
***EVALUATION OF
DIGITAL LITERACY AS AN AIR FORCE FOUNDATIONAL COMPETENCY***

Technical Report No. 3

**Prepared by:
Dr. Laura Barron
Patrick Rowles**

**Prepared for:
HQ AETC A3/6
Randolph AFB, TX 78150**

July 2021

Approved for public release; Distribution unlimited

Executive Summary

This report describes the validation of Digital Literacy as an Air Force Foundational Competency, and development of a brief, global Digital Literacy measure for inclusion in the MyVector Foundational Competencies (Pathfinder 2021) Assessment. A working definition of Digital Literacy was proposed, drawing from previous research from the European Commission's *Digital Competence Framework for Citizens* and a broader literature review to identify behavioral measures corresponding to this framework. Two surveys were conducted to evaluate specific Digital Literacy behaviors and develop Digital Literacy measures for the Air Force context. In Survey 1, a total of 2,748 Air Force members (enlisted, officer, and civilian, stratified by career field category) rated the importance of 62 Digital Literacy behaviors for effective performance in their current job. Participants also rated the importance and frequency with which they demonstrated effective behaviors associated with Digital Literacy and each of the other Air Force Foundational Competencies. In Survey 2, an independent sample of 1,894 Air Force supervisors identified members (of the same rank/grade and career field) who they viewed as having a high or lower potential for success in an Air Force career. Supervisors then rated each high and lower potential member on the same 62 Digital Literacy behaviors to establish criterion-related validity. The surveys additionally provided respondents the opportunity to offer suggestions for training and education to improve the digital literacy of Airmen. Results of the two surveys demonstrate support for the proposed Digital Literacy definition, with the explicit addition of "Digital Exploration" as a key component of the definition. Behavioral measures for inclusion in the MyVector Pathfinder 2021 assessment were identified to correspond to the three Digital Literacy sub-competencies that most strongly differentiated supervisor-rated potential for Air Force career success: Critical Evaluation of Information, Communication Medium Choice, and Digital Exploration. Implications and future directions are discussed, including recommendations for improving the training and education of Airmen on Digital Literacy based on a qualitative analysis of 1,046 open-ended survey comments.

Background: Digital Literacy as a Foundational Competency

As now codified in AFI 36-2670, *Total Force Development*, Airmen (officer, enlisted, and civilian) are expected to develop proficiency on the Air Force Foundational Competencies throughout their career, including but not limited to deliberate development on the Foundational Competencies in formal training and education programs (e.g., Basic Military Training, Professional Military Education, and civilian developmental education programs). Although previous studies (Barelka, Barron, Kulpa, Hernandez, & Coggins, 2019; Barron & Rolwes, 2020) had not initially evaluated Digital Literacy as a Foundational Competency, in Fall 2020 the competency was identified as critical by the Air Force Chief of Staff, with the Force Development Commander (AETC/CC) supporting the addition of Digital Literacy as a Foundational Competency.

As such, an Executive meeting of the Digital Talent Taskforce (DigTal TF) on July 9, 2020 tasked AETC/A3J to conduct a literature review on Digital Literacy. The goal of such a review was to identify a definition of Digital Literacy that would be applicable Air Force wide, across career fields and ranks/grades, consistent with other Air Force Foundational Competencies. Following this initial review, on behalf of AF/A2/A6, Ms. Theresa Sanchez sponsored the AETC/A3J study described in this report to establish a validated definition of Digital Literacy as part of the Air Force Foundational Competency model.

MyVector Foundational Competency Assessment

In November 2020, AETC/A3J released a voluntary self-assessment and 360 assessment on MyVector to provide a mechanism for Airmen to receive candid, confidential developmental feedback from supervisors, peers, and subordinates on their strengths and weaknesses among the Foundational Competencies (see Barron & Rolwes, 2020). The MyVector assessment additionally provides recommendations for freely available online educational resources (e.g., courses, articles, books, videos) to support identified areas for improvement. With the addition of Digital Literacy to the Foundational Competency Model, the MyVector assessment needed to be updated to include Digital Literacy. As such, the AF/A2/A6-sponsored study described in this report was also intended to guide development of the Digital Literacy assessment to be included on MyVector, based on prioritization of specific Digital Literacy behaviors of demonstrated importance across the Air Force.

Working Definition of Digital Literacy and Sub-Competency Behaviors

To provide a comprehensive working definition of Digital Literacy as an Air Force Foundational Competency, AETC/A3J conducted a review of the varied definitions of Digital Literacy and Digital Competence that have been widely cited in the research literature (see Table 1). In developing the content for the AF/A2/A6 study, we adopted the following working definition: “Uses technology to identify, critically evaluate, and synthesize data and information, create and manage digital content, and appropriately interact in a virtual environment,” aiming to capture the Information, Communication, Production, and Safety sub-competencies referenced in the European Commission’s comprehensive *Digital Competence Framework for Citizens* (Carretero et al., 2017; Skov, 2016; see Table 2). Further literature review was then conducted to identify published, peer-reviewed behavioral measures corresponding to the 16 narrower sub-competencies included in this model (Skov, 2016). Items were reviewed and adapted as needed for greater applicability to the Air Force context, and were approved by representatives from the Office of the Chief Information Officer (SAF/CN). Additionally, we developed items based on the current content of the DoD Cyber Awareness Challenge, an annual training requirement for all Air Force network users which addresses Data Protection and Online Identity Management sub-competencies. In all, 62 behaviors were included in the final survey version (See Table 3 for scale references and corresponding sample items).

Table 1. Widely Cited Definitions of Digital Literacy and Digital Competence

Reference	Definition(s)
Glister (1997)	Digital literacy (first popularized use of term) – “ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers” (about “mastering ideas, not keystrokes”) Bawden (2008) summarizes the competencies in Glister (1997) as including: - “knowledge assembly from diverse sources - retrieval skills, plus critical thinking to make informed judgments about retrieved information with wariness about the validity and completeness of internet sources - reading and understanding non-sequential and dynamic material - awareness of the value of traditional tools in conjunction with networked media - using filters and agents to manage incoming information - being comfortable w/ publishing & communicating information as well as accessing it”
Eshet-Alkalai (2004)	Digital literacy – an integration of five other literacies: - photo-visual literacy (“the art of reading visual representations”) - reproduction literacy (“the art of creative recycling of existing materials”) - information literacy (“the art of skepticism”) - branching literacy (“hypermedia and non-linear thinking”) - social-emotional literacy (encompassing “How to know whether individuals in a chat room are who they say they are?” “How can we tell if a call for blood

	donation is real or a hoax?” “Should we open an email from an unknown person?”)
Dig EuLit Project - Martin (2006b)	Digital literacy – “awareness, attitude, and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyze, and synthesize digital resources, construct new knowledge, create media expressions and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process”
Calvani et al. (2008)	Digital competence – “being able to explore and face new technological situations in a flexible way, to analyze, select, and critically evaluate data and information, to exploit technological potentials in order to represent and solve problems and build shared and collaborative knowledge, while fostering awareness of one’s own personal responsibilities and the respect of reciprocal rights/obligations” - Dimensions included in this definition: <u>Cognitive</u>: Being able to read, select, interpret, and evaluate data and information taking into account their pertinence and reliability <u>Technological</u>: Being able to explore and face problems and new technological contexts in a flexible way <u>Ethical</u>: Being able to interact with other individuals constructively and with a sense of responsibility using available technologies <u>Integration between 3 dimensions</u>: “Understanding the potential offered by technologies which enable individuals to share information and collaboratively build new knowledge”
American Library Association (2013)	Digital literacy – “ability to use information and communication technologies to find, understand, evaluate, create, and communicate information, an ability that requires both cognitive and technical skills”
Skov (2016)	Digital Competence – “combination of knowledge, skills, and attitudes with regards of the use of technology to perform tasks, solve problems, communicate, manage information, collaborate, as well as create and share content effectively, appropriately, securely, critically, creatively, independently, and ethically” - Four domains of digital competence included in this definition: <u>Information</u>: “Ability to identify, locate, retrieve, store, organize, and analyze digital information and evaluate relevance and purpose” <u>Communication</u>: “Ability to communicate, collaborate, interact with, and participate in virtual teams, and networks as well as make use of appropriate media, tone, and behavior” <u>Production</u>: “Ability to create, configure, and edit digital content, solve digital problems, and explore new ways to take advantage of technology” <u>Safety</u>: “ability to use digital technology safely and sustainably in relation to data, identity, and work injuries and to pay attention to legal consequences, rights, and duties”

Table 2. Subcompetencies Derived From the European Union's *Digital Competence Framework for Citizens* (Skov, 2016)

	Subcompetency	Definition
Information	INFORMATION SEARCH	Ability to search and find digital information, navigate between many online resources and sort through irrelevant information
	CRITICAL EVALUATION OF INFORMATION	Ability to process, understand and critically evaluate digital information when sent and received
	INFORMATION SELF-SERVICE	Ability to seek out and benefit from self-service solutions online
	INFORMATION STORAGE	The ability to format, organize and store digital material while keeping both safety and accessibility in mind
Communication	ACTIVE INTERNET PARTICIPATION	Ability to make use of, express opinions, or otherwise contribute actively in digital environments
	DIGITAL COLLABORATION	Ability to use technologies and media for teamwork, coordination and collaboration processes
	DIGITAL SOCIAL AWARENESS	Ability to reconcile behavior, tone, language and technology with regard to context and social relations
	DIGITAL MEDIA CHOICE	Ability to interact through a wide range of digital platforms and to be able to choose the best media for communicating with a specific recipient or group
Production	DIGITAL PRODUCTION AND SHARING	Ability to create, assemble parts and modify content in many different formats. E.g. images, text, video or sound
	DIGITAL EXPLORATION	Ability and willingness to stay updated on the technological developments and explore new digital opportunities
	AUTOMATION	Ability to modify or create digital solutions that can fully or partially automate and perform a task
	DIGITAL CONFIGURATION	Ability to adjust applications and devices to their own personal preferences, as well as to solve technical problems or tasks
Safety	DIGITAL LAW	Knowledge about current laws and licenses for digital behavior, information and content
	ONLINE IDENTITY MANAGEMENT	Ability to monitor/protect personal info online & know the consequences of personal digital footprints
	DATA PROTECTION	Ability to identify and protect sensitive data and understand related risks
	COMPUTING HEALTH	Ability to care for both physical and mental health in an everyday life surrounded by technology and media

Table 3. Behavioral Measures Corresponding to Each Digital Literacy Sub-competency

Subcompetency	Reference	Sample Item
INFORMATION SEARCH	Kurbanoglu et al. (2016)	Identify a variety of potential sources of digital information
CRITICAL EVALUATION OF INFORMATION	Kurbanoglu et al. (2016)	Determine the authoritativeness, currentness, and reliability of internet sources
INFORMATION SELF-SERVICE	van Deursen & van Duk (2014)	Use the internet to learn on your own
INFORMATION STORAGE	DoD Cyber Awareness Challenge	Securely store computer files
ACTIVE INTERNET PARTICIPATION	Kim & Glassman (2013)	Use social networking sites as a way of connecting with others
DIGITAL COLLABORATION	Ritzhaupt et al. (2010)	Use project management software
DIGITAL SOCIAL AWARENESS	Cavus et al. (2016)	Avoid sharing information about others on social networking sites that would harm their reputation
DIGITAL MEDIA CHOICE	Maruping & Agarwal (2004)	Choose an appropriate communication medium based on the need for immediate feedback (e.g., phone call rather than email to address a time-sensitive issue)
DIGITAL PRODUCTION AND SHARING	Ritzhaupt et al. (2010)	Use word processing software
DIGITAL EXPLORATION	Parasuraman & Colby (2015)	Provide others with advice on new digital technologies
AUTOMATION	Torkzadeh & Koufteros (1994)	Write simple computer programs
DIGITAL CONFIGURATION	Torkzadeh & Koufteros (1994)	Troubleshoot computer problems
DIGITAL LAW	Skov (2016)	Obtain permissions to use a photo, video, or other digital media content, as needed
ONLINE IDENTITY MANAGEMENT	Cavus et al. (2016)	Hide information shared on social networking sites or other online forums, as needed
DATA PROTECTION	DoD Cyber Awareness Challenge	Exercise caution when transmitting electronic information (e.g. encrypting personally identifiable information)
COMPUTING HEALTH	Skov (2016)	Recognize signs of computer overuse (e.g. headache, blurred vision, wrist pain)

Survey 1

Study Design:

Survey 1 was divided into two sections. In the first section, Air Force members rated the importance of the 62 identified digital literacy behaviors, as derived from the sources cited in Table 3, to correspond to each identified sub-competency. Survey participants rated their level of agreement that each behavior was “important to perform effectively in [their] current position” using a 6-point Likert scale:

1	2	3	4	5	6
Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree

In the second section, participants rated the overall importance of Digital Literacy for successful performance in the Air Force, and indicated how frequently they engaged in effective Digital Literacy behaviors, based on three examples (“common behaviors”) provided. The examples given were “Quickly learns how to use new digital devices, online services, or software,” “Effectively selects the most appropriate digital media to communicate in a given context,” and “Considers website credibility and currency when evaluating information from Internet sources.” Participants indicated importance and frequency of displaying the associated behaviors using the same response format as an earlier Foundational Competency survey (Barelka et al., 2019).

How do you personally rate the importance of **DIGITAL LITERACY** to perform successfully in the Air Force?

1	2	3	4	5	6
Not At All Important	Not Very Important	Slightly Important	Important	Very Important	Extremely Important

How often do you display the common behaviors of **DIGITAL LITERACY**?

1	2	3	4	5	6
Almost Never	Very Rarely	Rarely	Occasionally	Frequently	Very Frequently

Parallel questions with behavioral examples were included for each of the other Foundational Competencies (see Appendix A), to provide a basis for comparison. This data additionally

provided a means to evaluate the extent to which Digital Literacy may be more or less closely related to other Foundational Competencies. Specifically, we evaluated the extent to which individuals who place greater importance on a given competency (or who more frequently demonstrate effective behaviors associated with a given competency) are more likely to also recognize the importance of Digital Literacy and consistently perform effective behaviors associated with it.

Study Participants:

In November 2020, the Air Force Survey Office (AFPC/DSYS) identified representative samples of Air Force members (civilian, officer, and enlisted, stratified by career field category) and contacted them via email to request participation in the online CAC-enabled survey.

Based on MilPDS records, AFPC/DSYS identified 2,000 Air Force members in each of the five largest officer, enlisted, and civilian career field categories (see Table 4), excluding members who had participated in an earlier Foundational Competencies survey (Barelka et al. 2019; Barron & Rolwes, 2020). Due to a small percentage of undeliverable email addresses, the number of members in the other career field categories who received a survey invitation ranged from 1789 to 1991.

Table 4. Study 1 Participant Demographics

	Sample Invited to Participate in Survey	Surveys Completed	Survey Completion Rate	Most Common Career Fields of Respondents
Officers				
- Operations	1975	191	9.67%	11M (<i>n</i> = 27) 14N (<i>n</i> = 27) 17D (<i>n</i> = 22)
- Logistics	1789	217	12.13%	21R (<i>n</i> = 93) 21A (<i>n</i> = 79)
- Support	1825	225	12.33%	38F (<i>n</i> = 78) 32E (<i>n</i> = 70)
- Medical	1923	170	8.84%	46N (<i>n</i> = 31) 41A (<i>n</i> = 19)
- Other or missing	1949	239	12.26%	62E (<i>n</i> = 43) 63A (<i>n</i> = 39) 51J (<i>n</i> = 23)
Enlisted				
- Operations	1975	133	6.73%	1C3 (<i>n</i> = 16) 1B4 (<i>n</i> = 9) 1C8 (<i>n</i> = 9)
- Logistics	1991	112	5.63%	2A5 (<i>n</i> = 18) 2A3 (<i>n</i> = 11) 2A6 (<i>n</i> = 15)
- Support	1986	112	5.64%	3D1 (<i>n</i> = 25) 3P0 (<i>n</i> = 18)

- Medical	1954	102	5.22%	4N0 (n = 29) 4A0 (n = 21)
- Other or missing	1954	186	9.52%	8F0 (n = 31) 6F0 (n = 21) 7S0 (n = 15)
Civilian				
- Logistics	1980	212	10.71%	0346 (n = 31) 0301 (n = 22) 1670 (n = 19)
- Support	1960	310	15.82%	0301 (n = 46) 0343 (n = 42) 0201 (n = 40)
- Science & Engineering	1944	273	14.04%	0801 (n = 62) 0855 (n = 61)
- Other or missing	1986	264	13.29%	2210 (n = 32) 1102 (n = 27) 0301 (n = 20)
Unknown	30	3	10.00%	N/A
TOTAL	27,191	2749	10.11%	

A total of 2,749 Airmen completed the survey (10.11% completion rate). Although Active Duty, Air National Guard, and Air Force Reserves personnel were all invited to participate in the study, the survey completion rate among Air Force Reserves personnel (4.97%) was substantially lower than among other Air Force members (13.46% among Air Force civilians, 9.24% among Guard, and 9.20% among Active Duty).

Overall 27.1% of participants were female and 72.8% were male (gender information was missing for 0.1% of respondents). As shown in Table 4, 1,042 participants were officers (24.7% female, 75.3% male), 645 were enlisted (23.4% female, 76.6% male), and 1,059 were civilians (31.7% female, 68.3% male).

Results of Survey 1: Importance of Specific Digital Literacy Behaviors

Results indicated that most of the 62 identified behaviors were considered at least somewhat important by participants. The majority of respondents in all career field categories (Operations, Logistics, Medical, Force Support, Science & Engineering, and Other) identified the following five behaviors as “Extremely Important” for effective performance of their own current job:

- Use word processing software (e.g., Word)
- Use spreadsheet software (e.g., Excel)
- Use presentation software (e.g., Powerpoint)
- Use computers to organize information
- Exercise caution when transmitting electronic information

In total, 29 of the 62 Digital Literacy behaviors were rated by the majority of respondents as either “Important” or “Extremely Important” for effective performance of their current job (mean rating of 5.0+). The results were similar when analyzing the data by career field category, with 25 of the 62 behaviors having a mean of 5.0 or higher across all career field categories (See Appendix B and C for results by demographic). Behaviors with mean ratings of 5.0 or higher are shown in Table 5.

Table 5. Highly Rated Behaviors (“Important” in Current Jobs), By Content Area

Content Area	Behaviors
DoD Cyber Awareness Challenge (Data Protection)	• Follow organizational protocols for the use of electronic devices • Contact the necessary people if a password is taken • Lock electronic devices when not in use
Security on Social Networking Sites (Cavus et al., 2016)	• Protect personal information shared on social networking sites • Avoid sharing... ○ information about others on social networking sites that would harm their reputations ○ videos and photos on social networking sites that would harm my reputation
Digital Media for Collaboration (Maruping & Agarwal, 2004)	• Choose an appropriate communication medium based on the need... ○ ...for immediate feedback (e.g., phone call rather than e-mail to address time-sensitive issue) ○ ...to maintain a record of the communication (e.g., e-mail rather than phone when documentation may be needed) ○ ...for careful editing of message (e.g., e-mail rather than phone to convey complex factual information) ○ ...to convey non-verbal cues (e.g., in-person meeting or video teleconference for tactfully addressing a disputed issue) ○ ...for multiple simultaneous conversations (e.g., Internet meeting rather than individual phone calls)
Computer Self-Efficacy (Torkzadeh & Koufteros, 1994)	• Get help for computer systems problems • Learn to use a variety of software programs
Information and Career-Directed Internet Use (van Deursen & van Duk, 2014)	• Participate in online training • Use the internet to... ○ ...search for public information ○ ...search for information about training or education ○ ...learn on my own
Information Literacy (Kubanoglu, 2016)	• Identify a variety of potential sources of digital information
Digital Law (Skov, 2016)	• Report online harassment, bullying, or spreading of rumors or secrets to appropriate authorities when needed
Automation (Skov, 2016)	• Use common shortcut keys such as copy, paste, bold, undo, search, or print screen to minimize typing

Results of Survey 1: Relationship of Digital Literacy and Associated Sub-competencies to Other Foundational Competencies

In the second section of the survey, results indicated that Digital Literacy was rated similarly to other Foundational Competencies in terms of both importance and self-rated frequency of demonstrating effective competency behaviors (See Table 6). Overall, Digital Literacy was rated the 13th most important competency among 24 competencies, with a mean importance rating of 5.30 ($SD = .83$; $N = 2668$). Most respondents indicated that they Frequently (47.3% of respondents) or Very Frequently (35.4% of respondents) displayed the effective “common” behaviors associated with Digital Literacy. Notably, 13.7% of survey respondents indicated that they displayed these behaviors only “Occasionally” or less. See Table 6 for full results.

DIGITAL LITERACY: Uses technology to identify, critically evaluate, and synthesize data and information; create and manage digital content; and appropriately interact in a virtual environment.

COMMON BEHAVIORS:

- Quickly learns how to use new digital devices, online services, or software.
- Effectively selects the most appropriate digital media to communicate in a given context.
- Considers website credibility and currency when evaluating information from Internet sources.

How do you personally rate the importance of **DIGITAL LITERACY** to perform successfully in the Air Force?

0.3%	0.5%	1.8%	11.8%	35.4%	47.3%	100%
Not At All Important	Not Very Important	Slightly Important	Important	Very Important	Extremely Important	TOTAL

How often do you display the common behaviors of **DIGITAL LITERACY**?

0.3%	0.6%	1.4%	11.4%	47.3%	38.9%	100%
Almost Never	Very Rarely	Rarely	Occasionally	Frequently	Very Frequently	TOTAL

Table 6. Importance of Foundational Competencies for Successful Performance in an Air Force Career, and Self-Rated Frequency of Demonstrating Corresponding Behaviors

	Importance Mean	Importance Standard Deviation	Frequency Mean	Frequency Standard Deviation
DIGITAL LITERACY	5.30	0.83	5.22	0.78
Communication	5.70	0.59	5.57	0.62
Accountability	5.66	0.64	5.60	0.58
Teamwork	5.56	0.72	5.55	0.66
Decision Making	5.50	0.73	5.41	0.75
Leadership	5.46	0.81	5.28	0.88
Initiative	5.43	0.78	5.32	0.77
Self-Control	5.42	0.79	5.44	0.69
Flexibility	5.41	0.76	5.39	0.72
Developing Others	5.40	0.82	5.10	0.93
Resilience	5.40	0.81	5.35	0.74
Perseverance	5.39	0.78	5.37	0.75
Analytic Thinking	5.34	0.78	5.40	0.71
Service Mindset	5.20	0.95	5.37	0.79
Strategic Thinking	5.20	0.92	5.24	0.85
Information Seeking	5.19	0.86	5.41	0.73
Resource Management	5.19	0.90	5.20	0.84
Precision	5.14	0.89	5.20	0.79
Creative Thinking	5.10	0.93	5.07	0.89
Change Management	5.08	0.92	5.00	0.91
Fostering Innovation	5.07	0.97	4.87	0.99
Fostering Inclusion	5.07	1.07	5.07	0.94
Results Focused	4.99	0.98	5.24	0.81
Influence	4.92	1.00	4.96	0.96

In addition, we analyzed how closely related the various Digital Literacy subcompetencies were to the 22 existing Foundational Competencies based on correlations among importance and frequency ratings. We employed three methodologies, evaluating: (a) relationships between

Digital Literacy and other competency importance ratings (mean correlation with Digital Literacy = 0.32, r s ranging from 0.27 to 0.37), (b) relationships between Digital Literacy and other competency behavior frequency ratings (mean correlation = 0.23, r s ranging from 0.16 to 0.30), and (c) relationships between Digital Literacy frequency ratings and other competency importance ratings (mean correlation = 0.20, r s ranging from 0.15 to 0.26). As shown in Table 7, two of the three methodologies identified Analytical Thinking and Information Seeking as the Foundational Competencies that most closely related to Digital Literacy. All three methodologies converged in identifying Analytical Thinking, Information Seeking, Initiative, and Fostering Innovation among the top five competencies most closely related to Digital Literacy.

Table 7. Foundational Competencies Most Highly Correlated with Digital Literacy, Based on Overall Competency Ratings

Strongest Digital Literacy Correlates Based on... ...Importance ratings	...Frequency ratings	...Frequency with Importance ratings
Analytical Thinking ($r = .37$) Information Seeking ($r = .36$) Fostering Innovation ($r = .36$) Change Management ($r = .35$) Initiative ($r = .35$)	Initiative ($r = .27$) Fostering Innovation ($r = .24$) Analytical Thinking ($r = .24$) Information Seeking ($r = .23$) Creative Thinking ($r = .22$)	Analytical Thinking ($r = .26$) Information Seeking ($r = .24$) Initiative ($r = 0.24$) Flexibility ($r = .23$) Fostering Innovation ($r = .23$)

Separately, we also evaluated the extent to which behavioral items associated with each of the 16 subcompetencies in the Skov (2016) model corresponded to importance ratings for the current Foundational Competencies. As shown in Table 8, results varied substantially by subcompetency area; overall Fostering Innovation and Information Seeking were most closely related to the largest number of subcompetencies in the Skov (2016) model.

Table 8. Foundational Competencies Most Highly Correlated with Digital Literacy, Based on Rated Importance of Specific Sub-Competency Behaviors

	Digital Literacy Sub-competency	Most Closely Related to Foundational Competency of...
Information	INFORMATION SEARCH	Analytical Thinking ($r = .24$)
	CRITICAL EVALUATION OF INFORMATION	Information Seeking ($r = .28$)
	INFORMATION SELF-SERVICE	Information Seeking ($r = .23$)
	INFORMATION STORAGE	Fostering Innovation ($r = .27$)
Communication	ACTIVE INTERNET PARTICIPATION	Influence ($r = .17$)
	DIGITAL COLLABORATION	Fostering Innovation ($r = .22$)
	DIGITAL SOCIAL AWARENESS	Self-Control ($r = .22$)
	DIGITAL MEDIA CHOICE	Resilience ($r = .32$)
Production	DIGITAL PRODUCTION AND SHARING	Fostering Innovation ($r = .23$)
	DIGITAL EXPLORATION	Information Seeking ($r = .24$)
	AUTOMATION	Creative Thinking ($r = .13$)
	DIGITAL CONFIGURATION	Information Seeking ($r = .23$)
Safety	DIGITAL LAW	Fostering Innovation ($r = .26$)
	ONLINE IDENTITY MANAGEMENT	Fostering Innovation ($r = .26$)
	DATA PROTECTION	Fostering Innovation ($r = .28$)
	COMPUTING HEALTH	Resilience ($r = .31$)

Survey 2

The purpose of this survey was to provide complementary information to further establish the relative importance of specific components of Digital Literacy, based on how strongly specific Digital Literacy behaviors differentiate between high and lower potential members, and to determine which behaviors to include in the MyVector Foundational Competency assessment.

Study Design:

Based on a survey of Air Force supervisors, a modified criterion-sampling methodology was used to select items for inclusion on the MyVector assessments. In the survey, current Air Force supervisors were asked to think of two individuals they have worked with directly during their career:

- one Airman (enlisted/officer/civilian) who they view/viewed as having a **high potential for future success in an Air Force career**
- one Airman, **in the same rank/grade and career field**, who they view/viewed as having **lower potential for future success in an Air Force career**

Survey participants then indicated their level of agreement/disagreement that the member “**consistently and effectively**” engaged in each of the 62 behaviors using a Likert-type scale:

1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree

For each of the 62 behaviors, the survey participant was alternately able to indicate if:

- The Airman was not in a situation or position where this behavior was possible or applicable (**No opportunity to perform**)
- I had no opportunity to observe whether the Airman demonstrated the behavior (**Don’t Know**)

Study Participants:

Later in November 2020, the Air Force Survey Office (AFPC/DSYS) used MilPDS records to identify up to 2,000 current Air Force supervisors in each of the five largest officer, enlisted, and civilian career field categories. Members who had participated in an earlier Foundational Competencies survey (Barelka et al. 2019; Barron & Rolwes, 2020) or who had been invited to participate in the other concurrent Digital Literacy survey described in this report were excluded from the eligible populations. For career field categories with less than 2,000 eligible participants (Logistics and Support officers; civilian Force Support and Science & Engineering) AFPC/DSYS contacted the entire eligible populations.

Due to a small percentage of undeliverable email addresses, the number of members in the other career field categories who received a survey invitation ranged from 1835 to 1980.

Table 9. Study 2 Participant Demographics

	Sample Invited to Participate in Survey	Completed Surveys	Survey Completion Rate	Most Common Career Fields of Respondents
Officers				
- Operations	1949	132	6.77%	14N (<i>n</i> = 18) 17D (<i>n</i> = 16)
- Logistics	841	69	8.20%	21A (<i>n</i> = 20) 21R (<i>n</i> = 28)
- Support	1468	98	6.68%	38F (<i>n</i> = 32) 30C (<i>n</i> = 19) 32E (<i>n</i> = 19)
- Medical	1835	117	6.38%	46N (<i>n</i> = 23) 41A (<i>n</i> = 18)
- Other or missing	1882	165	8.77%	92S (<i>n</i> = 24) 63A (<i>n</i> = 15)
Enlisted				
- Operations	1954	112	5.73%	1C3 (<i>n</i> = 11) 1N1 (<i>n</i> = 10)
- Logistics	1980	124	6.26%	2A6 (<i>n</i> = 16) 2A3 (<i>n</i> = 15)
- Support	1970	115	5.84%	3D1 (<i>n</i> = 23) 3D0 (<i>n</i> = 19)
- Medical	1882	87	4.62%	4N0 (<i>n</i> = 19) 4A0 (<i>n</i> = 9)
- Other or missing	1892	134	7.08%	6C0 (<i>n</i> = 16) 6F0 (<i>n</i> = 15)
Civilian				
- Logistics	1872	174	9.29%	0346 (<i>n</i> = 36) 8801 (<i>n</i> = 18) 0301 (<i>n</i> = 14)
- Force Support	1752	195	11.13%	0301 (<i>n</i> = 58) 0201 (<i>n</i> = 23) 1701 (<i>n</i> = 23)
- Science & Engineering	1633	176	10.78%	0801 (<i>n</i> = 77) 0855 (<i>n</i> = 39)
- Other or missing	1929	196	10.16%	0301 (<i>n</i> = 23) 2210 (<i>n</i> = 24)
TOTAL	24,839	1,894	7.63%	

As shown in Table 9, a total of 1,894 supervisors completed the survey (7.63% survey completion rate). Although Active Duty, Air National Guard, and Air Force Reserves personnel were all invited to participate in the study, the survey completion rate among Air Force Reserves personnel (4.15%) was somewhat lower than among other Air Force members (10.31% among Air Force civilians, 6.68% among Active Duty, and 6.26% among Guard personnel).

Overall 20.7% of participants were female and 79.3% were male. Of the participants, 581 were officers (19.6% female, 80.4% male), 572 were enlisted (19.9% female, 80.1% male), and 741 were civilians (22.3% female, 77.7% male).

Of the 484 supervisors who rated on officers, 329 rated on members at the O1-O3 ranks, 145 rated on members in the O4-O5 ranks, and 10 rated on members at the rank of O6 or above. Of the 994 supervisors who rated on enlisted members, 416 rated on members at the E1-E4 ranks, 440 rated on members at the E5-E6 ranks, 138 rated on members at the rank of E7 or above. Of the 416 supervisors who rated on civilians, 263 rated on members in GS/GG positions. Other civilian ratee pay plans included: NH/NJ/NK (DoD Acquisition Workforce; $n = 83$), WS (Wage Schedule; $n = 30$), DR (Scientist and Engineer; $n = 19$), NF (Non-Appropriated Fund; $n = 13$), SES ($n = 2$), and various others ($n = 24$). Of the 263 supervisors who rated on GS/GG civilians, 26 rated on members at the GS-7 level or below, 78 rated on members in the GS-9 to GS-11 grades, 146 rated on GS-12 or GS-13 members, and 13 rated on members at the GS-14 level or above.

Study 2 Results:

For initial ease of interpretability, we dichotomized responses to indicate whether a given member had (“Agree” or “Strongly Agree”) or had not (“Disagree” or “Strongly Disagree”) effectively demonstrated each behavior if in a situation in which the behavior was possible or applicable. Responses of unknown were excluded from analysis.

Overall, behaviors associated with Digital Exploration, Information Search, Critical Evaluation of Information, and Communication Media Choice most strongly differentiated members that supervisors viewed as having higher potential than other Airmen (of the same rank and AFSC; see Appendix D for full results):

- **Digital Exploration:** Keeping up with the latest technological developments; figuring out new high-tech devices without help from others; and providing others with advice on new digital technologies
- **Information Literacy (Critical Evaluation of Internet Information):** Determining the authoritativeness, currency, and reliability of internet sources; identifying points of agreement and disagreement among internet sources; and synthesizing newly gathered digital information with previous information
- **Communication Medium Choice:** Choosing an appropriate communication medium (e.g., email, phone, video telecon, etc.) based on the need for nonverbal cues; immediate feedback; a record of the conversation; careful editing of the message; and/or simultaneous conversations

Although over 80% of the “high potential” Airmen that supervisors identified consistently and effectively demonstrated Digital Exploration, Information Literacy, and Communication Medium Choice behaviors, less than 50% of the identified “lower potential” Airmen did so. For example, 95.70% of identified high potential Airmen consistently and effectively “determined the authoritativeness, currentness, and reliability of Internet sources” as compared to only 43.80% of lower potential Airmen. Similarly, 97.90% of high potential Airmen consistently and effectively “chose an appropriate communication medium based on the need to convey nonverbal cues (e.g., in-person meeting or video teleconference for tactfully addressing a disputed issue)” as compared to 47.60% of lower potential Airmen. While 81.40% of identified high potential Airmen “kept up with the latest digital technological developments” only 32.50% of lower potential Airmen did so. The single strongest differentiator was “Figured out new high-tech digital products and services without help from others”; this behavior was identified as effectively performed by 81.2% of high potential members and only 27.9% of low potential members (difference of 53.3%).

In contrast, behaviors associated with **Data Protection** (covered in the annual DoD Cyber Awareness training) and **Proficiency with Common Software** (e.g., Word, Excel, and Powerpoint) were not particularly strong differentiators of supervisor-rated potential. Over 97% of identified high potential members consistently and effectively demonstrated these behaviors, but the vast majority of identified lower potential Airmen (over 80%) did so as well. See Appendix for full results.

The overall results were then used to identify illustrative behaviors corresponding to increasing levels on the Foundational Competency of Digital Literacy based on the extent to which consistently and effectively demonstrating these behaviors differentiated supervisor-rated Air Force career potential on the survey:

Expert	- Provides others with advice on new digital technologies - Figures out new high-tech digital products and services without help from others - Synthesizes newly gathered digital information with previous information
Advanced	- Uses many digital resources at the same time to conduct research - Selects digital communication medium based on situational needs (need for nonverbal cues, record of communication, simultaneous conversations, etc.)
Intermediate	- Uses the Internet to learn on their own - Uses common shortcut keys, such as copy, paste, bold, undo, search, etc., to minimize typing - Protects personal information shared on social networking sites or other online forums
Basic	- Follows organizational protocols for use of electronic devices - Gets help for computer system problems, as needed - Participates in online training

Recommendations for Modification of Digital Literacy Definition

Overall, the results of the surveys validated the importance of all of the primary subcompetencies (Information, Communication, Production, and Safety) included in the European Union’s *Digital Competence for Citizens* framework (Skov, 2016). In evaluating the proposed definition for Digital Literacy, the results of the two surveys were used to validate each component of the working definition. In Survey 1, production (i.e., common software proficiency) and safety (i.e., data protection issues covered on the DoD CyberAwareness Challenge) were rated by Airmen as most important for effective performance in their current jobs. However, some behaviors associated with Information and Communication were also rated as at least somewhat important by the majority of Airmen. In Survey 2, supervisor ratings showed Information and Communication behaviors to be among the strongest differentiators of potential for Air Force career success; Digital Exploration (a sub-component of Production in the Skov, 2016 model) behaviors were the strongest differentiators between high and lower potential members overall.

Taken together, these results indicated that there may be a need to emphasize “Digital Exploration” in the Air Force Foundational Competency definition (i.e., as distinct from “creation” of Digital Content and “identification” of digital information). Given this need, a new definition for Digital Literacy was proposed and ultimately approved by Lt General Brad Webb (AETC/CC) as for use as the official definition of Digital Literacy as an Air Force Foundational Competency:

“Uses technology to identify, critically evaluate, and synthesize data and information; **explore**, create and manage digital content; and appropriately interact in a virtual environment”

Development of a Brief Global Measure of Air Force Digital Literacy for Inclusion on MyVector Pathfinder Assessment

The MyVector Pathfinder assessment was designed as a means for Air Force members (enlisted, officer, and civilian) to obtain voluntary developmental feedback, and recommended resources (freely available online training, articles, books, videos, etc. with tips for competency improvement). Since November 2020, access to the self-assessment and 360 degree feedback functionality has been available to Air Force members using CAC-login. The assessment is intended to efficiently deliver feedback on personal competency strengths and weakness among the 24 Foundational Competencies, necessitating a very short measure of each competency.

To develop a brief 3-item measure we prioritized behavioral items based on the two surveys. Behaviors were chosen based on three criteria. First, selected behaviors had to have an overall mean importance rating of 5 (“Agree” on importance for effective performance) and be rated among the most important behaviors for current job success in Survey 1 (rated among the top 31 of 62 behaviors). Second, selected behaviors needed to be rated among the best differentiators (top 31 of 62) of high and low career potential in Survey 2. Finally, the digital literacy measure, in aggregate, had to capture distinct sub-competencies reflected in the Digital Literacy definition.

Based on these criteria, the three items chosen for inclusion in the 2021 MyVector Pathfinder assessment were:

1. Determine the authoritativeness and reliability of internet sources
2. Keep up with the latest digital technological developments
3. Choose an appropriate communication medium (e.g., email, phone, video telecon, etc.) based on situational needs

These items were chosen to correspond to each of the three sub-competencies that most strongly differentiated supervisor-rated potential for Air Force career success: Information Literacy (Critical Evaluation of Information), Digital Exploration, and Communication Medium Choice, respectively.

The seven items associated with Critical Evaluation of Information that appeared on the survey (adapted from Kurbanoglu et al., 2016) were highly intercorrelated (based on Survey 2, $\alpha = .88$ for ratings of High Potential members and $\alpha = .95$ for ratings of Lower Potential members) and were all among the strongest differentiators of supervisor-rated potential for success in an Air Force career. The selected item (“Determine the authoritativeness and reliability of internet sources”) was the strongest differentiator of the seven subcompetency behaviors, and the overall 2nd strongest differentiator of supervisor-rated career potential.

The four items associated with Digital Exploration that appeared on the survey (adapted from Parasuraman & Colby, 2015) were also highly intercorrelated ($\alpha = 0.87$ for ratings of High Potential members and $\alpha = 0.95$ for ratings of Lower Potential members) and were all rated among the strongest differentiators of supervisor-rated potential for success in an Air Force career. The selected item (“Keep up with the latest technological developments”) was the 2nd strongest differentiator of the four subcompetency behaviors, and the overall 7th strongest differentiator of supervisor-rated career potential. Note that the single strongest behavioral differentiator of supervisor-rated potential (“Figures out new high-tech digital products and services without help from others”) was not chosen because it was rated as less important for current job performance in Survey 1 than the selected items.

The final Pathfinder item provided a summary of the five behavioral items associated with Digital Media Choice that appeared on the survey (based on the Maruping & Agarwal, 2004 taxonomy). All five behavioral items associated Digital Media Choice were highly correlated ($\alpha = .91$ based on ratings of High Potential members; $\alpha = .96$ based on ratings of Lower Potential members), and were strong differentiators of supervisor-rated potential for success in an Air Force career. All five Digital Medium Choice items were stronger differentiators of at least some behaviors associated with Critical Evaluation of Information and Digital Exploration. “Choose an appropriate communication medium based on the need to convey nonverbal cues” and “Choose an appropriate communication medium based on the need for careful editing of message” were the 5th and 9th strongest behavioral differentiators of supervisor-rated potential overall.

Consistent with the recognized multidimensionality of Digital Literacy, the internal reliability of the three-item global measure of Digital Literacy was relatively low (based on Study 2, $\alpha = .52$ for ratings of High Potential members and $\alpha = .73$ for ratings of Lower Potential members). For this reason, we also sought to develop a longer, supplemental, standalone Digital Literacy assessment to provide feedback at the subcompetency level.

Development of a Standalone (8 subcompetency) Digital Literacy Assessment

Due to the multidimensionality of Digital Literacy, we also introduced a separate MyVector assessment to provide differentiated feedback on each applicable component of Digital Literacy. To ensure appropriateness for the Air Force context, we sought to limit the assessment to behaviors that were rated as among the most important for effective performance in current Air Force jobs (Survey 1) or among the strongest differentiators of supervisor-rated career potential (Survey 2). Specifically, from the 62 behaviors we identified those 49 behaviors (a) with a mean rating of 5.0 (“Important”) or higher in Survey 1, and/or (b) rated as among the top (31 of 62) differentiators of supervisor-rated career potential in Survey 2.

To evaluate dimensionality we conducted a Principal Components Analysis, with a Varimax rotation, based on the 1-4 Likert-type ratings of the 49 behavioral items deemed to be a higher priority based on results of either of the two surveys (responses of “Unknown” or “No Opportunity to Perform” were coded as missing data, applying mean replacement). Applying the minimum Eigenvalue of 1.0 heuristic (Kaiser, 1960) to ratings of Lower Potential members suggested eight factors should be retained. This eight factor solution yielded interpretable factors, with items from the same original scale reference generally loading together. Appendix E displays results of the eight factor solution with items and rotated factor pattern coefficients (loadings) shown for items with a minimum loading of .5. The three items with the highest loadings on each of the eight factors (highlighted in the Appendix E) were then selected for inclusion in MyVector as a short 3-item subcompetency assessment.

Factor labels, definitions, and the original scale reference for the selected item content is shown in Table 10. As shown in Appendix F and G, internal reliability estimates for the eight subcompetency scales ranged from .849 to .950 for ratings of low potential members, and ranged from .774 to .935 for ratings of high potential members. Intercorrelations among sub-competency scales varied considerably; while some aspects of digital literacy are only modestly correlated (e.g., Technological Exploration and Communication Medium Choice, $r = .391$) other sub-competencies were strongly related (Information Protection and Appropriate Social Media Use, $r = .737$).

Table 10. Digital Literacy Subcompetency Scales for Inclusion on Standalone MyVector Assessment

Sub-competency	Definition	Original Reference (Adapted Item Source)
Information Literacy	Recognizes when information is needed and locates, evaluates, and uses the needed information to achieve goals	Information Literacy (Kurbanoglu et al., 2016)
Communication Medium Choice	Recognizes how technology may help or hinder communication; selects the most appropriate medium (e.g., e-mail, phone, video telecon) for communication based on situational needs	Digital Media for Collaboration (Maruping & Agarwal, 2004)
Technological Exploration	Seeks out, learns, and adopts new technologies; pioneers the use of new technologies within one's organization or unit	Technological Readiness (Parasuraman & Colby, 2015)
Appropriate Social Media Use	Maintains awareness of others' access to information posted in social media or other online forums, and manages one's online identity and reputation appropriately	Security on Social Networking Sites (Cavus et al., 2016)
Information Protection	Identifies and safeguards sensitive electronic data, mitigating potential risks	DoD Cyber Awareness Challenge
Software Proficiency	Creates and modifies digital content (e.g., text, graphics, numeric data) using commonly available software	Multimedia Competencies (Ritzhaupt, Martin, & Daniels, 2010)
Active Internet Use	Seeks out and benefits from potential self-service solutions online	Information and Career-Directed Internet Use (van Deursen & van Duk, 2014)
General Computer Skills	Uses computers to organize information; adjusts settings and applications as needed to troubleshoot common computer problems	Computer Self-Efficacy (Torkzadeh & Koufteros, 1994)

As shown in Table 11, all eight sub-competency scales demonstrated strong criterion-related validity for distinguishing high from lower potential members ($ds > .90$ for all scales). Communication Medium Choice ($d = 1.81$) and Information Literacy scales ($d = 1.47$) demonstrated the strongest criterion-related validity overall.

Mean ratings of high potential members exceeded 3.0 for all eight subcompetency scales, such that the majority of supervisors “Agreed” or “Strongly Agreed” that the high potential members they had worked with consistently and effectively demonstrated the behaviors associated with these subcompetencies. However, there was substantially more variability in ratings of high potential members on Technological Exploration (mean = 3.07, SD = .88) than on the other subcompetencies.

Approximately three in four (75.4%) supervisors “Disagreed” or “Strongly Disagreed” that the lower potential members they worked with effectively demonstrated Technological Exploration (mean = 1.97), and approximately half of supervisors “Disagreed” or “Strongly Disagreed” that the lower potential members they worked with effectively demonstrated Information Literacy, Communication Medium Choice, and General Computer Skills (means = 2.38 to 2.48). Lower potential members were more highly rated on Software Proficiency and Active Internet Use (means = 3.25 and 3.12, respectively) than on other subcompetencies.

Table 11. Criterion-Related Validity of MyVector Digital Literacy Subcompetency Scales

	High Potential		Low Potential		<i>Cohen's d</i>
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	
Comm. Medium Choice ($N = 1607$)	3.69	.48	2.46	.83	1.81
Information Literacy ($N = 1293$)	3.51	.58	2.38	.92	1.47
General Computer Skills ($N = 1688$)	3.43	.59	2.48	.92	1.23
Appropriate Social Media Use ($N = 934$)	3.72	.48	2.80	.95	1.22
Technological Exploration ($N = 1113$)	3.07	.88	1.97	.95	1.20
Active Internet Use ($N = 1739$)	3.79	.39	3.12	.79	1.08
Information Protection ($N = 1476$)	3.67	.50	2.97	.88	0.98
Software Proficiency ($N = 1759$)	3.81	.40	3.25	.78	0.90

Qualitative (Thematic) Analysis of Open Ended Comments

In addition to the quantitative data describe above, each of the surveys included the opportunity for participants to provide (optional) qualitative feedback in the form of open-ended comments at the end of the survey. Specifically, participants were asked: “What types of training or education do you view as most important for improving the Digital Literacy of Airmen across career fields?” In total, 1,046 respondents provided comments in Survey 1.

We conducted a thematic analysis of the comments as follows:

- The first author read through the comments and developed a detailed code book (see Appendix H1) based on common themes and a priori areas of interest (i.e., comments on topics covered in the DoD CyberAwareness training required of all Air Force network users, as well as comments on digital literacy sub-competencies addressed in the quantitative portion of the survey).
- Two independent raters (psychology students), then read each comment separately and assigned each comment to one or more of the thematic categories in the code book. Comments that did not appear to correspond to any of the identified themes were categorized as “Other.” This process was used to document the frequency of various themes. Only comments that were categorized by both independent raters as corresponding to a given theme (or subtheme) were included in the frequency counts.

Thematic Categorization (Codebook Development)

Comments on Existing Training Offerings. Because all Air Force network users are required to complete a (one hour, online) DoD CyberAwareness Challenge course (<https://public.cyber.mil/training/cyber-awareness-challenge/>) on an annual basis, and the quantitative portion of our survey addressed applicable information security behaviors, we expected some comments on the DoD course and information security issues a priori. We sought to categorize cybersecurity content themes based on the DoD course structure (three primary areas, further divided into 3-6 modules):

- **Spillage** (Classified Data, Insider Threat, and/or Social Networking [need to limit social media sharing for security reasons]),
- **Sensitive Information** (Physical Security, Identity Management, and/or Sensitive Compartmentalized Information [SCI] and Facilities [SCIFs], and/or
- **Malicious Code** (Website Use, Social Engineering, Travel, Use of Government-Furnished Equipment, and/or Mobile Devices, and/or Home Security).

We also sought to capture comments on **other existing training** on digital literacy topics that the Air Force provides; while we were aware of some Air Force training offerings a priori (e.g., AF e-Learning, Digital University) we carefully read through the comments to identify others.

Comments on Need/Desire for Other Digital Literacy Training Content. The quantitative portion of the Digital Literacy survey included questions on competency behaviors corresponding to specific digital literacy sub-competencies. We sought to differentiate comments

on sub-competency behaviors that were addressed in the close-ended survey (comments on Information Literacy, Communication Medium Choice, Social Media Awareness, Basic/General Computer Skills, as well as comments on proficiency with specific types of software and computer programming) from other types of training content. Types of digital literacy skills that were not specifically addressed in the close-ended portion of the survey included typing, online etiquette, and general literacy skills needed for writing emails; these were included in the code book based on the first author's review of the survey comments.

Reactions to the Survey and Its Methodology. Though unsolicited, it is fairly common for survey respondents to comment on the survey method itself (regardless of the topic of the survey). As such, we additionally categorized (unsolicited) reactions to the rest of the survey and its methodology using an existing framework (Decorte et al., 2019).

Other Types of Comments. Comments on Digital Literacy **Training Delivery** (e.g., recommendations for delivering training online vs. in-person training and who should receive training in what forum), and **General Digital Literacy Comments** were categorized separately. Finally, although unsolicited, many comments addressed **Air Force Information Technology policies and procedures** rather than training; these were categorized as such.

See Appendix H1 for the full codebook. Note that we retained an "Other" category that allowed the two independent coders to capture any additional themes that were missed in the first author's initial review of comments during codebook development.

Overall Qualitative Results Summary

Overall, participants most frequently expressed the:

- Need/desire for (additional) training to develop **Software Proficiency** (355 of the 1,046 comments were categorized by both independent raters as addressing this theme)

In addition to **general comments about digital literacy training** (190 of the 1,046 comments), participants commonly provided **training delivery recommendations** (e.g., use of in-person vs. online training formats; 166 of the 1,046 comments) and/or commented on the **DoD Cyber Awareness course or the importance of training on cybersecurity issues** (81 of the 1,046 comments). See Table in Appendix H1.

A summary highlighting key themes regarding (1) recommended training content, (2) existing Air Force training offerings, and (3) recommendations for training delivery appears in the next sections. More detailed breakouts for each codebook category, and illustrative comments, appear in Appendices H1-H13.

Training Content Recommendations

Software Proficiency. Of participants who commented on the need for (additional) training for software proficiency, most referenced the need for training on Microsoft Office or specific Microsoft Office products. This makes sense given that Microsoft Office software is typically installed on the standard Air Force desktop. In all, 175 participants commented that the Air Force should offer more (and/or require) training on one or more Microsoft product(s).

Notably comments highlighted the importance of Microsoft Office training both early in a member's career ("from day one") and over the course of their career:

- "All Airmen **need a basic knowledge of Microsoft products from day one.** As individuals advance in rank having an increased knowledge in Power Point, Adobe, and Excel are critical to performing day to day functions."
- "Many people in the military have just very basic skills in Office and **waste many man-hours on troubleshooting and finding features.**"
- "I would like to see **Microsoft office classes taught regularly at the education center** with focus on Excel, Word, PowerPoint, SharePoint, and Microsoft Project as these are the daily used programs."
- "I have no formal computer training, but have applied myself out of necessity for 16 years active duty. My **efforts would have been, and would still be greatly bolstered with any form of official Microsoft Office training.**"

In terms of specific types of software, participants most frequently cited the need for the Air Force to offer (more) or require training on...

- **Spreadsheet software** (e.g., Microsoft Excel) (163 comments)
- **Word processing software** (e.g., Microsoft Word) (99 comments)
- **Presentation software** (e.g., Microsoft Powerpoint) (99 comments)
- **Email/calendar programs** (e.g., Microsoft Outlook) (58 comments)
- **Database software** (e.g., Microsoft Access) (45 comments)
- **Videoconferencing or digital collaboration tools** (e.g., Microsoft Teams, Zoom, WebEx, Google Meet, etc.) (41 comments)
- **Microsoft Sharepoint or other file sharing programs** (26 comments)
- **Adobe Acrobat (DC) or pdf/fillable forms** (16 comments)
- **Project management software** (e.g., Microsoft Project) (13 comments)

Separately, a smaller number of participants also commented on the need for training on how to navigate the **Air Force Portal or other Air Force-specific or DoD-specific systems and websites** (e.g., myPers, vMPF, LeaveWeb, DFAS, DPMAP, etc.) (16 comments)

While many of types of software that were mentioned had been referenced in the close-ended portion of the survey, some had not been included (i.e., email/calendar, videoconferencing, file sharing, and fillable form software) and may merit inclusion in other training (e.g., in-person Microsoft Office training that has been offered at a limited number of bases).

Many comments that referenced the importance of spreadsheet software (Microsoft Excel) noted that proficiency allows for automating tasks and can create major time savings for Air Force units. Participants also emphasized the applicability of Excel to a variety of different types of tasks (inventory, budgeting, scheduling) that are common across Air Force career fields:

- **“Microsoft Excel is what I consider the most important because it is what I like to call the swiss-army knife of all computer programs. You can log data within excel and can be geared toward any AFSC in the Air Force. (ex: inventory, budgets, schedules, etc.)”**
- **“Microsoft Excel is incredibly important and is the most frequently ideal way to automate tasks. It is rarely fully utilized. The Air Force should sponsor a program to teach members in all career fields to more effectively use Excel. This could consist of locally available commercial trainings or part of an AF run computer skills training that members can attend on a TDY status.”**
- **“Basic Excel is expected but never taught. Online resources should be available, and if they are, better publicized, for those who have not previously had classes on basic M365 programs. I have spent a lot of time in my AF career teaching basic functions/keyboard shortcuts, to help people do their jobs.”**

Although most comments on the need for further training on Powerpoint and Word tended to be fairly general, one respondent from Air Education & Training Command highlighted a concern that a lack of understanding of the full functionality of existing (already available) software was causing his leadership to acquire additional, unnecessary commercial software products at substantial cost to tax payers:

- **“There is a serious lack of training in Microsoft PowerPoint... I have been watching AETC starting to push Captivate, Camtasia, Articulate, and many other course development software to design products for the classroom that our current PowerPoint can do in a lot of cases. The education population acts like this is really great new technology, while having no understanding of the (already provided) software installed on every AF computer. I see a huge need for PowerPoint training to 1st, save money, and 2nd, use the software already purchased and provided. My concern is the AF is spending a ton of tax payers \$\$ pushing new technology to educators that haven't taken the time to learn the software already available on their computers.”**

Cybersecurity and Social Media Awareness Content Recommendations

Beyond general comments on the importance of cybersecurity training (36 comments), comments on cybersecurity training most commonly highlighted the potential need/desire for additional cybersecurity training focused on:

- **Social Networking** (*e.g., need to limit social media sharing*)(27 comments)
- **Sensitive Information** (*e.g., avoiding data breaches; handling PII*) (22 comments)

Although Social Networking is covered to a limited extent in the current CyberAwareness challenge, the relatively large number of comments on this issue may suggest that this limited coverage or limited emphasis in the required course may be insufficient. Although most comments on social networking focused on cybersecurity implications (27 comments as indicated), other common comments highlighted the need for training on social networking from the perspective of **Social Media Professionalism** and career consequences for individual Airmen (i.e., a need for Airmen to understand what not to post on social media to maintain their professional reputations) (7 comments). We note a short standalone online course freely available through the DoD Cyber Exchange that may more fully address such content concerns (*Social Networking and Your Online Identity*; <https://public.cyber.mil/training/social-networking-v4/>).

Two additional strongly worded comments highlighted the need for training to address cyberbullying and the potential consequences of #metoo posts. The latter commenter emphasized the need for addressing the impact of social media posts as part of annual Sexual Assault Prevention and Response (SAPR) training (see Appendix H13 for verbatim comments).

Other Training Content Recommendations

Participants who expressed a need/desire for **other digital literacy training content**, most commonly indicated that the Air Force should offer (more) or require training on:

- **Basic or General Computer Skills** (*e.g., computer hardware and basic troubleshooting, organizing computer files, short-cut keys, etc.*) (65 comments)
- **Information Literacy** (*e.g., online search strategies; internet research; how to evaluate the credibility, accuracy, reliability of internet information; synthesis of information; identification of misinformation*) (36 comments)
- **Computer Programming** (*i.e., how to code, certain programming languages, etc.*) (*e.g., Python, VBA, etc.*) (27 comments)
- **Literacy or Written Communication Skills** (*e.g., grammar/spelling to write email, reading comprehension to respond to emails*) (17 comments)
- **Email/Texting/Internet Etiquette** (12 comments)
- **Communication Medium Choice** (*e.g., when to use email vs. when in-person meeting or phone call is needed*) (10 comments)

Basic or General Computer Skills Training Content Recommendations

Several comments on the need for **Basic or General Computer Skills** emphasized the impact to the broader organization when members are unable to perform basic computer troubleshooting. Comments noted that Communication Squadrons “are not sufficiently resourced to provide immediate response to every trouble ticket” and indicated that there “needs to be basic literacy in self trouble shooting computer problems... before calling it quits or sending off to a helpdesk (and then getting nothing done while waiting on a response).”

Examples of basic or general computer skills that were highlighted included:

- Knowing to 'double click' on icons and links.
- How to find your computer name and IP address
- How to identify different parts and functions of computers
- How to get hardware plugged in (when working outside of one’s regular workplace)
- How to troubleshoot common network connectivity issues and connectivity to scanners/printers
- How to troubleshoot software updates, common email issues, etc.

One participant noted potential value in having more proficient Air Force members help teach Airmen who lack such proficiency as part of a formal USAF course at each base:

- “We should **enroll people in USAF-led courses at each base** that is similar to fundamentals of computers, troubleshooting, common equipment names, etc. With that said, it is also important to **query who among the force already have this competence to either potentially help teach**, or be allowed to not attend.”

Information Literacy Training Content Recommendations

Many comments on the need for additional training on **Information Literacy** topics noted that while most Airmen grew up using computers and the internet, many lack the ability to properly evaluate internet sources and distinguish reliable from unreliable information:

- “Most of the early to mid-career Airmen grew up with computers, so they likely already have the skills to use many of these devices and learn new ones. But **evaluating and synthesizing information from different online sources** and knowing how to evaluate the trustworthiness/ quality of these sources is an important skill and one that **doesn't come so naturally.**”
- “The skill of being able to **distinguish between credible and false information on the internet**, to include social media, is severely lacking. This **gap** threatens not only Airmen's ability to perform their duties but **puts at risk the foundation of democracy** that we all pledge to protect.”
- “Airmen are ultra connected to the digital world but digital literacy also means having skills to **determine the difference between high and low quality information** or analysis. Right now, **VERY FEW people have these skills** and they **ONLY** have them because of CHANCE, not because of deliberate development!! **FIX THIS ASAP!!**”

One participant offered as a personal example the challenge of enforcing mask policies during the COVID-19 pandemic when some Airmen believe (based on internet misinformation) that COVID-19 is a hoax:

- “**Recognizing disinformation and sketchy sources.** I cannot tell you how hard it is to enforce a mask policy when people I lead are ‘sure’ that COVID-19 is a political hoax. We need more critical thinking skills and we need to inoculate our people against these absurd types of claims.”

Although **Computer Programming** was not rated important for the majority of respondents in the close-ended portion of the survey, open-ended comments on the importance of training on Computer Programming noted broader benefits, such as improved analytical/critical thinking, that may make training on programming worthwhile to a larger number of Airmen:

- “**Basic computer programming**, e.g. Python. Many Airmen do not realize what a **time saver** some basic programming skills can be, and it **teaches logical thinking** as a fringe benefit.”
- “Coding. **Coding** simultaneously **teaches both analytical and creative thinking** while fostering research, precision, discovery, and familiarity with making digital devices work for oneself. In today's world, this should be on par with mathematics and language arts.”

Recommendations for Training Delivery

Participants were split between those who indicated the Air Force should offer more **online, video, or computer-based digital literacy training** (43 comments), and those who indicated the need for **more in-person (classroom) digital literacy training** (34 comments) and/or (live) **on-the-job training (OJT)** (20 comments). A smaller number of participants (11 comments) simply highlighted the need for more **job aids, pdfs, or “cheat sheets” with instructions** on how to use software and systems.

Participants who noted their desire for **online, video, or computer-based digital literacy training** expressed preferring this format because:

- Online instructors/facilitators may often be more knowledgeable than the instructor/facilitators available to teach an in-person course (or provide OJT)
- Students can access training at their own pace, as needed

In contrast, participants who indicated a desire for **on-the-job** digital literacy training (being taught by their supervisor or co-workers) expressed preferring this format because it:

- Avoids teaching someone skills that will not be needed in their specific scenario (specific office/organization)
- Helps build the leadership/mentoring skills of members who are more proficient by allowing them to teach their less experienced co-workers
- Allows for asking questions (more easily)

While there are clearly benefits of various formats (for different types of learners, in different Air Force contexts), the single most common theme in comments on training delivery format was that the Air Force should offer more **“hands-on” training** to improve digital literacy skills (56 comments). Note that this does not necessarily imply that hands-on training must be led by a live instructor or in a classroom setting. It does imply, however, that if online training is used, it must consist of more than reading text, watching a video demonstration, and completing a multiple choice test (three components that are currently incorporated in Skillport Microsoft Office training courses currently available to members through AF e-Learning).

Commenter definitions of “hands on” training do appear to vary somewhat. Clearly, interactive training involves “doing” and “hitting the keys and moving the mouse.” However, at least one participant noted explicitly that “hands-on” training could be delivered through pre-recorded video modules (presumably, if students follow along on using their own software during video demonstrations). Other participants emphasized that “hands on” training must include a hands-on practical test (“a hands on component that demonstrates student success”). We note that while assessments of this type are more challenging to incorporate within an online course without a live instructor, some examples of this do exist (e.g., Northstar Digital Literacy assessments of basic computer skills and Microsoft Office proficiency; publicly available for free at <https://www.digitalliteracyassessment.org/>). The large number of comments on the need for “hands on” training suggest the potential importance of incorporating assessments of this kind into future online Air Force digital literacy training offerings.

Comments on Existing Air Force or DoD Training Offerings

DoD CyberAwareness Challenge (Information Assurance Course).

The annually required online course received a balance of positive and negative comments (5 and 4 comments, respectively). While a few participants commented that the course should be longer (4 comments), comments on how often the course should be offered or for whom the course should be offered were rare (3 comments).

Overall, participant recommendations regarding cybersecurity training content may be most informative in considering potential course changes or revisions. As noted, participants commonly suggested the need for additional **cybersecurity training on two primary topics currently covered within the DoD CyberAwareness course: Social Networking** (to limit social media sharing; 27 respondents) and **Sensitive Information** (e.g., data breaches, PII; 22 respondents). A smaller number of respondents indicated the need for additional cybersecurity training on **Social Engineering** (e.g., internet hoaxes, phishing, etc.; 6 respondents) and personal **Mobile Devices** (3 respondents). We note that short, standalone online courses on these topics are currently available through the DoD Cyber Exchange and could potentially be required or more widely publicized to augment the DoD CyberAwareness Challenge.

Other Existing Air Force Online Training Offerings. Currently all Air Force members can obtain free, on-demand access to a large number of online courses through two sites: Air Force e-Learning (which offers a large catalog of Skillport courses) and the Air Force Digital University (<https://digitalu.af.mil>). The latter is a relatively new offering that provides any Airmen with free access to 5,500+ Udemy courses (augmented by a smaller number of offerings from Pluralsight, Udacity, Cloud Academy, and Now Secure). The Air Force also offers a much smaller number of online Universal Class offerings for free to Air Force members (<https://www.af.mil/News/Article-Display/Article/112131/universal-class-program-offers-personal-development-opportunities/>). Many of these online courses are designed to teach various types of digital literacy skills, particularly software proficiency and cybersecurity topics. From our review, courses specifically designed to address information literacy skills are not available in these offerings. [See Appendix I for a listing of sample Digital University, Skillport, Universal Class, and DoD Cyber Exchange course offerings by subcompetency].

[Note: The digital literacy assessment described in this report is now available in MyVector and provides recommendations on specific AF e-Learning courses (as well as other publicly available) resources based on a member's self-assessment results. A separate MyVector Foundational Competency assessment linking to Udemy courses offered through Digital University is projected to launch by the end of FY21.]

Notably, the open-ended survey comments suggested that very few members were aware of these offerings. Only four participants commented on Air Force e-Learning and only one participant commented about Digital University/Udemy. Some comments noted explicitly that not many

people know about these resources and that these are “under-advertised and “under-utilized.” Further, many comments on the need for (additional) software proficiency training seemed to request online training courses of the type that AF e-Learning and/or Digital University already provides.

Existing In-Person Training for Software Proficiency. In comments on Software Proficiency, a few participants mentioned in-person course offerings on Microsoft Office that were provided at certain bases (e.g., at Tinker) by Force Support Squadrons. These commenters noted that such offerings are not offered at all bases/wings, and they would recommend offering such courses more widely. The relatively large number of participants who specifically indicated a need for offering (more) in-person training (34 comments) suggests this may be an important avenue for the Air Force to pursue.

Existing In-Person Training for Information Literacy. One participant referenced the Activity Based Intelligence course (a mandatory course in 1N technical training, taught through the 480 ISRW at Goodfellow) that had potentially broader applicability for other Airmen to improve their information literacy skills.

An additional participant highlighted that while some aspects of Information Literacy may be addressed to a very limited extent in portions of Professional Military Education, he believed that the existing officer PME programs (Squadron Officer School, Air Command & Staff College, and Air War College) do not do so sufficiently:

- **“...We tell Airmen in SOS, ACSC and AWC that Critical Thinking is important...but we are never taught HOW to do it.... ACSC/AWC taught how to take pre-filtered quality information and order it into an influential and convincing position. Great....you taught them how to do the LAST step but you never taught them how to do the FIRST STEP: Information filtering, quality testing, analysis, do you have all the relevant info, is it significant?”**

Conclusion, Recommendations, and Next Steps

Defining core aspects of Digital Literacy that are applicable Air Force-wide provides an initial step towards improving professional development. The 2020 Digital Literacy survey established key sub-competencies that are commonly identified as important and was used to develop a psychometrically sound Digital Literacy assessment. This assessment has now been made available on MyVector to all Airmen, with identified links to developmental resources (articles, videos, freely available online courses) corresponding to specific competency behaviors validated through the 2020 survey. Air Force organizations should consider how Air Force training and education on Digital Literacy topics can be improved, supplemented, or more widely implemented across the enterprise.

Overall, the open-ended comments highlight the importance members place on improving the Software Proficiency of Airmen, with most of such comments focused on the Microsoft Office programs (Excel, Powerpoint, Word, Outlook) that are available on the standard Air Force desktop and widely used throughout the force. Although many free online, self-directed courses on how to use various features of these programs are available on-demand to Air Force members through AF e-Learning (Skillport) and Digital University (Udemy), comments suggested that most Air Force members may not be aware of these available resources. While some respondents believed online training in these types of programs would be sufficient, many others referenced the need for in-person, instructor-led courses, or at least “hands-on” (pre-recorded) online course courses that incorporate practical interactive elements (to include a practical test). Although in-person courses on Microsoft Office programs may be offered currently through Force Support Squadrons at certain bases, comments suggested that such in-person training courses are not widespread. The small number of respondents who reported taking formal courses like these all affirmed their utility and recommended additional offerings in this area.

Overall the DoD CyberAwareness Challenge that is required of all Air Force network users was generally characterized as useful for addressing Information Security issues, though some respondents recommended some form of additional training or education to supplement this requirement. Most commonly, the need for additional training on Social Media Usage was highlighted in open-ended comments on security aspects of digital literacy. We note the availability of 15-minute online course on this topic available through the DoD Cyber Exchange that may be helpful to more widely publicize or require (“*Social Networking and Your Online Identify*”).

Open-ended survey comments provided recommendations for integrating training/education on various digital literacy topics across the continuum of learning, beginning early in an Airman’s career (e.g., during First Term Airman Course or accessioning programs) and continuing throughout one’s career. A number of members recommended potential integration of certain Digital Literacy topics (e.g., Information Literacy and Communication Medium Choice) in formal Professional Military Education (PME) programs. Notably, Information Literacy is a topic that does not appear to be covered well by existing online course offerings that are freely available to Air Force members (i.e., no standalone courses on Information Literacy are offered through AF e-Learning or Digital University). Although officer PME may emphasize

information literacy in the academic context (i.e., citing reputable sources when writing a formal paper), there may need to be more of an emphasis on information literacy in a practical applied context. One participant's comment regarding potential applicability of an Activity-Based Intelligence course (offered in 1N technical training) to the wider Air Force may merit further evaluation.

Despite gaining input from a large representative sample of Airmen, the studies described in this report provide only a starting point for identifying applicable foundational digital literacy training needs. Future needs analysis should be conducted to establish the current proficiency levels of members at various career points and assess the potential need for Digital Literacy baseline, refresher, or remedial training and education throughout the continuum of learning.

Appendix A. Foundational Competency Definitions and Example “Common” Behaviors.

Foundational Competency	Definition	Example Behaviors
Accountability	Demonstrates reliability and honesty; takes responsibility for the actions and behaviors of self and team.	• Does the right thing even when it is unpopular or difficult. • Establishes standards consistent with the Air Force Core Values. • Holds myself accountable for rules and responsibilities.
Analytical Thinking	Identifies problems, evaluates alternative perspectives/solutions, makes effective recommendations, and identifies courses of action.	• Identifies interrelated issues and trends to address multiple facets of a problem. • Recognizes several likely causes of events or several consequences of actions. • Uses several analytical techniques to break apart complex problems.
Change Management	Adapts, helps others adapt, or implements change with the goal of ensuring unit goals are properly aligned to the desired end state.	• Involves others and shares information to build understanding and support for change. • Leads others in adapting to new conditions and adopting new technologies. • Manages complex transitions to successfully bring about desired change results.
Communication	Effectively presents, promotes, and prioritizes varied ideas and issues both verbally and non-verbally through active listening, clear messaging, and tailoring information to the appropriate audience.	• Clearly and succinctly conveys ideas. • Listens to ensure messages are understood. • Tailors messaging and briefings to address identified concerns of the audience.
Creative Thinking	Develops new insights into new situations and questions conventional approaches.	• Identifies connections between concepts that are not readily apparent to others. • Reconciles conflicting data to gain new insight into a complex problem. • Reframes issues to evaluate them from different perspectives.
Decision-Making	Makes well-informed, effective, and timely decisions that weigh situational constraints, risks, and benefits.	• Distinguishes information that is relevant to the decision at hand. • Makes well-thoughtout decisions under time pressure. • Rationally weighs all the information when uncertain.

Developing Others	Invests in others to maximize their contributions to the mission by inspiring and providing an environment of continual feedback and learning opportunities.	• Arranges successful experiences for others to build up their skills and confidence. • Identifies tasks that will give others opportunities to develop and strengthen skills. • Provides helpful advice about improving an individual's performance.
Flexibility	Adapts to and works with a variety of situations, individuals, or groups effectively.	• Changes approach when current approach is not working. • Develops plans to get the job done when initial plans fail. • Responds proactively to unexpected or ambiguous situations, opportunities, or risks.
Fostering Innovation	Builds a culture of behaviors and business practices that encourages, champions, and rewards creativity and informed risk-taking; is open to change.	• Encourages others to identify new ways to approach a task or project. • Promotes out-of-the-box thinking. • Welcomes the implementation of new ideas.
Influence	Intends to persuade, convince, or impress others to elicit their support to make specific impacts or achieve particular effects on others.	• Adapts a presentation or discussion to appeal to the interest and level of others. • Anticipates and prepares for other's reactions during discussions and presentations. • Appeals to ideals or values to overcome resistance and sway opinions of others.
Information Seeking	Demonstrates an underlying curiosity; desires to know more about things, people, oneself, the mission, or issues; is an eager, aggressive learner.	• Asks probing questions to get to the root of a situation or problem. • Identifies areas for further development in whatever I accomplish. • Identifies my own areas of deficit; plans and sets goals and strategies for learning.
Initiative	Does more than is required or expected to improve job results; takes action appropriately without prompting.	• Demonstrates an inspired work ethic. • Exceeds my job description (e.g., takes on extra tasks). • Puts in extra effort to complete work when not required.
Leadership	Inspires, builds, and sustains others' motivation and morale to accomplish the mission; organizes people and actions.	• Builds pride, unity, and teamwork in the unit and Air Force. • Inspires and motivates through interactions. • Uses formal authority and power in a fair and equitable manner.

Perseverance	Displays grit in accomplishment of difficult long-term goals. Works strenuously toward challenges; maintains effort and interest over years despite failure, adversity, and plateaus in progress.	• Overcomes setbacks in order to achieve goals. • Persists on difficult tasks even when others have already given up. • Sustains passion and commitment over a long period of time.
Precision	A concern for order, quality, and accuracy with an underlying drive to reduce uncertainty in the environment.	• Develops and uses systems to organize and keep track of information. • Double-checks accuracy of information and own work. • Monitors progress of a project against milestones or deadlines.
Resilience	Negotiates, manages, and adapts to significant sources of stress or trauma.	• Comes through difficult times with little trouble. • Recognizes the good in even the worst situations. • Recovers quickly from ongoing stressful events.
Resource Management	Carefully and responsibly administers resources placed under an Airman's control with the intent to maximize readiness and lethality and improve organizational performance.	• Makes good use of available time and other resources within my control. • Manages the allocation of resources in relation to organizational needs. • Organizes resources to execute the mission.
Results Focus	Demonstrates concern for working well or for competing against a standard of excellence.	• Continually works toward a defined standard of excellence. • Remains focused on mission outcomes. • Sets and acts to reach challenging goals for self or others (e.g., to improve productivity by 15% in 6 months).
Self-Control	Keeps emotions under control and restrains negative actions when under stress.	• Communicates concern without raising my voice. • Controls strong emotions, such as anger or frustration, in challenging situations. • Remains visibly calm in stressful situations when others are not remaining calm.
Service Mindset	Desires to help or serve others to meet their needs; makes and focuses efforts to discover and meet others' needs.	• Attempts to identify win/win solutions that meet the needs of others. • Lends a helping hand to team members when needed. • Makes myself fully available when others are going through a critical period.

Strategic Thinking	Considers and organizes activities and resources to achieve a desired goal; thinks on a large and small scale, long- and short-term.	• Continually reviews and adopts new strategies to meet long-term goals. • Develops plans that support long-term goals and objectives. • Recognizes long-term trends to anticipate future challenges not readily apparent to others.
Teamwork	Collaborates effectively with others to achieve a common goal or complete a mission task.	• Encourages and empowers others; makes them feel strong or important. • Ensures teams work together toward a common goal. • Invites all members of a group to contribute to a process.

Appendix B. Rated Importance of Digital Literacy Behaviors for Effective Performance in Respondents' Current Jobs (Survey 1)

Sub-competency (Skov, 2016)	Behavior (of 62)	Overall Mean Importance Rating (N = 2,748)	Officer Mean (N = 1,042)	Enlisted Mean (N = 645)	Civilian Mean (N = 1,059)
Digital Production	1. Use word processing software (e.g., Word)	5.73	5.83	5.63	5.7
Information Storage	2. Use computers to organize information	5.70	5.75	5.64	5.69
Digital Production	3. Use spreadsheet software (e.g., Excel)	5.69	5.73	5.64	5.67
Data Protection	4. Exercise caution when transmitting electronic information	5.65	5.65	5.54	5.71
Digital Production	5. Use presentation software	5.59	5.76	5.4	5.53
Data Protection	6. Follow organizational protocols for use of electronic devices	5.56	5.55	5.43	5.66
Digital Media Choice	7. Choose an appropriate communication medium... Based on the need for immediate feedback	5.48	5.6	5.41	5.4
Computing Health	8. Use common shortcut keys such as copy, paste, bold, undo, search, or print screen to minimize typing	5.47	5.51	5.45	5.45

Digital Social Awareness	9. Avoid sharing information about others on social networking sites that would harm their reputations	5.47	5.49	5.36	5.51
Digital Social Awareness	10. Avoid sharing videos and photos on social networking sites that would harm my reputation	5.46	5.48	5.31	5.53
Digital Media Choice	11. Choose an appropriate communication medium... Based on the need to maintain a record of the communication	5.45	5.5	5.35	5.47
Data Protection	12. Contact the necessary people if a password is taken.	5.42	5.39	5.27	5.54
Information Self-Service	13. Use the internet to search for public information	5.39	5.5	5.3	5.34
Digital Configuration	14. Get help for computer system problems	5.38	5.4	5.27	5.43
Digital Exploration	15. Learn to use a variety of software programs	5.38	5.33	5.36	5.44
Digital Law	16. Report online harassment, bullying, or spreading of rumors or secrets to appropriate authorities when needed	5.37	5.37	5.22	5.46
Information Self-Service	17. Participate in online training	5.37	5.35	5.2	5.49

Digital Media Choice	18. Choose an appropriate communication medium... Based on the need for careful editing of message	5.32	5.41	5.23	5.3
Information Self-Service	19. Use the internet to learn on my own	5.32	5.4	5.25	5.28
Digital Media Choice	20. Choose an appropriate communication medium... Based on the need to convey non-verbal cues	5.28	5.42	5.19	5.19
Information Storage	21. Lock electronic devices when not in use	5.26	5.23	5.09	5.4
Online Identity Management	22. Protect personal information shared on social networking sites or other online forums	5.25	5.21	5.17	5.34
Information Self-Service	23. Use the internet to search for information about training or education	5.24	5.23	5.26	5.24
Information Search	24. Identify a variety of potential sources of digital information	5.21	5.31	5.1	5.19
Critical Evaluation of Information	25. Select information from the Internet that is most appropriate to the information need	5.19	5.26	5.03	5.22
Digital Media Choice	26. Choose an appropriate communication medium... Based on the need for multiple	5.18	5.32	5.04	5.13

	simultaneous conversations				
Computing Health	27. Recognize signs of computer overuse, for example, headache, blurred vision or pain in the wrist	5.15	5.04	5.09	5.3
Information Storage	28. Securely store computer files	5.13	5.1	4.97	5.27
Critical Evaluation of Information	29. Interpret visual information from digital sources	5.13	5.34	4.87	5.09
Digital Law	30. Obtain permissions to use a photo, video, or other digital content as needed	5.09	4.99	4.96	5.27
Online Identity Management	31. Block requests from unknown/unwanted people on social networking sites or other online forums	5.07	5.03	5.03	5.15
Critical Evaluation of Information	32. Determine the authoritativeness, currentness, and reliability of Internet sources	5	5.1	4.87	4.99
Information Storage	33. Back up computer files	4.92	4.87	4.79	5.05
Critical Evaluation of Information	34. Use many digital resources at the same time to conduct research	4.88	4.88	4.82	4.92

Data Protection	35. Use different passwords to access equipment, devices, and digital services and modify them on a periodic basis	4.83	4.75	4.7	4.98
Digital Configuration	36. Troubleshoot computer problems	4.77	4.79	4.78	4.74
Critical Evaluation of Information	37. Synthesize newly gathered digital information with previous information	4.76	4.94	4.49	4.74
Critical Evaluation of Information	38. Identify points of agreement and disagreement among Internet sources	4.65	4.76	4.42	4.66
Online Identity Management	39. Hide information shared on social networking sites or other online forums, as needed	4.58	4.59	4.68	4.52
Critical Evaluation of Information	40. Evaluate www/Internet sources	4.51	4.64	4.27	4.53
Digital Configuration	41. Use computer or software user's guides when help is needed.	4.44	4.28	4.37	4.64
Information Search	42. Limit digital information search strategies by subject, language, and date	4.39	4.49	4.28	4.36
Information Search	43. Initiate digital information search strategies by using keywords and Boolean logic	4.27	4.32	4.03	4.37
Digital Collaboration	44. Use database software	4.1	3.75	4.17	4.4

Digital Production	45. Use course/learning management systems	4.07	4.22	4.09	3.9
Digital Exploration	46. Provide others with advice on new digital technologies	4.02	3.99	3.98	4.07
Digital Exploration	47. Keep up with the latest digital technological developments	3.97	3.92	3.93	4.03
Online Identity Management	48. Check the security configuration of applications used on a regular basis to access the Internet	3.93	3.79	3.85	4.12
Digital Collaboration	49. Use project management software	3.62	3.57	3.33	3.85
Digital Exploration	50. Figure out new high-tech digital products and services without help from others	3.54	3.52	3.56	3.55
Active Internet Participation	51. Use social networking sites	3.47	3.63	3.72	3.16
Digital Exploration	52. Acquire new digital technology before it has become widespread	3.41	3.34	3.4	3.48
Digital Production	53. Use bitmap image software	3.21	2.96	3.05	3.55
Digital Production	54. Use vector image software	2.87	2.55	2.85	3.19
Digital Production	55. Use desktop publishing software	2.85	2.51	2.87	3.18
Digital Production	56. Use video software	2.85	2.54	2.93	3.11
Digital Production	57. Use audio software	2.8	2.48	2.89	3.07

Digital Production	58. Use screen recording software	2.79	2.55	2.77	3.04
Digital Production	59. Use content management systems	2.71	2.5	2.74	2.9
Automation	60. Write simple computer programs	2.67	2.42	2.68	2.9
Digital Production	61. Use 3D modeling tools	2.53	2.28	2.41	2.85
Digital Production	62. Use web authoring tools	2.43	2.16	2.4	2.71

Appendix C. Rated Importance of Digital Literacy Behaviors for Effective Performance in Respondents' Current Jobs, By Career Field Category (Survey 1)

Sub-competency (Skov, 2016)	Behavior (of 62)	Operations (N = 324)	Logistics (N = 329)	Medical (N = 272)	Science & Engineer (N = 273)	Force Support (N = 310)	Other (N = 691)
Digital Production	1. Use word processing software (e.g., Word)	5.72	5.68	5.71	5.76	5.80	5.80
Information Storage	2. Use computers to organize information	5.77	5.59	5.70	5.79	5.72	5.76
Digital Production	3. Use spreadsheet software (e.g., Excel)	5.68	5.67	5.66	5.74	5.75	5.73
Data Protection	4. Exercise caution when transmitting electronic information	5.65	5.53	5.66	5.74	5.74	5.64
Digital Production	5. Use presentation software	5.63	5.52	5.60	5.65	5.62	5.65
Data Protection	6. Follow organizational protocols for use of electronic devices	5.54	5.42	5.47	5.66	5.65	5.59
Digital Media Choice	7. Choose an appropriate communication medium... Based on the need for immediate feedback	5.52	5.45	5.50	5.44	5.42	5.54
Computing Health	8. Use common shortcut keys such as copy, paste, bold, undo, search, or print screen to minimize typing	5.50	5.37	5.48	5.47	5.50	5.53

Digital Social Awareness	9. Avoid sharing information about others on social networking sites that would harm their reputations	5.39	5.39	5.35	5.57	5.48	5.51
Digital Social Awareness	10. Avoid sharing videos and photos on social networking sites that would harm my reputation	5.39	5.37	5.33	5.56	5.49	5.50
Digital Media Choice	11. Choose an appropriate communication medium... Based on the need to maintain a record of the communication	5.35	5.39	5.42	5.53	5.47	5.49
Data Protection	12. Contact the necessary people if a password is taken.	5.38	5.26	5.26	5.61	5.48	5.50
Information Self-Service	13. Use the internet to search for public information	5.28	5.28	5.43	5.51	5.42	5.54
Digital Configuration	14. Get help for computer system problems	5.46	5.21	5.49	5.43	5.47	5.40
Digital Exploration	15. Learn to use a variety of software programs	5.40	5.17	5.45	5.46	5.51	5.42
Digital Law	16. Report online harassment, bullying, or spreading of rumors or secrets to appropriate authorities when needed	5.34	5.30	5.19	5.48	5.46	5.38

Information Self-Service	17. Participate in online training	5.23	5.20	5.35	5.51	5.48	5.46
Digital Media Choice	18. Choose an appropriate communication medium... Based on the need for careful editing of message	5.28	5.25	5.26	5.38	5.34	5.40
Information Self-Service	19. Use the internet to learn on my own	5.25	5.21	5.43	5.48	5.30	5.41
Digital Media Choice	20. Choose an appropriate communication medium... Based on the need to convey non-verbal cues	5.23	5.31	5.31	5.21	5.21	5.39
Information Storage	21. Lock electronic devices when not in use	5.29	5.01	5.18	5.39	5.36	5.31
Online Identity Management	22. Protect personal information shared on social networking sites or other online forums	5.23	5.18	5.02	5.44	5.25	5.25
Information Self-Service	23. Use the internet to search for information about training or education	5.11	5.14	5.35	5.36	5.30	5.32
Information Search	24. Identify a variety of potential sources of digital information	5.22	5.03	5.24	5.36	5.17	5.32

Critical Evaluation of Information	25. Select information from the Internet that is most appropriate to the information need	5.05	4.99	5.29	5.30	5.31	5.26
Digital Media Choice	26. Choose an appropriate communication medium... Based on the need for multiple simultaneous conversations	5.18	5.11	5.15	5.29	5.17	5.28
Computing Health	27. Recognize signs of computer overuse, for example, headache, blurred vision or pain in the wrist	5.03	4.94	5.11	5.28	5.42	5.17
Information Storage	28. Securely store computer files	5.11	4.93	4.95	5.36	5.33	5.18
Critical Evaluation of Information	29. Interpret visual information from digital sources	5.13	5.09	5.14	5.39	4.94	5.18
Digital Law	30. Obtain permissions to use a photo, video, or other digital content as needed	4.81	4.88	5.03	5.30	5.29	5.14
Online Identity Management	31. Block requests from unknown/unwanted people on social networking sites or other online forums	5.15	4.98	4.86	5.23	5.03	5.10

Critical Evaluation of Information	32. Determine the authoritativeness, currentness, and reliability of Internet sources	4.99	4.77	5.07	5.15	5.02	5.10
Information Storage	33. Back up computer files	4.76	4.74	4.90	5.18	5.19	4.91
Critical Evaluation of Information	34. Use many digital resources at the same time to conduct research	4.84	4.69	4.88	5.14	4.87	4.95
Data Protection	35. Use different passwords to access equipment, devices, and digital services and modify them on a periodic basis	4.81	4.56	4.77	4.99	4.99	4.89
Digital Configuration	36. Troubleshoot computer problems	4.82	4.49	5.00	4.79	4.85	4.84
Critical Evaluation of Information	37. Synthesize newly gathered digital information with previous information	4.80	4.55	4.77	5.04	4.76	4.85
Critical Evaluation of Information	38. Identify points of agreement and disagreement among Internet sources	4.61	4.40	4.71	4.81	4.69	4.72
Online Identity Management	39. Hide information shared on social networking sites or other online forums, as needed	4.62	4.58	4.57	4.64	4.41	4.57

Critical Evaluation of Information	40. Evaluate www/Internet sources	4.44	4.23	4.57	4.75	4.55	4.64
Digital Configuration	41. Use computer or software user's guides when help is needed.	4.43	4.14	4.39	4.76	4.70	4.43
Information Search	42. Limit digital information search strategies by subject, language, and date	4.40	4.31	4.36	4.57	4.32	4.49
Information Search	43. Initiate digital information search strategies by using keywords and Boolean logic	4.21	3.96	4.33	4.75	4.39	4.27
Digital Collaboration	44. Use database software	3.77	3.92	3.95	4.10	4.49	4.14
Digital Production	45. Use course/learning management systems						
Digital Exploration	46. Provide others with advice on new digital technologies	4.03	3.85	3.81	4.56	3.92	4.04
Digital Exploration	47. Keep up with the latest digital technological developments	3.90	3.78	3.67	4.39	3.91	4.08
Online Identity Management	48. Check the security configuration of applications used on a regular basis to access the Internet	3.73	3.69	3.80	4.12	4.11	3.97

Digital Collabor- ation	49. Use project management software	3.17	3.37	3.33	4.32	3.75	3.64
Digital Exploration	50. Figure out new high-tech digital products and services without help from others	3.50	3.45	3.23	4.03	3.31	3.66
Active Internet Participa- tion	51. Use social networking sites	3.38	3.47	3.54	2.45	3.80	3.59
Digital Exploration	52. Acquire new digital technology before it has become widespread	3.33	3.22	3.17	3.83	3.42	3.48
Digital Production	53. Use bitmap image software	2.77	2.89	3.07	3.49	3.72	3.24
Digital Production	54. Use vector image software	2.42	2.57	2.81	3.20	3.33	2.84
Digital Production	55. Use desktop publishing software	2.47	2.50	2.85	2.96	3.43	2.82
Digital Production	56. Use video software	2.48	2.48	2.83	2.81	3.48	2.89
Digital Production	57. Use audio software	2.40	2.47	2.81	2.74	3.46	2.83
Digital Production	58. Use screen recording software	2.57	2.43	2.73	2.91	3.30	2.82
Digital Production	59. Use content management systems	2.51	2.40	2.75	2.70	3.15	2.72
Automation	60. Write simple computer programs	2.58	2.38	2.44	3.86	2.48	2.68
Digital Production	61. Use 3D modeling tools	2.18	2.23	2.49	3.14	2.89	2.43
Digital Production	62. Use web authoring tools	2.10	2.14	2.39	2.48	2.94	2.43

Appendix D. Percentages of Supervisor-Identified High and Lower Potential Members who “Consistently and Effectively” Demonstrate Digital Literacy Behaviors (Study 2)

		%Members Engage in Behavior (if applicable and oppty to observe)		
Skov (2016) Subcompetency	Behavior (of 62)	% High Potential	% Lower Potential	Difference Δ
Digital Exploration	1. Figured out new high-tech digital products and services without help from others	81.20%	27.90%	53.30%
Critical Evaluation of Information	2. Determined the authoritativeness, currentness, and reliability of Internet sources	95.70%	43.80%	51.90%
Digital Exploration	3. Provided others with advice on new digital technologies	83.30%	31.60%	51.70%
Critical Evaluation of Information	4. Identified points of agreement and disagreement among Internet sources	94.30%	43.20%	51.10%
Digital Media Choice	5. Chose an appropriate communication medium based on the need to convey non-verbal cues	97.90%	47.60%	50.30%
Critical Evaluation of Information	6. Evaluated www/Internet sources	92.80%	43.60%	49.20%
Digital Exploration	7. Kept up with the latest digital technological developments	81.40%	32.50%	48.90%
Critical Evaluation of Information	8. Synthesized newly gathered digital information with previous information	96.20%	48.50%	47.70%
Digital Media Choice	9. Chose an appropriate communication medium based	97.70%	52.10%	45.60%

	on the need for careful editing of message			
Critical Evaluation of Information	10. Used many digital resources at the same time to conduct research	94.30%	48.80%	45.50%
Information Search	11. Initiated digital information search strategies by using keywords and Boolean logic	85.80%	41.30%	44.50%
Digital Media Choice	12. Chose an appropriate communication medium based on the need for immediate feedback	98.20%	54.00%	44.20%
Digital Media Choice	13. Chose an appropriate communication medium based on the need to maintain a record of the communication	98.10%	53.90%	44.20%
Digital Media Choice	14. Chose an appropriate communication medium based on the need for multiple simultaneous conversations	96.30%	52.50%	43.80%
Digital Configuration	15. Troubleshoot computer problems	83.90%	40.30%	43.60%
Digital Exploration	16. Acquired new digital technology before it became widespread	66.70%	24.10%	42.60%
Digital Collaboration	17. Used project management software	71.70%	29.90%	41.80%
Digital Configuration	18. Used computer or software user's guides when help was needed	84.20%	43.40%	40.80%
Digital Law	19. Obtained permissions to use a photo, video, or other digital content, as needed	95.10%	54.40%	40.70%

Information Search	20. Identified a variety of potential sources of digital information	96.80%	57.00%	39.80%
Critical Evaluation of Information	21. Selected information from the Internet that was most appropriate to the information need	97.80%	58.20%	39.60%
Digital Production	22. Used bitmap image software	74.10%	36.70%	37.40%
Digital Social Awareness	23. Avoided sharing videos and photos on social networking sites that would harm the Airman's reputation	96.80%	57.00%	39.80%
Information Search	24. Limited digital information search strategies by subject, language, and date	89.30%	52.40%	36.90%
Digital Social Awareness	25. Avoided sharing information about others on social networking sites that would harm their reputations	98.50%	62.60%	35.90%
Critical Evaluation of Information	26. Interpreted visual information (e.g., graphs, tables, diagrams) from digital sources	97.90%	62.40%	35.50%
Digital Law	27. Reported online harassment, bullying, or spreading of rumors or secrets to appropriate authorities, when needed	96.00%	61.50%	34.50%
Digital Exploration	28. Learned to use a variety of software programs	97.20%	63.00%	34.20%
Digital Production	29. Used vector image software	51.80%	18.30%	33.50%
Information Self-Service	30. Used the Internet to learn on their own	98.10%	64.80%	33.30%
Online Identity Management	31. Blocked requests from unknown/unwanted people on	97.40%	64.60%	32.80%

	social networking sites or other online forums			
Digital Production	32. Used content management systems	49.80%	17.10%	32.70%
Computing Health	33. Recognized signs of computer overuse	91.80%	59.40%	32.40%
Online Identity Management	34. Hid information shared on social networking sites or other online forums, as needed	92.30%	60.60%	31.70%
Digital Collaboration	35. Used database software	80.00%	48.50%	31.50%
Digital Production	36. Used screen recording software	54.50%	23.50%	31.00%
Digital Production	37. Used desktop publishing software	51.70%	20.80%	30.90%
Information Storage	38. Backed up computer files	91.30%	60.60%	30.70%
Digital Production	39. Used course/learning management systems	91.00%	60.60%	30.40%
Information Self-Service	40. Used the Internet to search for information about training or education	97.70%	67.40%	30.30%
Online Identity Management	41. Protected personal information shared on social networking sites or other online forums	98.00%	67.90%	30.10%
Digital Production	42. Used 3D modeling tools	44.50%	14.80%	29.70%
Digital Production	43. Used video software	57.80%	28.30%	29.50%
Computing Health	44. Used common shortcut keys, such as copy, paste, bold, undo, search, or print screen, to minimize typing	96.90%	67.90%	29.00%
Online Identity Management	45. Checked the security configuration of applications used on a regular basis to access the Internet	75.00%	46.90%	28.10%
Digital Production	46. Used audio software	56.90%	29.10%	27.80%

Information Storage	47. Used computers to organize information	97.90%	70.30%	27.60%
Automation	48. Wrote simple computer programs	47.70%	20.40%	27.30%
Digital Production	49. Used web authoring tools	40.30%	13.60%	26.70%
Data Protection	50. Contacted the necessary people if a password was taken	98.00%	73.40%	24.60%
Data Protection	51. Used different passwords to access equipment, devices, and digital services and modified them on a periodic basis	91.70%	67.50%	24.20%
Information Storage	52. Securely stored computer files	95.80%	72.30%	23.50%
Data Protection	53. Exercised caution when transmitting electronic information	98.00%	75.20%	22.80%
Information Storage	54. Locked electronic devices when not in use	96.00%	75.50%	20.50%
Digital Configuration	55. Got help for computer system problems	94.50%	74.50%	20.00%
Digital Production	56. Used presentation software	97.20%	79.30%	17.90%
Data Protection	57. Followed organizational protocols for use of electronic devices	98.70%	82.70%	16.00%
Digital Production	58. Used spreadsheet software	98.30%	83.70%	14.60%
Information Self-Service	59. Used the Internet to search for public information	98.90%	85.40%	13.50%
Information Self-Service	60. Participated in online training	97.90%	84.50%	13.40%
Digital Production	61. Used word processing software	99.10%	91.00%	8.10%
Active Internet Participation	62. Used social networking sites	95.30%	87.20%	8.10%

Appendix E. Factor Pattern Coefficients with Varimax Rotation for Eight Factor Solution (Supervisor Ratings of Lower Potential Members)

Factor 1 –Appropriate Social Media Use (3 item $\alpha = .950$)

Maintains awareness of others' access to information posted in social media or other online forums, and manages one's online identity and reputation appropriately

*Avoid sharing videos and photos that would harm their reputation	.815
*Block requests from unknown people on social networking	.796
*Protect personal information shared on social networking	.792
*Avoid sharing information about others that would harm reputations	.792
Obtain permissions for digital content	.755
*Hide information shared on social networking as needed	.733
*Contact necessary people if password was taken	.718
*Report online harassment	.713
Recognize signs of computer overuse	.633

Factor 2 – Information Literacy (3 item $\alpha = .940$)

Recognizes when information is needed and locates, evaluates, and uses the needed information to achieve goals

*Identify points of agreement and disagreement among Internet sources	.788
*Evaluate Internet sources	.778
*Determine the authoritativeness, currentness, and reliability of Internet sources	.769
*Synthesize newly gathered digital information with previous information	.731
*Select information from the Internet that is most appropriate to the information need	.713
*Use many digital resources to conduct research at the same time	.628
*Interpret visual information from digital sources	.621
*Limit digital information search strategies by subject, language, and date	.602
*Identify a variety of potential sources of digital information	.570
*Initiate digital information search strategies by using keywords and Boolean logic (e.g., “AND,” “OR”)	.556

Factor 3 – Communication Medium Choice (3 item $\alpha = .942$)

Recognizes how technology may help or hinder communication; selects the most appropriate medium (e.g., e-mail, phone, video telecon) for communication based on situational needs

Choose an appropriate communication medium	.851
...Based on the need to convey nonverbal cues*	
...Based on the need for immediate feedback*	.825
...Based on the need for careful editing of the message*	.818
...Based on the need for multiple simultaneous conversations*	.804
...Based on the need to maintain a record of the communication*	.787

Factor 4 – Technological Exploration (3 item $\alpha = .948$)

Seeks out, learns, and adopts new technologies; pioneers the use of new technologies within one's organization or unit

*Acquire new digital technology before it becomes widespread	.857
*Keep up with the latest digital technological developments	.846
*Figure out new digital products without help from others	.832
*Provide others with advice on new digital technologies	.772

Factor 5 – Information Protection (3 item $\alpha = .921$)

Identifies and safeguards sensitive electronic data, mitigating potential risks

*Securely store computer files	.734
*Lock electronic devices when not in use	.717
*Exercise caution when transmitting electronic information	.640
Back up computer files	.638
*Use different passwords to access equipment	.589
*Follow organizational protocols for use of electronic devices	.494

Factor 6 – Software Proficiency (3 item $\alpha = .898$)

Creates and modifies digital content (e.g., text, graphics, numeric data) using commonly available software

*Use spreadsheet software	.789
*Use presentation software	.766
*Use word processing software	.737
*Use database software	.535

Factor 7 – Active Internet Use (3 item $\alpha = .849$)

Seeks out and benefits from potential self-service solutions online

*Use the Internet to search for public information	.699
*Participate in online training	.690
*Use the Internet to learn on their own	.603
*Use the Internet to search for information about training or education	.553

Factor 8 – General Computer Skills (3 item $\alpha = .860$)

Uses computers to organize information; adjusts settings and applications as needed to troubleshoot common computer problems

*Troubleshoot computer problems	.679
*Use computer guides when help is needed	.626
*Learn to use a variety of software programs	.538
*Use computers to organize information	.532
*Get help for computer system problems	.490

**Appendix F. Intercorrelations Among (3 Item) Digital Literacy Subcompetency Scales
(Ratings of Low Potential Members)**

	1	2	3	4	5	6	7	8
1. Appropriate Social Media Use	(.950)							
2. Information Literacy	.613	(.940)						
3. Communication Medium Choice	.610	.578	(.942)					
4. Technological Exploration	.402	.553	.391	(.948)				
5. Information Protection	.737	.575	.563	.406	(.921)			
6. Software Proficiency	.496	.518	.469	.402	.560	(.898)		
7. Active Internet Use	.519	.634	.467	.466	.543	.605	(.849)	
8. General Computer Skills	.538	.664	.494	.663	.544	.548	.590	(.860)

Note. Pairwise *N*s = 829-1581. Internal reliability estimates (α) are shown on the diagonal.

**Appendix G. Intercorrelations Among (3 Item) Digital Literacy Subcompetency Scales
(Ratings of High Potential Members)**

	1	2	3	4	5	6	7	8
1. Appropriate Social Media Use	(.873)							
2. Information Literacy	.413	(.881)						
3. Communication Medium Choice	.523	.482	(.905)					
4. Technological Exploration	.349	.499	.347	(.935)				
5. Information Protection	.560	.429	.528	.407	(.853)			
6. Software Proficiency	.363	.364	.436	.355	.389	(.863)		
7. Active Internet Use	.360	.490	.440	.410	.439	.485	(.789)	
8. General Computer Skills	.350	.509	.348	.596	.439	.380	.451	(.774)

Note. Pairwise *N*s = 1116-1835. Internal reliability estimates (α) are shown on the diagonal.

Appendix H1. Open-ended survey question: “*What types of training and/or education do you view as most important to improve the digital literacy of Airmen across career fields?*”

	Code	Description
General reaction to the survey	GA1	General positive appreciation of the study
	GA2	General negative reaction to the study
	GA3	Positive appreciation of the instrument
	GA4	Comments of gratitude
	GA5	The study is biased, through its formulation of questions
	GA6	The study is biased, through the sampling strategies or the choice for an on-line survey
	GA7	Request for clarification of the ‘real goals’ of this study
	GA8	Expressions of anxiety / distrust towards researchers
Methodological comments	M1	Detailed comments on wording of particular questions (vague wording, unclear questions,...); including suggestions for clarifications
	M2	Detailed comments on (missing) answer options for particular questions (missing age categories; missing option to answer ‘0’; etc.
	M3	Detailed comments on missing option to skip questions or missing option to refuse to answer (‘I don’t want to answer this question’)
	M4	Detailed comments on missing questions
	M5	Comments on the lack of the possibility to change their answers
	M6	Detailed comments on duplicate questions (repetitions in the survey)
	M7	Comments on length of the study
	M8	Suggestions for further promotion of the survey
	M9	Suggestions for extra/further research
General Comments on Air Force IT	IT	Comments on Air Force IT policies, slow Air Force network, etc. (unrelated or not directly related to digital literacy skills training)
General Comments on Training	GT1	General comments on importance of digital literacy training/education, or general comment that more training should be provided (without further specification)
	GT2	Current Air Force training on digital literacy skills is sufficient or not needed; or focus training on other competencies instead (e.g., Leadership, Resilience) NOTE: Categorize comments about Critical Thinking under Information Literacy (NSFT); Categorize comments about Communication skills separately (NSFT) (both were addressed in some form in the survey as part of Digital Literacy)
	GT3	Focus on recruiting/selection/screening (e.g., new enlistees or new hires should already be digitally literate before entering Air Force) rather than training
	GT4	Any (further) training on digital literacy topics should be career-field (AFSC- or job series-) specific (e.g., update CFETPs; defer to functional communities)
	GT5	Comment <u>only</u> references training that should be offered for a specific career field
	GT6	Any (further) training that is offered should be optional (not mandatory)
	GT7	Evaluate an individual’s digital literacy skills to determine what training should be offered to the individual
	GT8	Hold Airmen accountable for learning digital literacy skills
	GT9	Comments on which ranks/grades or age groups have the greatest need for digital literacy training
	GT10	Comments on which career fields/job types have the greatest need for digital literacy training (or greater need for certain types of training)

	GT11	References need for continual, recurring or just-in-time training, without referencing a specific point in a member's career
University programs and professional certifications	U1	Comments on AFIT (Air Force Institute of Technology)
	U2	Comments on DAWIA or Defense Acquisition University (DAU) certification
	U3	Comments on industry certifications (e.g., PMP, CompTIA)
	U4	Comments on professional continuing education credits (e.g., CEUs, CLEs, CPEs)
	U5	Comments on college or postgraduate courses (no reference to degree)
	U6	Comments on applicable university (undergrad or graduate) degrees (e.g., in computer science, computer engineering)
Comments on existing training offerings (<i>other than annual DoD CyberAwareness CBT</i>)	A1	Airmen need to become aware of how to find/access training courses that are already offered (i.e., AF e-Learning [Skillport/Skillsoft]; Udemy courses through Air Force Digital University) [Note: Also code A2 and/or A3 separately if applicable]
	A2	Comments about AF e-Learning
	A3	Comments about Udemy (available through AF DU)
	A4	Comments about in-person courses offered to personnel at specific bases/wings (i.e., Microsoft Office courses at base Professional Development Center)
	A5	Comments about commercial/paid subscription-based online course offerings other than AF e-Learning/Skillport and Udemy, e.g., Sophia.org; Lynda.com (LinkedIn Learning), O'Reilly Learning
	A6	Comments about other free or open source online course offerings, e.g., Software Carpentry, Coursera
	A7	Comments about courses offered in Air Force technical training for specific career fields (e.g., Intel course Activity-Based Intelligence) with potentially broader applicability
Comments on current annual DoD Cyber Awareness (Information Assurance) course on ADLS and/or other training on cybersecurity issues	DOD1	General positive comments on current DoD Cyber Awareness course
	DOD2	General negative comments about current DoD Cyber Awareness course
	DOD3	Current DoD Cyber Awareness course should be required more often
	DOD4	Current DoD Cyber Awareness course should not be required, should be required less often, or for fewer Air Force members
	DOD5	Should change delivery format of DoD Cyber Awareness course (e.g., provide instructor-led training instead of CBT)
	DOD6	Should update/change annual DoD Cyber Awareness course content (add Ia-c, IIa-c, or IIIa-f suffix for specific desired topics if applicable)
	DOD7	Current DoD Cyber Awareness course should be longer or include more content (add Ia-c, IIa-c, or IIIa-f suffix for specific desired topics if applicable)
	DOD8	General comment on importance of security training, without reference to DoD Cyber Awareness course
	DOD9	Comment on need for (further) training on cybersecurity topic(s) covered in DoD Cyber Awareness course, but without reference to DoD Cyber Awareness course itself (add Ia-c, IIa-c, or IIIa-f suffix if applicable) Topics include: (I) <u>Spillage</u>: a. Classified Data b. Insider Threat c. Social Networking (e.g., <i>need to limit social media sharing</i>) [NOTE: Does not cover social media professionalism or positive benefits of social media; code that under Other Digital Literacy training content] (II) <u>Sensitive Information</u> (e.g., data breaches; PII): a. Physical security (e.g., securing CAC),

		b. Identity Management (e.g., PINs, two-factor authentication), c. Sensitive Compartmented Information (SCI) and facilities (SCIFs) • <u>(III) Malicious Code</u> (e.g., viruses): a. Website Use (e.g., website encryption, cookies, identity theft, etc.) b. Social Engineering (e.g., internet hoaxes, phishing, etc.) c. Travel (e.g., insecure Wi-Fi connections) d. Use of Government-Furnished Equipment (GFE) e. Mobile Devices (e.g., password protection; GPS tracking) f. Home Computer Security (e.g., antivirus, firewall protection, etc.)
Recommendations on Other Digital Literacy Training: Content	C1	Comments on training to use Air Force-specific or DoD-specific systems and websites (e.g., AF Portal, myPers, vMPF, ATAAPS, LeaveWeb, DFAS, DPMAP, DCPDS, DTS, TMT, etc.)
	C2	Comments on training to troubleshoot DoD or Air Force-specific IT issues, e.g., new CACs, updating GAL, how to use AF VPN
	C3	Comments on training to use/locate AF e-Pubs (e.g., AFIs, AFMANs) or Technical Orders
	SFT	Comments on training on software programs or types of software programs (see codes in SFT table)
	NSFT	Comments on training/education on other digital literacy skills (see codes in NSFT table)
Recommendations for Other Digital Literacy Training: Training Delivery Format	F1	Should offer (more) on-the-job training (OJT) to improve digital literacy skills
	F2	Should offer (more) opportunities for self-directed learning to improve digital literacy skills
	F3	Should offer (more) one-on-one training/mentoring to improve digital literacy skills
	F4	Should offer (more) in-person training to improve digital literacy skills (Note: Code comments on “Classroom” training as referencing in-person training)
	F5	Should offer (more) instructor-led training to improve digital literacy skills (Note: This may include instructor-led training provided online or in-person)
	F6	Should offer (more) hands-on training to improve digital literacy skills
	F7	Should offer (more) video-based training, internet/online training or computer-based training (CBTs) to improve digital literacy skills
	F8	Should offer (more) job aids, user guides, pdfs, or email other documents (e.g., step-by-step instructions with screenshots) to improve digital literacy skills
	F9	Should identify/offer list of POCs/SMEs to contact for specific support (e.g., to answer questions on specific issues, such as how to use certain software or systems)
Recommendations for Other Digital Literacy Training: When Training Should Be Offered	W1	Provide training to new accessions (e.g., in Basic Military Training [BMT] and/or officer commissioning programs [ROTC, USAFA, or OTS])
	W2	Provide (more) training during formal technical training (e.g., Initial Skills Training [IST] for career field)
	W3	Provide training during Professional Military Education (PME) (e.g., NCOA, SNCOA, SOS, ACSC, etc.)
	W4	Provide (more) training for new employees (e.g., civilian hires or upon entry into a new organization or duty assignment)
Other Comments	O	Other

Recommendations on Digital Literacy Training Content: Software (SFT)

	Code	Description
Comments on Need to Learn What Software is Available	SFT0	Should offer orientation/training to learn what different types of software/programs are available
References Adobe product(s)	SFT1	Should offer (more) or require training on Adobe product(s) *Note: <u>ALSO</u> code reference to specific type of software, if applicable—i.e., SFT6, 11, etc.
References Microsoft product(s)	SFT2	Should offer (more) or require training on Microsoft product(s) (e.g., Office suite, MS 365, etc.) *Note: <u>ALSO</u> code reference to specific type of software, if applicable—i.e., SFT1, 2, 3, 4, 5, etc.
Comments on Need for Training on the Types of Software Referenced in the Survey	SFT3	Should offer (more) or require training on word processing software (e.g., Microsoft Word)
	SFT4	Should offer (more) or require training on spreadsheet software (e.g., Microsoft Excel)
	SFT5	Should offer (more) or require training on presentation software (e.g., Microsoft Powerpoint)
	SFT6	Should offer (more) or require training on database software (e.g., Microsoft Access)
	SFT7	Should offer (more) or require training on project management software (e.g., Microsoft Project)
	SFT8	Should offer (more) or require training on image, audio, video, or screen recording software (e.g., Photoshop, Illustrator, Audacity, Premiere, Captivate, etc.)
	SFT9	Should offer (more) or require training on online course/learning management systems (e.g., Blackboard or Moodle)
	SFT10	Should offer (more) training on web authoring tools (e.g., Dreamweaver);
	SFT11	Should offer (more) for training on 3D modeling tools (e.g., Maya)
Comments on Need for Training on Software Not Referenced in the Survey	SFT12	Should offer (more) training on how to use email/calendar programs (e.g., Microsoft Outlook) *Note: See NSFT for comments on writing effective email text, when to use email vs. phone/in-person, etc.
	SFT13	Should offer (more) training on Adobe Acrobat (DC) or how to use pdf/fillable forms
	SFT14	Should offer (more) training on videoconferencing or digital collaboration tools (e.g., Microsoft Teams, Zoom, WebEx, Google Meet, etc.)
	SFT15	Should offer (more) training on MS Sharepoint or other file sharing programs
	SFT16	Should offer (more) training on data visualization software (e.g., Tableau or Microsoft Power BI)
	SFT17	Should offer (more) training on positive use of social media (benefits of communicating via Facebook, LinkedIn, etc. rather than just avoiding risks/negative professional consequences of inappropriate posts)
	SFT18	Should offer (more) training on data storage or cloud storage
	SFT19	Should offer (more) training on a different type of software, not listed
Other	SFT0	Other comments on training on specific software/programs

Recommendations on Digital Literacy Training Content: Other Digital Literacy Skills (NSFT)

	Code	Description
Comments on Other Types of Training Content Referenced in the Survey	NSFT1	Should offer (more) training on Computer Programming (i.e., how to code, certain programming languages, etc.) (e.g., Python, VBA, etc.)
	NSFT2	Should offer (more) training on Basic or General Computer Skills (e.g., computer hardware and basic troubleshooting, organizing computer files, short-cut keys, etc.)
	NSFT3	Should offer (more) training on Information Literacy (e.g., online search strategies; internet research; how to evaluate the credibility, accuracy, reliability of internet information; synthesis of information; includes critical thinking, identification of misinformation)
	NSFT4	Should offer (more) training on Communication Medium Choice (e.g., when to use email vs. when in-person meeting or phone call is needed)
	NSFT5	Should offer (more) training on Social Media Professionalism (i.e., what not to post to maintain your professional reputation)
Comments on Other Types of Training Content Not Referenced in the Study	NSFT6	Should offer (more) training on typing
	NSFT7	Should offer (more) training on email/texting/internet etiquette
	NSFT8	Should offer (more) training on applicable literacy or written communication skills (e.g., grammar/spelling to write email, reading comprehension to respond to emails)
	NSFTO	Other comments on specific types of digital literacy training content (NOT focused on cybersecurity issues or software/programs)

Appendix H2. Frequency of Overall Content Themes in Open-Ended Comments.

Q: “What types of training and education do you view as most important to improve the Digital Literacy of Airmen across career fields?”	# of Respondents Citing Theme
Survey Reactions/Methodological Comments (GA/M)	7
Comments about various AF IT policies/procedures/delays (IT)	27
General comments about digital literacy training (e.g., general importance) (GT)	190
<u>Training Content Recommendations:</u>	
-- Need for (more) training on... DoD/AF-specific systems (C)	16
-- Need for (more) training for... Software Proficiency (SFT)	355
-- Need for (more) training on... Other Digital Literacy skills (NSFT)	189
DoD Cyber Awareness course or related content on cybersecurity issues (DOD)	81
Other existing AF training offerings (A)	15
University programs and certifications (U)	9
Training delivery format recommendations (e.g., classroom vs. online) (F)	166
When training should be offered (W)	17
Other/ Miscellaneous (O)	29

Note. Comments could be categorized as corresponding to more than one theme, if applicable. Themes were only included in the frequency count if both independent raters categorized a comment as belonging to a given theme.

Appendix H3. Illustrative General Comments on Digital Literacy Training (GT)

Theme	# of Respondents Citing Theme	Sample Comments
General comments on importance of digital literacy training/education, or general comment that more training should be provided (without further specification) (GT1)	37	• “All of the competencies mentioned in this survey are important and the member can best figure out where they can strengthen their portfolio. The Air Force should work to provide an effective, flexible training portfolio and provide time to their members to take the provided training.” • “ALL training and education should incorporate digital literacy. USAF training barely addresses it today.” • “All Airmen have to have the core foundational training on key products and tools and that must be updated yearly or our workforce falls behind on tools that make their job easier, better access to data and collaboration” • “I think we do a very poor job of training members on the actual digital literacy skills they need to perform their work, and instead rely on the member's own initiative. This limits potential efficiencies, as the member likely will not know what question to ask (or which to google), and could spend hours trying to figure out something such as how to adjust a MS Project schedule to USG Fiscal Years.” • “There should be training of all programs. Too many times I have to train myself on how to use some of our Air Force programs and most of the time I can't even use them to their full capacity because I don't know all that they can do for me.”
Any (further) training on digital literacy topics should be career-field (AFSC- or job series-) specific (e.g., update CFETPs; defer to functional communities) (GT4)	35	• “Any training that contributes to your job is important, but it varies depending on your career field.” • “This depends on the job code/career field. Even 2210's vary from network defense to sys admin to computer programmer; quite a wide skill set.” • “We need to develop applications that are relevant to each career field. Otherwise, with a cookie-cutter approach (which is always the default because it's cheaper) we'll end up trying to fit a square peg in a round hole. We need to introduce airmen to a virtual world like a conference (e.g., AFA, AFSA, LOA, NGAUS, etc.) and allow them to "shop" for on-demand training/development opportunities for the areas that supplement their AFSC... As part of their development/feedback, they can be coached by their supervisor and complete standardized workcenter requirements that are shaped by their CFMs, lead technicians, supervisors/trainers/raters, and unit training personnel.” • “As a former high school teacher, we would need to conduct a needs assessment in relation to the AFSC requirements.”
Comments on which ranks/grades or age groups have the greatest need for digital literacy training (GT9)	32	[Focus on older or more senior populations]: • “Younger airman are probably more in tune with all this. it is us older vets that have the most adjusting to do.” • “In regards to some of the older service members who can't do some of the more fundamental computer work, maybe just a FAQ that people can reference” • “More computer skills training for those who make up the older workforce. Sometimes it is more of a struggle to learn those skills without the proper training resources to back it. So many times

		new systems are adopted by the AF and personnel have to learn to use without much guidance/training.” • “Our Airmen are already digitally literate. It's the AF leadership, the old people, that aren't digitally literate.” • “Most of our Airmen know more about digital literacy than our leaders.” <i>[Focus on younger or more junior populations]:</i> • “For young airmen who may not have attended college, an immersion into the digital world as the Air Force defines it will be necessary.... Indoctrinating new recruits into the military's digital culture is extremely important if we are to keep our networks, our information, and our culture safe and intact.” • “Most young troops come in with a basic level of digital literacy, however, I believe that young Airmen should have basic computer skills taught during BMT or Tech school.” • “Growing Airmen who may not work on computers on a daily basis in their early careers, but as they rise in rank helping them develop the necessary computer skills to continue to be successful as they move from being field technicians to being more in an office setting.”
References need for continual, recurring or just-in-time training, without referencing a specific point in a member's career (GT11)	19	• “Just in time training is the best. People need to have a need to store the information presented to them in training. Convince them it's in their best interest, and they will invest their limited time to learn it.” • Applicable software training during work hours. Continual/recurring training to ensure personnel are utilizing the software correctly. • “The only way to make education stick is to make Airmen use it daily. This is why customs & courtesies, dress & personal appearance are almost perfect among them; they practice it daily. If you make them digitally literate, but do not influence them to use the skills daily, they will forget the knowledge.”
Current Air Force training on digital literacy skills is sufficient or not needed; or focus training on other competencies instead (GT2)	15	• “Teamwork and tolerance; inclusion-based training that teaches respect and kindness toward all people. The soft skills of communication and caring are more important than knowing the facts about computer programs.” • “I don't think that more training needs to be available since we have access to Skillsoft. I do think that we as an Air Force need to actively dedicate time toward innovation. Right now innovation is for that down time you have or after everyone has left for the day. If we truly want to stay ahead then we need to block out at least 5% of a work week for innovation and then have people deliver on what they came up with.” • “I think the question of "what types of training or education do you view as most important" is irrelevant, quite frankly... I believe what's far more important is a hunger and thirst for training, education, and information.... If you have to wait around to be taught something or given a class, you're behind the power curve. Innovators find the resources and information they need and request it themselves.”
Any (further) training that is offered should be optional (not mandatory) (GT6)	7	• “Optional completion of training would be preferred. Some AFSCs may not need the training, so making it mandatory may not be ideal.”

		• “Individual knowledge is going to vary so this training probably shouldn't be mandatory--it'll be a waste of man-hours for somebody with a computer science background, for example--but it should be available.”
Comment <u>only</u> references training that should be offered for a specific career field (GT5)	4	• “For STEM field, need for 3D analytical tool training” • “Programming languages such as SysML & python are critical to the enterprise architecting work I am performing now. Highly recommend taking INCOSE MBSE best practices and incorporating them into the 6X career fields.”
Focus on recruiting/selection/screening (e.g., new enlistees or new hires should already be digitally literate before entering Air Force) rather than training (GT3)	4	• “We can teach how to utilize new software or devices, but airmen entering the Air Force need to be pretty digitally literate before enlisting.” • “We need folks with computer science or computer engineering degrees ideally. At minimum, a technical degree. It starts there. Hire the right type of person.”
Hold Airmen accountable for learning digital literacy skills (GT8)	4	• “Call people out who can't use MS Office tools...we wouldn't praise a carpenter who didn't know how to swing a hammer... why do we keep limping along with employees that can't use our basic tools of the modern office? Reward people for proficiency in a range of tools.” • “It should be driven from leadership down to utilize technology to increase productivity, and people should be held accountable for doing that (after a learning period)... People learn very well when it is a necessity. Raised awareness and real-time feedback from peers and supervisors on how to improve minor processes are the answers.”
Evaluate an individual's digital literacy skills to determine what training should be offered to the individual (GT7)	3	• “Each recruit should be evaluated for computer literacy, the people that are already onboard should be given computer training online. The training is already in eLearning but a way to establish it was completed would have to be established. Allow everyone in the existing force to take selected computer training beyond eLearning for free based on their need based on their work assignment...” • “Assessing the training needs of our Airmen and then pointing out the resources available.”
Comments on which career fields/job types have the greatest need for digital literacy training (or greater need for certain types of training) (GT10)	1	• “I think a lot of the time, our command support staff needs more training on digital literacy than anyone else... I would hope for the officers that by the time they commission they already know how to use word, PPT, excel, etc through their studies at school, but the airmen should definitely get a crash course at some point in all of this programs.”

Appendix H4. Illustrative Comments on University Programs and Certifications (U)

Theme	# of Respondents Citing Theme	Sample Comments
Comments on college or postgraduate courses (no reference to degree) (U5)	5	• “College undergraduate level training to increase skills in Microsoft office products (Word, Excel, Power Point, etc.)” • “More Graduate level education should be done internally by the Air Force. The goal of education to the Air Force is to improve the Air Force, not to necessarily get the Airmen a great job when they leave the Air Force.”
Comments on professional continuing education credits (e.g., CEUs, CLEs, CPEs) (U4)	1	• “We need to introduce airmen to a virtual world like a conference (e.g., AFA, AFSA, LOA, NGAUS, etc.) and allow them to "shop" for on-demand training/development opportunities for the areas that supplement their AFSC or leadership development (virtual/augmented reality, blackboard courses with CEUs or college credits, etc.).”
Comments on applicable university (undergrad or graduate) degrees (U6)	1	• “Harvard Business School, financial forecasting training and development”
Comments on industry certifications (e.g., PMP, CompTIA) (U3)	1	• “Certificate training. Self learning”

Appendix H5. Illustrative Comments on Existing Air Force Training Offerings (A)

Theme	# Citing Theme	Sample Comments
Comments about AF e-Learning (A2)	4	• (+) “I really do think that the AF E-Learning site is a wonderful resource. Our office, in particular, loves the Microsoft classes located on there... I highly - highly - recommend that site for basic skills that many airman do not necessarily have, regardless of AFSC.” • (-) “We need to have free, self-paced learning opportunities that isn't the e-learning site... because that site sucks. Everything is antiquated that is provided to learn from.”
Comments about commercial/paid subscription-based online course offerings other than AF eLearning and Udemy (A5)	3	• “I think the USAF should have institution-wide access to something along the lines of LinkedIn Learning (formerly Lynda.com) so members can attain "just-in-time" (JIT) training on whatever they need. There are also MANY independently-created YouTube videos that can provide JIT, HOWEVER, YouTube has been blocked on the AFNET. The USAF also already has SkillPort e-Learning site training, which may be under-advertised and under-utilized.” • “Lynda Learning is a great training resource.”
Comments about other free or open source online course offerings (A6)	2	• “Much can be learned from programs like Software Carpentry which is a generally open-source education program” • “Offer courses through Coursera.”
Comments about Udemy (through AF DU) (A3)	1	• “Udemy has a lot of [training classes] available but not many people know about it.”
Airmen need to become aware of how to find/access training courses (A1)	1	• “A central database (web-based) that lists all computer programs/systems that one might encounter, with links to free online training, would be helpful. Sometimes it's hard to know where to find training for a system. Sometimes it's widely available on the internet for free.”

Appendix H6. Illustrative Comments on DoD CyberAwareness course or related content (DOD)

Theme	# of Respondents Citing Theme	Sample Comments
General comment on cybersecurity training importance (DOD8)	36	“Cyber hygiene is the most important since every Airmen uses IT and can be a potential vulnerability if they are ignorant or irresponsible...” “education of increasing cyber security requirements and their importance.” “AF needs to develop a ...cyber course that teaches the fundamentals of cyber defense and offense... this cyber education course needs to be a priority.”
Should update/change DoD CyberAwareness course content (DOD6)	9	“OpSEC and Cyber-Awareness are the foundation of all airmen's digital competency. If there are faults it may be time to update and upgrade the training.” “Have outside agency's that are proficient at managing cyber systems, security firms , and servers etc come in and re write the mandatory cyber training...” “For the annual training requirement to remain effective, it must be updated often to keep the airman engaged.”
General positive comments about current DoD CyberAwareness course (DOD1)	5	“Cyber Awareness training is probably the most important training for non cyber career fields.”
General negative comments current DoD CyberAwareness course (DOD2)	4	“The current cyber awareness training ... is NOT effective in building digital literacy.” “I would not count DOD Cyber Awareness as digital literacy.” “Existing training forums are a "compliance" box-checking solution, not effective education or awareness tools.”
Current DoD CyberAwareness course... Should be longer or include more content (DOD7)	4	“Remaining safe online, something that goes deeper than the yearly cyber awareness training. They need to know how apps, games and other programs are scraping their information.” “Basic cyber security information/posture -- more than annual JKO training which is NOT enough.”
... Should be required more often (DOD3)	2	“Cybersecurity related training beyond the annual”
...Should be required less often or for fewer members (DOD4)	1	“The lengthy "Cyber Challenge" training... is great training the first time...it is incredibly annoying when you have taken it multiple times... do not need to continually inoculate the herd with the exact same trainings every year...”

Appendix H7. Illustrative Comments on Need for further training on specific cybersecurity topic(s) covered in DoD CyberAwareness course (DOD9)

Theme	# Citing Theme	Sample Comments
Social Networking (DOD9Ic) <i>(e.g., need to limit social media sharing)</i>	27	• “Teach a class to Airmen on the hidden effects of social networking ... I can find on anyone by just loading their name into a search engine based on what you post on social media that could help our adversaries.” • “Social media is a huge problem for the military in regards to OPSEC [Operation Security]. I believe the DoD should impress the importance of responsible social media training ...” • “... From my perspective, it seems that the most obvious shortfalls in digital literacy exist among young enlisted members who don't understand the AF expectations and dangers surrounding social media posts.” • “I believe social media training and education is most important to show all airmen the good and bad of all platforms. It can become such a mental obstacle if someone were to post something unfavorable, to protect their selves from predators/foreign entities which in turn helps their career...”
Sensitive Information (e.g., data breaches; PII) (DOD9II)	22	• “In many different fields besides Cyber we handle PII and other sensitive information on a regular basis. Digital literacy is very important in keeping our mission and country safe from the enemy. Little information collected over time will paint a picture that can be exploited.” • “It goes without saying, that PII protection is the most important thing we need to train Airman to properly due...” • “Regular training and education on the ramification of information leakage. Showing the ease of which digital information is obtained and exploited is very helpful. Showing how to protect personal and government information goes a long way.”
Social Engineering (DOD9IIIb) <i>(e.g., internet hoaxes, phishing, etc.)</i>	6	• “Digital literacy ... is just as important as all the other factors someone working in a cyber career field deals with... understanding how adversaries can use social engineering to get a person to spill secrets and even classified information is very important...” • “It's important to know how to recognize scams, phishing, and many other ways that social engineering is done.” • “...How to recognize phishing attempts and scams would be great...”
Malicious Code (e.g., viruses): Mobile Devices (e.g., password protection; GPS tracking) (DOD9IIIe)	3	• “Learning about the dangers of certain apps on my personal phone.” • “I would suggest more "Publicly Available Information" (PAI) training tailored for non-cyber Airmen. This makes people more aware of the vulnerabilities out there as well as some of the avenues that attackers can get your data. Good cyber hygiene is always a great topic to train on so that people are more informed and can hopefully make better decisions when using social media and/or smartphone technology.” • “Training on... how easy it is to access information unless it is encrypted or sent via VPN. The training should be focused on personal devices and personal information in order to get the attention of the Airmen. Then, carry the discussion over to how devastating it would be if official information were this easily accessible.”

Appendix H8. Illustrative Comments on Need for Training Airmen on DoD/AF-Specific Systems/Websites or DoD/AF-Specific Information Technology Issues (C)

Theme	# of Respondents Citing Theme	Sample Comments
Comments on training to use Air Force-specific or DoD-specific systems and websites (e.g., AF Portal, myPers, vMPF, ATAAPS, LeaveWeb, DFAS, DPMAP, DCPDS, DTS, TMT, etc.) (C1)	16	• “Basic use of the AF portal such as LeaveWeb, myPay, AFFMS II, myPers, vMPF. A lot of new airmen have no clue on how to do these and its often the first line supervisor who needs to explain/show all of these, thus taking time away from their actual AF jobs. I myself had nobody to teach me all these and just learned it (and a bit more) by myself but that one i attribute to my natural sense of curiosity/ experimental nature. Most other Airmen don't feel the same and will need to be guided hand in hand.” • “First, what Airmen need to know to navigate the basics of being an Airman: virtual MPF, AF portal, MyPay/virtual finance, remote email access, email etiquette, and basic troubleshooting of access, permissions, and alternate means of contact (for example, we are not consistent in listing commercial numbers and DSN numbers, which is necessary to support distributed/telework situations, nor are we responsible in updating website certificates to guarantee access by members of the force). Then, basic program functionality, including word processing formatting, spreadsheet use and limitations, and knowledge management requirements for sharepoint and share drive use. Everything else, including programming skills and proficiency with more specific systems (network operations, systems operations, digital media editing), can then be targeted toward those functional communities responsible for those activities.” • “I think we need to offer basic computer Training and then some classes on the Programs and websites we use often (TAA, MyPERS, MyBiz, digital T.O., JEDMICS, Airforce Forms, and many others)...” • “Amn: navigate portal, know about digital resources for career items (AFVEC, leaveweb, AFFFM II, email etiquette) all of these items can be handled by NCOs (NCOs must be trained and pass on information to AMN).”
Comments on training to use/locate AF e-Pubs (e.g., AFIs, AFMANs) or Technical Orders (C3)	1	• “Air Force Programs User Training: Air Force computer programs (GDSS, ePEX, JASPERSOFT) and online web programs (LEAVE WEB, ePUBS, DFAS, vPC, MICT, MICP, DTS)”

Appendix H9. Illustrative Comments on Need for Training Airmen for Software Proficiency (SFT)

Theme	# Citing Theme	Sample Comments
Should offer (more) or require... training on Microsoft product(s) (e.g., Office suite, MS 365, etc.) (SFT2)	175	It would be highly valuable for everyone to be very literate in usage of all Microsoft Office programs... Many people in the military have just very basic skills in Office and waste many man-hours on troubleshooting and finding features. - I have no formal computer training, but have applied myself out of necessity for 16 years active duty. My efforts would have been, and would still be great bolstered with any form of official Microsoft office training. - I took a class... that taught me/walked me through how to use the different Microsoft products. I believe providing this resource, at least to our brand new members, could be beneficial to improving their daily work lives. I have seen many people that barely even touched the toolbar when they would open a new document. - Legitimate, well-funded, thorough training on the Microsoft Office suite. None of this "oh somebody in the unit can teach it" stuff that has been the case in my past units. - We do not actually set aside meaningful time with experts to learn the digital literacy skills. It is assumed everyone can use Office effectively, but there are so many hidden tricks, such as working with templates, that are not taught... Most of this type of training can be in small segments, and just in time, if it was readily available online - using interactive learning techniques. Intermediate training on Office suite of programs for NCOs - going beyond just entering information and tapping into the greater functionality. - I think a basic Microsoft class/tutorials would be beneficial across all AFSC's when beginning a career in the Air Force. - All Airmen need a basic knowledge of Microsoft products from day one. As individuals advance in rank having an increased knowledge in Power Point, Adobe, and Excel are critical to performing day to day functions. - I would like to see Microsoft office classes taught regularly at the education center with focus on Excel, Word, PowerPoint, SharePoint, and Microsoft Project as these are the daily used programs.
...training on Adobe product(s) (SFT1)	21	...we don't train our people on what different systems are capable of. Even with the systems we have access to, the service would benefit from courses on what capabilities the Microsoft and Adobe suites offer. - Teach how to use basic Microsoft/Adobe Programs. This was something learned throughout my career but would have been helpful to have foundational knowledge coming in. - Microsoft and adobe products training. Other platforms must be based on individual / duty position requirement.
...training on spreadsheet software (e.g., Excel) (SFT4)	163	Microsoft Excel is what I consider the most important because it is what I like to call the swiss-army knife of all computer programs. You can log data within excel and can be geared toward any AFSC in the Air Force. (ex: inventory, budgets, schedules, etc.) Microsoft Excel is incredibly important and is the most frequently ideal way to automate tasks. It is rarely fully utilized. The Air Force should sponsor a program to teach members in all career fields to more effectively use Excel. This could consist of locally available commercial trainings or part of an AF run computer skills training that members can attend on a TDY status.

		• Things like Pivot Tables and advanced formulas in Excel or linking in PowerPoint can lead to massive time savings. I keep getting assigned to admin sections because I can use these, and have automated myself out of two jobs so far. For example, taking a daily report that takes about an hour to generate and then automating it using a pivot table and graph can save my work center can add up to hundreds of hours of a year and frees up time for other problems. • More in-depth Excel training or even a simple class for using spreadsheets to our benefit. I've never seen a career field that didn't use some type of Excel workbook to log and track their progress.
...training on word processing software (e.g., Microsoft Word) (SFT3)	99	• Basic Excel/Word use is expected but never taught. Online resources should be available, and if they are, better publicized, for those who have not previously had classes on basic M365 programs. I have spent a lot of time in my AF career teaching basic office functions/keyboard shortcuts, to help people do their jobs. • Everyone should know how to type without looking at their keyboards. This is especially important at the staff level. Know how to use Word features to create better products quicker. • Every Airman should be able to effectively, "proficiently" use Word, outlook, excel, PowerPoint and adobe and get additional training to be experts on systems used in their respective career fields with actual tests that verify competency. It's about time and efficiency. In money making corporations, "Time is money", but for the military "time is defense" (our true bottom line).
...training on presentation software (e.g., Microsoft Powerpoint) (SFT5)	99	• "There is a serious lack of training in Microsoft PowerPoint... If I were king for a day... I would design a level I, II, III type training because the training world seriously lacks the knowledge of the incredible power of PowerPoint to be used to screen record, audio record, animate slides, and many more incredible features. I have been watching AETC starting to push Captivate, Camtasia, Articulate, and many other course development software to design products for the classroom that our current PowerPoint can do in a lot of cases. The education population acts like this is really great new technology, while having no understanding of the (already provided) software installed on every AF computer. I see a huge need for PowerPoint training to 1st, save money, and 2nd, use the software already purchased and provided. My concern is the AF is spending a ton of tax payers \$\$ pushing new technology to educators that haven't taken the time to learn the software already available on their computers." • "...WORD, POWERPOINT and EXCEL because this is the most common means of transferring or relating information across the AF." • "How to run a meeting via Powerpoint. This is SO painful. Even the scheduling people - especially the scheduling people - are so bad at navigating computers during meetings. Keyboard shortcuts, how to set up and adjust (focus, stretch, etc/) on a projector, how to navigate through a slideshow, knowing how to effectively edit a slideshow/excel/whatever is up on the big screen during a meeting so that everyone doesn't have to wait."
...training on how to use email/calendar programs (e.g., Microsoft Outlook) (SFT12)	58	• "...We also need to teach how to use e-mail, the calendar, and schedule assistance. Please review the essay Managing Oneself by Peter Drucker and develop training based on those principles. Right now we throw people into computer jobs and they have no idea how to use a computer other than browsing the internet, shopping, and using social media. We would increase productivity a great amount if we would just teach them how to use a computer. You wouldn't expect a pilot to fly a plane with no training, so why do we let people use a computer without training. A computer can do far more damage than an airplane."

		• “Most important: how to use Microsoft Office for email to include proper use of tools, functions.” • “Using our own Outlook email to set it up and design the look, set up a calendar. To USE the thing you are being trained on and not just going through a manual.” • “...I do see an importance in all Airmen learning how to effectively use common programs that all career fields use, such as Outlook and Adobe. Time management can be significantly improved if we learned from our time as young Airmen how to manage and organize emails...” • “All levels of PME should (at a minimum) have formal Outlook and Excel training as without those NCOs are falling behind.”
...training on database software (e.g., Microsoft Access) (SFT6)	45	• “More advanced applications to enhance and build on current items. Example: we use EXCEL a lot, ACCESS would be amazing, however few of us know how to utilize it, and if we can't use it as a group, progress of the program dies on the vine. Creating a need for progression of usage then providing the useful training in ACCESS would be beneficial... otherwise we get stuck in 'old and antiquated -inefficient' ways of doing things, which isn't good for individuals nor offices/teams.” • “Access training since it is very complex or provide a user friendly database that works with MS Office.” • “Having a few people well versed in Access to build and maintain organization databases wouldn't hurt”
...training on videoconferencing or digital collaboration tools (e.g., Microsoft Teams, Zoom, WebEx, Google Meet, etc.) (SFT14)	41	• “As we bring on more digital meeting sources (i.e., ZoomGov, CRV, Teams, etc.), we need to focus more on training. Several times, these sources are pushed to the field with no training or even an explanation on when (or for what use) one platform might be better than the other, or where one may work well for one aspect, but have limitations or deficiencies for another aspect (i.e., transition or discussion of CUI).” • “There should be some "how to" videos/webinars... for areas that we are now need in the teleworking area. Many of us learned through trial and error or google. For example all the areas of Zoom/MS Teams - how to preschedule a recurring meeting, how to share slides, etc. These are simple things but can cause delay in getting things done.” • Training is the key to success, so new programs, such as TEAMS and Office 365 prior to roll out should have a hands on classroom type training. Some were provided a 30 min session, but it was not enough.” • “A regular refresher on MS suite... as well as monthly ‘new tools’ like how to use ZoomGov, Webex, etc.”
...training on MS Sharepoint or other file sharing programs (SFT15)	26	• “Microsoft office (all platforms)/ Microsoft Teams & SharePoint to be offered at several levels... This will facilitate more productive work in the virtual environment. My unit has NO training for Microsoft SharePoint, but we are expected to utilize it over a folder on a server--yet no one knows how to use it effectively and efficiently.” • “Air Force should provide SharePoint training to all Airmen similar to the DoD providing DTS training. If the Air Force is going to launch a program, they need to train the 3FXX, 38Fs, 17Ds, and 3Ds on the new software because Comm Focal Point and Commander's Support Section will be focal point for assisting Airmen who may lack digital literacy.” • “Understand how to store, update, and protect shareable information on SharePoint for the organization. It's so easy to do, yet many people are lazy and pretend to not understand so they don't have to do the work. Instead, they'd rather have their unit's "SharePoint guru" do it.” • “Our Airmen need to understand how to use and MAINTAIN a database. We are hampered by Microsoft Access being our only database option to

		solve unit level problems. It requires substantial education and training from all users for it to be effective.”
...training on Adobe Acrobat (DC) or how to use pdf/fillable forms (SFT13)	16	• “Classes on how to more effectively use... Adobe PDF (search, highlight, digitally sign, etc).” • “Adobe Acrobat DC (adding signatures & editing document)” • “Basic software training is a necessity (word, excel, power point, access and even manipulating PDF documents)”
...training on project management software (e.g., Microsoft Project) (SFT7)	13	• “MS Project could help with a wide variety of long-term taskers / projects.” • “More training and exposure to Microsoft office and the extended family of applications such as Project, Visio, etc. ...Project is really good for project management, which is a really common job of an Officer.” • “I would like to use Project instead of PowerPoint to create program schedules so Project training and a transition to Project would be nice.”
...training on online course/learning management systems (e.g., Blackboard or Moodle) (SFT9)	7	• “As we move towards more distance learning platforms such as Blackboard, Moodle, and Canvas it is imperative that we get training... At my organization for instance, instructors with no experience are managing, supporting, and maintaining the Blackboard system from AETC without proper training or experience to do it.” • “The best type of training is basic application use for all programs such as Outlook, Excel and PowerPoint. Other programs that would benefit the effectiveness of Airman such as Publisher, SharePoint, Blackboard, etc as needed.”
...training on data storage or cloud storage (SFT18)	5	• “Data management with regard to cloud storage, the need and value.” • “Training for new digital tools as they roll out, such as cloud services”
...training on a different type of software, not listed (SFT19)	4	• “...using OneNote is a foreign concept to many. OneNote can be a powerful team data organization tool if managed properly.” • “... For personnel who spend all day in front of a computer, additional training in OneNote” • “...Funding should be available for unclassified operations to use Slack and other workplace tools that increase productivity at wing- or group-scale enterprise levels.” • “VR and software usage training”
...training on positive use of social media (SFT17)	3	• “Effective use of social media to promote the mission” • “It would be nice to have additional training across the board for Social Media platforms (as I am unfamiliar with how some of them operate) to increase communication among all members.” • “Social media tools”
...training on image, audio, video, or screen recording software (SFT8)	2	• “Excel, Web based programs, Word, video programs and PowerPoint” • “Working with excel/audio programs/publishing programs.”
...orientation/ training to learn what different types of software/ programs are available (SFT0)	1	• “Knowing what different types of software are available, who has access to it and can competently use it would help to fully utilize it.”

Appendix H10. Illustrative Comments on Need for Training Airmen on Other (Non-Software) Digital Literacy Topics (NSFT)

Theme	# of Respondents Citing Theme	Sample Comments
Should offer (more) training on... Basic or General Computer Skills (e.g., computer hardware and basic troubleshooting, organizing computer files, short-cut keys, etc.) (NSFT2)	65	“... basic trouble shooting and IT functions should be taught (i.e. how to find a computer name, how to delete browser history, how to change compatibility view settings). I work in a support career field and have had to use basic troubleshoot and IT functions several times throughout my career.” “Basic computer familiarization skills need to be taught at all bases.” “I believe it would be of great benefit to train Airmen to troubleshoot day to day network connectivity issues frequently experienced while using web-based platforms to conduct work. Additionally, once we're "signed off" then we need to have the appropriate "permissions" to correct the issue. Our communications folks are not sufficiently resourced to provide immediate response to every trouble ticket; in many cases this causes a work stoppage that inhibits mission accomplishment.” “We should enroll people in USAF-led courses at each base that is similar to fundamentals of computers, troubleshooting, common equipment names, etc. With that said, it is also important to query who among the force already have this competence to either potentially help teach, or be allowed to not attend.” “... How to trouble shoot why my internet isn't working. How to find your computer name and IP address.... Training in how to id differ parts and functions of computers and equipment.” “Hardware--how to get things plugged in and working when it’s not in your everyday workplace.” “There also needs to be basic literacy in self trouble shooting computer problems and the responsibility to perform basic task before calling it quits or sending off to a helpdesk (and then getting nothing done while waiting on a response).”
... Information Literacy (e.g., online search strategies; internet research; how to evaluate the credibility, accuracy, reliability of internet information; synthesis of information; includes critical thinking, identification of misinformation) (NSFT3)	36	“Learning to discern reliable from unreliable Internet sources is the most important skill Airmen need to boost in the realm of digital literacy.” “The skill of being able to distinguish between credible and false information on the internet, to include social media, is severely lacking. This gap threatens not only Airmen's ability to perform their duties but puts at risk the foundation of democracy that we all pledge to protect.” “Most of the early to mid-career Airmen grew up with computers and other digital devices, so they likely already have the skills to use many of these devices and learn new ones. But evaluating and synthesizing information from different online sources and knowing how to evaluate the trustworthiness/quality of these sources is an important skill and one that doesn't come so naturally.” “Airmen need to know how to evaluate information they see posted online. They need to be aware of the tactics currently being used to spread disinformation online.” “Recognizing disinformation and sketchy sources. I cannot tell you how hard it is to enforce a mask policy when people I lead are ‘sure’ that COVID-19 is a political hoax. We need more critical thinking skills and we need to inoculate our people against these absurd types of claims.”

		• “All Airmen must be taught how to identify what makes any source (printed media, Internet, film, TV program, radio program/news, etc.) credible and what makes one suspect or not credible. They must be able to check several credible sources and form their own opinion. They must also be able to spot misinformation and disinformation.” • “...we never create a common baseline across Airmen. We tell Airmen in SOS, ACSC and AWC that Critical Thinking is important...but we are never taught HOW to do it.... ACSC/AWC taught how to take pre-filtered quality information and order it into an influential and convincing position. Great....you taught them how to do the LAST step but you never taught them how to do the FIRST STEP: Information filtering, quality testing, analysis, do you have all the relevant info, is it significant? BLUF: Airmen are ultra connected to the digital world but digital literacy also means having skills to determine the difference between high and low quality information or analysis. Right now, VERY FEW people have these skills and they ONLY have them because of CHANCE, not because of deliberate development!! FIX THIS ASAP!!”
...Computer Programming (i.e., how to code, certain programming languages, etc.) (e.g., Python, VBA, etc.) (NSFT1)	27	• “Coding. Coding simultaneously teaches both analytical and creative thinking while fostering research, precision, discovery, and familiarity with making digital devices work for oneself. In today's world, this should be on par with mathematics and language arts.” • “Basic computer programming, e.g. Python. Many Airmen do not realize what a time saver some basic programming skills can be, and it teaches logical thinking as a fringe benefit.” • “We need to create common and accessible education on basic programming skills so that Airmen at the lowest level can write programs to buy back their time on simple tasks.” • “At least an introduction to programming in a simple language such as Python. This will provide simple introduction to ‘behind the scenes’ of what they are using. This advanced ‘basics’ can also help with production workforce development, making personnel less afraid of new technologies” • “Regularly recurring options to attend more advanced classes (i.e. use of macros in Excel, basic computer programming, etc.).”
... literacy or written communication skills (e.g., grammar/spelling to write email, reading comprehension to respond to emails) (NSFT8)	17	• “I think most Airmen are extremely tech savvy. We need to teach them to write and articulate themselves well. Everything we produce is via electronic means--briefings, papers, etc.” • “Proper writing skills and common sense are key to digital communication. Digital correspondence shows no emotion so clearly articulating what one means is pivotal.” • “When writing an email, you have the time to go back and read what you wrote before you send it. Does it make sense? Will the reader understand what you meant to communicate? In other words, will the receiver of the communication actually receive the message which was intended by the sender? Is the sender considering that the receiver might not have all of the information on the subject? Does the sender need to expand on the message being sent?” • “Writing courses in proper English, writing for the audience (info vs. action), and writing concisely for leadership.” • “Airmen need more training in basic written & oral communication skills. Officers and Senior NCOs routinely use vernacular commonly found in text-messages in official communication. Perhaps the appropriate time and place for reinforcement of communication skills is during PME.”

...email/texting/internet etiquette (NSFT7)	12	• “The use of Excel, Word, PowerPoint, and email etiquette are most important” • “Proper etiquette, professionalism using electronic communication” • “Some type of e-mail etiquette... would help Airmen of all ranks/ages.” • “Possibly a course in email etiquette in ALS... how to deal with sensitive topics with subordinates over a digital media... Even if you don't want to send the email that is going to break the unwanted news, eventually you are going to have to.”
...Communication Medium Choice (e.g., when to use email vs. when in-person meeting or phone call is needed) (NSFT4)	10	• “When to use which communication tool when communicating with others. If it's important, don't assume I've read your email. If it's a complex issue, let's discuss rather than sending 800 chat messages.” • “It may help to have a force educated on proper communication and knowledge management. Too much time is wasted on the wrong communication method being used (meeting vs email, email chain vs Teams/Slack group, etc.) • “More ability to communicate personally. SO MUCH TIME IS LOST by attempting to reach the right person, exchange of emails when it would be much simpler and efficient to pick up the phone and call someone” • “Recommend in all of our PME we add emphasis on communication and when it should be digital and when it should be analog.” • “Supervisor/interactive training/refresher training and/or include as element of the evaluation process. (Note, on military evaluations, one of the "graded" categories is "Communication Skills" with enlisted evaluation using term "various mediums".) Tongue and Quill contains a whole chapter on workplace challenges that includes e-mail.”
...Typing (NSFT6)	9	• “Teaching typing skills to Airmen that do not know how to type.” • “Typing, hot keys, etc. would be the best place to start.” • “Typing would be key. Hunting and pecking just doesn't work.” • “Everyone should know how to type without looking at their keyboards. This is especially important at the staff level.” • “More training with typing would provide a good baseline for improving the speed at which Airmen work across different career fields.”
...Social Media Professionalism (i.e., what not to post to maintain your professional reputation) (NSFT5)	7	• “Social Media training; specifically Airmen have to understand the impact of social media responses to the Air Force image and that there are things that once posted could result in disciplinary actions.” • “Social media education on what is appropriate to put online and what is not in terms of both OPSEC/security and professionalism.” • “It is important for everyone to understand the importance of what you should and should NOT post on social media.” • “Let's move to a platform that teaches Airmen how to lock their social media accounts and what is and isn't appropriate if others can see their accounts.” • “A ‘what not do on social media’ intensive course would be helpful.”

Appendix H11. Illustrative Comments on Training Delivery Format (F)

Theme	# of Respondents Citing Theme	Sample Comments
Should offer (more) hands-on training to improve digital literacy skills (F6)	56	• “Hands-on training is the most important... Often reading about technology or watching a demonstration is inadequate to develop proficiency.” • “Interactive training. Doing. Hitting the keys, moving and clicking the mouse. Reading and not doing doesn't do any good.” • “Absolutely hands-on! CBTs do not work when trying to increase digital literacy unless there is a hands on component that demonstrates student success.” • “...there needs to be an emphasis on hands on practical application based training. We don't teach maintainers the theory of metallurgy and then expect them to know how to turn a wrench and tighten a bolt. However in the world of Cyber we constantly see just that.” • “Hands-on tutorials, typically delivered by pre-recorded video modules to allow the student to proceed at their own pace. There are going to be some who need a lot of guidance, and others who need very little. Therefore, being able to choose one's own pace and fill knowledge gaps are necessary, and also the most efficient use of one's time.” • Hands-on with applications, exercises to walk you through the various scenarios; practice, practice, practice and then be tested on the skills. People hate tests, but there must be some type of evaluation tool after the training for the instructors to see application/deficiency and for workers to evaluate comprehension and areas of improvement; videos clips MUST be incorporated into the training.”
Should offer (more) video-based training, internet/online training or computer-based training (CBTs) to improve digital literacy skills (F7)	43	• “Basic and advanced CBTs on Excel, Word, PowerPoint, Outlook, SharePoint, etc. If we already have the tools, then we need to know how to fully employ them.” • “training videos. in person training is rarely effective because the facilitators are RARELY knowledgeable or effective and oftentimes questions are too specific for a class environment.” • “There should be some “how to” videos/webinars that can be accessed on demand for a variety of subjects, from simple how to change a password, to more complex situations.” • “Video and interactive training is extremely important and needs to be easy to find and in one place. There are so many training mediums that it's confusing to know where to look.” • “More use of ADLS or online training one can take at their own pace and time is most important to improve digital literacy of Airmen across career fields.”
Should offer (more) in-person training to improve digital literacy skills (F4) (Note: Code comments on “Classroom” training as in-person training)	34	• “I'm coming from an education background and I still believe that an in-person training is the best training for most people.” • “Classroom type environment or tutorials that you can ask questions, interact with a person.” • “In-person live training not virtual CVR or Teams.” • “I have my associate degree and have taken computer classes at Weber State University years ago. Here at Hill AFB I have been sent to Excel training which was very helpful. I would be interested in future classes to help me improve my digital literacy in different areas whether online or in person.”

		• “Face-to-Face basic fundamentals that can be provided by the Communications Squadron that can be demonstrated to the trainee, practiced by the trainee, and assessed by a trainer.”
Should offer (more) on-the-job training (OJT) to improve digital literacy skills (F1)	20	• “Because every office is different, consolidate the training each office needs to successfully implement their strategies, and keep the training in-house. This will allow each Airman to learn on the job training in their specific office, as well as not teach someone a skill that will not be used in their specific scenario. This will also provide continuity in each office, and offer the opportunity for those experienced in the tasks to teach those not experienced and provide leadership skills.” • “On the job training I feel is always best. When someone can sit with you and walk you through how systems work it tends to stick better. Running a checklist to complete certain tasks is always an option as well as just paying closer attention to what is going on and overlooking your work.” • “I think people who will have to deal with computers... should receive minimal training while in tech school. As they enter their actual work environment, it should be on the job training and learning as they go.”
Should offer (more) job aids, user guides, pdfs, documents to improve digital literacy skills (F8)	11	• “Cheat sheets are a great resource so as not to bottle neck the system, i.e. IT folks. Learning basic trouble shooting.” • “Basic help files should be again included in the Standard Desktop software. User manuals should be made available for other packages.” • “Hands on, on the job training, with examples, starting off with smaller tasks. While having properly subdivided PDF or PPT documents as references for complicated tasks.”
Should offer (more) instructor-led training to improve digital literacy skills (F5) (<i>online or in-person</i>)	8	• “Training that is instructor led and not dependent on CBT. Too much is pushed to individuals to learn on their own and no time is given to learn. We end up spending more time flailing than it would have taken to take the time and train right the first time up front.” • “Instructor led virtual classroom” • “...Excel and PowerPoint is essential for my current position. Many of my peers are a bit rusty with these programs and courses lead by a virtual instructor would benefit us greatly”
Should offer (more) opportunities for self-directed learning to improve digital literacy (F2)	7	• “Self-sought training. You are only going to be genuinely interested if it's affecting you at the moment. So the training you search for would be more influential on what you soak in.” • “Enough conceptual background so they can move forward and teach themselves” • “Needs to be self-guided with direct influence from immediate supervisors/team leads.”
Should offer (more) one-on-one training to improve digital literacy (F3)	4	• “I prefer one-on-one training, even if it is via a platform like Zoom.” • “More one on one training to learn new software programs when they are implemented in the workplace. On line can only do so much!”
Should identify/offer list of POCs/SMEs to contact for specific support (e.g., to answer questions) (F9)	3	• “Walk-through visual instructions and specific SMEs for each digital tool / software.” • “When involved in a computer program, regardless of software type, having a TEAM locally available to provide a walk-thru, or troubleshoot a problem, is huge” • “The most valued training for digital aircraft maintenance is OJT and daily demonstrations and help from digital experts. We usually have none on the floor or accessible every hour and believe me we need them every hour. Aircraft maintenance mechanics have very little time to be on a computer”

Appendix H12. Illustrative Comments on When Training Should Be Offered (W)

Theme	# of Respondents Citing Theme	Sample Comments
Provide (more) training during formal technical training (e.g., Initial Skills Training [IST] for career field) (W2)	8	• “Providing a basic computer skills training block in maybe tech school would be amazing for our airmen.” • “Training should be offered early (BMT or initial tech schools) on common platforms (e.g. SharePoint, DOD SAFE, etc) as well as retraining tailored training to personnel who have been in for ~10-years or more.” • “I think the USAF needs to provide training (online or in tech school) to show its members how to use software to the fullest potential. This would give more time back to our Airmen to focus on other tasks (instead of something that is tedious).”
Provide training during Professional Military Education (PME) (e.g., NCOA, SNCOA, SOS, ACSC, etc.) (W3)	7	• “Communication and Computer skills trainings during PME if not already being taught.” • “I completed a Brookings Executive Education course on executive communication last year that was particularly helpful. Recommend in all of our PME we add emphasis on communication and when it should be digital and when it should be analog.” • “I think there has been several good documentaries and podcasts in recent years that highly the tactics commonly deployed by organizations trying to sow discord and division in society. These could be mandatory viewings during professional military training and civilian leadership training to inoculate against online misinformation campaigns.” • “All levels of PME should (at a minimum) have formal outlook and excel training as without those NCOs are falling behind.”
Provide training to new accessions (e.g., in Basic Military Training [BMT] and/or officer commissioning programs [ROTC, USAFA, or OTS]) (W1)	4	• “I think officers -- in addition to requiring a bachelor's degree -- should be required to have certifications in... Microsoft Enterprise (Word, Excel, PowerPoint, Access) and Adobe for a start... it could be a part of the existing PME construct early in their career (USAFA, ROTC, OTS). The level of certification should be such that Lts and Capts are able to use existing IT infrastructure (or recognize opportunities to use existing IT infrastructure) to improve day-to-day operations within their units and/or recognize when existing infrastructure is insufficient to fill the need and pass that need to the acquisition community.” • “Most young troops come in with a basic level of digital literacy, however, I believe that young Airmen should have basic computer skills taught during BMT or Tech school.”

Appendix H13. Other Illustrative Comments (O)

Theme	# Citing Other Themes	Sample Comments
Other Themes Not in Code Book	29	<i>Recommendations for how the Air Force should communicate information regarding digital topics:</i> • “Real life scenarios that shows how lack of things can go wrong. To emphasize the need for training an/or education on this topic.” • “I personally like top 10 lists.” • “Routine updates to “did you know” updates to systems would assist many professionals.” <i>Publicize what software/programs are available:</i> • “Actually, it's not so much the training as it is the availability/access to programs... So maybe what I need are trial/sample programs.” • “Communication about options is a great first step. Example: why are so many units using disparate means to enable hybrid tele/in-office work when the DoD has a solution that both in the office and from home without a VPN (CVR Teams). The Air Force does not need its own CHES instantiation of teams, nor do individual units need their own solutions. If everyone was on the same system, it would significantly ease a lot of the issues we've been having as a joint force.” <i>Other needed training topics (Standards of conduct/protocol in digital environment, bullying, reporting sexual harassment on social media):</i> • “digital protocols to establish rules of engagement in all forms of engaging with members. As we have had Zoom and MSTEams meetings, there have been dress code standard questions.” • “I see a lot of people waste a lot of time on social media during work hours when that time could be spent at home. People show up to work during a pandemic and are on facebook for 4 hours, this is an issue I wanted to bring up in case this forum is the right one that could change that. How much better would it be to stay and home and telework, if they want to come to the building and facebook for 8 hours.” • “ALL individuals should have sexual harassment training and I think our workforce should incorporate some time of “bullying” awareness, because it happens much too often and cause individuals to not feel comfortable coming to work, ultimately putting an impact of their work performance.” • “...I have recently seen an airman post a #metoo experience and unbeknownst to them that was brought to the attention of their direct supervisor who forced one of their coworkers to show them what was posted thus forcing the airmen to report that experience even though they did not want to. This took the decision from the airmen which put unfair stress and discomfort on them all the while they had to relive that experience all over again. The outcome of that case was even worse, the Air Force found evidence the perpetrator was guilty but could not convict them due to statute of limitations. All this goes to show that SAPR training is needed as well, social media needs to be included in this training to help other airmen from having their decision taken from them on to report and/or how to report the harassment/abuse.” <i>Providing training without consequences for admitted deficiency or (initial) failure:</i> • “Competency-base education that can provide enough of scenario that allows people to “test-fail-retake” and learn from mistakes.” • “I believe that the Air Force could look into creating a culture of caring and teaching and training without judgement so people of all ranks and experiences feel

		comfortable about being honest about their digital literacy, that way they could get the training they need for us to be a stronger and faster AIR FORCE.” <i>Provide incentives for digital innovation and digital training:</i> • “HAF needs to provide incentive to units that embrace innovative digital programs. I would think that through some sort of monitoring (number of teams messages per capita vs emails sent) this could be done.... Give money to units that embrace change, improve effectiveness, and cut costs. Stop giving money to units to blow on new office chairs every year. ENCOURAGE TELEWORK. Telework is so beneficial. Make it a viable option even outside COVID. Keep providing free online courses through Udemy. Incentivize people to take those courses. Maybe make it so they get promotion points.”
--	--	--

Appendix I. Sample Online Training Courses Freely Available to Air Force Members, Through AF e-Learning, Digital University, Universal Class, and DoD Cyber Exchange (AO: July 2021)

<u>Subcompetency</u>	<u>AF e-Learning (Skillport), Digital University (Udemy), Universal Class, and/or DoD Cyber Exchange Course(s)</u>
Information Literacy	Very limited applicable content within Udemy courses such as: - <i>Master Cognitive Biases and Improve Your Critical Thinking</i> or - <i>Security Awareness Training</i>
Communication Medium Choice	Applicable content within Udemy courses such as: - <i>Effective Email Communication: Enhancing Your Voice at Work</i> or - <i>Winning Communication Skills for Telephone, Conference Calls</i>
Technological Exploration	<u>Skillport:</u> - <i>Leading with Digital Technology</i> - <i>Keeping Your Skillset Current in the Digital Economy</i> <u>Udemy:</u> - <i>Digital Transformation Masterclass</i> - <i>Trends of the Future for Business & Technology</i> - <i>Rise Of The Machines: Impact Of Automation On A Human World</i>
Appropriate Social Media Use	<u>DoD Cyber Exchange:</u> - <i>Social Networking and Your Online Identity</i>
Information Protection	<u>Udemy:</u> - <i>Security Awareness Training, Internet Security for Employees</i> - <i>Security Awareness Training</i> - <i>Information Security Awareness</i> <u>DoD Cyber Exchange:</u> - <i>Phishing Awareness</i> - <i>DoD Mobile Devices</i> - <i>Identifying and Safeguarding Personally Identifiable Information (PII)</i>
Software Proficiency	<u>Skillport:</u> - <i>Getting Started with Word; Microsoft Office Intermediate Word</i> - <i>Microsoft Office Beginning Excel; Microsoft Office Intermediate Excel; Using Formulas in Excel</i> - <i>Microsoft Office Powerpoint Best Practices</i> <u>Udemy:</u> - <i>Microsoft Office Shortcuts and Tips</i> - <i>Microsoft Excel: Excel from Beginner to Advanced</i> - <i>Microsoft Powerpoint from Beginner to Advanced</i> - <i>Comprehensive Microsoft Word</i> <u>Universal Class:</u> - <i>Office 2019: Word, Excel, Powerpoint, and Outlook</i>
Active Internet Use	<u>Universal Class:</u> - <i>Computer Literacy Level 2, Internet Basics</i>
General Computer Skills	<u>Universal Class:</u> - <i>Computer Literacy Level 1, Computer Basics</i> - <i>Typing and Keyboarding 101</i>

References

- American Library Association (2013). *Digital Literacy, Libraries, and Public Policy: Report of the Office for Information Technology Policy's Digital Literacy Task Force*.
- Barelka, A., Barron, L., Kulpa, P., Hernandez, S., & Coggins, M. (2019). *Development and Validation of Air Force Foundational Competency Model*. Retrieved from <https://apps.dtic.mil/sti/pdfs/AD1083781.pdf>
- Barron, L. G. & Rolwes, P. (2020). *Development of Air Force Foundational Competency Assessments*. Retrieved from <https://apps.dtic.mil/sti/pdfs/AD1120209.pdf>
- Bawden, D. (2008). Origins and concepts of digital literacy. *Digital literacies: Concepts, Policies, and Practices*, 30, 17-32.
- Becker, B. W. (2018). Information literacy in the digital age: Myths and principles of digital literacy. *School of Information Student Research Journal*, 7. Retrieved from <https://scholarworks.sjsu.edu/ischoolsrj/vol7/iss2/2/>
- Carretero, S., Vuorikari, R., & Punie, Y. (2017). The digital competence framework for citizens. *Publications Office of the European Union*.
- Calvani, A., Cartelli, A., Fini, A., & Ranieri, M. (2008). Models and instruments for assessing digital competence at school. *Journal of e-Learning and Knowledge Society*, 4, 183-193.
- Cavus, N. & Ercag, E. (2016). The scale for the self-efficacy and perceptions in the safe use of the internet for teachers: The validity and reliability studies. *British Journal of Educational Technology*, 47, 76-90.
- Decorte, T., Malm, A., Sznitman, S. R., Hakkarainen, P., Barratt, M. J., Potter, G. R., Werse, B., Kamphausen, G., Lenton, S., & Frank, V. A. (2019). The challenges and benefits of analyzing feedback comments in surveys: Lessons learned from a cross-national online survey of small-scale cannabis growers. *Methodological Innovations*, 12, 2059799119825606.
- Eshet-Alkalai, Y. (2004). Digital literacy: A conceptual framework for survival skills in the digital era. *Journal of Educational Multimedia and Hypermedia*, 13, 93-106.
- Glistner, P. (1997). *Digital Literacy*. New York: John Wiley.
- Kim, Y., & Glassman, M. (2013). Beyond search and communication: Development and validation of the Internet Self-efficacy Scale (ISS). *Computers in Human Behavior*, 29, 1421-1429. [Organization Self-Efficacy subscale]
- Kurbanoglu, S. S., Akkoyunlu, B., & Umay, A. (2016). Developing the information literacy self-efficacy scale. *Journal of Documentation*, 62, 730-743. [Initiating Search Strategy; Assessing and Comprehending Information; Interpreting, Synthesizing, and Using Information Scales]
- Martin, A. (2006). A European framework for digital literacy. *Nordic Journal of Digital Literacy*, 1, 151-161.

- Maruping, L. M. & Agarwal, R. (2004). Managing team interpersonal processes through technology: A task-technology fit perspective. *Journal of Applied Psychology*, 89, 975-990.
- Parasuraman, A., & Colby, C. L. (2015). An updated and streamlined technology readiness index: TRI 2.0. *Journal of service research*, 18, 59-74.
- Ritzhaupt, A., Martin, F., & Daniels, K. (2010). Multimedia competencies for an educational technologist: A survey of professionals and job announcement analysis. *Journal of Educational Multimedia and Hypermedia*, 19, 421-449.
- Skov, A. (2016). *What is Digital Competence?* Retrieved July 22, 2020 from <https://digital-competence.eu/front/what-is-digital-competence/>
- Torkzadeh, G. & Koufteros, X. (1994). Factorial validity of a computer self-efficacy scale and the impact of computer training. *Educational and Psychological Measurement*, 54, 813-821. *[Advanced Computer Skills subscale]*
- Van Deursen, A. J. A. M. & van Dijk, J. A. G. M. (2016). Modeling traditional literacy, internet skills and internet usage: An empirical study. *Interacting with Computers*, 28, 13-26. *[Information- and Career-directed Internet Search subscale]*