



Distributed Learning Gap Report

Needs, Challenges, and Primary Gaps Impacting the Implementation
of Distributed Learning in the DoD

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Executive Summary

This report summarizes the primary gaps identified as a result of the Advanced Distributed Learning (ADL) Initiative's 2016 requirements campaign. Problem areas were identified by examining qualitative data collected from 57 participants from 19 different Federal organizations. A total of 286 gaps were collected through interviews and then consolidated into 24 themes.

In order of priority, the identified gaps in DoD distributed learning included the following:

1. Legacy architecture and closed (stovepiped) applications
2. LMS-centric web-based course content
3. Cybersecurity policies constrain progress
4. Lack of integration with human capital management capabilities
5. Difficulty staying current with learning technologies and standards
6. Performance assessment based on (individual) knowledge recall
7. Access to learning content requires an active network connection
8. Learning content designed for the masses ("one size fits all")
9. Browser incompatibility for learning content on DoD networks
10. Low-level interactivity in learning content ("page-turners")
11. Emerging technologies and specifications are a poor fit for DoD environments
12. Overly complex learning content development and testing processes
13. Resources wasted on independent, often duplicable COTS explorations
14. Deficient online collaboration options
15. Limited bandwidth and network latency problems
16. Impending discontinuation of proprietary software plug-ins (e.g., Adobe Flash)
17. Senior leaders lack awareness of distributed learning obstacles
18. Slow adoption of mobile technologies
19. Overclassification of some distributed learning content
20. Inefficiencies in learning technology acquisition and deployment across DoD
21. Evaluation of the impact of distributed learning is rarely conducted
22. Shortage of cybersecurity expertise in distributed learning organizations
23. Limited access to learning technologies in classified environments
24. Deficient contract language for procuring compliant learning technologies

This report describes the interview methods and analysis processes used in the requirements campaign, as well as the identified gaps and corresponding desired future states.

Background

The DoD faces a growing challenge to meet the breadth, depth, and tempo of its expanding education and training needs. While budgets are shrinking, the complexity of missions is increasing and demands on personnel are growing. Technologies—such as distributed learning capabilities—can help address these challenges, but the training, education, and operations communities must make informed decisions about which technologies to pursue and how to best implement them.

The Advanced Distributed Learning (ADL) Initiative was established to explore how Federal training and education programs and policies can better support flexible, lifelong learning through the use of technology. In 2016, the ADL Initiative conducted a requirements campaign to examine the status quo of distributed learning across the DoD and related Federal security agencies, pinpoint shared distributed learning gaps among stakeholders, and help guide future research and development investments (from ADL Initiative as well as other Federal agencies) to mitigate those gaps.

Methodology

Distributed learning includes a wide range of capabilities, systems, training and education needs, learner requirements, and technologies. Therefore, we used an open-ended qualitative approach for this research project. We identified interview participants through the Defense Advanced Distributed Learning Advisory Committee (DADLAC). Since 2007, the DADLAC has served as an advisory group to foster information exchange, resource sharing, and collaboration across the DoD. The DADLAC includes the ADL Initiative director as well as the Service and Joint distributed learning leads and other invited DoD or Federal distributed learning decision-makers from organizations such as the Office of Personnel Management and Defense Language and National Security Education Office. After participants from a DADLAC organization completed an interview, they were asked to refer other DoD stakeholders for subsequent interviews. Data collection took place from May through August 2016 in a series of 25 telephone-based interviews, including a total of 57 people from 19 different organizations. Table 1 lists the agencies that participated; the list does not include specific office names in order to anonymize individual responses and allow participants to speak frankly.

Table 1. Targeted Stakeholder Participants	
<ul style="list-style-type: none"> • Joint Force Development (J7) • Joint Forces Staff College • Army Training and Doctrine Command • Army Combined Arms Center • Army Research Lab • Army University • USMC College of Distance Education and Training • USMC The Basic School • Marine Corps Systems Command • Naval Education and Training Command 	<ul style="list-style-type: none"> • Naval Seas Systems Command • Naval Postgraduate School • Naval Surface Warfare Center • Air Education and Training Command • Air Force School of Aerospace Medicine • Air University • Department of Homeland Security • Office of Personnel and Management • Defense Language and National Security Education Office

During the interviews participants responded to focused questions about distributed learning gaps (see Table 2), which they received in advance. These questions simply served as guidance to allow for open-ended responses. The entire interview took on the form of a narrative, rather than being grouped by specific data points.

Table 2. Requirements Campaign Interview Questions
<p>Participants were provided with these questions prior to the interview:</p> <ul style="list-style-type: none"> • What types of online learning technology does your organization use? Which provide the most problems? • What is your biggest concern with Systems (Learning, HR, etc.)? Mobile? Peripherals? • Does your organization use an ultra-customized version of a Learning Management System? ...If so, which one? (for smaller organizations, do their sub-components use the larger organization's system?) • What (if any) distributed learning technology issues hinder your organization's ability to develop, deliver, or improve learning experiences? • Do you feel like your organization's decision-makers are well-informed of new educational technologies? ...What could be done to improve that (either way)? • On a scale of 1 to 10, how well does your organization support Cloud-based technologies? • How does an administrator gain access to student records for analysis? • What are some areas where you think the ADL Initiative can help your organization?
<p>The following questions were asked for each area, as described by the last question:</p> <ul style="list-style-type: none"> • On a 1-5 scale (5 being highest), how big of a "win" if completed; how big of a "loss" if not completed? • Do you have any specific guidance, publications, or links to resources that document this area? • What is the impact on organizational readiness if you meet this requirement?

Primary Gaps Impacting Distributed Learning

A total of 286 individual gaps were identified from the interviews. These were then consolidated into 24 themes, which are detailed below. The gaps are listed in descending order of importance based on the total number of occurrences reported by the participants.

Gap 01: Legacy, closed architectures

Current State: Legacy architecture and closed (stovepiped) applications

Desired State: Modernized, service-based, interoperable open architectures

Gap Description: In the DoD, the distributed learning infrastructure includes many legacy applications with closed architectures that limit interoperability and data sharing. These applications have not yet adopted contemporary distributed computing practices for sharing data, such as exposing it through modern web service approaches or Application Programming Interfaces (APIs). As a result, these closed-architecture applications create data silos (e.g., of learner performance data, usage data, learning content meta-data). In other words, the data locked in to the application (often stored in proprietary databases and formats), cannot be shared or aggregated with other data sources. This prevents DoD organizations from integrating heterogeneous applications or assembling “big data” gathered from multiple sources, and it tends to lock organizations into a particular software vendor or version. Unlocking stovepiped applications and data silos could help improve training, education, human capital management; create future efficiencies; and better enable ongoing modernization.

Gap 02: LMS-centric systems

Current State: LMS-centric web-based course content

Desired State: Technology-agnostic content

Gap Description: Historically, “distributed learning” referred to online learning content delivered via a web-browser, connected to a network, and controlled through a Learning Management System (LMS). In this traditional approach, learning content is tightly integrated with the respective LMSs. Today, however, distributed learning involves many more forms and can use a wider variety of delivery media (e.g., mobile devices, simulators, video players, e-readers, and augmented and virtual reality). Correspondingly, there is a need to manage more diverse learning activities and, in particular, monitor learners’ interactions and performance across these various learning opportunities. Such tracking and reporting on learning must be achieved in an interoperable way (i.e., one that prevents data silos). Currently, the DoD still relies heavily on LMSs to deliver distributed learning and document associated learner performance outcomes. Not only does this limit the types of available distributed learning experiences, but (because of the way most LMSs are designed) it also tends to severely restrict the amount and type of performance data that can be stored. DoD stakeholders would like to move to a technology-agnostic content management, learning delivery, and performance tracking system—a system where distributed learning is no longer so tightly federated with LMS technologies.

Gap 03: Cybersecurity compliance processes

Current State: Cybersecurity policies constrain modernization

Desired State: Streamlined cybersecurity compliance processes for new capabilities

Gap Description: All DoD applications that receive, process, store, display, or transmit classified or unclassified data must meet a broad range of cybersecurity regulations, including multiple security and trust policies, personally identifiable information rules, and encryption and classification marking standards. Although recognized as important security measures, the processes required to adhere to these regulations create bottlenecks for implementing new training and education applications, protocols, and data formats. As a result, attempts to integrate new learning technologies often encounter long delays and significant costs—as a direct result of cybersecurity review processes.

For example, consider the Federal Risk and Authorization Management Program (FedRAMP), the cybersecurity approval process for cloud-based products and services. According to [FedRAMP](#) (2016 September), the median cost to vendors to complete the FedRAMP processes is \$2.25 million, with a more than \$100,000 additionally required for ongoing monitoring required to sustain FedRAMP compliance. These costs do not include the additional time and labor resources required on by Government stakeholders who may be involved the process.

In addition to resource challenges, some cybersecurity regulations create access and usability issues. For instance, some overly broad or antiquated cybersecurity regulations cannot be effectively applied to emerging capabilities; for instance, applying Common Access Card (CAC) authentication rules to mobile devices hinder their usability. There is a need to make the cybersecurity compliance processes more efficient and cost-effective for training and education technologies. DoD stakeholders requested more streamlined compliance pathways and also fewer restrictions for those learning technologies that pose little-to-no security risk.

Gap 04: Human capital management

Current State: Lack of integration with human capital management capabilities

Desired State: Integrated human capital management strategy and capabilities

Gap Description: Today, data about a person’s knowledge, skills, training and education outcomes, and operational experiences are scattered throughout various DoD training, education, and human resources applications. DoD needs a capability that enables aggregation of those data across systems as well as a corresponding integrated strategy for using those aggregated data to more effectively conduct holistic human capital management actions. Integrated applications (along with a strategy for using those aggregated data) could, for example, help the DoD have more insight into individuals’ and teams’ competencies, better align training and professional development opportunities to personnel’s needs, gain greater insights into individual and collective readiness, and perform more effective workforce acquisition, management, and optimization functions.

Gap 05: Currency with evolving technologies

Current State: Difficulty staying current with learning technologies and standards

Desired State: Up-to-date learning technology expertise and resources

Gap Description: DoD organizations have difficulty maintaining currency with the latest distributed learning trends, technologies, and standards. Part of the challenge involves a lack of resources for professional development. This creates a gap in acquiring and maintaining the knowledge and skills necessary for technical development, deployment, and measurement of learning. Another part of the challenge is that military network security and software restrictions prevent or hinder organizations from experimenting with the latest learning technologies. As a result, DoD training and education organizations often find themselves years behind the latest software, hardware, and networking capabilities. These organizations need more efficient ways to stay abreast of emerging learning technologies as well as permissive testing environments where they can safely experiment with new capabilities.

Gap 06: Performance assessment

Current State: Performance assessment based on (individual) knowledge recall

Desired State: More robust (individual and team) performance assessment

Gap Description: Traditionally, distributed learning assessment in DoD has involved monitoring an individual's course progress and completion in an online environment, along with basic summative evaluations of that learner's knowledge. These evaluations typically take the form of simple quizzes that assess memorization and basic understanding. Correspondingly, distributed learning instructional design opportunities have been largely limited to the lower-order cognitive domain. However, DoD needs better ways to train, educate, and assess higher-order cognitive skills, applied performance skills, and multi-person team contexts. DoD distributed learning systems need ways to record and assess more diverse learning experiences for both individuals and teams, and they require enhanced assessment methods, which can better address higher-order cognitive skills, as well as affective and psychomotor capabilities.

Gap 07: Distributed learning without persistent network access

Current State: Access to learning content requires an active network connection

Desired State: Both connected or disconnected devices can access learning content

Gap Description: As described in Gap #2 above, "distributed learning" historically referred to online learning content delivered via an Internet (or intranet) connected web-browser. Today, however, DoD needs distributed learning capabilities that can deliver content and receive data without requiring persistent network connections. In other words, learners should also not always require an active Internet (intranet) connection to access distributed learning content or for data about their learning performance to be collected. Local data storage options, synchronization functions, and related software and networking infrastructure are needed to support periods of no connectivity (e.g., aboard ships) and then incorporate

the disconnected learning activities and outcomes into the greater, online distributed learning system once network connections are reestablished.

Gap 08: Personalization and adaptation

Current State: Learning content designed for the masses (“one size fits all”)

Desired State: Personalized and adaptive learning

Gap Description: Personalized learning is instruction that adapts to meet the individual needs of each learner. Today, DoD distributed learning content includes little-to-no personalization. Most e-learning content is delivered using a SCORM-conformant LMS, which allows for basic personalization and content sequencing, but (if it is even used) such sequencing typically takes the form of simple “testing out” of course segments by passing parts of a pre-test. Rarely are more sophisticated adaptive mechanisms used. Yet, incorporating greater personalization into distributed learning could achieve significant gains to learning effectiveness and efficiency. DoD distributed learning offerings—from traditional browser-based e-learning to content delivered via more sophisticated newer technologies—need to more broadly incorporate a greater scope of adaptive functions.

Gap 09: Browser incompatibility

Current State: Browser incompatibility for learning content on DoD networks

Desired State: Consistent browser support of learning content on DoD networks

Gap Description: Most DoD distributed learning content is designed to run in a web browser, and a majority of content created before 2016 was specifically designed for older versions of Microsoft’s Internet Explorer, which does not support modern web standards such as HTML5. Although Microsoft released “Edge” in 2015, a new browser with modern web standards compatibility, many DoD computers still only allow older versions of Internet Explorer. Designing e-learning content for multiple browser brands and versions, each with varying degrees of web standards compatibility, causes major problems.

First, because of the wide range of both personal and DoD web browsers that personnel might use to access DoD distributed learning content, organizations must design web-courses for a wide range of browsers. Inevitably, this introduces inconsistencies and unforeseen errors into courses, which subsequently creates usability problems for learners and often forces organizations to rely on help desks to assist personnel with configuration and access issues.

Yet, even with help desk support, some learners cannot modify their installed applications and must use rigid older browsers. This causes the second major problem; that is, DoD distributed learning developers must create different versions of the same content suitable for both modern and legacy systems. HTML5 content exemplifies this issue. Content developers use HTML5 in lieu of older insecure and proprietary plug-in technologies (most notably Adobe Flash) to natively support embedded audio and video. Multimedia content created before 2016 usually works with the Internet Explorer 11, which allows the use of deprecated plug-ins, but newer standards-based browsers, such as Microsoft Edge, Google Chrome, or Firefox, use HTML5 instead.

In summary, because web content must function in both modern and legacy configurations, distributed learning acquisition efforts require additional development and test time, incur greater financial costs, and involve more code complexity. This also creates an increased reliance on help desk support and, consequently, impacts learners' time and diminishes the quality of their distributed learning experiences.

Gap 10: Interactive Multimedia Instruction

Current State: Low-level interactivity in learning content (“page-turners”)

Desired State: Greater interactivity, built upon learning science best practices

Gap Description: The DoD defines four levels of e-learning interactivity (see *Department of Defense Handbook: Development of Interactive Multimedia Instruction*), and these interactivity levels generally correspond to varying levels of learning (e.g., fact, rule, procedure, discrimination, and problem solving) as well as to the expected learning outcomes (e.g., memorization, understanding, application, judgment, and creativity).

A significant amount of distributed learning content still uses Interactive Multimedia Instruction Level I. These courses—often negatively referred to “page-turners”—involve passive learning with limited interactions, typically just “next” and “forward” buttons with supplementary multiple-choice quizzes. More interactive techniques exist, and when used effectively (i.e., adhering to learning science recommendations), greater interactivity can enhance learner engagement, foster higher-order learning outcomes, and ultimately support more effective learning. DoD distributed learning organizations recognize this interactivity gap and have a desire to incorporate more interactive content. However, they require the necessary resources, tools, and infrastructure needed to more frequently deliver higher-level distributed learning interactivity.

Gap 11: R&D transition

Current State: Emerging technologies and specifications are a poor fit for DoD environments

Desired State: Emerging technologies and specifications transition smoothly into DoD use

Gap Description: Many DoD organizations cannot easily adopt emerging learning concepts, technologies, and software standards—even those developed by DoD laboratories. Too often, new capabilities are developed without full consideration of DoD implementation restrictions, compatibility challenges, or end-user expectations. As a result, organizations must spend unnecessary time and resources retrofitting new technologies to function in DoD contexts (or they simply preserve with poorly suited systems). Early coordination between R&D entities and DoD stakeholders could mitigate this challenge. Thus, there is a need for DoD organizations to become involved with R&D efforts early, such as in the initial requirements-gathering stage. This will facilitate a smoother downstream transitions and increased compatibility with existing DoD policy and infrastructure.

Gap 12: Content testing, creation, and maintenance

Current State: Overly complex learning content development and testing processes

Desired State: Streamlined learning content lifecycle processes and tools

Gap Description: Testing, deployment, and maintenance of distributed learning content are overly resource-intensive, time-consuming, and complicated. Currently, developing and testing new content requires specialized professionals with extensive knowledge of and experience with advanced distributed computing concepts, programming, cybersecurity, learning technology standards, and content management practices. In fact, most DoD distributed learning organizations require a dedicated support staff just for troubleshooting these activities.

Commonplace distributed learning content should not encounter so much technical complexity. For instance, creating SCORM-conformant e-learning content should not routinely involve testing and implementation hurdles. Better standards, processes, content testing, and content authoring tools are needed. Developing these will speed acquisition timelines and free specialize DoD distributed learning staff to spend time on more valuable pursuits, such as evaluating distributed learning effectiveness or incorporating advanced learning analytics into their systems.

Gap 13: COTS transition

Current State: Resources wasted on independent, often duplicable COTS explorations

Desired State: Streamlined interagency COTS analyses and integration pathways

Gap Description: Often, DoD programs identify Commercial-Off-The-Shelf (COTS) software and tools that could meet their requirements. They spend time individually prototyping, piloting, and evaluating the technologies—only to later discover it would be too difficult and costly for these tools to gain approval to use these tools in a DoD context. DoD organizations need an independent COTS software evaluation process to help integrate efforts across the Department, as well as centralized way to streamline the approval, acquisition, and deployment of new distributed learning COTS software and capabilities.

Gap 14: Collaboration software

Current State: Deficient online collaboration options

Desired State: Enterprise collaborative learning capabilities

Gap Description: Distributed learning can involve many forms, including synchronous lessons where the learners and instructor collaborate simultaneous with the support of a groupware application. Currently, Defense Collaboration Services (DCS) is the only approved software approved and provided for DoD networks. However, DCS users frequently report access, performance, and usability problems that substantially affect the learning experience. Commercial and academic learning environments (outside of DoD) already use sophisticated and stable groupware platforms. DoD needs an enterprise collaborative software solution, which can integrate with existing applications and media, to improve education and training opportunities across the entire Department.

Gap 15: Bandwidth and network latency

Current State: Limited bandwidth and network latency problems

Desired State: Network optimization and low latency

Gap Description: Some DoD organizations consistently encounter poor network performance when streaming videos or interactive multimedia content, such as web-based simulations and virtual worlds. For instance, DCS can take 30 to 60 seconds to simply render a PowerPoint slide shared on an instructor’s screen. These latency problems not only affect remote teams in poorly connected locations around the world; they also occur in CONUS learning centers and schoolhouses—even those using local networks. Many factors contribute to this issue, including such as bloated applications and protocols, network congestion, cybersecurity restrictions, and the need for modernized infrastructure and networking optimization mechanisms. A multifaceted approach will be required to mitigate the latency issues, and, in turn, support increasingly bandwidth-hungry applications, meet learners’ expectations for responsiveness, and support quality, interactive learning experiences.

Gap 16: Proprietary browser plug-ins

Current State: Impending discontinuation of proprietary software plug-ins (e.g., Adobe Flash)

Desired State: Learning content no longer depends on proprietary plug-ins

Gap Description: A significant amount of DoD e-learning content uses legacy, proprietary browser plug-ins, such as Java and Adobe Flash, for its delivery. Reliance on propriety plug-ins not only limits flexibility and restricts modernization, but it can also pose security risks. Java and Adobe Flash, for instance, are no longer supported in modern, secure, standards-based browsers, such as Microsoft Edge, Chrome, and Firefox. This means that older distributed learning content, if it relies on legacy plug-ins, no longer functions correctly in contemporary browsers.

As mentioned in Gap #9, above, dependence on Adobe Flash poses a considerable challenge. For now, most DoD organizations are attempting to support backward compatibility of Flash-based content by developing multiple, redundant content versions, suitable for different browsers. However, a DoD-wide strategy and phased approach for addressing the obsolescence of Flash, and other plug-ins, is needed. More than that, DoD organizations need a broader lifecycle management strategy for distributed learning content, so that organizations can more smoothly modernize their content delivery mechanisms without interruptions to training and education schedules or negative impacts on mission readiness.

Gap 17: Leadership expectations for new technologies

Current State: Senior leaders lack awareness of distributed learning obstacles

Desired State: Senior leaders have realistic understanding of technology capabilities

Gap Description: DoD senior leaders and executives need to understand both the promise *and challenges* of emerging learning technologies. Commercial vendors and popular media can create a “hype” around new technologies, instilling a sense of excitement without fully conveying an

understanding of implementation restrictions and learning science considerations. Senior leaders sometimes learn about new technologies through these marketing-heavy channels and then push for technical solutions without completely understanding the feasibility of adopting those capabilities in DoD learning environments. Relatedly, interviewees reported that senior leadership tend to focus resources towards initiative that will meet future learners' need, while neglecting the obstacles faced by personnel today. Hence, there is a need to better inform and engage senior leaders about the obstacles associated with learning technology; so they can make more informed technology decisions—for both today's and tomorrow's learners.

Gap 18: Mobile learning

Current State: Slow adoption of mobile technologies

Desired State: Streamlined processes for developing and deploying mobile learning

Gap Description: DoD mobile devices fall into one of two categories: Government Furnished Equipment (GFE) or personal devices (i.e., Bring Your Own Device [BYOD]). Both categories face challenges. GFE devices must adhere to stringent trust and security restrictions, while personal devices have greater variability (for instance, in screen size, targeted operating system, version, and connectivity) making the design and development of their apps potentially more complex and volatile. Adding another layer of complexity, the deployment of mobile applications is also regulated, such as through Mobile Device Management (MDM) processes or DoD-controlled app stores. Because of the multi-faceted challenges and requirements associated with mobile technology development and deployment, DoD learning environments have been slow to adopt mobile technology. Mobile technologies, such as smartphones, hold significant and growing promise for performance support and mobile learning. Their use in DoD should not be marginalized due to security requirements or slow software approval processes. Instead, DoD must find a way to meet regulations while also accelerating development and approval processes. To do this, DoD needs better processes, guidelines, and tools for developing and deploying mobile technology.

Gap 19: Overclassification

Current State: Overclassification of distributed learning content

Desired State: Better calibrated processes and policies for learning content classification

Gap Description: By default, most DoD distributed learning content is classified as For Official Use Only (FOUO). As a result, a significant amount of content is unjustifiably overclassified, unnecessarily limiting its access in unclassified learning environments, by interagency and international partners, and via mobile applications. The distributed learning content classification process needs to be modernized and refined, so that Defense personnel and our military partners can more readily access non-sensitive learning materials. The DoD training and education community also requires the capabilities and resources to improve distributed learning content classification and distribution policy and processes, including pathways to retroactively reduce or remove inappropriate classification markings on existing materials.

Gap 20: Duplicative learning applications

Current State: Inefficiencies in learning technology acquisition and deployment across DoD

Desired State: Consolidated DoD learning applications

Gap Description: Throughout the Department, various distributed learning IT systems, such as LMSs and student information systems, provide equivalent or duplicate functionality. Duplication may occur from lack of awareness, a too-narrow focus (e.g., procuring software based purely on the network performance or itemized requirements of a single geographical location), or out of a desire for local control. Although DoD and other Federal memos periodically instruct organizations to find resource savings by consolidating their IT systems (e.g., Secretary of Defense Memo, 17 Feb 2017, OSD001246-17/CMD001796-17), more than motivation and top-down guidance is required. Interviewees expressed a desire to eliminate duplications, but acquisition barriers prevent this. Before greater consolidation of IT systems can occur, Department-wide solutions must address the many challenges associated with procurement and licensing of learning applications. Once those bottlenecks are resolved, then distributed learning organizations will be freed to explore greater efficiencies through consolidation.

Gap 21: Learning impact evaluation

Current State: Evaluation of the impact of distributed learning is rarely conducted

Desired State: Empirical evaluation of distributed learning impacts

Gap Description: DoD programs lack sufficient mechanisms for assessing the quality and impact of their distributed learning offerings. While various evaluation models (e.g., Kirkpatrick's Four Levels) exist, many programs lack the resources or support necessary to establish mature evaluation strategies for their distributed learning systems.

To additionally complicate matters, many DoD distributed learning environments use SCORM to record and report on learners' course completion and assessment scores. SCORM lacks robust performance tracking and analysis capabilities. This restricts the data available for analyses, and it further hinders organizations' ability to evaluate the effectiveness of their training and education offerings. As a result, there is typically no evidence of longitudinal retention and no opportunity to correlate distributed learning outcomes to actual job performance. Similarly, organizations cannot correlate personnel's distributed learning experiences to other training/education outcomes, developmental experiences, job performance, or duty assignments.

The use of SCORM (and its limited assessment model) exacerbates the problem; however, this issue primarily derives from a lack of strategy with regard to evaluating distributed learning impacts. Due to the contractual nature of content development and delivery, content vendors are not incentivized (or resourced) to evaluate its longitudinal impact or broader effectiveness. Similarly, program managers typically lack the resources or top-down approval to pursue such broad, cross-cutting evaluations.

Gap 22: In-house cybersecurity expertise

Current State: Shortage of cybersecurity expertise in distributed learning organizations

Desired State: Dedicated cybersecurity resources for distributed learning organizations

Gap Description: Many DoD distributed learning organization have too few cybersecurity personnel with knowledge of and expertise with Defense software and data security requirements. This issue is likely to grow in severity, as cybersecurity requirements expand and complex new technologies, such as distributed computing and big data opportunities, evolve. DoD learning programs need dedicated cybersecurity professionals, who can keep pace with the growth of learning technology and stay ahead of cyber threats.

Gap 23: Classified environments

Current State: Limited access to learning technologies in classified environments

Desired State: Equal support for learning technologies in classified environments

Gap Description: Learners in classified environments need better access to distributed learning. Classified environments necessarily have more stringent access controls and heavier security restrictions for software applications, content, and data. Classified distributed learning content (delivered in a classified environment) also inherently incurs stricter regulations, due to the nature of the learning materials. However, classified environments also restrict outside access to unclassified resources and systems, which limits options for personnel to access learning content or applications, creates firewalls that often overly restrict content and data interoperability, and sometimes results in manual data entry of learning outcomes or performance data. Distributed learning organization need processes and system that safely provide equivalent opportunities for accessing and delivering distributed learning content and tracking learners' associated performance in classified environments.

Gap 24: Contracting language

Current State: Deficient contract language for procuring compliant learning technologies

Desired State: Detailed learning technology acquisition contract development guidance

Gap Description: Defense organizations must take special care when writing acquisition documents, in order to successfully address rapidly advancing learning technologies, web standards, cybersecurity requirements, and licensing best practices. While DoD programs frequently share their experiences and lessons learned with one another, interviewees suggested more could be done—at an enterprise level—to provide consistent acquisition language and detailed guidance for distributed learning programs. These programs particularly struggle to author contracts that meet evolving requirements for learning technologies, content, and technology standards, such as xAPI. Developing validated contract examples and templates, for use across DoD, could help address this issue.

Summary

A total of 24 gap themes were identified from 286 unique gaps as a result of the 2016 ADL Requirements Campaign. The sheer number of gaps identified implies that Defense distributed learning stakeholders are facing significant obstacles. Several of the gaps likely stem from larger IT infrastructure challenges, and solving these will require collaboration and integration of resources across many Federal organizations. Some of the gaps might also be unique to certain DoD organizations, their acquisition processes or program funding abilities.

Given the amount of anticipated complexity involved in analyzing these gaps, it is recommended that a follow-on gap analysis report be produced. A deeper analysis of the gaps would provide a clearer picture of the related issues and enable the development of resolution strategies.

Summary of Findings

(in order of priority)

#	Status Quo (Gaps)	Desired End State
1	Legacy architecture and closed (stovepiped) applications	Modernized, service-based, interoperable open architectures
2	LMS-centric web-based course content	Technology-agnostic content
3	Cybersecurity policies constrain progress	Streamlined cybersecurity compliance processes for new capabilities
4	Lack of integration with human capital management capabilities	Integrated human capital management strategy and capabilities
5	Difficulty staying current with learning technologies and standards	Up-to-date learning technology expertise and resources
6	Performance assessment based on (individual) knowledge recall	More robust (individual and team) performance assessment
7	Access to learning content requires an active network connection	Both connected or disconnected devices can access learning content
8	Learning content designed for the masses ("one size fits all")	Personalized and adaptive learning
9	Browser incompatibility for learning content on DoD networks	Consistent browser support of learning content on DoD networks
10	Low-level interactivity in learning content ("page-turners")	Greater interactivity, built upon learning science best practices
11	Emerging technologies and specifications are a poor fit for DoD environments	Emerging technologies and specifications transition smoothly into DoD use
12	Overly complex learning content development and testing processes	Streamlined learning content lifecycle processes and tools
13	Resources wasted on independent, often duplicable COTS explorations	Streamlined interagency COTS analyses and integration pathways
14	Deficient online collaboration options	Enterprise collaborative learning capabilities
15	Limited bandwidth and network latency problems	Network optimization and low latency
16	Impending discontinuation of proprietary software plug-ins (e.g., Adobe Flash)	Learning content no longer depends on proprietary plug-ins
17	Senior leaders lack awareness of distributed learning obstacles	Senior leaders have realistic understanding of technology capabilities
18	Slow adoption of mobile technologies	Streamlined processes for developing and deploying mobile learning
19	Overclassification of some distributed learning content	Better calibrated processes and policies for learning content classification
20	Inefficiencies in learning technology acquisition and deployment across DoD	Consolidated DoD learning applications
21	Evaluation of the impact of distributed learning is rarely conducted	Empirical evaluation of distributed learning impacts
22	Shortage of cybersecurity expertise in distributed learning organizations	Dedicated cybersecurity resources for distributed learning organizations
23	Limited access to learning technologies in classified environments	Equal support for learning technologies in classified environments
24	Deficient contract language for procuring compliant learning technologies	Detailed learning technology acquisition contract development guidance