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November 19, 2021

The Honorable Kirsten Gillibrand

Chair

Subcommittee on Personnel

Committee on Armed Services

United States Senate

Digital Services: Considerations for a Federal Academy to Develop a Pipeline of Digital Staff

Dear Madam Chair:

A talented and diverse cadre of digital-ready, tech-savvy federal employees is critical to a modern, efficient government that can help agencies carry out their missions and address challenges facing the United States. As the federal government continues its modernization efforts across agencies, it faces a severe shortage of digital expertise in fields such as artificial intelligence (AI), data science, application development, cybersecurity, computational biology, and robotics process automation. Federal agencies have faced challenges in hiring, managing, and retaining staff with digital service skills because of a limited pipeline of candidates and slow bureaucratic processes.[1]

Since 2001, GAO has identified mission-critical gaps in federal workforce skills and expertise in fields such as science, technology, engineering, and mathematics as high-risk areas.[2] A recent report issued by the National Security Commission on Artificial Intelligence (NSCAI) reinforced the implications of the nation's deficit in digital expertise.[3] The NSCAI report recommended,

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[1]GAO, Federal Chief Information Officers: Critical Actions Needed to Address Shortcomings and Challenges in Implementing Responsibilities, GAO-18-93 (Washington, D.C.: Aug. 2, 2018); National Security Commission on Artificial Intelligence, Final Report (March 2021).

[2]GAO, *High-Risk Series: Dedicated Leadership Needed to Address Limited Progress in Most High-Risk Areas,* GAO-21-119SP (Washington, D.C.: March 2, 2021).

[3]NSCAI, *Final Report*.

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among other things, that the federal government establish a new service academy—similar to the military academies—to train future civil servants in the digital skills needed to modernize government (see fig. 1).

Figure 1: Example of a Digital Service Academy Concept

Source: GAO analysis of roundtable participants' perspectives and government documents (text) and Irina Strelnikova/stock.adobe.com (graphic). | GAO-22-105388

Text of Figure 1: Example of a Digital Service Academy Concept

Illustrative example of a U.S. Digital Service Academy
- A degree-granting institution
- Curriculum designed to meet agencies' needs
- Students receive specialized training and experience
- Graduates perform a term of federal digital service

Source: GAO analysis of roundtable participants and government documents (text) and Irina Streinkova/stock.adobe.com (graphic). | GAO-22-105388

You asked us to gather perspectives of federal technology leaders on establishing an academy that could provide a dedicated talent pool to help meet the federal government's needs for digital expertise. This report summarizes the perspectives that selected technology leaders shared on 1) federal workforce needs for digital services staff, 2) key characteristics of a digital service academy, and 3) considerations to help ensure agencies can absorb graduates of a digital service academy.
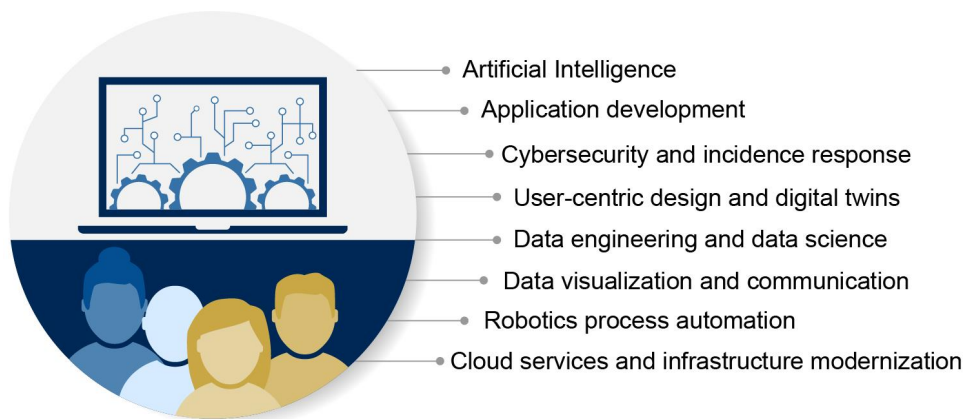
To gather perspectives, GAO convened a roundtable discussion on October 13, 2021 comprised of chief technology officers, chief data officers, chief information officers, and those in similar roles across the federal government, as well as knowledgeable representatives from academia and nonprofits. See enclosure I for additional information on our objectives, scope, and methodology. For a list of roundtable participants, see enclosure II.

We conducted our work from August 2021 to November 2021 in accordance with all applicable sections of GAO's Quality Assurance Framework. The framework requires that we plan and perform the engagement to obtain sufficient and appropriate evidence to meet our stated objectives and to discuss any limitations to our work. We believe that the information and data obtained, and the analysis conducted, provide a reasonable basis for any findings and conclusions in this product.

Background

Federal agencies rely on digital services to interact with the public and improve organizational performance. Such digital services, as defined by the Office of Management and Budget, may include the delivery of digital information (e.g., data or content) and transactional services (e.g., online forms) across a variety of platforms, devices, and delivery mechanisms such as websites, mobile applications, and social media.[4] The types of digital services take a variety of forms (see fig. 2).

Figure 2: Selected Examples of Digital Services Skills, Expertise, and Disciplines

- Artificial Intelligence
- Application development
- Cybersecurity and incidence response
- User-centric design and digital twins
- Data engineering and data science
- Data visualization and communication
- Robotics process automation
- Cloud services and infrastructure modernization

Source: GAO analysis of roundtable participants' perspectives, and industry and government documents. | GAO-22-105388

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[4]Office of Management and Budget, *Policies for Federal Agency Public Websites and Digital Services*, M-17-06 (Washington, D.C.: Nov. 8, 2016).

Text of Figure 2: Selected Examples of Digital Services Skills, Expertise, and Disciplines

Examples of Digital Services Skills
- Artificial Intelligence
- Application development
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Source: GAO analysis of roundtable participants, and industry and government documents. | GAO-22-105388

Individuals interested in pursuing careers in digital services can obtain the necessary skills through a variety of pathways. For example, individuals can attend undergraduate and graduate degree programs, certification programs, and digital skills "boot camps," or they can access free online courses and learn on their own. Additionally, some employers provide on-the-job training in areas such as AI, data science, and cloud services. For example, one company we interviewed has established an academy to provide its new digital services employees a multi-week, in-person training to enhance their skills.

The three sections below summarize the discussions by roundtable participants and include considerations for establishing a federal academy and developing a pipeline of digital services staff in the federal government.

Session I: Federal Workforce Needs for Digital Services Staff

Roundtable participants discussed agencies' immediate and long-term needs for digital services staff, the types of work that a more technically savvy workforce could execute, and challenges associated with current hiring methods.

Immediate and Long-Term Needs

Agencies' needs for digital services staff span varying degrees of urgency and roles, with some work requiring immediate attention while other projects are more long-term. For example, one participant noted that their agency has over 2,000 open positions requiring digital skill sets, and another noted numerous project backlogs at their agency. Such gaps may lead to cascading implementation challenges. Additionally, participants said there is a long-term need for in-house talent across roles such as executives, program staff, product managers, software developers,

and engineers who understand data architecture and elements. However, another participant cautioned that adding more people alone would not fully meet agencies' needs for digital services. Rather, it will be equally important to foster a data-centric culture within agencies (see session III for a further discussion on data-centric culture).

One Participant's View on the Long-Term Needs for Digital Services Staff

"The real long-term [goal] of bringing digital services people into government is that we are trying to bring modern ways of working … into government."

Source: Participant in the Digital Service Academy Expert Panel Roundtable. | GAO-22-105388

Types of Work

Roundtable participants discussed the following kinds of work that additional digital services staff could carry out:

- **Updating legacy systems.** Agencies could leverage additional digital services staff to modernize their legacy IT systems and digitize existing paper-based information such as public health records. Participants stated that modernizing existing systems could lead to advancements, such as early warning detection and prevention systems for diseases and cybersecurity attacks.

- **Applying advanced technologies.** Agencies could leverage additional digital services staff to solve problems by applying advanced technologies to offer innovative customer-facing services such as AI technologies in healthcare or conduct investigative work using machine learning systems. Further, participants noted that digital services staff could also use newer technologies to develop services faster or at lower cost.

- **Managing cybersecurity risks.** Staff with the knowledge, skills, and abilities to secure their digital services could help agencies more effectively manage risks associated with the cybersecurity of systems in a cloud environment. One participant noted that certain agency risk management activities should not be outsourced to contractors because of their sensitive nature.

- **Reimagining service delivery.** Agencies could improve the delivery of government services by hiring new digital services staff with skills such as redesigning business processes and change management, or training existing staff on those skills. For example, staff who understand how an agency collects data on its users and their

satisfaction could help the agency improve its business processes and operate more efficiently.

Current Efforts to Meet Digital Services Needs

Participants said that agencies try to meet their current digital services workforce needs through a mix of the following efforts:

- **Civil service hiring.** Participants said they hire civil servants for roles in digital services. For example, one participant said their agency uses the civil service hiring process to fill AI-related positions. However, because the agency did not have the technology environment and projects in place before new staff came onboard, most of those employees left because they did not have enough relevant work to do. Further, this participant said their agency's previous use of term appointments created a challenge with turnover, because term employees would leave the agency for higher-paying positions in industry after the term was complete. Giving employees a high degree of freedom in their work and highlighting the agencies' mission and purpose can help motivate them to stay, according to participants.

- **Use of contractors.** Agencies use contractors to meet some needs but recognize that certain tasks should not be outsourced. For example, participants said that more sensitive tasks such as data security, privacy, and risk management should not be contracted out. One participant noted that contractors adhere strictly to tasks defined by contractual agreements, while federal digital services staff can tackle a broader range of work as their position affords them a holistic view of the agency, its mission, and its objectives.

- **Intergovernmental Personnel Act Mobility Program.** In some instances, agencies hire personnel on temporary assignment under the Intergovernmental Personnel Act Mobility Program.[5] According to one participant, in the absence of an Office of Personnel Management occupational series for certain digital services positions, this mechanism

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[5]Intergovernmental Personnel Act of 1970, Pub. L. No. 91-648, 84 Stat. 1909 (1971), as amended, codified at 5 U.S.C. §§ 3371-3375. The Intergovernmental Personnel Act's Mobility Program provides for the temporary assignment of personnel between the federal government and state and local governments, colleges and universities, Indian tribal governments, federally-funded research and development centers, and other eligible organizations.

allows agencies to acquire specialized digital skills from state and local governments, institutions of higher education, and other program-eligible organizations.

- **Fellowships and internships.** Agencies can recruit digital service staff through fellowship programs like the Presidential Management Fellowship and Presidential Innovation Fellowship, as well as internships. Such programs connect federal agencies with technical talent for short-term assignments. However, agencies will need in-house digital talent to train and supervise new interns, according to one participant.

Session II: Key Characteristics of a Digital Service Academy

A digital service academy could help develop the pipeline of digital services workers to better meet the needs of the federal workforce, according to roundtable participants.[6] Considerations for such an academy include the kinds of skills that would be taught and the composition and size of a graduating class. We describe the skills, composition and size of digital services staff discussed during the roundtable below.

Skills

According to participants, digital services staff would require a variety of both digital and government-related skills to meet agencies' needs. The following are examples of these skills:

- **Digital skills.** The types of skills digital services staff would need to learn include user experience design, application development, and computational biology, in addition to the skills in the subject areas described in figure 2 such as cybersecurity, AI, and cloud services.

- **Government-related skills.** Knowing how to navigate the requirements of federal data governance and developing a broad understanding of the agency will also be important. For example, digital services staff need to understand and negotiate data sharing agreements for the success of projects. Having the expertise to work with data in a government or mission-specific context, an awareness of the potential for bias in data, and an understanding of the unique nature of government functions and timelines would allow digital services staff to conduct their work more efficiently.

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[6]A federal digital service academy—similar to the military academies—would train future civil servants in the digital skills needed to modernize government.

One Participant's View on Digital Services Staff Skill Sets

"A big skill set that is hard to fill (largely due to lack of understanding in these functions) is in data management, data governance - the core functions necessary that will enable data science and AI"

Composition, Degree Level, and Size

Participants said the following factors may affect how a digital service academy could meet agency needs:

- **Composition.** A digital service academy composed of a diverse student body may help address government needs.[7] One participant noted that programs may attract a more diverse student body if they have a technical and a social, leadership-driven component. For example, a course on "responsible data science" would likely attract students who are demographically diverse and interested in mission-driven work.

- **Degree Level.** A digital service academy could target graduate-level education. Participants said that a master's degree pipeline may be more appropriate than an undergraduate pipeline because agencies need staff with advanced skills in leading projects and programs, data curation, and digitalization. One approach would be to offer a 4- to 5- year combined undergraduate and master's degree, according to participants.

- **Size.** Further analysis will be needed to determine the optimal size of a digital service academy to meet ongoing hiring needs across the federal government. Participants said agencies would need to develop annual estimates of the number of graduates they could absorb.

Session III: Considerations to Ensure Agencies Can Absorb Graduates of a Digital Service Academy

Agencies can prepare for a pipeline of qualified digital services staff by taking steps such as integrating mission needs into digital service projects, developing professional growth opportunities, cultivating institutional relationships, establishing support networks, and building a

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[7]One company we spoke to said they recruit students from a variety of fields like engineering, computer science, and mathematics into its academy, and also underscored the need to recruit from fields in the social sciences.

data-centric culture, according to roundtable participants. At the same time, participants discussed challenges associated with existing policies, infrastructure, laws, and regulations that may hinder agency recruitment and retention of digital services staff.

Agency Considerations

Participants said agencies should consider the following steps to ensure they can absorb graduates of a digital service academy:

- **Integrate mission needs into digital service projects.** Agencies can help digital services staff better understand how their projects relate to the agency's mission needs. Participants said that often, the staff view their job as supporting a technology, rather than the agency's mission.

One Participant's View on Supporting the Agency Mission with Technical Talent

"If I ask someone what they do ... they associate their work with the system that they work on, not the business [i.e., agency mission] that they support ... [But] the data supports a business, not just a system. And to that end, one of the things we need to do to prepare is make sure that we understand what problems we're trying to solve. So if I bring on this capability, this talent, we need to make sure we are very clear on what we are asking them to help us solve."

Source: Participant in the Digital Service Academy Expert Panel Roundtable. | GAO-22-105388

- **Develop professional growth opportunities.** Creating professional growth opportunities such as trainings can help develop staff. One participant said their agency is piloting a program that will provide existing staff with the training and mentorship needed to obtain certifications in conducting data, cloud, and cybersecurity work. The program would create a career trajectory to help retain staff when they would otherwise need to wait for a higher-paying position to become available before they could advance.

- **Cultivate relationships with academic institutions.** Partnerships with universities could allow agencies to influence curriculums that meet agency needs and build a more robust recruiting pipeline. Participants said a digital service academy could offer a similar opportunity, allowing agencies to work with the academy to create curriculums that include topics such as ethics, data stewardship, and public problem-solving that would help produce graduates positioned for successful careers in government.

- **Establish support networks.** Support networks could help foster mentoring of new hires and promote culture change. Participants said digital staff can benefit from mentorship provided by agency staff, but the prevalence of contractors limits these opportunities. Additionally, the work of digital service staff may introduce changes that could be met with resistance from existing employees, making it more difficult for them to succeed. One participant noted that they collaborated with other agencies to provide digital service staff with opportunities to network with others to promote change.

One Participant's View on the Importance of Supporting New Talent

"In addition to training/recruiting, it is important for [agencies] to provide an environment that supports incoming talent. In other words, how do we help people be successful because of the environment they are in, not despite it?"

Source: Participant in the Digital Service Academy Expert Panel Roundtable. | GAO-22-105388

- **Build a data-centric culture.** Participants said digital service staff in the federal workforce should be good data stewards, care about data and data privacy, and see the value in digitizing. Moreover, a shift to a more data-centric culture may be an important factor to leverage digital services skills, and education and training are key to making this shift, according to one participant. Branding the federal government as an employer that drives change and promotes freedom to think creatively could attract a stronger talent pool.

Government-Wide Considerations

Participants discussed challenges associated with existing policies, infrastructure, laws, and regulations that may hinder agency recruitment and retention of digital services staff. Specifically, they discussed the following:

- **Full-time equivalent (FTE) availability.** FTE allocations are used by the Office of Management and Budget to manage employment in agencies. Without additional FTE allocations, participants said, agencies' capacity to absorb digital service academy graduates would be limited. Even with expanded budgets, agencies at or near their FTE caps would not be able to bring in new digitally-skilled staff and would instead need to rely on contractors for digital services work.

- **Modernizing technological infrastructure.** Participants said a lack of modern technology infrastructure limits the ability of government agencies to leverage the skills of digital services staff.

- **Establishing career pathways.** Federal agencies face challenges in recruiting and retaining digitally-skilled staff as the career path is not well-defined. As noted earlier, the current Office of Personnel Management occupational series does not capture the range of the digital services positions needed in the federal government, which limits recruitment efforts. Once staff are hired, the opportunities for training, development, and advancement may be limited because of bureaucratic obstacles, according to participants.

- **Addressing compensation concerns.** The current salaries and compensation for federal digital services staff are not competitive with industry. Two participants noted that, as of October 2021, the lowest level of compensation for digital services staff is GS-9, and others discussed increasing pay caps to provide more competitive options.[8] Others were concerned about differences in pay between agencies with participants noting that staff leave for other agencies that can offer more competitive salary ranges.

- **Streamlining the federal hiring process.** Without a more streamlined approach to onboarding staff, many digital service staff would likely not be willing to wait out the lengthy federal hiring process when the private sector can hire quickly and often with better pay. For example, one participant said onboarding takes 9 months on average, and that a recent onboarding of an official in a digital services leadership role took 19 months.

- **Existing laws and regulations.** Awareness of certain laws and regulations, such as the Federal Information Security Modernization Act of 2014, and data governance requirements, is key for effective implementation of digital services in the government.[9]

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[8]According to OPM, the General Schedule annual base pay scale for a GS-9 position in calendar year 2021 ranges from $46,083 to $59,907. Pay scales differ by location, for example, a GS-9 position for an individual currently working in the San-Jose-San Francisco-Oakland geographic area ranges from $65,180 to $84,732.

[9]The Federal Information Security Modernization Act of 2014 (FISMA) requires federal agencies in the executive branch to develop, document, and implement an information security program to provide information security for the information and information systems that support the operations and assets for the agency. The Federal Information Security Modernization Act of 2014 (Pub. L. No. 113-283, 128 Stat. 3073, (2014)) largely superseded the Federal

Participants said that additional training for digital services staff on the way government operates in areas such as hiring authorities, acquisition regulations, and security laws may help.

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We are sending copies of this report to the appropriate congressional committees and other interested parties. In addition, the report is available at no charge on the GAO website at https://www.gao.gov.

If you or your staff have any questions about this report, please contact Candice N. Wright at (202) 512-6888 or WrightC@gao.gov, Taka Ariga at (202) 512-6888 or ArigaT@gao.gov, or David Hinchman at (214) 777-5719 or HinchmanD@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in enclosure III.

Sincerely yours,

Candice N. Wright
Director, Science, Technology Assessment, and Analytics

Taka Ariga
Chief Data Scientist and Director of Innovation Lab

David Hinchman

Information Security Management Act of 2002 (FISMA 2002), enacted as Title III, E-Government Act of 2002, Pub. L. No. 107-347, 116 Stat. 2899, 2946 (2002).

Acting Director, Information Technology and Cybersecurity

Enclosure I: Objectives, Scope, and Methodology

Our objectives for this report were to examine the perspectives of federal technology officials and other stakeholders on (1) federal workforce needs for digital services staff, (2) key characteristics of a digital service academy, and (3) considerations to help ensure agencies are prepared to support and grow a digital service workforce.

To conduct our work across all three objectives, we convened a half-day, cross-sectoral roundtable meeting of participants from the federal government, academia, and nonprofit sectors based on their knowledge of agencies' workforce needs and experience with recruiting and retaining a digital services workforce. Participants were invited to share their perspectives on establishing an academy to meet the federal government's digital workforce needs; we did not ask participants to speak on behalf of the federal agencies or organizations that these participants represent. We obtained a range of perspectives on the need for digital services in the federal government, the types of work that could be performed by digital services staff, and agency preparedness to absorb graduates from a digital service academy. We asked nonfederal participants who attended the meeting to identify any potential conflicts of interest, and we found the group of participants, as a whole, had no inappropriate biases. In some cases, we followed up with participants to get additional information on the comments they made during the roundtable meeting. In addition to the roundtable, we also spoke with representatives from industry and the nonprofit sector regarding their experiences with a digital services workforce, or their knowledge of establishing a similar academy. We also reviewed related reports and other background information.

We conducted our work from August 2021 to November 2021 in accordance with all applicable sections of GAO's Quality Assurance Framework. The framework requires that we plan and perform the engagement to obtain sufficient and appropriate evidence to meet our stated objectives and to discuss any limitations to our work. We believe that the information and data obtained, and the analysis conducted, provide a reasonable basis for any findings and conclusions in this product.

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Enclosure II: Roundtable Meeting Participation

We convened a half-day, cross-sectoral roundtable meeting of participants from the federal government, academia, and nonprofit sectors based on their knowledge of agencies' workforce needs and experience with recruiting and retaining a digital services workforce. The meeting was held virtually on October 13, 2021. Participants who attended the meeting are listed below.

Van Patrick Bevill	Federal Retirement Thrift Investment Board
Keith Bluestein	Small Business Administration
George Chambers	Department of Health and Human Services
Christopher Chilbert	Consumer Financial Protection Bureau
Suzi Connor	Centers for Disease Control and Prevention
Kirsten Dalboe	Federal Energy Regulatory Commission
Adam Goldberg	Department of the Treasury
Nick Hart	Data Foundation
Mark Lerner	Partnership for Public Service
Oki Mek	Department of Health and Human Services
Renata Miskell	Office of Inspector General Department of Health and Human Services
Jennifer Rostami	General Services Administration
Julia Stoyanovich	New York University
Raghav Vajjhala	Federal Trade Commission
Gary Washington	Department of Agriculture

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Enclosure III: GAO Contacts and Staff Acknowledgments

GAO Contacts

Candice N. Wright at (202) 512-6888 or WrightC@gao.gov,

Taka Ariga at (202) 512-6888 or ArigaT@gao.gov,

David Hinchman at (214) 777-5719 or HinchmanD@gao.gov.

Staff Acknowledgments

In addition to the contacts made above, Farahnaaz Khakoo-Mausel (Assistant Director), Britney Tsao (Analyst-in-Charge), David Hong, Tind Shepper Ryen, and Michael Walton made key contributions to this report. Jehan Chase, Louise Fickel, Anika McMillon, and Andrew Stavisky also contributed to this report.

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