



U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND C5ISR CENTER

Diminishing Manufacturing Sources and Material Shortages (DMSMS) and
Additive Manufacturing (AM)

8 NOVEMBER 2023

DSIAC Webinar

TODAY'S DISCUSSION



Image source: Alpha Stock Images

- DMSMS and Obsolescence
- Proactive vs. Reactive
- Challenges and Resolutions
- Additive Manufacturing (AM)
- How AM Can Support DMSMS

DMSMS OVERVIEW



Diminishing Manufacturing Sources and Material Shortages (DMSMS)

Loss, or impending loss, of manufacturers or suppliers of items, raw materials, or software

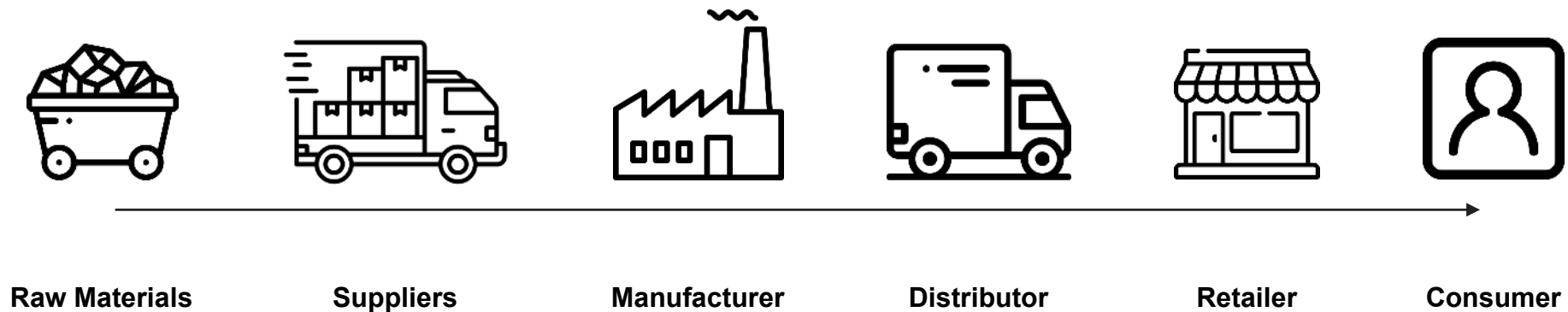


Image source: flaticon.com

Any part of the supply chain can cause a DMSMS issue.

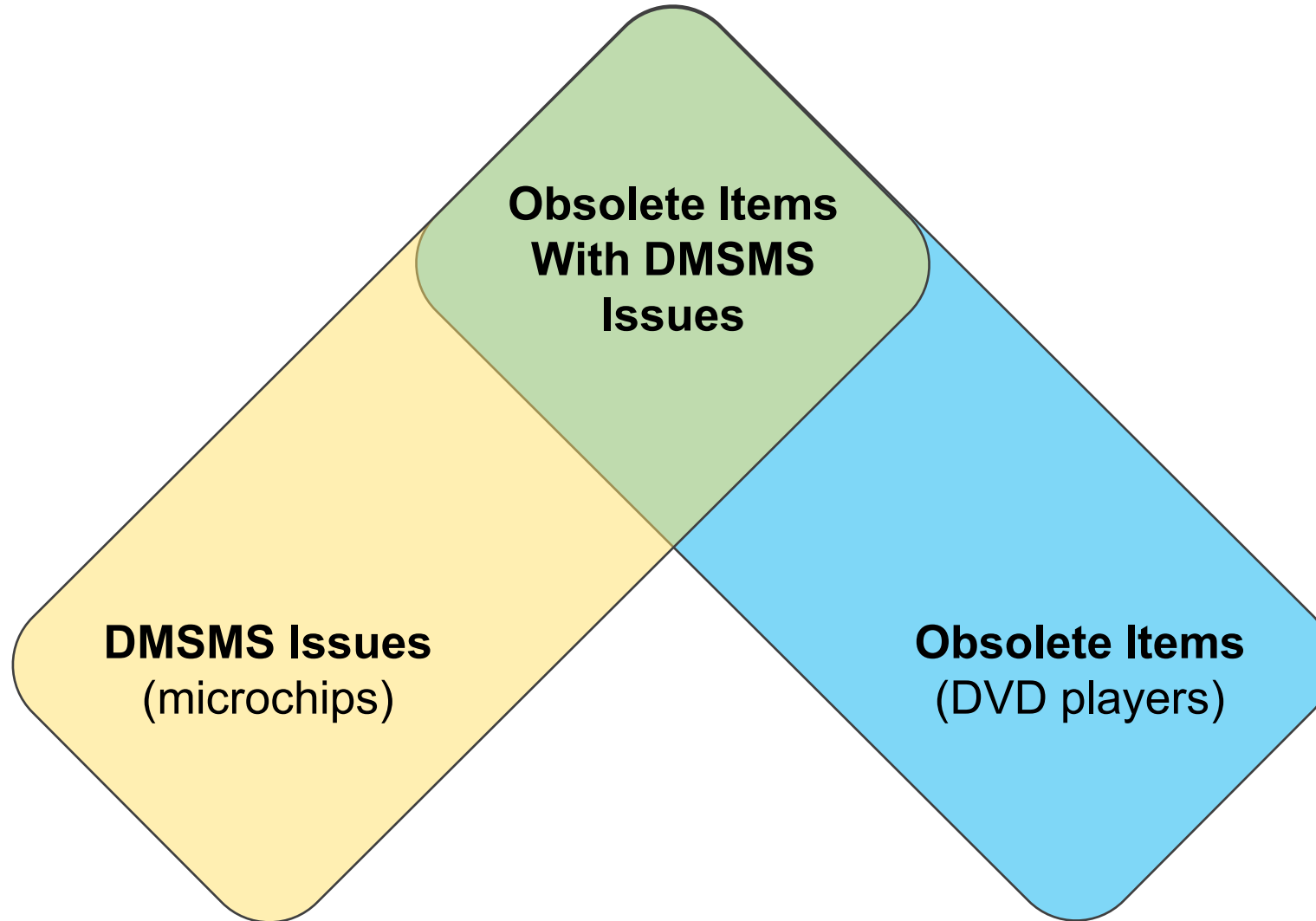
OBSOLESCENCE



- Several official resources define “obsolescence” in slightly different ways:
 - **SD-22:** a part is obsolete when it is “...*out-of-date and superseded by something new.*”
 - **DFARS:** parts which are “...*no longer available from the OEM or an authorized aftermarket manufacturer.*”
 - **IEC 62402:2019:** an obsolete part is one which “...*is no longer in production from the manufacturer in accordance with the original specification.*”

Parts are not obsolete simply because they are hard to find.

DMSMS & OBSOLESCENCE RELATIONSHIP



There is no DMSMS issue if needed quantities can be found.

SD-22: DMSMS BEST PRACTICES



Download PDF: https://quicksearch.dla.mil/qsDocDetails.aspx?ident_number=275490

DMSMS MANAGEMENT PROCESS



Image source: CCDC C5ISR

All things go obsolete eventually.

DMSMS STEPS EXPLAINED



- *Prepare* the foundations for DMSMS processes and management.
- *Identify* items with obsolescence risks.
- *Assess* when and at what level (e.g., item or next higher assembly) to resolve the issue.
- *Analyze* the most cost-effective resolution.
- *Implement* the resolution.
- *Strategize* by evaluating results for DMSMS processes, improving effectiveness and efficiency.

Each of these steps applies throughout the system life cycle.

PROACTIVE VS. REACTIVE

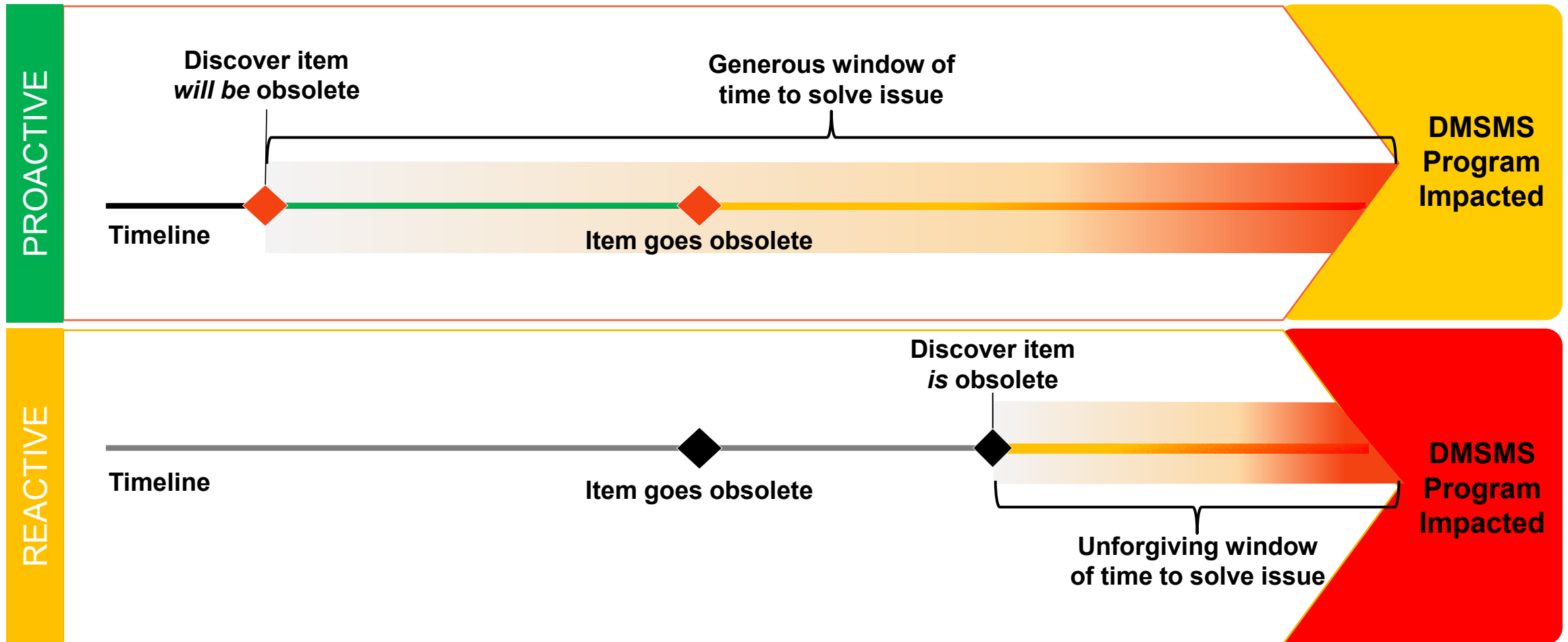


Image source: CCDC C5ISR

PROACTIVITY BEST PRACTICES



- Monitoring and Surveillance
 - Continuous canvassing of commercial market for changes in your parts
- Data Management
 - The what, when, where, and how of data capturing, cataloging, and utilization
- Roadmaps
 - Data visualization tool that identifies when items are to be replaced or refreshed
- Risk Identification
 - Selects and prioritizes items most at risk for current and future readiness or availability impacts
- System Readiness Health Evaluations
 - Snapshot of obsolescence health of the system design
- Case Management
 - Tracks and manages DMSMS issues from identification to resolution



PROACTIVE DMSMS EFFORTS

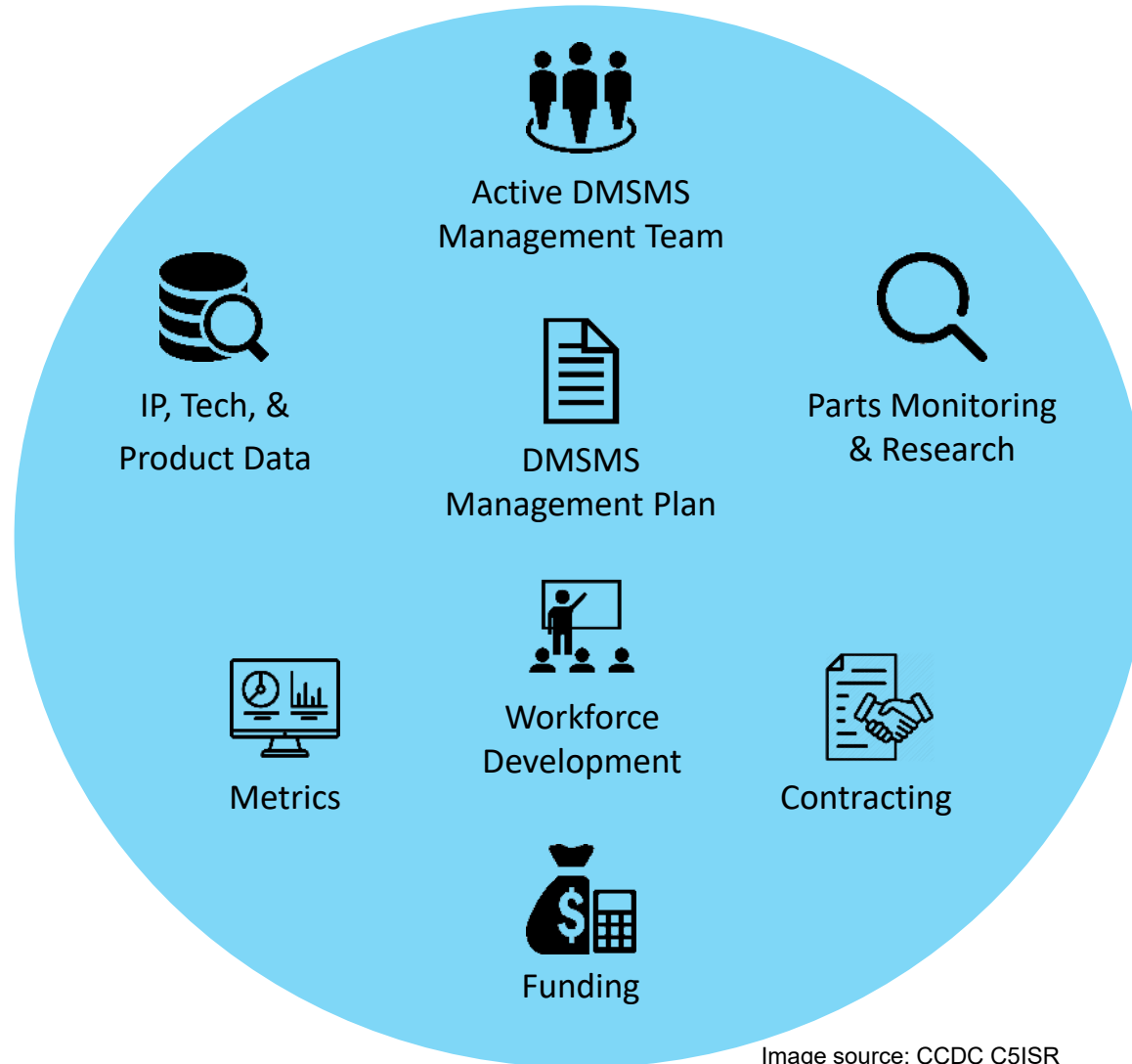


Image source: CCDC C5ISR

A proactive strategy is a collaborative effort between government and industry.

COMMON CHALLENGES



Funding

- Not enough
- Takes too long to get

Economy of Scale

- Manufacturer's minimum production run for part vastly exceeds weapon system demand and/or budget

Lead Time

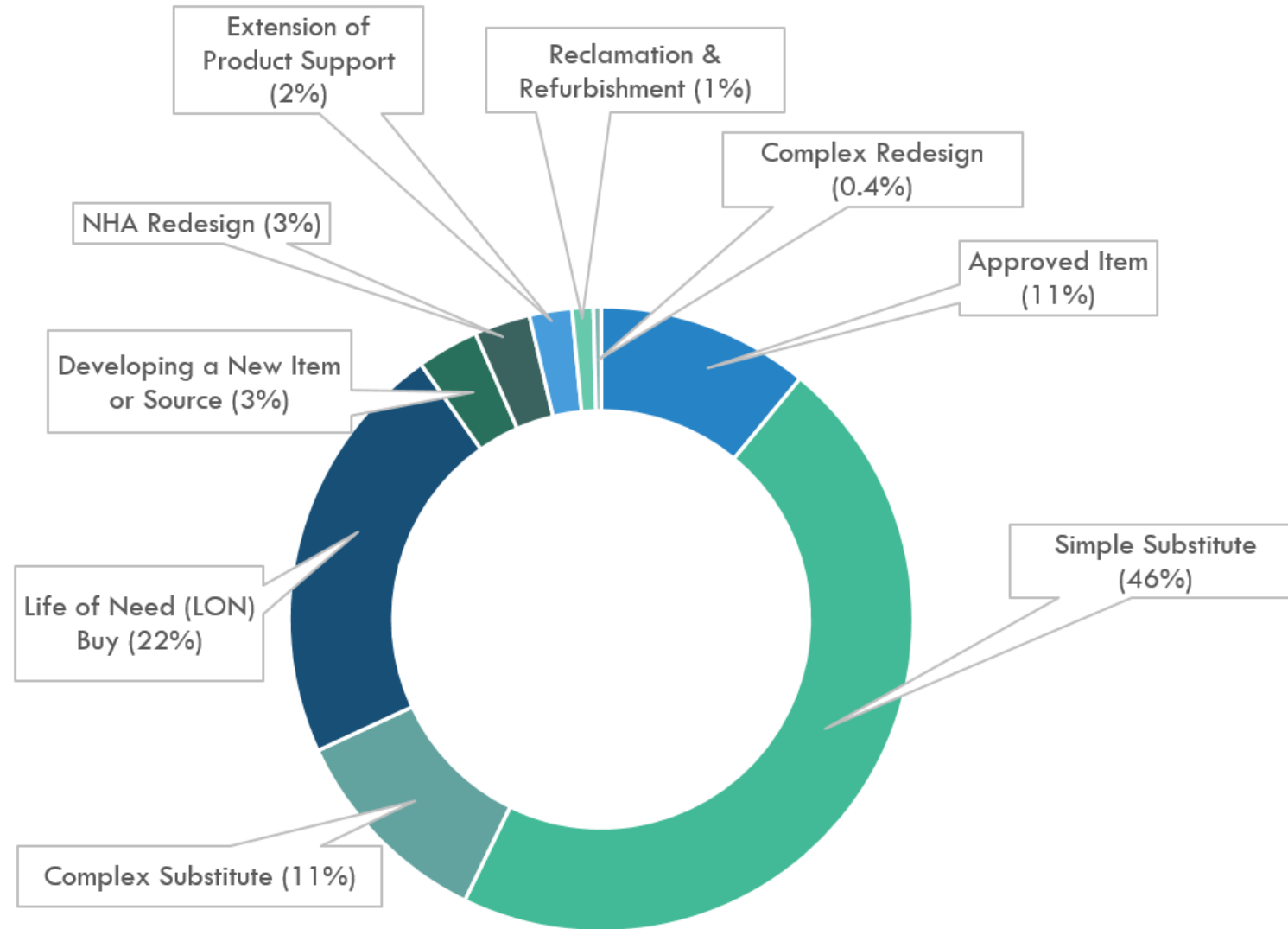
- Too long to get existing parts delivered
- Too long to have parts made

Form/Fit/Function

- New part model has changes that make it difficult or impossible to use with current system design (e.g., PS/2 Port vs. USB)

Teams often face more than one challenge.

DMSMS RESOLUTIONS



Percentages per SD-22



THE QUALITY TRIANGLE

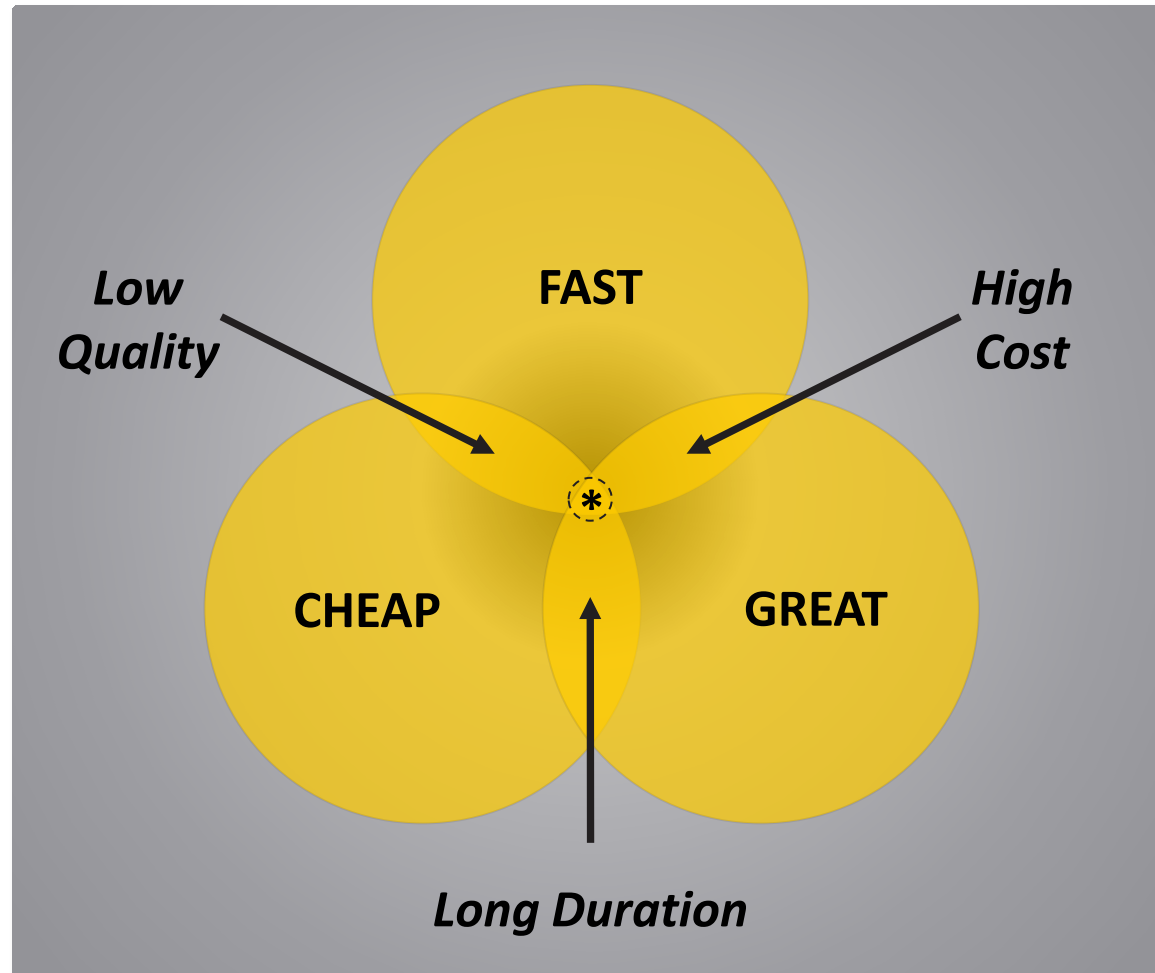


Image source: CCDC C5ISR

** Unattainable*

There are no solutions, only tradeoffs.



ADDITIVE MANUFACTURING....

ATSM DEFINITION

The process of making a three-dimensional solid object of virtually any shape from a digital model using an additive process, where successive layers of material are laid down in different shapes.

- *Seven commonly accepted types.*
- *Rapidly growing industry thanks to advances in computing, machine controls, expiration of original patents, etc.*
- *3D printing is a subset of AM.*

Do weapons system engineers know this definition?

ADDITIVE MANUFACTURING.... WHAT MOST PEOPLE THINK



Image source: Shutterstock.com



Image source: Shutterstock.com



Image source: pexels.com, credit Vanessa Loring

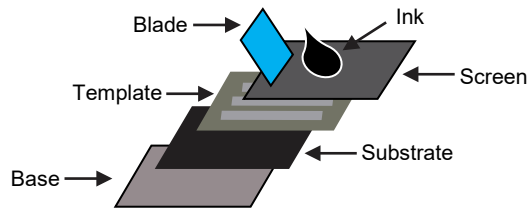
We all know people like this.

HYBRID MANUFACTURING OF ELECTRONICS

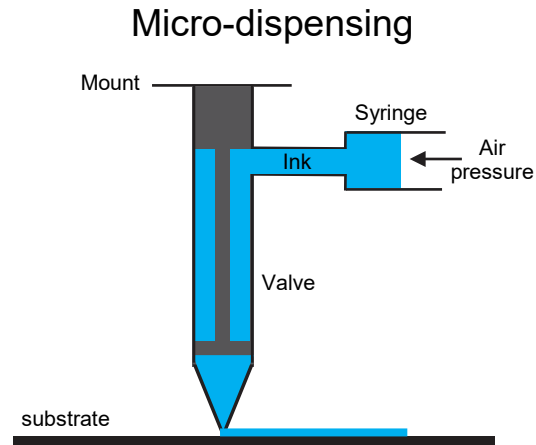


- **Printed electronics** are functional electronic devices or components that were created through an additive process or multiple additive processes. Some of these enable conformal shape printing.

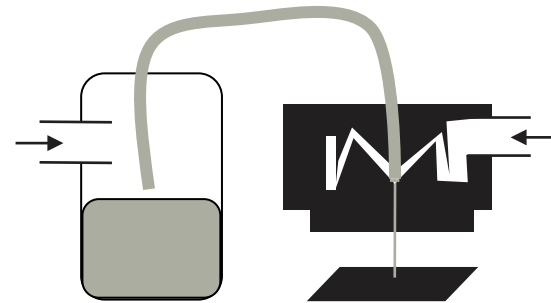
Screen Printing



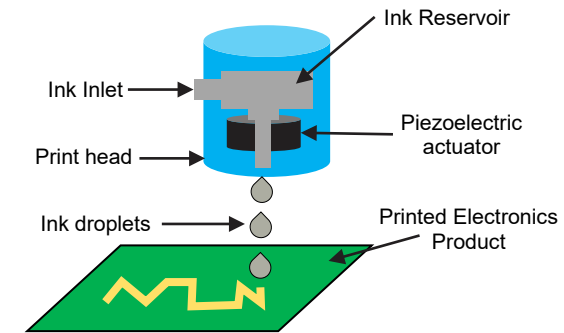
Direct Write



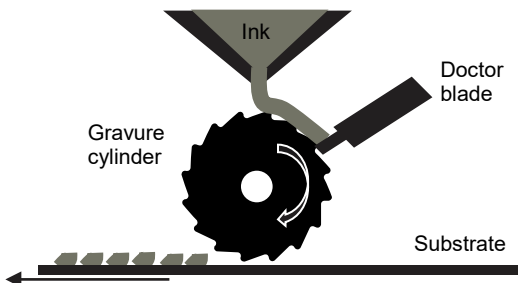
Aerosol Jetting



Inkjet



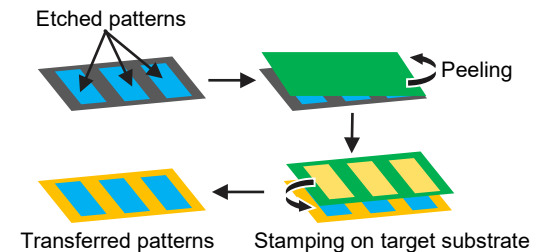
Others



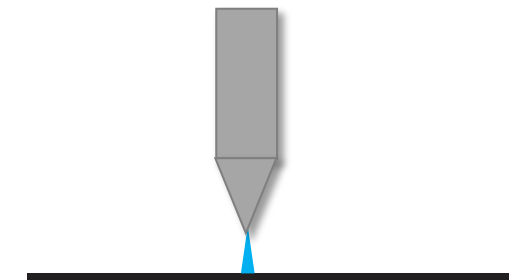
Gravure & Gravure Offset



Nano-imprinting



Transfer Printing/Stamping



Cold Plasma Jetting

HYBRID MANUFACTURING OF ELECTRONICS SUPPORTING MFG.



Polymer Deposition

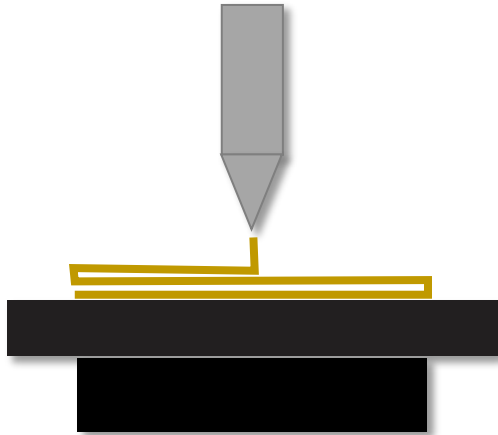


Image source: DSAC

Micro-milling

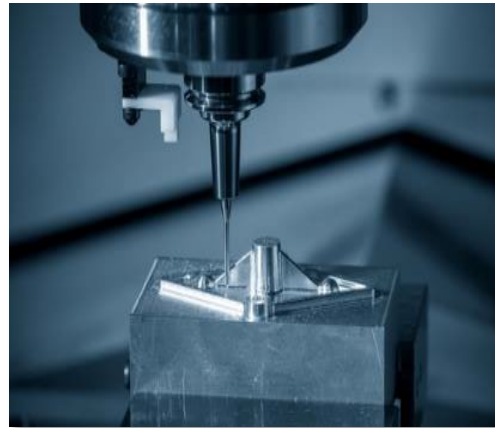


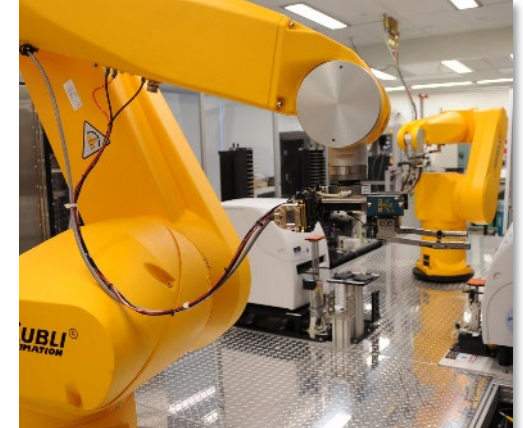
Image source: Shutterstock.com

Laser-Etching



Image source: Courtesy laserax.com

Robotics/Automation



Credit: National Center for Advancing Translational Sciences (<https://www.flickr.com/photos/64860478@N05/5964663403>)

Electro-/Electroless Plating

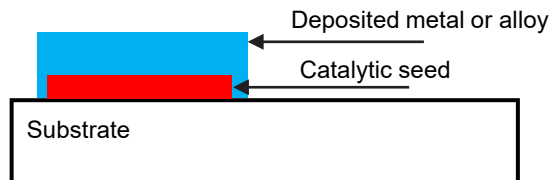
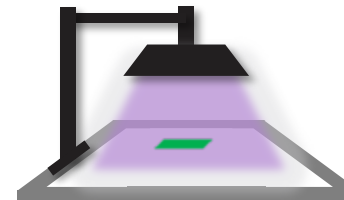


Image source: DSAC

Curing/Sintering



UV



Thermal

MINDSET



~~Cool tech to use, the future is now~~

AM can sidestep your supply chain issue.

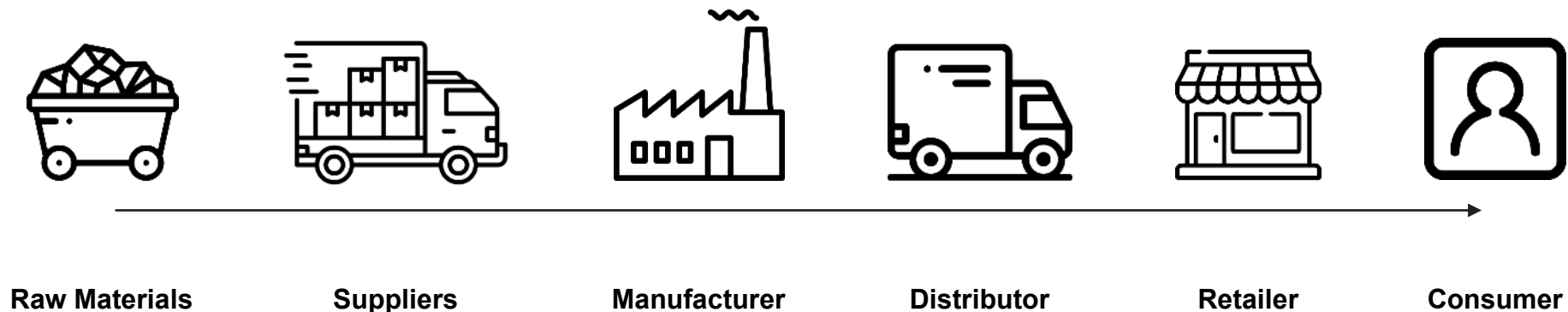


Image source: flaticon.com

AM can support DMSMS resolutions.

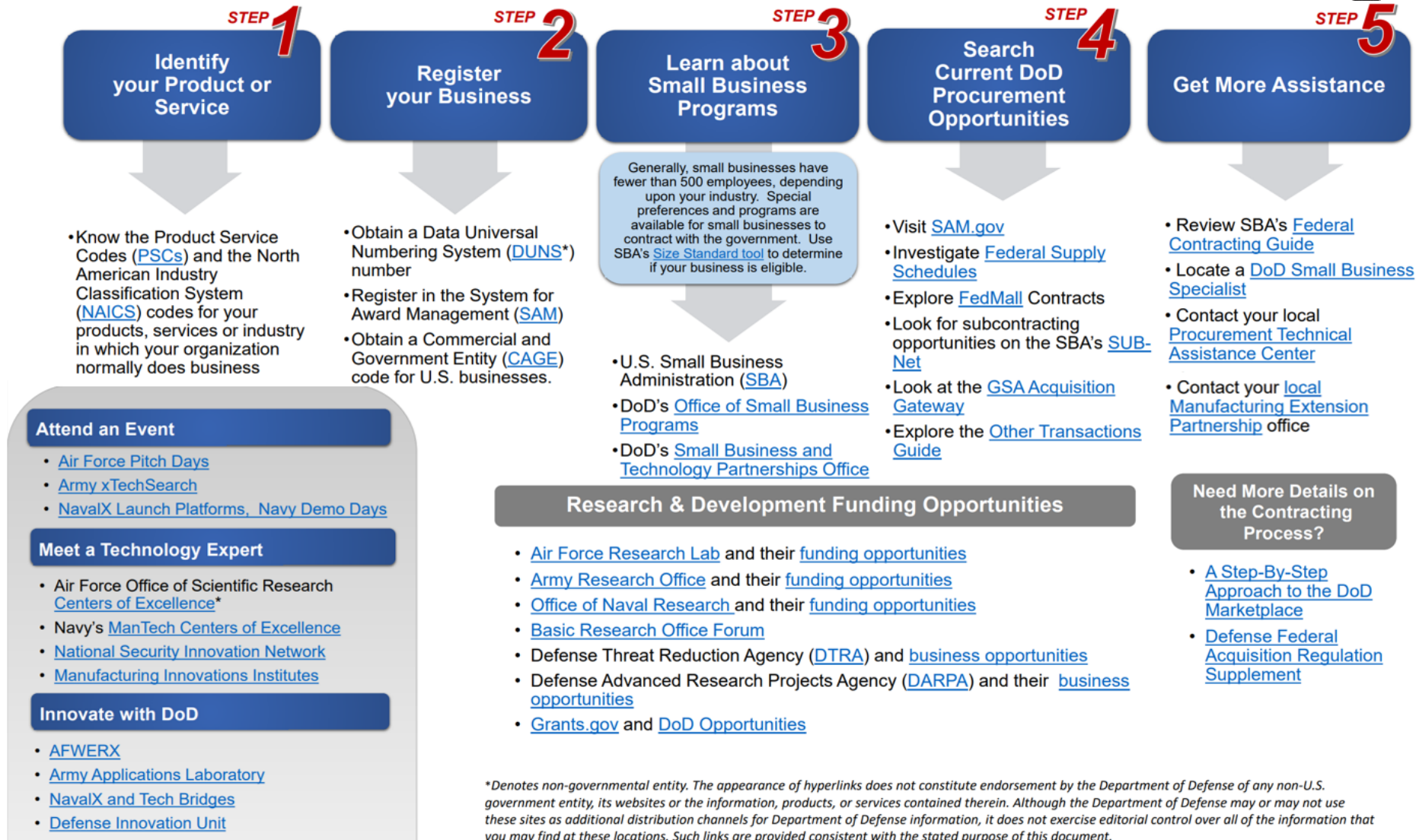
PROMOTE BENEFITS OF AM



- Cost - some applications may be cheaper to 3D print, especially for production runs.
- SWAP (Size, Weight, and Power) - Can be optimized.
 - Topology, strength, heat exchange, etc.
- Unique Designs - Designs that can't be made traditionally.
 - Think internal curved fluidic passages inside a metal block that couldn't be machined out.
- Reduce Part Count - Combine multiple parts into one.
 - One 3D printed waveguide vs. five waveguides for a system.
- Reduced Time - Print parts when you need them as a stop-gap solution to improve readiness.
- Broader Industrial Base and Alternate Solutions - Access to multiple options to meet unique and unexpected needs.

AM can help minimize supply chain and DMSMS issues.

DOING BUSINESS WITH THE DOD



www.businessdefense.gov/docs/resources/Doing-Business-with-DoD-Feb_2022.pdf

CONCLUSIONS



- DMSMS poses significant risk to sustainment of systems.
- This interdisciplinary problem offers opportunities to create an environment of solutions.
- AM introduces diversity and flexibility into DMSMS solutions.

Proactive DMSMS is the goal

OPEN DISCUSSION



Questions & Answers

Ask any questions you may have