![GAO]

Leading Practices: Agency Acquisition Policies Could Better Implement Key Product Development Principles

Erin Carson, Senior Analyst
Contracting and National
Security Acquisitions

GAO-22-104513

GAO

Objectives

1. What are the key principles that guide leading company product development efforts?

2. To what extent do DOD, DHS, and NASA department-wide and primary policies for major acquisitions incorporate key principles that leading companies rely on for successful product development?

Key Principles Enable Companies to Deliver to Market with Speed

Leading Companies Use Four Key Principles for Product Development

Principle 1	Principle 2	Principle 3	Principle 4
Attain a sound business case that is informed by research along with collaboration with customers	Use an iterative design approach that results in minimum marketable products	Prioritize schedule by off-ramping capabilities when necessary	Collect customer feedback to inform improvements to the minimum marketable product

Source: GAO summary of company information. | GAO-22-104513

Key Principle 1:
Attain a Sound Business Case

PRINCIPLE
Attain a sound business case that is informed by research along with collaboration with customers

Sub-principles

1) Invest time to research a marketable product.

2) Solicit early feedback from customers for both hardware and software development.

3) Develop cost/schedule/performance tenets, or parameters, to define project goals before allocating initial funding.

4) Preserve institutional memory and share corporate knowledge in order to develop initial estimates, avoid earlier mistakes, and build on previous success.

5) Continuously evaluate cost, schedule, and performance parameters to ensure a high level of confidence in the project team's ability to deliver the product within cost and schedule targets prior to committing to a public release date.

6) Employ right-sized teams that have sufficient experience and autonomy to develop the product.

7) Willing to end product development if the product no longer has a sound business case.

Source: GAO summary of company information. | GAO-22-104513

Company examples: Qualcomm, Amazon, Kiewit, SpaceX, and Siemens.

Key Principle 2: Use an Iterative Design
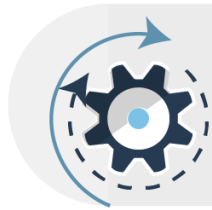
PRINCIPLE
Use an iterative design approach that results in minimum marketable products

Sub-principles

1) Use modern design tools during both hardware and software development that enable multiple design iterations.

2) Use elements of Agile development methodologies that promote iteration in both hardware and software product development.

3) Use iterative design and testing to identify a minimum marketable product that can be followed by successive updates for both hardware and software development.

Source: GAO summary of company information. | GAO-22-104513

Company examples: Amazon, IBM, SpaceX, GE Renewable Energy, and Gulfstream.

Key Principle 3: Prioritize Schedule

PRINCIPLE

Prioritize schedule by off-ramping capabilities when necessary

Sub-principles

1) Use periodic reviews throughout the product development process to monitor project performance, and take steps to ensure development remains on course.

2) Maintain a realistic assessment of product development activities, with a willingness to make difficult decisions about capabilities.

3) Off-ramp capabilities that present a risk to delivering the product on schedule.

Source: GAO summary of company information. | GAO-22-104513

Company examples: Merck, Gulfstream, Siemens, and Qualcomm.

Key Principle 4: Collect Customer Feedback
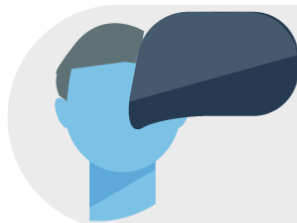
PRINCIPLE

Collect customer feedback to inform improvements to the minimum marketable product

Sub-principles

1)   Establish a process to facilitate ongoing engagement with customers after product release.

2)   Use customer feedback to identify challenges to address and new features to include in subsequent releases.

Source: GAO summary of company information. | GAO-22-104513

Company examples: Amazon, Gulfstream, Carnival Corporation, and Derecktor.

Agency Acquisition Policies Implement Some, but not all, Key Product Development Principles

Key principle	Department of Defense (DOD)	Department of Homeland Security (DHS)	National Aeronautics and Space Administration (NASA)
Attain a sound business case	partially	partially	fully
Use an iterative design	partially	partially	partially
Prioritize schedule	partially	partially	fully
Collect customer feedback	partially	fully	partially

☐ Agency policies **do not** implement the majority of the sub-principles in the key principle

▮ Agency policies **partially** implement the majority of the sub-principles in the key principle

■ Agency policies **fully** implement all of the sub-principles in the key principle

Note: For each agency, we determined the extent to which primary acquisition policies include language reflecting the key principles and sub-principles of product development that our work identified.
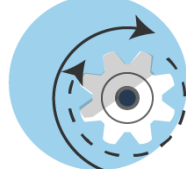
Ongoing Work Addresses Metrics and Methods to Implement Principles

Principle 1

Attain a sound business case that is informed by research along with collaboration with customers

Principle 2

Use an iterative design approach that results in minimum marketable products

Principle 3

Prioritize schedule by off-ramping capabilities when necessary

Principle 4

Collect customer feedback to inform improvements to the minimum marketable product

Source: GAO summary of company information. | GAO-22-104513

- What design tools and methodologies do leading companies rely on to facilitate iterative development of new products?
- What metrics and indicators do leading companies track when undertaking iterative development?

- What tools and metrics do leading companies use to prioritize capabilities?
- What tools and methodologies do leading companies use to incorporate customer feedback to inform delivery decisions for new software and hardware?

GAO

Questions?

For more information, please contact:

Erin Carson

Senior Analyst

Contracting and National Security Acquisitions (CNSA)

carsone@gao.gov

Backup: Legacy Best Practices as Compared to New Leading Practices

	Legacy Best Practices	New Leading Practices
Goals of the work	Provide independent, forward-looking criteria for evaluating DOD acquisition programs	Refresh methodology for new product types and tools and develop criteria applicable to any acquisition program
Types of products	Hardware-centric	Hardware and software hybrid
Emergent priorities	Capability and cost	Schedule
Predominant models	Linear, incremental development	Iterative, agile development
Key theme of findings	Knowledge attainment	Speed to market

Backup: Met with Leading Companies Across Diverse Industries and Products

Company	Primary industry	Product description
Amazon.com	Internet and direct marketing retail	Electronic services that include retail and cloud-computing, as well as consumer electronics, such as Kindle Fire tablets, Fire TV, and Amazon Echo
Carnival Corporation	Cruise line	Commercial ship buyer and operator
Derecktor	Construction	Custom sailing and motor yachts, ferries, and workboats
GE Renewable Energy	Industrial	Onshore and offshore wind platforms, hydropower services, high voltage equipment
Gulfstream Aerospace Corporation	Aerospace and defense	Business-jet aircraft for customers in the U.S. and internationally
IBM	Information Technology	Application software, cloud computing, cybersecurity, information technology infrastructure, and artificial intelligence, among others
Kiewit Corporation	Construction and engineering	Engineering and construction projects for transportation; oil, gas, and chemical; power; building; water/wastewater; industrial; and mining
Merck	Pharmaceuticals	Medicines and vaccines for the prevention, treatment, and control of disease
Planet	Aerospace and data analytics	Satellite data and analytics
Qualcomm	Semiconductors	Integrated circuits and system software for use in wireless voice and data communications, among other things
Siemens	Industrial	Electrical components and equipment, services and products for oil and gas and power generation
SpaceX	Aerospace and defense	Rockets and spacecraft for satellites, cargo, exploration, and other things
Virgin Orbit	Aerospace and defense	Satellite development and launching services

Source: GAO analysis of company information. | GAO-22-104513

GAO

Backup: Recommendations

- We made nine recommendations to DOD, DHS, and NASA to update acquisition policies to fully implement key principles of product development. All three agencies concurred.

  - DOD: Update acquisition policies to fully implement the following principles throughout development:
    - attaining a sound business case;
    - applying iterative design approaches;
    - off-ramping capabilities when needed to maintain schedule; and
    - incorporating feedback from users of initial capabilities

  - DHS: Update acquisition policies to fully implement the following principles throughout development:
    - attaining a sound business case
    - applying iterative design approaches; and
    - off-ramping capabilities when needed to maintain schedule

  - NASA: Update acquisition policies to fully implement the following principles throughout development:
    - applying iterative design approaches; and
    - incorporating feedback from users of initial capabilities