GAO Agile Guide – Using a WBS in an Agile Environment

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Agenda

- Background
- Best Practice Guides
- Agile Guide Overview
- Using a WBS in an Agile Environment

Background

About GAO

- GAO is an independent, nonpartisan agency serving the Congress to help improve the performance and ensure the accountability of the federal government

- Core values are Accountability, Integrity, and Reliability

- To ensure independence, the Comptroller General (CG) is appointed to a 15-year term by the President. Other than the CG, there are no political appointees at GAO

Oversight, Insight, Foresight

About GAO (Our Work)

- GAO work is primarily done at the request of congressional committees or subcommittees or is mandated by public laws or committee reports. We also undertake research under the authority of the Comptroller General.

- Some examples of our work include:
  - Auditing agency operations to determine whether federal funds are being spent efficiently and effectively
  - Investigating allegations of illegal and improper activities
  - **Reporting on how well government programs and policies are meeting their objectives**
  - **Performing policy analyses and outlining options for congressional consideration**
  - Issuing legal decisions and opinions, such as bid protest rulings and reports on agency rules

- In 2018, Congress directed the formation of the Science, Technology Assessment, and Analytics (STAA) team, recognizing that the accelerating pace of innovation has created a need for more and deeper analysis of science and technology

More information about GAO can be found at www.gao.gov

Best Practice Guides

Best Practice Guides

Why develop best practice guides?

- Legislators, government officials, and the public want to know whether government programs are achieving their goals and what these programs are expected to cost and when they are expected to be finished.
  - Best practice guides provide clear criteria to establish the quality of program artifacts and whether they provide managers and oversight organizations enough information to make informed decisions.

- Developing reliable program cost and schedule estimates is critical to
  - Effectively using public funds.
  - Meeting OMB's capital programming process.
  - Avoiding cost overruns, missed deadlines, and performance shortfalls.

- The Guides help provide a framework for managing the government's acquisition efforts and ensuring the successful development and integration of cutting-edge technologies and their integration into large and complex systems.

Overview: Best Practice Guides

- **Cost Estimating and Assessment Guide**
  - Issued: March 2020, GAO-20-195G
- **Schedule Assessment Guide**
  - Issued: December 2015, GAO-16-89G
- **Technology Readiness Assessment Guide**
  - Issued: January 2020, GAO-20-48G
- **Agile Assessment Guide**
 - Issued: November 2023, GAO-24-105506

Agile Guide Overview
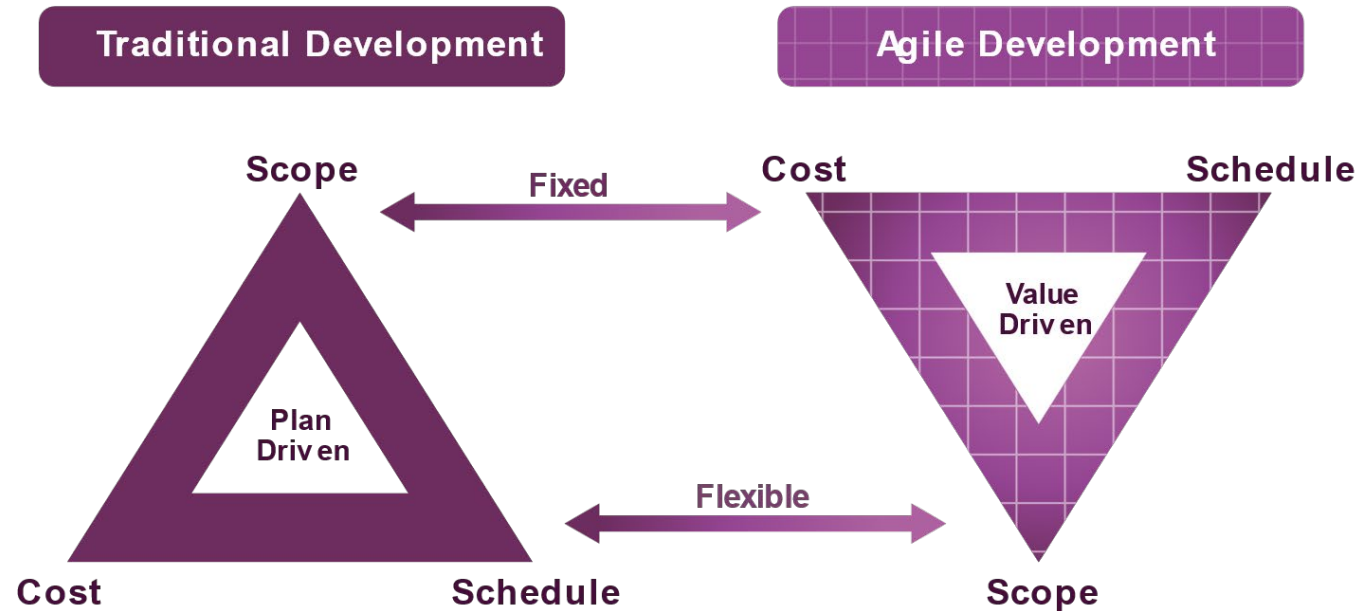
GAO Agile Assessment Guide: What is Agile?

- An approach to developing and delivering software that allows stakeholders to validate requirements, processes, and system functionality in increments, and deliver functionality to users in shorter cycles.

- Government has traditionally followed a "waterfall" approach.
  - It typically involves sequential phases, often with delivery of working software years after development begins.
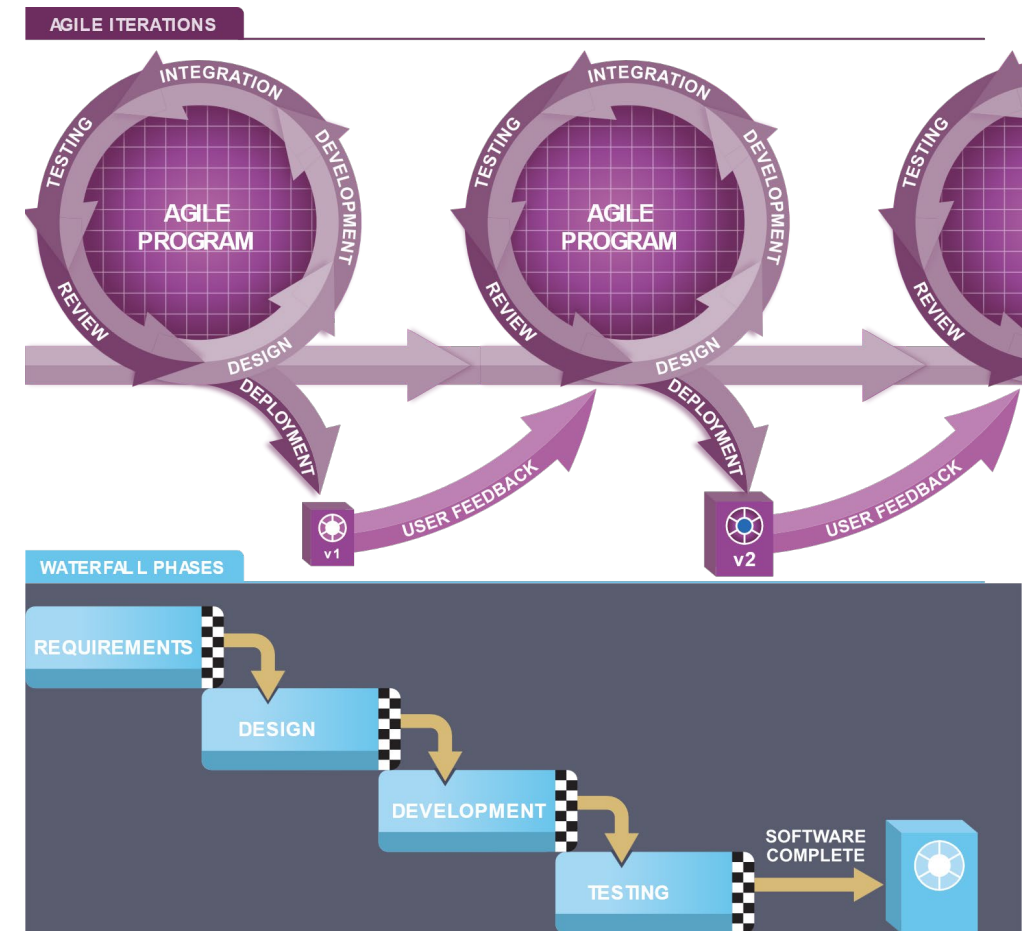
Source: GAO analysis of DOD and USCIS Information.t | GAO-24-105506

Shifting the Emphasis in Agile Development

- Iterative and incremental development
- Early and continuous software delivery

Source: Federal Aviation Administration. | GAO-24-105506

GAO Agile Assessment Guide: Chapters

- Chapter 1: Background

- Chapter 2: Agile Adoption Challenges in the Federal Government and Actions Taken in Response

- Chapter 3: Agile Adoption Best Practices

  - Team activities, Program processes, and Agency environment

- Chapter 4: Overview of Agile Execution and Controls

- Chapter 5: Requirements Development and Management in Agile

- Chapter 6: Agile and the Federal Acquisition Process

- Chapter 7: Agile Program Monitoring and Control

  - Work Breakdown Structure (WBS), Cost estimating, Scheduling, and Earned Value Management (EVM)

- Chapter 8: Agile Metrics

GAO Agile Assessment Guide: Appendices

- Appendix I: Objective, Scope, and Methodology
- Appendix II: Key Terms
- Appendix III: Related Terms
- Appendix IV: Auditor's Key Questions and Effects
- Appendix V: Common Agile Frameworks
- Appendix VI: Debunking Agile Myths
- Appendix VII: Background for Case Studies and Agile in Action
- Appendix VIII: Specialists Who Helped Develop this Guide
- Appendix IX: GAO Contacts and Staff Acknowledgements

GAO Agile Assessment Guide: Key Terms

- **Road map**: A high-level plan that outlines a set of releases and the associated features. The road map is intended to be continuously revised as the plan evolves.

- **Release**: A planning segment of requirements that deploys needed capabilities. The release is a time boxed event that consists of a set number of iterations that are determined by the program. The **release plan** is where different sets of usable functionality or products are scheduled to be delivered to the customer.

- **Backlog**: A list of features, user stories, and tasks to be addressed by the team, program or portfolio and is ordered from the highest priority to the lowest priority. A backlog can occur at varying levels; for example, a product backlog is a high-level backlog that contains all the requirements for the entire program.

For more terms and definitions see the Agile Guide's Appendix II: Key Terms
It is important to define the terms with the program early because terms can vary

# Deeper Dive: Using a WBS in an Agile Environment

The Role of the WBS in Agile Development

- Department of Homeland Security's Homeland Advanced Recognition Technology (HART) Program
  - *Biometric Identity System: DHS Needs to Address Significant Shortcomings in Program Management and Privacy* (GAO-23-105959)
- DOD National Background Investigation Services (NBIS)
  - *Personnel Vetting: DOD Needs a Reliable Schedule and Cost Estimate for the National Background Investigation Services Program* (GAO-23-105670)
- Department of Defense (DOD) F-35's Block 4 Modernization
  - *F-35 Joint Strike Fighter: More Actions Needed to Explain Cost Growth and Support Engine Modernization Decision* (GAO-23-106047)
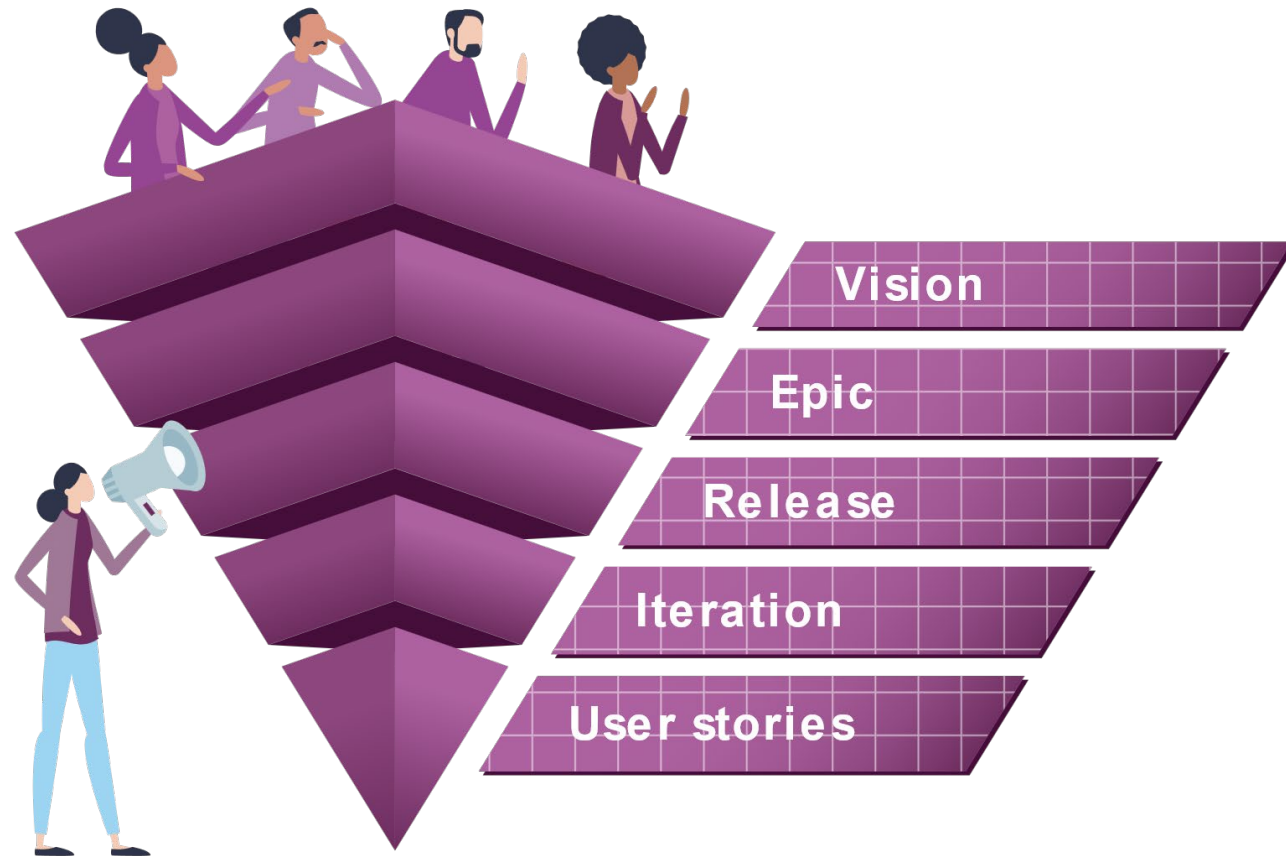
The Need for an Estimating Structure

- Getting back to basics and keeping the plan comprehensive

Source: GAO. | GAO-20-195G
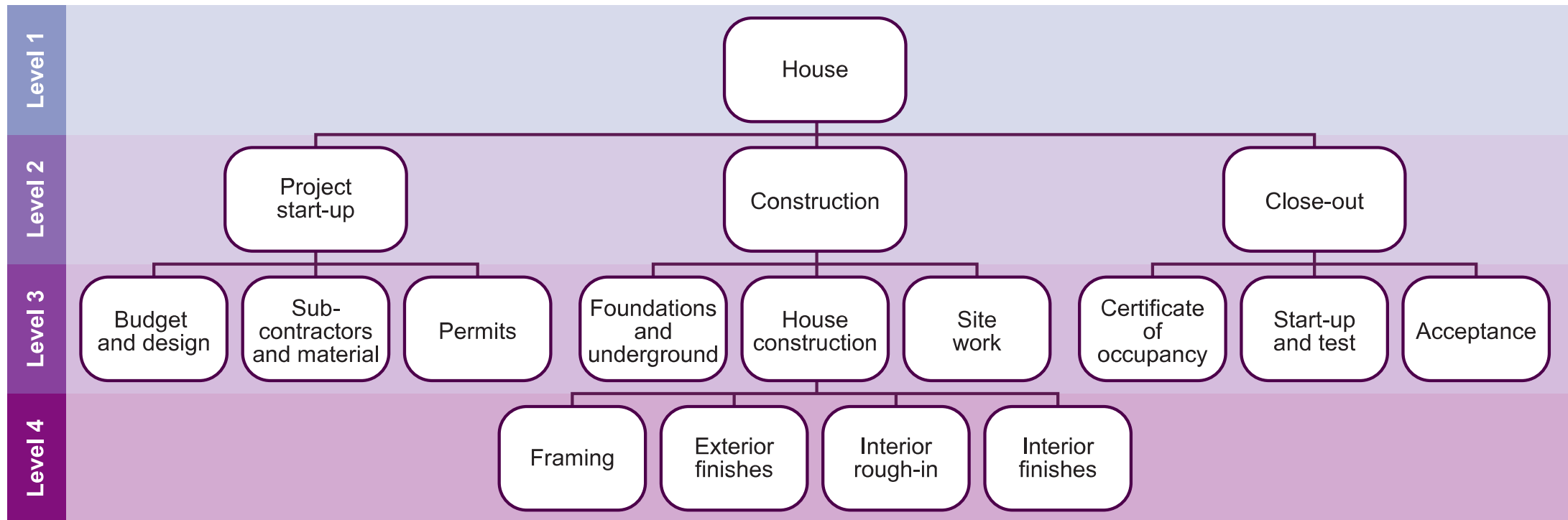
Agile Hierarchy Drives Development

Start with a high-level program goal and priority requirements and end development when the program goal has been met.

Vision

Epic

Release

Iteration

User stories

Source: GAO representation of Agile planning levels (data);   Vectormine/stock.adobe (images). | GAO-24-105506
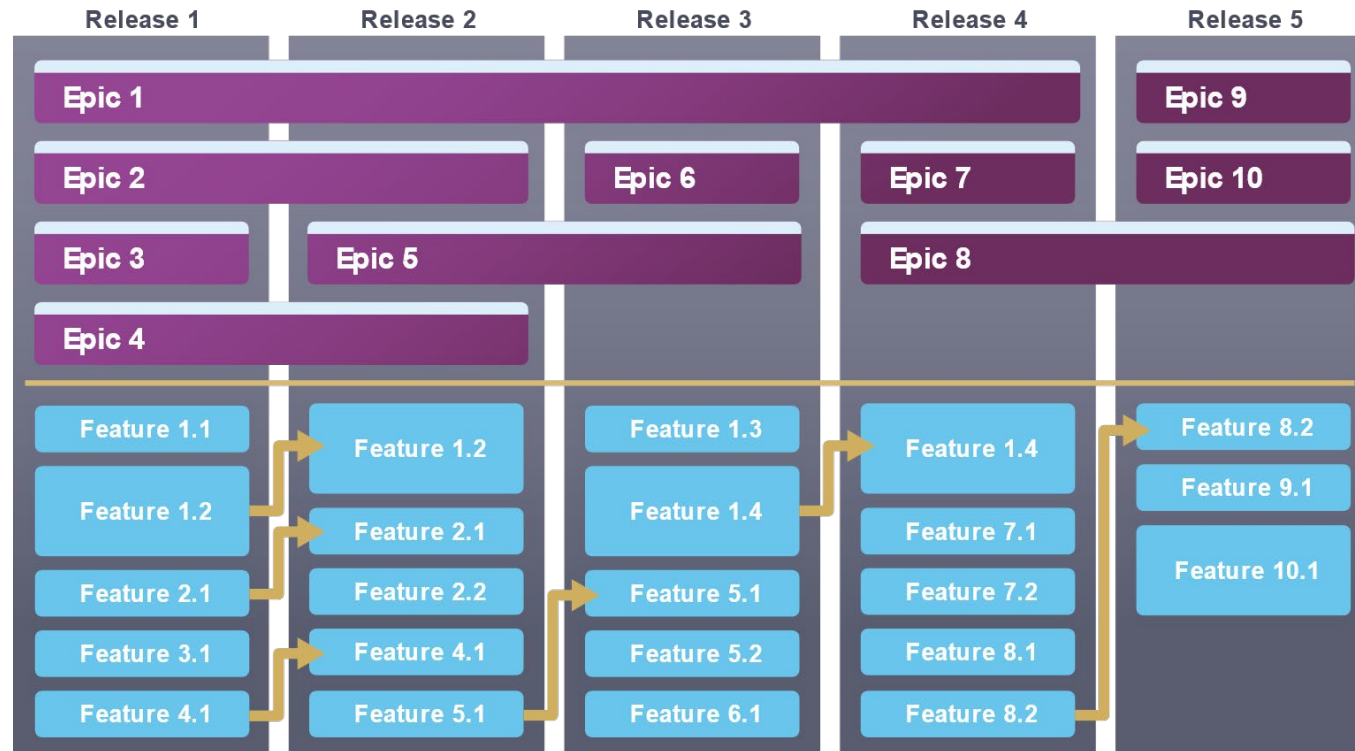
Recasting the WBS for Agile Development

- Cost elements align with WBS <u>and</u> reflect release schedule
  - WBS supports cost estimating
- WBS elaboration continues during development

Pre-release/iteration planning

WBS	Title	Release
1.1	Prime mission product	
1.1.1	Epic 1	R1
1.1.2	Epic 2	R1/R2
1.2	Program management	All
1.3	Hardware	R1
1.4	Software licenses	R2

Post-release/iteration planning

WBS	Title	Release
1.1	Prime mission product	
1.1.1	Epic 1	R1
⭐ 1.1.1.1	Feature 1.1	R1
⭐ 1.1.1.2	Feature 1.2	R1
1.1.2	Epic 2	R1/R2
⭐ 1.1.2.1	Feature 2.1	R1
⭐ 1.1.2.2	Feature 2.2	R2
⭐ 1.1.2.3	Feature 2.3	R2
1.2	Program management	All
1.3	Hardware	R1
1.4	Software licenses	R2

Source: GAO. | GAO-24-105506

Matching Development to the Roadmap

Releases are not an Agile schedule artifact to track progress, but they are an aspect of management and an essential adjunct to planning.

Source: National Defense Industrial   Association, Integrated Program Management Division. | GAO-24-105506

Updating the WBS and Roadmap

Release 1 | **Work Breakdown Structure (WBS)** | **Release 2** | **Updated WBS**

WBS	Title	Release
1.1	Prime mission product	
1.1.1	Epic 1	
1.1.1.1	Feature 1.1	R1
1.1.1.2	Feature 1.2	R1
1.1.2	Epic 2	R1/R2
1.1.2.1	Feature 2.1	R1
1.1.2.2	Feature 2.2	R1
1.1.3	Epic 3	R1
1.1.3.1	Feature 3.1	R1
1.1.3.2	Feature 3.2	R1
1.1.4	Epic 4	R2/R3
1.1.5	Epic 5	R3/R4
1.2	Program management	All
1.3	Hardware	R1
1.4	Software licenses	R2

Release 1 epics/features: Epic 1 (Feature 1.1, Feature 1.2), Epic 2 (Feature 2.1, Feature 2.2), Epic 3 (Feature 3.1, Feature 3.2)

Release 2 epics/features: Feature 1.3, Feature 2.3, Feature 2.4, Epic 4 (Feature 4.1, Feature 4.2)

Updated WBS

WBS	Title	Release
1.1	Prime mission product	
1.1.1	Epic 1	
1.1.1.1	Feature 1.1	R1 ✓
1.1.1.2	Feature 1.2	R1 ✓
1.1.1.3	Feature 1.3	R2
1.1.2	Epic 2	R1/R2
1.1.2.1	Feature 2.1	R1 ✓
1.1.2.2	Feature 2.2	R1 ✓
1.1.2.3	Feature 2.3	R2
1.1.2.4	Feature 2.4	R2
1.1.3	Epic 3	R1 ✓
1.1.3.1	Feature 3.1	R1 ✓
1.1.3.2	Feature 3.2	R1 ✓
1.1.4	Epic 4	R2/R3
1.1.4.1	Feature 4.1	R2
1.1.4.2	Feature 4.1	R2
1.1.5	Epic 5	R3/R4
1.2	Program management	All
1.3	Hardware	R1
1.4	Software licenses	R2

WBS is Essential to the Cost Estimate in Agile Development

- Department of Homeland Security's Homeland Advanced Recognition Technology (HART) Program (GAO-23-105959)
  - The HART life cycle cost estimate covered government and contractor costs from the beginning of the program's planning activities and was based on a work breakdown structure that included four cost categories.
  - The estimate excluded some costs (*and related cost elements*) due to a lack of data and uncertain requirements that officials planned to further define as the program approached initial operational capability.

> A product-oriented WBS helps ensure that the cost estimate accounts for all costs. It also outlines how program elements progressively subdivide into more detail as new information becomes available.

WBS Anchors Cost and Schedule Estimating

- DOD National Background Investigation Services (NBIS) (GAO-23-105670)
  - Defense Counterintelligence and Security Agency (DCSA), conducts personnel vetting for majority of the federal workforce
  - Originally slated to be fully operational in 2019
- Agile development of NBIS
  - Cost estimate WBS reflects budget categories, not specific NBIS products
  - Schedules did not include a WBS

Without a WBS, the program lacks a framework to develop a schedule and cost plan that can easily track technical accomplishments in relation to the plan as well as completion of activities and tasks.

WBS Supports EVM in Agile Development

- Department of Defense (DOD) F-35's Block 4 modernization (GAO-23-106047)
  - Lockheed Martin's Integrated Program Management Report data for Follow-On Modernization Phase 2.3
- The cost estimation mechanisms for the F-35 Block 4 Modernization Program have not provided visibility into the relative modernization cost growth versus new capabilities
  - Frequent baseline changes due to the inclusion of new scope made the program's EVM data difficult to interpret.

A continual shift of the baseline budget to match actual expenditures results in deceptive baselines by covering up variances early in the program, delaying insight until they are difficult, if not impossible, to mitigate.