Toward a More Agile Systems Engineering Technical Review Process

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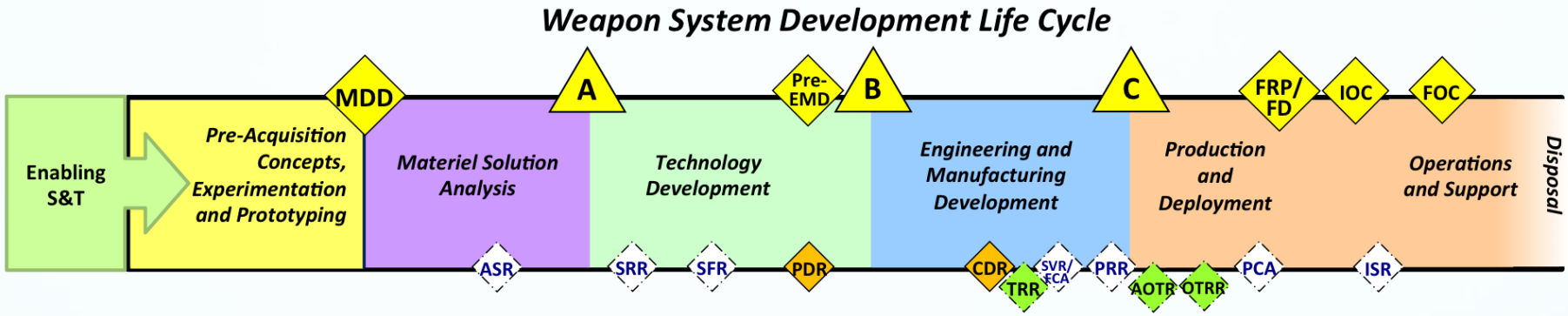
Overview

- Background
- Traditional and Agile approach
- Case Studies
- Conclusion

Background

- Use of Agile methodologies become hindered when subject to traditional Systems Engineering Technical Review (SETR) processes
- A new Agile SETR process is needed
- Researching best overall approach to implementing Agile methodologies while still capturing the essentials of the SETR process.

Traditional Review Process

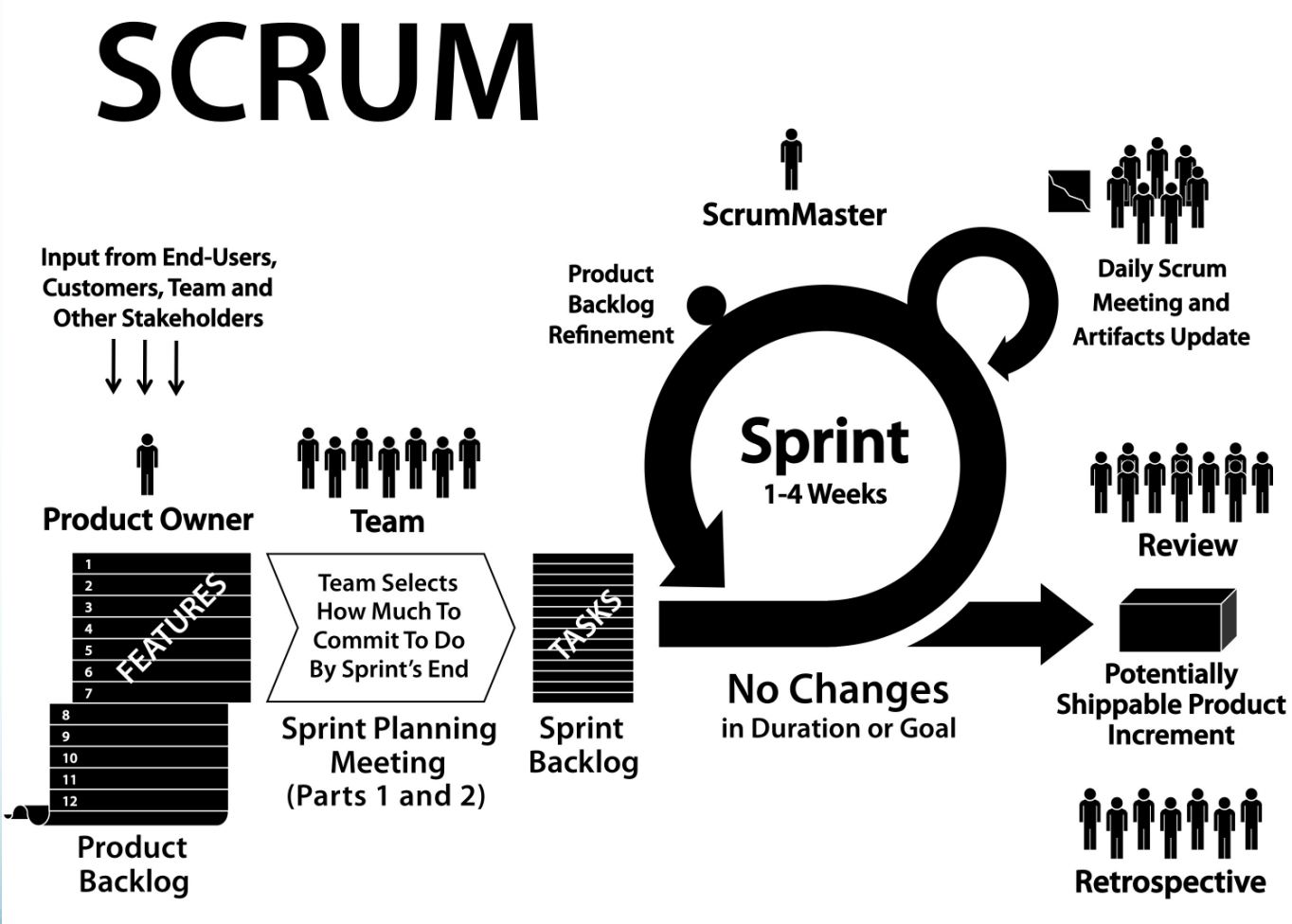


AOTR - Assessment of Operational Test Readiness
ASR - Alternative Systems Review
CDR - Critical Design Review
EMD - Engineering and Manufacturing Development
FCA - Functional Configuration Audit
FD - Full Deployment
FOC - Full Operational Capability
FRP - Full-Rate Production
IOC - Initial Operational Capability
ISR - In-Service Review
MDD - Materiel Development Decision
OTRR - Operational Test Readiness Review
PCA - Physical Configuration Audit
PDR - Preliminary Design Review
PRR - Production Readiness Review
S&T - Science and Technology
SRR - System Requirements Review
SFR - System Functional Review
SVR - System Verification Review
TRR - Test Readiness Review

- Mandatory technical reviews
- Best practice technical reviews and audits
- Test reviews (see DAG Chapter 9)

Reference: Defense Acquisition Guide Chapter 4 Section 4.2.1

Agile Methodology



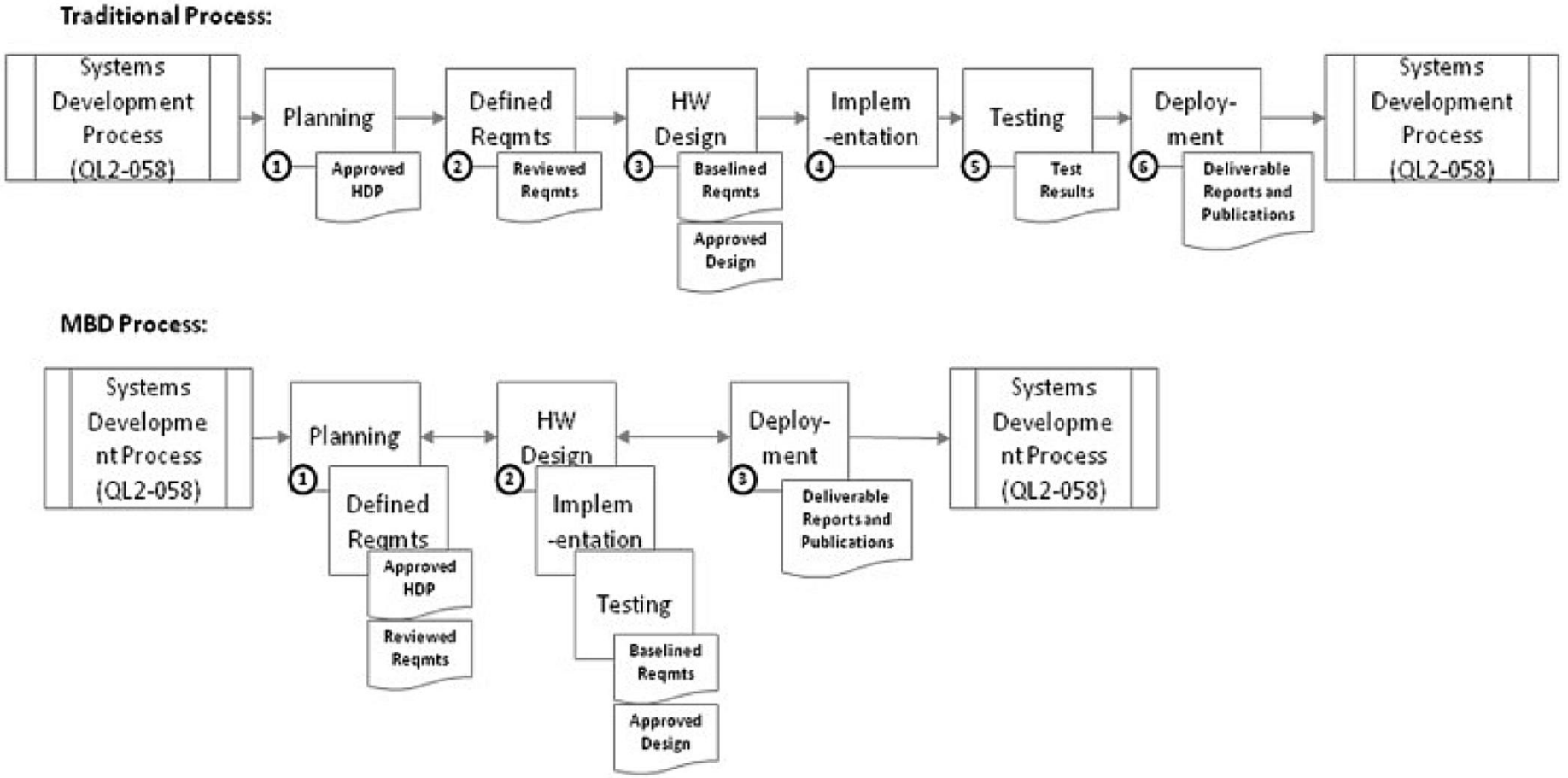
Reference: Deemer, P., Benefield, G., Larman, C., & Vodde, B. (2010). The scrum primer.

Multi-Mission Bus Demonstrator (MBD) Case Study

- Commercial Satellite program under Johns Hopkins University Applied Physics Laboratory (JHU/APL)
- CubeSat standards
- Agile Systems Engineering
  - Fraction of cost of traditional process
  - Comparable performance
- MBD sponsor did not require normal NASA processes

Reference: Huang, P. M., Darrin, A. G., & Knuth, A. A. (2012). Agile hardware and software system engineering for innovation (pp. 1–10). Presented at the Aerospace Conference, 2012 IEEE, IEEE. doi:10.1109/AERO.2012.6187425

MBD Agile Systems Engineering Process vs Traditional Process



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MBD Review Process

- Performed a single review
  - Only Design Review (ODR)
  - Conducted multiple informal reviews
- Schedule of 14 Months
- Budget of $10 Million
- Project was successful
  - Implemented Agile methods
  - Created updated SETR process
  - Met Cost, Schedule, and Performance
  - Did not sacrifice Engineering Management reviews

Reference: Huang, P. M., Darrin, A. G., & Knuth, A. A. (2012). Agile hardware and software system engineering for innovation (pp. 1–10). Presented at the Aerospace Conference, 2012 IEEE, IEEE. doi:10.1109/AERO.2012.6187425

DOD Agile and SETR Background

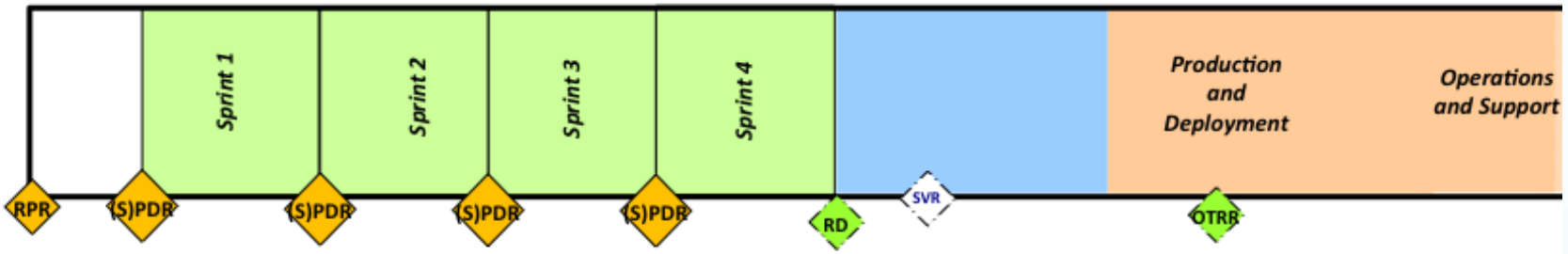
- Projects under the United States Department of Defense (DOD) are governed by law and policy
  - DODI 5000.02 governs Acquisition of Defense Systems
- Each military service implements policy that requires the use of a SETR process
  - Implementing Agile methods becomes difficult when subject to strict processes
- Some military services have implemented pilot programs to allow for Agile methods

DOD Case Studies

- Research of Agile methods with SETR processes being conducted
  - Multiple military services are being considered with projects from each service
- Service I Project A
  - Large DOD Project with Budget >$140 Million
  - Pilot program for Agile Software Engineering
  - Obtained permission from leadership to deviate from normal SETR process
- Service II Project B
  - Medium sized DOD Project with Budget of around $100 Million
  - Software Database system that collects health and status information on Major US Weapons Systems
  - Obtained permission from leadership to deviate from normal SETR process post traditional CDR

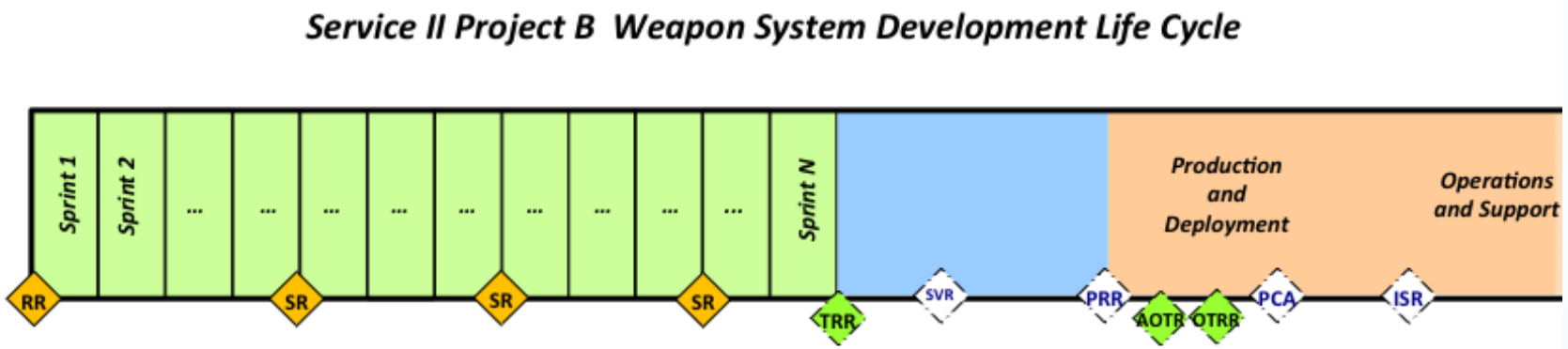
DOD Service I Project A Agile SETR Process

Service I Project A Weapon System Development Life Cycle



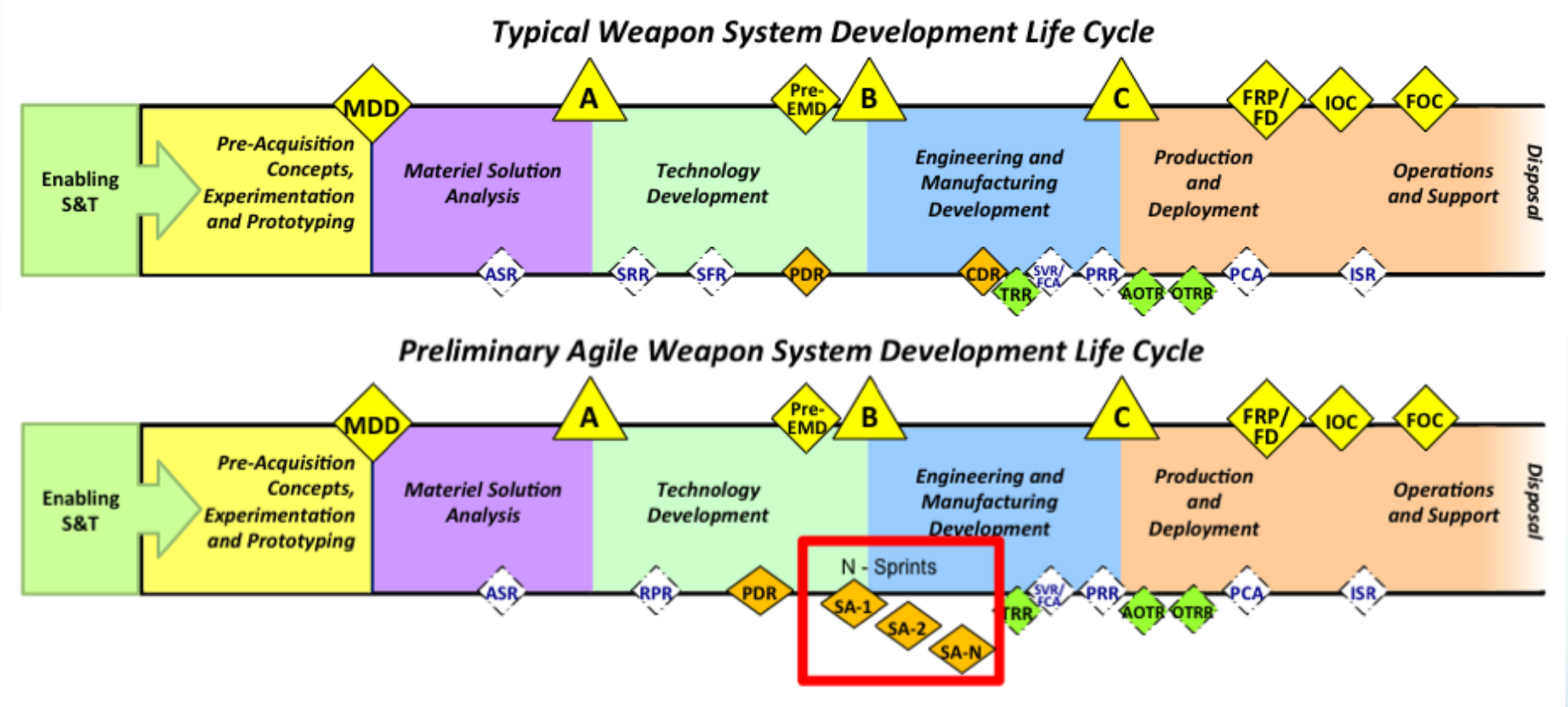
- Release Planning Review (RPR) vice SRR and SFR
- Sprint Preliminary Design Review (S)PDR vice PDR
  - Performed prior to each Sprint
  - Limited participation to must have personnel
- Removed CDR using Daily Build/Test/Integration cycle as alternative
- Release Demonstration (RD) vice TRR
- Performed a typical SVR and OTRR on final release roughly every 4th Sprint

DOD Service II Project B Agile SETR Process



- Sprint Audits performed every 4th Sprint
  - Independent Senior Engineer
  - Ensure review of process
- Final build used traditional SVR and TRR

Preliminary Agile SETR Process



- Use Release Planning Review (RPR) in place of SRR/SFR
- Perform Sprint Audits (SA) for N Sprints determined at PDR
- CDR not required
- All other reviews are unchanged

Tenants of the Preliminary Agile SETR Process

- Define Requirements at Release Reviews
- Sprint Audits align with Agile methods
- CDR covered using Sprints
- Test and Production reviews unchanged
- Allows for multiple iterations

Conclusions

- Implementing an Agile SETR process allows for use of Agile Methods while keeping the value of a traditional review process
- Commercial and Government projects can benefit from a new Agile SETR process
- Leaders can leverage research to implement an Agile SETR process within their organization

Future Work

- Measure, evaluate and document process improvements
- Continue collection of Case Studies
- Perform detailed interviews to capture tenants
  - Good changes to the SETR process
  - Bad changes to the SETR process
- Finalize Agile SETR process for Leadership implementation

References

- Deemer, P., Benefield, G., Larman, C., & Vodde, B. (2010). The scrum primer.
- Defense Acquisition Guide Chapter 4 Section 4.2.1
- DODI 5000.02, AT&L, U. (2008). INSTRUCTION, 1–80.
- Huang, P. M., Darrin, A. G., & Knuth, A. A. (2012). Agile hardware and software system engineering for innovation (pp. 1–10). Presented at the Aerospace Conference, 2012 IEEE, IEEE. doi:10.1109/AERO.2012.6187425

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