

# Enterprise Course Catalog (ECC) Minimum Viable Product (MVP)

## Test & Evaluation Report

22 March 2022

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# **Enterprise Course Catalog (ECC) Minimum Viable Product (MVP) Test & Evaluation Report**

10 Jan 2022



## **EDUCATION COURSE CATALOG**

A single Defense-wide training and education course catalog made up of consolidated distributed learning course listings across the DoD which is accessible through a single web-based portal.



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## Executive Summary

### Purpose of this Document

The *Enterprise Course Catalog (ECC) Minimum Viable Product (MVP) Test & Evaluation Report* provides findings from the ECC MVP test and evaluation (T&E) conducted with designated DoD stakeholders at the end of FY21.

### Target Audience and Intended Use

- School administrators, decision makers, and instructional technologists
- Track progress on ECC MVP KPIs, gain insight into usability and existing functionality, and capture opportunities for future development.

**Description of Effort:** The ECC MVP was deployed in the ADL's IT Sandbox to support testing activities. Designated Stakeholder Representatives (DSRs) from the ECC's defense-wide Integrated Program Team (IPT) provided staff to participate in a series of testing activities centered on different ECC users (i.e., learners, managers, administrators). Testing compared typical workflows, processes, and common tasks performed by each role using the ECC and other non-ECC catalog systems and tools. Search times for ECC and non-ECC scenarios were compared. Comments and usability ratings were captured. Joint Knowledge Online (JKO), Air Education and Training Command (AETC), Defense Acquisition University (DAU), the Defense Logistics Agency (DLA), and the Defense Civilian Personnel Advisory Service (DCPAS) provided personnel to participate in this test.

**Key Findings:** Usability scores ranged from 3.8 to 4.4 out of 5 indicating overall positive response to the ECC portal. Test results also show that the ECC MVP meets or exceeds many of the KPIs defined for the project. Table 1 provides the performance target along with performance achieved at the end of FY21. Usability testing was also performed simultaneously with other tests.

*Table 1. ECC MVP KPI progress overview. Summary of ECC KPIs, targeted metrics, and results achieved based on testing*

<i>Key Performance Indicator (KPI)</i>	<i>Target</i>	<i>Achieved</i>
<b>Infrastructure</b>		
<ul style="list-style-type: none"><li>• Number of connected course catalog systems</li></ul>	<b>4</b>	<b>2 live</b> – Courses available for testing were collected in real-time from live instances of edX and DAU course catalogs <b>2 emulated</b> – AETC and JKO used cached versions of their local course catalog to populate available ECC courses
<ul style="list-style-type: none"><li>• Number of unique courses within repository</li></ul>	<b>60K</b>	<b>Approximately 2,000</b> -- discoverable courses (containing required attributes) from connected systems
<b>IMPACT: Accessibility</b>		
<ul style="list-style-type: none"><li>• Time saved</li></ul>	<b>10%</b>	<b>31%</b> -- search scenarios using ECC were completed on average, 31% faster, then when using non-ECC systems.
<ul style="list-style-type: none"><li>• Cost saving</li></ul>	<b>500k</b>	<b>Estimated \$1.2M</b> – cost savings based on time savings above and OPM FedScope salary data on 768,285 personnel

<i>Key Performance Indicator (KPI)</i>	<i>Target</i>	<i>Achieved</i>
<b>IMPACT: Manage course Metadata</b>		<i>Not tested</i>
<ul style="list-style-type: none"> <li>Time savings associated with managing course information</li> </ul>	<b>10%</b>	N/T
<ul style="list-style-type: none"> <li>Cost savings associated with ECC MVP use</li> </ul>	<b>500k</b>	N/T

**Limitations:** Testing and evaluation was constrained to the ECC's existing features, functions and number of courses. This may have contributed to the *degree* of difference observed between ECC and non-ECC search times.

**Next Steps:** Next steps focus on providing feedback to developers, continuing to work with DSRs to integrate ECC with native course catalogs, and refining KPI testing approach.

- **Feedback to ECC development team.** Usability ratings suggested ECC MVP is intuitive and easy to use. Although ratings were positive, improvements are recommended in areas of search efficiency and system responsiveness. Feedback from participants included recommendations for improvements to the existing ECC portal (e.g., removing coding syntax in course names and descriptions, improve search queries to differentiate between courses with the same name). Other recommendations include new features or capabilities (e.g., add an "E-mail: Library PoC" option, along with each Search result, to ask additional questions, and a 'Saved Search' option).
- **Increase ECC course catalog fidelity.** Continue to work with DSRs to integrate with local course catalogs to extend the number of courses available within the ECC.
- **Leverage insights to improve KPI assessment as ECC transitions to operational capability.**
  - Improve ECC testing method and scenarios (e.g., allow participants to perform search in a more natural manner, leading to more realistic estimates of time to complete search activities and time savings realized when using ECC.
  - Refine assumptions for estimating cost savings. Work with DSRs to develop a better understanding of the frequency of Experience Consumer search activities, and develop more refined estimates of the organizational demographics and the distribution of personnel across various pay grades and structures.
  - Expand to include estimates of cost savings based on reduction of duplicate course acquisition.

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# Enterprise Course Catalog (ECC) Minimum Viable Product (MVP) Test & Evaluation Report

## 1.0 Objectives

Evaluate initial Enterprise Course Catalog (ECC) Minimum Viable Product (MVP) prototype deployed within the Advanced Distributed Learning (ADL) Initiative's Sandbox at the end of FY21 against the functional infrastructure and user impact KPIs set forth by the ADL Initiative in 2020 (and documented in the strategic plan), as well as gather usability feedback and future requirements from designated representative stakeholders.

## 2.0 Background

Organizations, civilian and military, invest resources and develop software systems to meet their own individual organizational needs. This is similarly the case with Training and Education course catalog systems and has resulted in hundreds of different education and training communities using a wide variety of methods to describe and publish their learning activities. Hundreds of proprietary and disconnected catalog capabilities exist across the DoD. From an organizational perspective the present lack of commonality and interoperability results in inefficiency and duplication of efforts developing and managing training and education resources; and from a consumer perspective, a lack of awareness of and access to available learning opportunities. Furthermore, existing course catalogs are not architected to easily transfer data about learning activities between the different DoD systems that require these learner data. Catalogs integrated into proprietary platforms use pre-determined, point-to-point connections to transfer data between systems, which results in lengthy integration efforts for each connected system. These systems rarely accommodate new and emerging types of learning activities, such as e-books, mobile devices, augmented reality, or simulations, and they fail to provide insight into the learning activities that comprise each course. Current course catalogs also use sparse, non-standard metadata to describe their courses, which limits the ability to share resources across DoD components and identify course duplication.

As ADL and its partners move toward Enterprise-level solutions facilitating sharing and reuse of resources across organizations, the ECC is being developed to consolidate various listings of learning opportunities and resources currently contained in 'silos' into a Defense-wide training and education course catalog accessible through a single web-based portal. The enterprise capability promotes search, discovery, and alignment of DoD courses, approved learning activities, and other resources through one seamless interface supporting timely access to course information.

### 2.1 System Under Test (SUT): Enterprise Course Catalog Minimum Viable Product

In September 2020, the ADL Initiative kicked off the development of an operational MVP ECC capability. The ECC Prototype was developed by Deloitte and edX, completed in September 2021, and is housed in the ADL Sandbox. The Sandbox was developed by ADL in collaboration with the Office of Personnel Management's (OPM) USALearning to accommodate technical experimentation with the 2019 TLA Reference Implementation (<https://adlnet.gov/news/2020/01/20/ADL-Initiative-established-a-TLA-Sandbox-project/>). The sandbox provides client-side access points for integration with different learning-



delivery systems such as Learning Management Systems (LMSs) or ebooks and supports test and evaluation of developmental systems such as ECC.

The ECC is a learning experience discovery service that aggregates courses and other learning resource metadata housed across various internal and external sources to promote the discovery and accessibility of these learning opportunities.

The system is made up of three components, or independently deployable software services. These components include the ECC Client Tier, the Application Tier, and the Data Tier. The ECC *Client Tier* represents the user-facing aspect of the system designed to enable human or external system/machine interactions; the *Application Tier* represents the core logic of the system; and the *Data Tier* represents the resources external to the ECC system made available to the system for processing.

Each component is made up of one or more software packages, libraries, or modules. The Client Tier includes the *Experience Discovery Service (XDS)* which is the course catalog interface or portal facilitating discovery of learning experiences by learners and supervisors (Figure 1) and the *Experience Management Service (XMS)* which enables experience owners/managers to modify metadata. The Application tier includes *Experience Index Agents (XIA)* which are automated scrapers/bots that extract, transform, and load learning experience metadata from source course catalogs into ECC and *Experience Index Service (XIS)* which integrates metadata collected by XIAs with metadata provided by Experience Owners and/or Experience Managers. Finally, the Data Tier includes the *Enterprise Schema Service (XSS)* which is the Total Learning Architecture (TLA) component responsible for managing pertinent object/record metadata schemas and metadata mappings for transforming records; and the *Experience Source Repository (XSR)* which includes the internal and external databases and services containing learning experience records to aggregate and present for discovery.

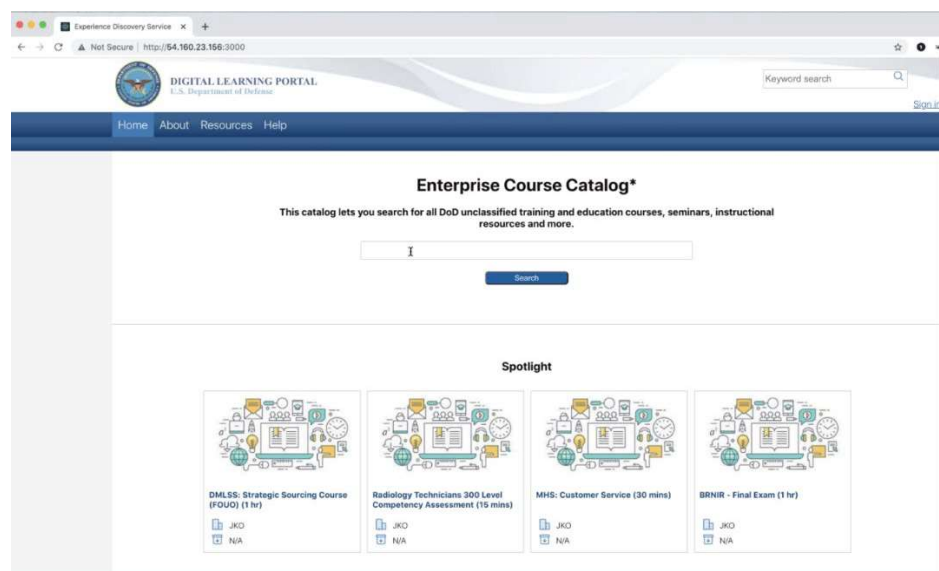


Figure 1. ECC Prototype Release Candidate Portal

The ECC MVP was deployed in the ADL sandbox and included training and education resources from four course catalogs. The ECC Application Tier scraped publicly available metadata from Defense Acquisition University (DAU) and eDX for addition in the ECC repository. In addition, a small subset of Joint Knowledge Online (JKO) Air Education and Training Command (AETC) course catalog offerings provided

by DSRs were emulated within the ECC repository. Collectively across the four course catalogs, the ECC MVP prototype contained over 2,000 courses. Although there is no technical limitation to the number of courses that can be indexed by the ECC, the availability of course and 'required' course metadata within the source repositories impacted the actual number of courses included in the prototype. For example, the edX source repository (access via a public web service API) provides information on approximately 3,000 courses. The DAU source repository (similarly a public web API) provides access to a few thousand courses. JKO and AETC stakeholders provided sample datasets which contained several thousand records each. To be discoverable within ECC, the courses made available (from any of the four systems) had to additionally have enough requisite metadata to enable proper transformation to the P2881 format. Records missing required attributes (or their values) were not searchable within the ECC MVP Discovery Service experience.

## 2.2 End User Personas and Use Cases

Discovery sessions with ECC DSRs held by Deloitte resulted in identification and documentation of multiple digital course catalog user personas and use cases:

- **Experience Consumer** - Is responsible for discovering, accessing, and interacting with learning experiences presented by the ECC system. ECC Experience Consumers gather course information and make decisions regarding the appropriateness or relevance of a course intended to meet a learning requirement and may select in the future, to launch the course. Experience Consumers include anyone in the organization that needs training and therefore represent a wide range of people and roles within an organization. Example use cases for consideration within ECC include:
  - Find and launch/register for specific annual training requirement course.
  - Explore and identify course(s) to meet defined developmental needs.
- **Experience Manager** - Is responsible for modifying learning experience records and/or augmenting learning experiences with supplemental information within the system. They may be responsible for maintaining the metadata for a single experience, and they may be responsible for hundreds or even thousands of learning experiences. Experience Managers may serve as a point of contact for assigned learning experience records, although they are not necessarily the point of contact for registration or delivery of the experience itself. Example use cases include:
  - Enter new course.
  - Update or modify course records when course information changes.
- **System Operator** - Is responsible for installing, configuring, validating, hardening, and monitoring the system. We expect System Operators to be responsible for the provisioning, configuration, and management of a given system. Simple or contained installations may have a single dedicated system operator, whereas complex and/or distributed systems with components deployed at various locations often will feature multiple system operators. Example use cases include:
  - Conduct initial ECC system setup, configuration, and validation.
  - Perform routine ECC system monitoring.
  - Perform ECC system updates.

The experience persona and use cases provided the foundation for ECC prototype development along with test point requirements for evaluation.

## 2.3 Scope of the Evaluation

The test and evaluation event included evaluation of the ECC MVP prototype to support end user task requirements. Testing focused primarily on the Experience Consumer role, examining progress toward four KPIs; initial data were gathered surrounding Experience Manager activities. The ECC Experience Consumer portal evaluation included scenario-based testing examining the capability to complete and time to perform search tasks using the integrated ECC systems as compared to current, native, siloed systems. Ratings of usability and participant feedback in terms of ‘sustains’ and ‘improves’ were also captured. The ECC Experience Manager portal was not mature enough for evaluation, however a survey was developed to capture initial baseline information surrounding time to edit metadata.

Although this effort was deemed ‘not research’ by ADL Internal Review Board (IRB), and therefore exempt from Human Subjects Research Protections, care was taken to adhere to ethical and scientific standards with respect to participants and data.

## 3.0 Methodology

### 3.1 Research Questions

The current experimental research was conducted to address two research questions associated with time and cost:

- To what extent will the use of ECC, an integrated course catalog portal, save users time gathering course information currently residing in multiple independent course catalogs?
- What are the associated labor cost savings resulting from personnel spending less time in course catalog search activities?

### 3.2 Hypotheses

This document provides results of the experimental evaluation of the primary hypothesis:

*Participants will take less time to complete course information search tasks using ECC than using independent, non-ECC course catalog systems.*

### 3.3 Research Design

Testing involved a mixed methods (quantitative and qualitative) experimental design with repeated measures.

Two conditions were created manipulating the course catalog(s) used.

- **ECC condition:** During the ECC condition, participants used the ECC MVP prototype to complete course information search activities.
- **Non-ECC condition:** During the non-ECC condition, participants used their native system, i.e., AETC or JKO, as they were able, and the publicly available edX and DAU course catalogs, to complete course information search activities.

During scenario-based testing participants completed course catalog search scenarios involving both ECC condition (prototype portal) and non-ECC condition (AETC or JKO; and edX and DAU). ECC usability information was gathered via post scenario survey.

In addition to, but separate from, scenario-based testing of the ECC Experience Consumer portal, baseline course management data were collected from course managers via a Course Manager Survey.

### 3.4 Participants

Experiment volunteers were recruited from an existing ECC working group comprised of stakeholders across a variety of DoD organizations (JKO, AETC, DAU, Defense Logistics Agency, and Defense Civilian Personnel Advisory Service).

Participants representing two course catalog user types were recruited:

- **Experience Consumer** - Active duty, retired, and DoD civilian employees accessing course catalogs as a learner to meet organizational and personal training needs.
- **Experience Manager** - DoD employees using course catalogues as part of their job responsibility.

Ten DSRs representing three stakeholder organizations participated in the Experience Consumer study: three USAF/AETC, six Defense Logistics Agency, and one from the Office of the Under Secretary of Defense for Personnel and Readiness.

In general, participants had limited familiarity with ECC: very familiar (1), familiar (2), a little familiar (3) and not familiar (4); however, participants did have experience with other course catalog systems such as Education and Training Course Announcements (ETCA), iCompass, SAP-Success Factors LMS, and Advanced Distributed Learning Service (ADLS).

Limited response to the Experience Manager survey included three DSRs, all from Defense Logistics Agency.

### 3.5 Materials

Key materials developed for this study included test scenarios and participant surveys. Materials can be found on the ECC internal SharePoint site:

<https://adloffice365.sharepoint.com/:f:/s/RDE/ErGRtC2yezZFqC22nx3RKHkBpaXQXL4LASvWJUKGUGRxRw?e=hoyUY1>

- **Participant Demographic and Sign-Up Sheet** - Is an online sign-up sheet used to obtain participant contact information and brief demographics, and to capture availability to participant in test sessions.
- **Test Scenarios** - Two types of test scenarios were developed to exercise search capabilities across ECC and non-ECC conditions annual training scenarios and professional development scenarios. Each scenario included 3 courses pulled from multiple course catalogs. A subset of scenarios was identified for each participant based on the systems to which the participant had access/permissions.
- **ECC Usability Survey** - This survey was developed through collaboration with Deloitte to provide formative feedback to the development team. The survey includes participant perceptions of ECC

Prototype Portal functionality, ease of use, and potential task performance and time savings, and provides opportunities for participants to offer suggestions for improvements or additional capability

- **Course Manager Survey** - This survey was developed to gather data on duplication in course management to better define how the ECC's automation capabilities, intended to reduce if not eliminate the requirement for duplicate data entry, can support this process and provide value to stakeholders. The survey includes 9 metadata fields. For each field, respondents are asked to provide estimates of frequency of updating, the total number of times the field data must be entered across various systems, system names, and an estimate of the total amount of time required to make all updates for that field

**Supporting Materials** - In addition, a facilitator guide and data collection sheets were used to support standardization of test session execution and data recording.

- **Facilitator Guide** - A script was used to guide test sessions. The narrative included an introduction to the ECC prototype and study goals, consent to record, demonstration of the ECC portal, and instructions on completing the scenarios.
- **Data Collection Form** - Structured data collection forms were created to ensure appropriate test scenarios were given to participants and to capture time to complete scenarios and observer notes (e.g., anything that might artificially shorten or lengthen the time to compete, technical challenges, etc.).

### 3.6 Procedures

A pilot was conducted involving ADLI employees. Based on pilot testing, the facilitator script was streamlined to make as efficient use of participant time as possible. To further reduce the time burden of participation one scenario was eliminated. Finally, a small subset of scenarios was slightly modified to improve clarity of the search scenario task.

All ECC MVP Experience Consumer test sessions were conducted and recorded in MS Office Teams meetings. Sessions were scheduled to last approximately one hour. Researchers followed the facilitator guide throughout sessions providing an overview of test goals, a brief demonstration of ECC MVP Prototype, test scenario instructions, and an overview of how data would be collected using the MS Teams chat feature. At the end of the session, participants were asked to complete an online usability survey to provide usability ratings and comments on the ECC MVP Prototype.

Participants completed test sessions using their own computers and shared their screen via Teams. Test scenarios were shared via chat. Participants verbally indicated readiness to begin each scenario at which time the researcher began a timer. Participant 'answers' for each course within the scenario were submitted via chat. Upon completion participants indicated they were done with the scenario and the timer was stopped. Each participant was assigned 5 search scenarios (these were randomly selected from a superset of scenarios consistent with the course catalogs to which each participant had access) and performed those same scenarios within each condition. Participants were randomly assigned to condition order (ECC followed by non-ECC or non-ECC followed by ECC). Scenario order within conditions was also randomized.

**Two significant technical challenges emerged during testing with participants outside of ADL.**

1. **ECC and digital certificates** -Testers accessing ECC encountered certificate errors/warning. Due to DoD cybersecurity controls, the ability to circumvent or accept the risk of progressing to a website with certificate errors is curtailed or impossible; therefore, testers were unable to access the ECC portal. Testing was therefore halted for approximately 2 weeks until the certificate issue was resolved.
2. **Online collaboration tools, versions, and DoD and non-DoD computers** - Challenges using online collaboration tools across DoD and non-DoD systems are widely known. To conduct the ECC T&E event remotely, ADL relied on MS Teams. Testers encountered many issues such as connecting to ADL-initiated MS Teams meetings, accessing MS Teams, JKO/AETC from a single computer, and entering Teams meetings from the lobby

The T&E and IT teams explored alternatives such as ZoomGov and GoToMeeting, however, no single solution presented. Workarounds were found for individual situations, e.g., using the internet browser rather than the Teams client app; use Teams meeting URL in meeting invites rather than using the built in Teams/Outlook feature to add a Teams meeting, which channels invitees to use the Teams client; using multiple computers. These technical challenges did however limit the total number of participants for the study.

Experience Managers provided information through an online survey. Participants were presented with 9 metadata fields contained within ECC MVP and asked to consider the process for updating those fields within their current system(s). For each field, participants were asked to provide the system(s) involved, the total time to make updates and the frequency of updates needed.

## 4.0 Results

Test data were gathered and analyzed to answer the primary study hypothesis with respect to time savings, and subsequently to develop estimated cost savings. Usability ratings and developmental feedback are also reported here.

### 4.1 Time

Mean time to complete scenarios was compared between ECC and non-ECC conditions across all scenarios and then for two subsets of scenarios (Table 2) in which participants searched for known courses and exploratory courses. For example: “The deadline to complete your annual training requirements is coming up. You want to confirm the following information before registering. Course Location: Health Promotion Workshop (AETC System); Course Description: International Acquisition Management (DAU System); Course Description: Communicating and Negotiating in a Dynamic Global World (edX System)”and “You are interested in developing leadership skills that can be applied throughout your acquisitions career as a Program Manager. Given the catalog(s) you are currently being asked to use, find the title of 3 courses that you think are the most relevant and paste the course names into chat.

	<b>Mean time to complete (seconds)</b>		
<b>Condition</b>	<b><i>All Scenarios</i></b>	<b><i>Known course scenarios</i></b>	<b><i>Exploratory course scenarios</i></b>
ECC	125	120	130
Non-ECC	181	134	244

Difference	56	14	114
% time saved	31%	10%	46%
P-value	<i>P(T&lt;=t) one-tail</i> <b>0.008</b>	<i>P(T&lt;=t) one-tail</i> 0.293	<i>P(T&lt;=t) one-tail</i> <b>0.0004</b>

Table 2. Comparison of mean time (in seconds) to complete scenarios.

T-tests indicate participants took significantly less time, on average 56 seconds less, to complete all scenarios (ECC = 125 secs compared to the non-ECC condition = 181 secs;  $p=.008$ ). When comparing ECC to non-ECC conditions, this 56 seconds represents an average time savings of 31%.

Looking at specific scenario types, no difference was detected between conditions when search scenarios included *known* courses only ( $p=.293$ ); however, participants completed *exploratory* searches significantly faster when using ECC (114 seconds, 46%,  $p=.0004$ ).

## 4.2 Cost

A methodology was developed to translate average time savings per individual to the estimated dollars that time represents, meaning labor or time that can be allocated to other job responsibilities, not realized fiscal reduction. The approach involved 3 steps:

1. **Determine average time savings per person per search activity** - Initial estimates of average time savings *for a single search experience* using the ECC MVP were generated from the scenario-based testing described above. The estimated number of searches or interactions with a course catalog over a given time period is not yet captured or estimated. See “Next Steps” below for discussion.
2. **Determine cost associated with time per person** - Break annual salary into hourly rate using the Office of Personnel Management’s (OPM) 2087-hour model, and further to minutely rate, keeping in mind that the cost of 1 hour of a GS-15’s time is very different from the cost of a GS-5’s time, for instance.
3. **Determine the aggregated cost associated with multiple individuals across an organization** - Labor cost savings will be different for different organizations depending upon the salary demographic distribution of individuals within the organization.

As noted, initial time savings data required for step 1 was obtained from the ECC MVP test event. To calculate costs associated with steps 2 and 3 several government personnel reporting references were reviewed. According to the President’s FY2022 Budget, the actual number of civilian and uniformed federal personnel in 2020 was 4,253,133; with estimates for 2021 and 2022 of 4,295,224 and 4,314,153, respectively (Figure 2). To obtain required data for this exercise however, personnel data were pulled from FedScope ([Federal Workforce Data: FedScope \(opm.gov\)](https://www.opm.gov/fedscope/)). FedScope provides public access to OPM’s Enterprise Human Resources Integration-Statistical Data Mart (EHRI-SDM) which provides information about the Federal civilian workforce. FedScope presents the most recent five years of federal workforce data provided by approximately 120 federal agencies. Information is available on: Employment, Accession, Separation, and Employment trends. Appendix A presents data contained in the Employment category used to identify the number of civilian personnel from grades 2 to 15 (as well as those of unreported GS level, N/A) along with the average salary for that grade (or those reported as N/A) for the Department of the Air Force, Department of the Army, Department of Defense, and the Department of the Navy reported at the end of FY20 (Sept 2020).

Table 3.Total Federal Employment					
(as measured by full-time equivalents)					
Description	2020 Actual	2021 Estimate	2022 Estimate	Change: 2021 to 2022	
				FTE	Percent
<b>Executive Branch Civilian</b>					
All Agencies, Excluding Postal Service	2,179,917	2,199,387	2,249,971	50,584	2.2%
Postal Service <sup>a</sup>	569,288	579,741	563,690	-16,051	-2.8%
Subtotal, Executive Branch Civilian	2,749,205	2,779,128	2,813,661	34,533	1.2%
<b>Executive Branch Uniformed Military</b>					
Department of Defense <sup>b</sup>	1,389,398	1,399,318	1,381,998	-17,320	-1.3%
Department of Homeland Security (USCG)	41,244	42,252	42,703	451	1.1%
Commissioned Corps (DOC, EPA, HHS)	6,371	6,366	6,679	313	4.7%
Subtotal, Uniformed Military	1,437,013	1,447,936	1,431,380	-16,556	-1.2%
<b>Total, Executive Branch</b>	<b>4,186,218</b>	<b>4,227,064</b>	<b>4,245,041</b>	<b>17,977</b>	<b>0.4%</b>
<b>Legislative Branch<sup>c</sup></b>	<b>33,673</b>	<b>34,495</b>	<b>34,914</b>	<b>419</b>	<b>1.2%</b>
<b>Judicial Branch</b>	<b>32,242</b>	<b>33,665</b>	<b>34,198</b>	<b>533</b>	<b>1.6%</b>
<b>TOTAL</b>	<b>4,253,133</b>	<b>4,295,224</b>	<b>4,314,153</b>	<b>18,929</b>	<b>0.4%</b>

**Source:** President's FY2022 Budget, Analytical Perspectives, Table 5-2, p. 44, <https://www.govinfo.gov/content/pkg/BUDGET-2022-PER/pdf/BUDGET-2022-PER.pdf>.

a. Includes the Postal Rate Commission.

b. Includes activated Guard and Reserve members on active duty. Does not include full-time support (Active Guard & Reserve (AGRSs)) paid from Reserve Component appropriations.

c. FTE data not available for the Senate (positions filled were used for actual year and extended at same level).

Figure 2. Total Federal Employment numbers from President's FY2022 Budget

Department	Number personnel included in analysis	Savings per department per search event per person		
		Known course search	Exploratory course search	Total
DEPT OF THE AIR FORCE	174,501	\$29,826.19	\$242,870.39	\$272,696.57
DEPT OF THE ARMY	254,411	\$44,905.09	\$365,655.71	\$410,560.79
DEPT OF DEFENSE	114,071	\$20,336.50	\$165,597.22	\$185,933.72
DEPT OF THE NAVY	225,302	\$40,909.20	\$333,117.75	\$374,026.95
<b>Total</b>	<b>768,285</b>	<b>\$135,976.97</b>	<b>\$1,107,241.06</b>	<b>\$1,243,218.04</b>

Table 3. Notional cost savings in terms of labor hours.

Note: Numbers include 270,285 personnel of unreported GS-level however with reported average annual salaries ranging across departments from 78,279 to 92,592 used in the analysis.

Estimated savings based on this limited example suggest, if each civilian employee reported by FedScope used ECC to conduct ONE known course search event (e.g., to find 3 annual training courses) and ONE exploratory search (e.g., to identify developmental opportunity for a mid-year Individual Development Plan; IDP), the Department of the Air Force, Department of the Army, Department of Defense, and the Department of the Navy combined could save over \$1.2M.

### 4.3 Usability

ECC portal prototype usability survey included multiple sections gathering Likert ratings of usability, along with qualitative comments on the benefits of ECC, feedback for future development, and perceptions of expected time to complete search tasks using ECC. Eight participants completed the survey.

#### ECC Portal Usability Ratings



Each item was rated on a 1-5 points Likert scale, with 1 representing the low end of the scale and 5 the high end of the scale. Items means ranged from 3.8 to 4.4 indicating overall positive response to the ECC portal (*Table 4*).

Item	Average Rating
Ease of use	4.4
Intuitiveness	4.4
Search efficiency	3.8
System Responsiveness	4.4
System Representativeness	3.8
Search task difficulty	4.1

*Table 4. Mean ECC usability ratings.*

Average *ease of use* rating was 4.4, falling between *easy* and *very easy* to use; average *intuitiveness* rating was also 4.4, falling between *very* and *extremely intuitive*; average search efficiency rating was 3.8, nearing the rating of 4 *very efficient*; average *search task difficulty* rating was 4.1, *not so difficult*. Average system responsiveness rating was 4.4, falling between *good* and *very good*. Respondents average rating of the *representativeness of the source data* was 3.8, falling between *somewhat* and *very accurate*; however multiple respondents indicated difficulty responding to this item in terms of their ability to accurately judge. Based on participants self-reported lack of insight into the degree to which the ECC course content represents source repositories other test approaches for assessment need to be developed.

### ***Sustains and improves***

Major benefits of ECC reported by participants included time savings due to the portal capability to search multiple course catalogs simultaneously, as well as the ease of use of the portal itself. The ECC was referred to as a “one-stop shop”, and one participant noted being “able to view multiple sources is a big time saver”. Participants indicated time savings could be realized for supervisors and employees searching for relevant courses; as well as for instructional systems designers searching for training content to leverage, in whole or part, to meet customer training needs. Further, respondents indicated ECC MVP offered advantages over other course catalogs by addressing limitations associated with access to information contained in multiple sites, difficulty navigating disparate course catalog websites, and limited or niche content.

**Developmental feedback on ECC from participants included both 1) improvements to the existing ECC portal, and 2) recommendations for new features of capabilities. Areas identified as in need of Improvement include both GUI and refinement of content presentation:**

- Consider minimizing font size on course pages (consider more conventional font size).
- Clean up UI in terms of coding syntax e.g., in course names and descriptions.
- Check for “dead” or outdated programs (remove; annotated for immediate recognition) courses that have been superseded by newer classes.
- Differentiate between courses in the results list with the same name (indicate how are they different).

**Additional features or capabilities requested include:**

- Add credentials, competencies, developmental experiences, and badging.
- Add a "E-mail: Library PoC" option, along with each Search result, to ask additional questions.
- Add a 'Saved Search' option.
- Add AI / fuzzy-logic ML in the ECC search engine.

Results were mixed in terms of expectations of time to complete search task. Half of the participants indicated tasks took more time than expected and half less time. Participants noted lack of familiarity with ECC and that the goal and time constraints of the study prohibited them from spending the time they would typically dedicate to find appropriate courses (sometimes hours sifting through courses and reading descriptions in detail).

Even if users anticipate spending a significant amount of time exploring courses to find appropriate content to meet developmental needs, ECC efficiency, intuitiveness, and ease of use will likely improve the user experience and still result in less time than if current, local course catalogs were used to perform the same tasking.

#### 4.4 Experience Manager survey

The ECC MVP Experience Manager portal maturity level and low number of Experience Manager surveys completed limit findings.

Of the 8 metadata items listed, all participants described all metadata fields as updated, *infrequently*, with one exception - one participant indicated *somewhat frequent* "Course Title" changes. With the exception of Course Description and Location, the Total number of times entered was consistently, 1. One participant indicated Course Description and Location were entered a total of 2 to 3 times. For each metadata field, Table 5 provides system(s) updated and the total time to make updates. Participant systems included LMS, MS Word on LAN and a Dev tool, LMS, SAP. Changes typically required 1, 2 or 5 mins. However, the course title and description typically took longer.

Metadata Field	System(s) Entered	Total Time to Make Updates
Course title	LMS	10 min
	MS Word on LAN	15 seconds
	Dev tool, LMS, SAP	20
Course Description	LMS	20 min
	MS word on LAN	15 minutes
	LMS	5 mins
Start date	LMS	5 min
	Excel spreadsheet -Team Level	1 minute
	LMS	5 mins
End date	LMS	5 min
	Excel spreadsheet - Team level	1 minute
	LMS	5
course audience	LMS	15 min

Metadata Field	System(s) Entered	Total Time to Make Updates
	MS Word on LAN	5 minutes
<b>Instructor</b>	LMS	2 min
	MS Word on LAN	1 minute
<b>location</b>	LMS	5 min
	MS Word	1 minute
<b>author</b>	LMS	2 min
	MS Word on LAN	2 minutes
<b>Duration</b>	LMS	2 min
	MS Word on LAN	1 minute

Table 5. Course metadata updates.

In response to the final question, “How representative are the metadata fields above in reflecting the metadata fields you typically include for courses in your organization’s course catalog system?”, two participants indicated representative, while one responded, somewhat representative.

Recommendations for additional metadata fields from the respondent indicating ‘somewhat representative’ included: delivery mode(s); cost F2F vs. Virtual; Catalog Coding; Audience Type; and Prerequisites (if any).

## 5.0 Conclusion

The ECC MVP prototype connected four independent course catalog repositories- AETC, JKO, DAU, and edX and contained approximately 2,000 courses.

Scenario based testing of the prototype versus DSRs current approaches demonstrated users were able to complete search tasks in a shorter period of time saving labor hours and costs through ECC’s integrated repository and usable, intuitive, and responsive interface.

Related to course catalog search time two important caveats must be noted. First, the ECC MVP is a scoped prototype with limited functionality compared to other catalogs in the evaluation and containing far fewer courses through which users were required to search. Although there is little doubt as to the many benefits of ECC, these differences may have contributed to the *degree* of difference observed between ECC and DSRs native approach to complete scenarios. Additionally, for exploratory scenarios in particular, users indicated they felt constrained by the limits of the test sessions. In reality participants indicated they would likely have taken hours to search for courses appropriate to fill developmental gaps, spending more time reading and evaluating additional course descriptions.

The costing methodology developed and applied suggests the use of ECC and associated time savings could result in significant cost savings when aggregated across individuals within an organization. As the ECC continues development and transition to operational environments, it is anticipated that FedScope data would be replaced by organization specific data to compute a tailored, more accurate estimate of labor cost savings. Furthermore, as ECC development continues and testing scenarios become more representative of real-world course search activities. The time savings per search event can be refined to

generate more accurate estimates. The evolution of scoping the cost estimate based on specific organizational parameters and improved search scenario time estimating procedures and ECC enhancements will lead to more meaningful data as we move into subsequent FYs.

## **6.0 Next Steps**

This was the first in a series of ECC test events. Next steps focus on providing ECC capability feedback and recommended improvements and enhancements to Deloitte and continuing to refine and improve testing approach and metrics to meet testing requirements of ECC as it transitions to an operational environment. Further development of ECC along with tailoring of the testing approach will produce a more precise reflection of progress toward the KPIs.

ADL will work with Deloitte and DSRs to better define not only the steps, but importantly the temporal components of course catalog search tasks for different use cases. Insights will be used to improve ECC testing scenarios (e.g., remove perceived time pressure) and allow participants to perform search in a more natural manner, leading to more realistic estimates of time to complete search activities and time savings realized when using ECC.

Given we have a framework and excel “tool” for estimating cost savings as a function of labor hour expenditure, ADL will work with DSRs to develop a better understanding of the frequency of Experience Consumer search activities, for example, estimating the average number and type of course catalog search events in which they engage per month or year, e.g., the number of annual training courses required by the organization and realistic estimates of developmental / exploratory course ‘sessions’ per year, along with factors impacting variability such as GS-level. In addition, ADL will work with candidate transition DSRs to develop more refined estimates of the organizational demographics in terms of the distribution of personnel across various pay grades and structures. In addition, we will re-engage testing of the Experience Manager user portal as it matures to provide similar estimates of time reduction and cost savings.

As a final step, upcoming ADL T&E efforts will address an additional KPI surrounding cost reduction based on the potential for ECC use to minimize duplication of course development efforts.

Appendix A: Notional Cost Saving Spreadsheet.

		FEDSCOPE DATA		Transformation based on OPM 2087 hours/wk yr		Savings per person per search event using ECC		Savings per department per search event per person	
GS	Department	GS personnel as of SEP 2020	Avg. Salary	Avg. hourly rate*	labor cost per minute	Known course search only ***	Exploratory course search only ****	Known course search	Exploratory course search
						0.23	1.90		
1	DEPT OF THE AIR FORCE	NA							
1	DEPT OF THE ARMY	NA							
1	DEPT OF DEFENSE	NA							
1	DEPT OF THE NAVY	NA							
2	DEPT OF THE AIR FORCE	61	\$26,244	\$12.57	\$0.21	\$0.05	\$0.40	\$2.98	\$24.29
2	DEPT OF THE ARMY	61	\$28,481	\$13.65	\$0.23	\$0.05	\$0.43	\$3.24	\$26.36
2	DEPT OF DEFENSE	51	\$27,788	\$13.31	\$0.22	\$0.05	\$0.42	\$2.64	\$21.50
2	DEPT OF THE NAVY	16	\$30,608	\$14.67	\$0.24	\$0.06	\$0.46	\$0.91	\$7.43
								\$9.77	\$79.59
3	DEPT OF THE AIR FORCE	197	\$29,628	\$14.20	\$0.24	\$0.06	\$0.45	\$10.88	\$88.56
3	DEPT OF THE ARMY	228	\$31,857	\$15.26	\$0.25	\$0.06	\$0.48	\$13.53	\$110.21
3	DEPT OF DEFENSE	2,058	\$33,105	\$15.86	\$0.26	\$0.06	\$0.50	\$126.95	\$1,033.76
3	DEPT OF THE NAVY	181	\$32,209	\$15.43	\$0.26	\$0.06	\$0.49	\$10.86	\$88.46
								\$162.23	\$1,320.99
4	DEPT OF THE AIR FORCE	931	\$36,465	\$17.47	\$0.29	\$0.07	\$0.55	\$63.26	\$515.12
4	DEPT OF THE ARMY	2,611	\$35,787	\$17.15	\$0.29	\$0.07	\$0.54	\$174.11	\$1,417.79
4	DEPT OF DEFENSE	4,273	\$34,318	\$16.44	\$0.27	\$0.06	\$0.52	\$273.25	\$2,225.02

		FEDSCOPE DATA		Transformation based on OPM 2087 hours/wk yr		Savings per person per search event using ECC		Savings per department per search event per person	
GS	Department	GS personnel as of SEP 2020	Avg. Salary	Avg. hourly rate*	labor cost per minute	Known course search only ***	Exploratory course search only ****	Known course search	Exploratory course search
4	DEPT OF THE NAVY	1,309	\$36,899	\$17.68	\$0.29	\$0.07	\$0.56	\$90.00	\$732.88
								<b>\$600.63</b>	<b>\$4,890.81</b>
5	DEPT OF THE AIR FORCE	4,388	\$41,569	\$19.92	\$0.33	\$0.08	\$0.63	\$339.89	\$2,767.68
5	DEPT OF THE ARMY	8,520	\$40,977	\$19.63	\$0.33	\$0.08	\$0.62	\$650.55	\$5,297.36
5	DEPT OF DEFENSE	3,036	\$40,936	\$19.61	\$0.33	\$0.08	\$0.62	\$231.58	\$1,885.76
5	DEPT OF THE NAVY	4,624	\$41,748	\$20.00	\$0.33	\$0.08	\$0.63	\$359.71	\$2,929.09
								<b>\$1,581.74</b>	<b>\$12,879.90</b>
6	DEPT OF THE AIR FORCE	4,422	\$45,123	\$21.62	\$0.36	\$0.08	\$0.68	\$371.81	\$3,027.59
6	DEPT OF THE ARMY	11,331	\$46,338	\$22.20	\$0.37	\$0.09	\$0.70	\$978.38	\$7,966.83
6	DEPT OF DEFENSE	4,587	\$46,976	\$22.51	\$0.38	\$0.09	\$0.71	\$401.52	\$3,269.53
6	DEPT OF THE NAVY	4,464	\$47,171	\$22.60	\$0.38	\$0.09	\$0.72	\$392.38	\$3,195.06
								<b>\$2,144.09</b>	<b>\$17,459.00</b>
7	DEPT OF THE AIR FORCE	10,043	\$50,722	\$24.30	\$0.41	\$0.09	\$0.77	\$949.21	\$7,729.29
7	DEPT OF THE ARMY	17,479	\$50,813	\$24.35	\$0.41	\$0.09	\$0.77	\$1,654.99	\$13,476.32
7	DEPT OF DEFENSE	4,533	\$52,447	\$25.13	\$0.42	\$0.10	\$0.80	\$443.01	\$3,607.33
7	DEPT OF THE NAVY	10,586	\$52,474	\$25.14	\$0.42	\$0.10	\$0.80	\$1,035.09	\$8,428.61
								<b>\$4,082.30</b>	<b>\$33,241.56</b>
8	DEPT OF THE AIR FORCE	2,034	\$57,239	\$27.43	\$0.46	\$0.11	\$0.87	\$216.94	\$1,766.54
8	DEPT OF THE ARMY	4,505	\$57,739	\$27.67	\$0.46	\$0.11	\$0.88	\$484.69	\$3,946.79
8	DEPT OF DEFENSE	1,013	\$58,246	\$27.91	\$0.47	\$0.11	\$0.88	\$109.95	\$895.27
8	DEPT OF THE NAVY	1,953	\$59,179	\$28.36	\$0.47	\$0.11	\$0.90	\$215.36	\$1,753.68

		FEDSCOPE DATA		Transformation based on OPM 2087 hours/wk yr		Savings per person per search event using ECC		Savings per department per search event per person	
GS	Department	GS personnel as of SEP 2020	Avg. Salary	Avg. hourly rate*	labor cost per minute	Known course search only ***	Exploratory course search only ****	Known course search	Exploratory course search
								\$1,026.95	\$8,362.28
9	DEPT OF THE AIR FORCE	14,950	\$61,165	\$29.31	\$0.49	\$0.11	\$0.93	\$1,703.91	\$13,874.72
9	DEPT OF THE ARMY	23,172	\$61,650	\$29.54	\$0.49	\$0.11	\$0.94	\$2,661.95	\$21,675.87
9	DEPT OF DEFENSE	4,687	\$61,933	\$29.68	\$0.49	\$0.12	\$0.94	\$540.90	\$4,404.50
9	DEPT OF THE NAVY	11,354	\$63,127	\$30.25	\$0.50	\$0.12	\$0.96	\$1,335.57	\$10,875.37
								\$6,242.34	\$50,830.45
10	DEPT OF THE AIR FORCE	1,127	\$70,717	\$33.88	\$0.56	\$0.13	\$1.07	\$148.51	\$1,209.28
10	DEPT OF THE ARMY	1,516	\$76,493	\$36.65	\$0.61	\$0.14	\$1.16	\$216.08	\$1,759.55
10	DEPT OF DEFENSE	202	\$68,516	\$32.83	\$0.55	\$0.13	\$1.04	\$25.79	\$210.00
10	DEPT OF THE NAVY	1,129	\$71,675	\$34.34	\$0.57	\$0.13	\$1.09	\$150.79	\$1,227.84
								\$541.17	\$4,406.67
11	DEPT OF THE AIR FORCE	21,344	\$74,427	\$35.66	\$0.59	\$0.14	\$1.13	\$2,960.12	\$24,103.84
11	DEPT OF THE ARMY	32,258	\$76,939	\$36.87	\$0.61	\$0.14	\$1.17	\$4,624.74	\$37,658.57
11	DEPT OF DEFENSE	12,701	\$76,317	\$36.57	\$0.61	\$0.14	\$1.16	\$1,806.19	\$14,707.51
11	DEPT OF THE NAVY	19,390	\$76,850	\$36.82	\$0.61	\$0.14	\$1.17	\$2,776.67	\$22,610.05
								\$12,167.72	\$99,079.98
12	DEPT OF THE AIR FORCE	26,061	\$89,404	\$42.84	\$0.71	\$0.17	\$1.36	\$4,341.61	\$35,353.13
12	DEPT OF THE ARMY	39,017	\$92,721	\$44.43	\$0.74	\$0.17	\$1.41	\$6,741.17	\$54,892.36
12	DEPT OF DEFENSE	21,010	\$94,077	\$45.08	\$0.75	\$0.18	\$1.43	\$3,683.09	\$29,990.89
12	DEPT OF THE NAVY	32,795	\$92,972	\$44.55	\$0.74	\$0.17	\$1.41	\$5,681.50	\$46,263.63
								\$20,447.37	\$166,500.02

		FEDSCOPE DATA		Transformation based on OPM 2087 hours/wk yr		Savings per person per search event using ECC		Savings per department per search event per person	
GS	Department	GS personnel as of SEP 2020	Avg. Salary	Avg. hourly rate*	labor cost per minute	Known course search only ***	Exploratory course search only ****	Known course search	Exploratory course search
13	DEPT OF THE AIR FORCE	16,870	\$109,204	\$52.33	\$0.87	\$0.20	\$1.66	\$3,432.86	\$27,953.33
13	DEPT OF THE ARMY	29,069	\$112,170	\$53.75	\$0.90	\$0.21	\$1.70	\$6,075.89	\$49,475.10
13	DEPT OF DEFENSE	14,690	\$114,336	\$54.78	\$0.91	\$0.21	\$1.73	\$3,129.74	\$25,485.00
13	DEPT OF THE NAVY	22,967	\$112,814	\$54.06	\$0.90	\$0.21	\$1.71	\$4,828.03	\$39,313.99
								<b>\$17,466.53</b>	<b>\$142,227.43</b>
14	DEPT OF THE AIR FORCE	5,341	\$132,584	\$63.53	\$1.06	\$0.25	\$2.01	\$1,319.52	\$10,744.68
14	DEPT OF THE ARMY	10,305	\$141,265	\$67.69	\$1.13	\$0.26	\$2.14	\$2,712.60	\$22,088.31
14	DEPT OF DEFENSE	7,177	\$139,288	\$66.74	\$1.11	\$0.26	\$2.11	\$1,862.77	\$15,168.29
14	DEPT OF THE NAVY	6,840	\$135,774	\$65.06	\$1.08	\$0.25	\$2.06	\$1,730.52	\$14,091.35
								<b>\$7,625.41</b>	<b>\$62,092.63</b>
15	DEPT OF THE AIR FORCE	1,537	\$164,215	\$78.68	\$1.31	\$0.31	\$2.49	\$470.32	\$3,829.72
15	DEPT OF THE ARMY	3,332	\$177,143	\$84.88	\$1.41	\$0.33	\$2.69	\$1,099.85	\$8,955.89
15	DEPT OF DEFENSE	3,880	\$170,735	\$81.81	\$1.36	\$0.32	\$2.59	\$1,234.40	\$10,051.58
15	DEPT OF THE NAVY	3,073	\$168,325	\$80.65	\$1.34	\$0.31	\$2.55	\$963.86	\$7,848.58
								<b>\$3,768.43</b>	<b>\$30,685.77</b>
N/A	DEPT OF THE AIR FORCE	65,195	\$82,693	\$39.62	\$0.66	\$0.15	\$1.25	\$10,045.84	\$81,801.81
N/A	DEPT OF THE ARMY	71,007	\$85,569	\$41.00	\$0.68	\$0.16	\$1.30	\$11,321.94	\$92,192.91
N/A	DEPT OF DEFENSE	30,173	\$78,279	\$37.51	\$0.63	\$0.15	\$1.19	\$4,401.16	\$35,837.99
N/A	DEPT OF THE NAVY	104,621	\$92,592	\$44.37	\$0.74	\$0.17	\$1.40	\$18,050.76	\$146,984.73
								<b>\$43,819.69</b>	<b>\$356,817.45</b>
								<b>\$137,025.09</b>	<b>\$1,472,593.22</b>



		FEDSCOPE DATA		Transformation based on OPM 2087 hours/wk yr		Savings per person per search event using ECC		Savings per department per search event per person	
GS	Department	GS personnel as of SEP 2020	Avg. Salary	Avg. hourly rate*	labor cost per minute	Known course search only ***	Exploratory course search only ****	Known course search	Exploratory course search
								Known course search	Exploratory course search
						DEPT OF THE AIR FORCE		\$29,826.19	\$242,870.39
						DEPT OF THE ARMY		\$44,905.09	\$365,655.71
						DEPT OF DEFENSE		\$20,336.50	\$165,597.22
						DEPT OF THE NAVY		\$40,909.20	\$333,117.75

\* Calculated using OPM's 2087 hour per work year model

\*\* based on 56 sec savings

\*\*\* based on 14 sec savings

\*\*\*\* based on 114 sec savings