for practical test, evaluation, and certification criterion.

• **Agile is More Than A Software Process.**
  – Practices must extent to capability needs to address operational deficiencies. Agile principles requires more experienced team and unity of effort.

Incomplete upfront analysis leads to continual un-measureable progress, un-testable/ un-assessable evaluation objectives, and unmet expectations.
Challenges

- **Process**: How is “Agile Development” compatible with DoD Acquisition Directives and documentation requirements
- **Team**: Earlier involvement by Test and Evaluation to identify shortfalls earlier, mitigate risk, and prevent testing issues
- **Resources & Capacity**: Limited resources for shorter testing cycles – Integrated Test and Evaluation
- **People**: Limited subject matter experts and need for training professionals
- **Technique**: Documentation, Backlog Management, Requirement Creep, and similar pitfalls
- **Risks**: Schedule compression, fix time within sprints and immaturity of authoritative mission threads
• **Rules of the Road**
  – System Engineering discipline
  – Technique: Information Technology “Box”
  – Method: Agile Development and Testing
Information Technology (IT) Box

- **Input:** Requirement, Objectives, Resources, Environment
- **Output:** Scope to Resources, Expectations
Agile Development and Testing

- Requirement Analysis
- User Collaboration
- Sprint Backlog (Highest Priority User Requirements)
- Product Backlog (Requirements Generation)
- User Stories

- Integrated Test Team
- Continuous Integration and Test

- Allocate and Test Planning
- Test Execution
- Post Execution
- Responsive to the user

- 4–8 Weeks

Adapted from many sources
• Right Requirement?
• Requirement Right?
• What does that mean?
• User expectation?
Requirement Management

Requirement Analysis
- User-Tester trace in terms of conditions and issue context (Domain-based)
- Developers interpret requirements into priority stacks with user feedback
- Review against post-implementation reviews, discrepancies, and issue data bases (backlog requirements)

User Collaboration
- Develop mission-based user stories (ATDD), improve quality through iterations
- Identify objective architectures* and implementation baseline
- Iteratively conduct trade-off analysis and/or build conference: balance priority, feedback, and cost, schedule, acceptable risk.

* Operational, reference, business process, system, technical, data,
Requirement Management

Document Driven Process and Gates?

Pedigree

Joint Publications

Concept of Operations

Universal Joint Tasks (TTP, SOP)

Capability Development Document

Capability Package

Architectures Business Development Modules, Operational Views,

Context / Conditions

Need

Integrated Priority Lists, Decision Support Toolkit (DST), Release sequence Plan (RSP)

Baseline

Information Support Plan (T-ISP)

Functional Transition Plan (baseline)

Requirement Synthesis & Test Planning

Use Cases

User Story*

User Expectation (Criterion) (MOE/MOS/MOP)

Build Plan

Operational Sponsor

Operational & Sustainability

Replicated operational environment feedback

Doctrine to Concept of Operations

Requirements Decomposition & Architecture

System (Services)

Meeting system requirements

Detailed Design

Component

Test Planning

* Critical activities, information, threat to data, information, network, redundancy, impact
Requirement Development and Management

Traceable-Driven – Recommendation #1

UserStories

• Enter Data
  ✓ Requirement Lists
• Add Data
  ✓ Requirement Lists
• Follow Rules / Conditions
  ✓ Requirements

User Stories*

* Cumulative Scenarios, Vignettes, and Epics,

Pedigree

Baseline

• Functional Description
• Joint Publications, Manual
• Context / Conditions
  ✓ Format, Styles, Standards, Information Exchanges
• Technical Baseline
  ✓ Systems, Components, Interfaces
  ✓ Current Specs
• Current Function / Performances

Requirement Structure (x, y, z, w)

• Systems (Functions: Situational Awareness, Planning, Intelligence, ...)
• Components
• Sub-Components
• Classes
• other

Requirements Database

Reqt-to-Story-to-Case(s)

Testing

Test Library

• Test Cases
• Automated
• Manual
• Smoke/Technical “ping”
• Functional
• User Acceptance (vignette, story)
• Automated (load, sim-stim)

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Integrated Review/Audit Process
Recommendation#2: Conduct more challenging reviews/audits

Do we have the right requirement?

Prioritize Characterization

Requirements Decomposition & Architectures
- Operational Need
- Testable Utilities
- Replicated operational environment / feedback

Deficiencies & Workarounds

How do you know?
What does that mean?
Can you show me?

Mission
- Doctrine to Concept of Operations
  - Requirements
  - Operational Context

Platform
- System (Services)
  - Meeting system requirements
  - Meeting standard profiles

System
- System Integration, Verification and Validation
  - Functional Testing
  - Functional Area Tasks

Component
- Component Testing
  - Interfaces and standards conformance

Component Testing
- Component Testing
  - Interfaces and standards conformance

Infrastructure
- Infrastructure Development & Assessment
  - Standards

Backlog Budgeting

Detailed Design
- Allocated Requirements
- Approach Requirements
- Surveys objectives (to Sprints)

Test Planning
- Risk-Based Level of Test
- Data Analysis Structure
- T&E Master Plan

Component Standards

MISSION

Operational Sponsor
- Operational & Sustainment
  - Replicated operational environment / feedback

Testing & Exercises
- Exercise to Operational Testing
  - Scenario-based tasks
  - Exercise (operational scale & tempo)
  - Acceptance Testing
  - Sustainment

Operational Sponsor
- Operational & Sustainment
  - Replicated operational environment / feedback

Replicated operational environment / feedback

Return on Investment

Post Review

Limitations & Training

Deficiencies & Workarounds

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Return on Investment

Post Review

Limitations & Training

Deficiencies & Workarounds

How do you know?
What does that mean?
Can you show me?
• Highest Priority? Limited resources to improvements
• Trade-space to meet expectations?
• Incremental useful capability / utility? Maintenance versus improvement?
• Criteria to meet integrated testing criteria?
Agile Development and Scope

Allocation and Test Planning

- Perform user-developer-program manager exchanges to translate requirements as optimal achievable sprint packages (i.e., scrum activities)
- Transforms and allocates requirement into sequential development sprints based upon technical maturity, complexity, and useful functionality for incremental releases
- Align requirements, test objectives, and sprint-specific user cases within the annual cycles
- Develop criteria for cumulatively increase useful utility and meeting priority objectives
- Shape test cases to support integrated testing objectives (Standards, Information Assurance, Function, Technical, User Acceptance)
Agile Development and Scope
Formal Process and Document Driven Process?

Objective Priority
- Capability Release Plan
- Standard Implementation Guides

Strategy*
- Test and Evaluation Strategy
- Risk Plan

Events
- Test Concept Papers
- Mission-driven architectures (Mission threads, Mission Sequential Events List, ...)

* Oversight
Annual Success Objectives Secures Tomorrow’s Mission-Based Successes (scope-focused) – Recommendation #3

**Content and Constructs** (usage patterns, functional business processes, schema, service behavior and interaction patterns, technical performances, etc.) objectives

**TODAY’s**

Notional Annual Fiscal Year (FY)

- Requirements functions
  - Validated KPPs
  - No harm functional criteria
  - Developments
  - Current Baseline

- IT Box Current FY

- $$, time, risk

**Guidance and Initiatives**
- Agile IT Process
- Do-No-Harm performance and utility
- Integrated Testing
- Sustain and Incremental improvements

**Enablers**
- Joint experimentations
- Synchronizing programs
- Exercise cycles
- Distributed Test Capacities

**Progressive events**
- Risk Reduction
- Assessment
- Limited objective
- Integrated testing

**Annual FY foundation for FY+1**

- Requirements Functions
- Mission objective

- IT Box FY11

- KPP
- Functional no-harm
- Mission-task Improvement Criteria

- $$, time, risk

- On-going Pgms
- Fix/Patches
- Baseline

**Context and Orchestration of services/systems to mission-tasks metrics (MOE) utility.**

**TOMORROW’S**

- Joint experimentations
- Synchronizing programs
- Exercise cycles
- Distributed Test Capacities

- Minimize re-work, re-engineering, and life-cycle costs

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Synchronize Sub-Processes
Concurrent Planning and Responsive – Recommendation #4

Improve integration of ‘agile development’ with tactical/strategic planning and backlog management
Assessment and Testing

- Risk-based testing?
- Representative users? Environment?
- Full and meaningful reciprocity?
- Return on Investment
Assessment and Testing

Assess and Testing
• Execute an integrated test team (inclusive of all disciplines)
• Conduct risk-based testing based on successively increased functionality with desired test robustness
• Conduct testing in conjunction with other venues
• Mature towards automated or standardized test plan and reports (full and meaningful reciprocity)

Post Execution and Sustainment
• Provide evidential recommendations to acquisition, information assurance, interoperability, and fielding
• For incident reports; (1) Determine operational-based impact, root-causes, and qualify limitations; and (2) Assess if the backlog requirement is sufficiently important to impact next sprint
• Review lesson learned; including the network, tools, and processes for continual improvements
Invest in Efficiencies and Experienced Resources – Recommendation #5

- Synchronize and Leverage Opportunities, as appropriate
- Multi-Disciplined and Experienced Resources, as possible
Build Test / Assessment Cards

Thorough Traceability – Recommendation #6

Intent: Take function-based test cards and trace to operations to reflect capability need-driven acceptance, relevant to operations***

<table>
<thead>
<tr>
<th>Requirement / Capability Need</th>
<th>Business Process Model (COA Development)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traceability</td>
<td>Ability to locate pre-built templates</td>
</tr>
<tr>
<td>Link to</td>
<td>based on country, service,</td>
</tr>
<tr>
<td>Priority mgmt tools</td>
<td>mission/task, type unit...</td>
</tr>
<tr>
<td>(DST/RSP)</td>
<td></td>
</tr>
<tr>
<td>Traceability</td>
<td></td>
</tr>
<tr>
<td>to Joint Planning &amp;</td>
<td></td>
</tr>
<tr>
<td>Execution Architecture</td>
<td></td>
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<tr>
<td>reference</td>
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<tr>
<td>Subset from Story</td>
<td></td>
</tr>
<tr>
<td>Description, Capability</td>
<td></td>
</tr>
<tr>
<td>Package</td>
<td></td>
</tr>
<tr>
<td>Percent of key inputs available</td>
<td></td>
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<tr>
<td>Timeliness to locate and</td>
<td></td>
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<tr>
<td>access template</td>
<td></td>
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<tr>
<td>Risk Score*</td>
<td>3</td>
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<tr>
<td>Priority**</td>
<td>High</td>
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</table>

* Risk management score based on # dependencies, priority, mission impact level, risk analysis in JC2 S&M, TISP, or other risk identification group
** Based upon aggregate scoring and/or priority numbering
*** In aggregate provide same basis of information to architectural-driven, test fidelity mission threads (i.e., OV/BPM relevant critical activities to operational expected outcome). Intent to ‘bring together’ critical acceptance data within an agile practice.
Build Test Cards
Rec # 6 cont’d. Operational Context to Meet Expected Accomplishment

Sponsor started with mission-driven context (vignette) to determine enabling functions and tools

**Scenario, Vignette reference #**

Identified and access xyz templates by country, military service, mission/task, type unit...

Example: Filter, select, compare xyz COA to abc plan (expected outcome)

In given vignette: accessed “n” templates within “time”
Modified, Create, ...
Access and Compared ....

Assessment Cards built deck (or aggregate into MSEL) for given functions/activities to demonstrate
## Surveys written to Capability Need Statement – Example Derived from NRID into Questionnaire – Recommendation #7

<table>
<thead>
<tr>
<th>NRID #</th>
<th>NRID Description</th>
<th>Requirement Satisfaction Statement</th>
<th>Perspective</th>
</tr>
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<tbody>
<tr>
<td>310.1</td>
<td>Provide insight into national, theater, and tactical collection tasking and activities; assess to Collection Management information (planned collection, collection accomplished, requirement satisfaction, collection parameters, etc.,)</td>
<td>IST provides US Army Tactical Units access to Collection Management information (planned, accomplished, requirements satisfaction, collection parameters, etc; via interface with PRISM</td>
<td>IST Users</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IST as employed in JFEWE provides the Collection Manager at the AOC with insight into tactical collection tasking and activities by providing visibility of tactical ISR assets</td>
<td>Collection Manager</td>
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### General Questions for the Collection Management Lead:

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(3) Approximate number of deliberate collection requirements submitted during JFEWE

(4) IST as employed in JFEWE provides the Collection Manager at the AOC with insight into tactical collection tasking and activities by providing visibility of tactical ISR assets

(5) IST provides US Army Tactical Units ability to more efficiently and effectively interface and collaborate with theater and JTF Collection Manager elements to generate collection requirements via interface with PRISM

[Survey Options]

- [ ] Strongly Agree
- [ ] Agree
- [ ] Agree, but reservations
- [ ] Disagree
Conclusions: Few considerations

• Requirement Management - Stay on Focus
  – Answer-driven

• Development Methodology - Incremental
  useful capability-driven
  – Event-driven within cycles
  – Budget ‘allowance’ for requirements, schedule, fix

• Assessment and Testing: Integrated Testing
  – Multi-disciplined
  – Experienced over Quantity