

BUILDING DIGITAL CAPACITY

REPORT ON THE TRAINING NEEDS ANALYSIS

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Executive Summary

The Schools of Public Administration (SPA) and Information Management (SIM) in the Faculty of Management (FOM) at Dalhousie University, and the Canadian Digital Service (CDS) team worked together to conduct a broad-based Training Needs Analysis (TNA) of federal employees to better understand and empirically assess the current training needs for digital capacity across the Government of Canada (GC). The objective of this work is to provide insights as to how the GC can develop digital disciplines and adapt training and skills development capacities for a digital workplace and to directly inform the development of digital training programs for public servants. Given the size of the federal public service this represents an enormous task, one that had never before been tackled at this scale, and is a critical first step in an ongoing process of continuously framing and measuring digital competence and training needs.

Guiding Research Questions

This research was guided by the following key questions:

- What are the key digital disciplines necessary for governments to thrive in a digital era?
- To what extent are skills in these disciplines present within the GC?
- How are digital training capacities perceived at present by GC employees?
- How can the capacity of the GC to provide training be improved going forward?
- In an era of constant technological disruption, what are some of the medium to longer-term challenges on the horizon in terms of skills development, training capacities and workforce development?

Methods, Scope and Research Plan

The methods were based on a commitment to work collaboratively, in the open, and with a user centred approach. Through all the stages of work, the FOM team worked with CDS, and key stakeholders through iterative rounds, to co-create the survey and the interview questions ensuring they reflected the digital priorities of the GC. The scope of the research included public

servants who design, develop or deliver digital services (e.g., the Computer Science (CS) group), public servants who impact digital service delivery in policy or operational positions (non-CS), as well as senior leaders and decision makers (e.g., Chief Information Officers.)

To answer the research questions, a plan was designed which included three parts.

1. An **Environmental Scan** of existing digital training and learning programs in the GC, other jurisdictions and sectors within Canada, and internationally.
2. The development and implementation of a **Survey** which included 30 Digital Disciplines organized around key areas: Agile, Product Development, Privacy and Security, Data and User Experience. The Survey was:
 - a. Distributed to a randomized population (**Randomized Survey**) to allow for calculation of statistical accuracy. It resulted in 600 fully completed and 385 partially completed Randomized Surveys from 7 departments.
 - b. Released openly (**Open Survey**) to encourage broad participation across all federal public servants. It resulted in 990 fully completed and 1187 partially completed Open Surveys from over 30 departments.
3. **Senior Leader Consultations** with selected CIO's and senior administrators from departments. This resulted in 23 Senior Leader Consultations from 10 departments.

Throughout the study, **basic capacity** is defined as a general understanding, where someone could explain the discipline to another person. **Advanced capacity** indicates someone could apply the discipline and has thorough knowledge of the discipline. **Training capacity** refers to the ability of the GC to provide the required digital training given current internal resources. **Sufficient capacity** is defined as at least as many people report having the skill as are required to have it by their position, across the organisation as a whole. It is based on current, formal skill requirements, not the anticipation of future trends.

Findings

The following selected findings were drawn from an analysis of the quantitative data in the Randomized Survey, a comparison from the data in the Open Survey, as well as a thematic analysis from the consultations and open-ended questions in both surveys. A full list of findings can be found in the body of the Report.

Disciplines

For most of the disciplines intrinsic to modern service design and delivery, there is not sufficient capacity at the advanced level.

Based on the self-assessed skill levels, we can only be confident of having sufficient capacity at the advanced level to meet present needs for a small number of disciplines, and there is little in the way of excess capacity should demand increase. At the basic level, sufficient skills and capacity were found for all 30 disciplines across both CS and non-CS staff. As such, there is at least the potential of broad capacity insufficiency, and attention needs to be paid to maintaining and enhancing the total stock of capacity within the GC.

For the CS population we only found a sufficient level of reported advanced capacity in five of thirty disciplines: Identity/Access Management, Recognizing Private Information, User Interface Design, Assistive Technologies and Open Source Coding. This means there is only a relatively short list of disciplines for which we can confidently assert a sufficient degree of advanced capacity across the CS community.

For the non-CS population, participants only reported enough advanced skills to meet present demand in the four of thirty disciplines: Recognizing Private Information, Privacy Policies and Procedures, Addressing Privacy Breaches and Data Visualization.

The number of people required to have advanced knowledge, and possessing advanced knowledge of disciplines, forms a minority of the overall population; advanced capacity is concentrated in the organization.

The growing digital government movement indicates the possibility of a forthcoming skills gap in the GC.

The growing relevance of digital disciplines means that the lack of excess capacity at the advanced level creates a vulnerability and shortfalls in skills as demand increases. The lack of a cushion makes the organization vulnerable to either a sudden loss of capacity, or to a sudden spike in the demand for skills.

The CS community, in contrast to the non-CS, or the organization as a whole, is demographically different; it is older, is predominantly male, and located disproportionately in the NCR. The CS community is a distinct group of technical specialists demographically different than the norm for the public service as a whole, and their relative age has implications

for loss of capacity as this cadre retires, implying a need to develop a broader skill base before this happens.

There is a heightened sensitivity to the reality that the skills required for many of today's jobs are not necessarily those that will be central to tomorrow's requirements and opportunities, and that the anticipatory elements to training and development are a fundamental enabler of ongoing adaptation and relevance. This point is especially salient within an increasingly competitive and globalizing workforce within which public sector organizations must compete with both one another and other sectors in recruiting and retaining talent.

The relevance of disciplines seems tied to personal experience of use.

At an aggregate level, the degree to which a discipline is deemed relevant seems to closely mirror the degree to which it is expected to be used currently, instead of another value system, such as relevance based on the organizational importance of the skill. The association of use and relevance may prove to be a barrier in convincing people of the need for knowledge of skills they don't use, or the utility of training "about" skills, rather than "in" them. The association of work relevance with training requests could inhibit those seeking training in skills that are not immediately used in the work, but are relevant to the larger organization or will be relevant in the future. This is highlighted by the frequency with which there were comments to the effect that technical skills were not relevant to a respondent.

Current Training Experience

Lack of opportunity, and lack of knowledge of opportunity, were commonly reported barriers to training.

Close to half of CS and over half of non-CS respondents indicated they do not know the amount of their learning budget. A significant number of both groups reported a lack of offerings, a lack of local opportunity, and a lack of time as barriers to training. CS designates are more likely to report lack of funding as a barrier, but are also more likely to have training paid for by an employer. A perception that there was a lack of support from management for training, and that digital training was not in their personal development plans were also barriers, as training is only for job-specific skills.

Training delivery issues were also flagged as a barrier for training, including delivery of instruction and courses; availability; the quality of the content and instructors; and technical issues. For example, some employees flagged that they had been encouraged or instructed to take online courses, which did not suit their learning style, or where the job requirements were

specialised and so they felt they needed more targeted discussion with the instructor. Respondents also commented that the courses they required were not available or were cancelled. The need for higher quality courses or instruction was also flagged, as well as needing to be able to access training from their government network and devices. This indicates that there is a need for research with the audience for training, that is assessed continuously throughout development and implementation.

When employees want to learn new skills, they indicate they use diverse and informal methods that rely on working in groups with multidisciplinary skills.

Employees indicated that they most frequently learn from their co-workers and peers. They commented on learning new skills, problem solving and collaborating with others to learn. In addition, respondents commented on seeking out those known to be “experienced” to help with specific issues. Employees also use their own personal networks, outside work, to learn. Employees identified that they use self-learning techniques, through training programs and courses and free resources to direct their own learning. Some employees commented on accessing and using free resources and videos through libraries and online, and smaller numbers access personal coaching, mentoring from co-workers and job-shadowing as ways to learn new skills. Professional associations, LinkedIn and personal business contacts were also identified as learning channels.

Training Needs

Understanding why digital is important, and how it will impact how public servants work

Participants in the survey commented that the GC needs a shared context on digital disciplines, to help address the diversity of digital training needs. Some need introductory training, some need business literacy on digital skills they have, and others need to leverage these disciplines effectively as managers. Across all qualitative data, there was a strong thread of excitement and interest in digital.

Across all the senior consultations we heard that the need for digital training is broader than technical training. While senior leaders confirmed the 30 disciplines were appropriate and relevant, they wanted to start the conversation at a higher level. We heard that the first priority should be to help all employees understand why digital is important and to consider that the movement to digital necessitates a change management agenda.

Another group of priorities that emerged were around agile methods and the need for new methods for product and service development. Senior leaders commented on waterfall

methodology being ingrained in the culture, and how that needs to shift to agile. Along with agile, design thinking, and the disciplines related to user research and user experience were highlighted as critical skills that were needed now. Similarly, comments from survey respondents highlighted that they felt they could be doing more to be user centered, and would like additional training.

There is growing awareness that effective execution requires integrated and collaborative actions across traditionally distinct groups.

Senior leaders spoke of the range of training available, but wanted digital training focussed on public sector organizations. Flexible options such as online training and resources were of interest, but many also commented on the strength of bringing diverse employees together for training, where they could also learn from each other. A mixed approach, where are brought together for training, then go back to their workplace to implement, and come back to reflect and iterate was discussed as an option. Respondents viewed online as the training method most often recommended, but online is not always best for complex learning. Having employees learn in interdisciplinary teams, modelling their work, was also suggested.

Related to this, all of the senior leaders commented on the need for digital training to consider the mix of the technical and the business or organizational. In order for digital strategies to work, the training needs to bring together the different stakeholders, and help them understand how the new technologies can be leveraged to enhance the business lines. Senior leaders commented on the need to mix these “two worlds”, for the technologists to understand the business orientation, and for the business side to move closer to the technology, and understand possibilities from a service orientation.

Training Recommendations

The following suggestions build upon many of the key threads emerging from our analysis and provide a basis for future alignment across digital innovation, training and development, and wider and more holistic human resource planning and investments:

- **Broaden and Deepen Digital Literacy:** a digital primer should be created to give all employees - especially new employees - a basic and shared conceptualization of a ‘digital’ lens.
- **Foster a More Proactive Training Culture:** currently, training and skill relevance are closely tied to immediate work relevance. We recommend shifting from reactive to a proactive training culture, through for example, initiating pilot programs that make

training more accessible on an anticipatory basis, rather than strictly based on immediate work requirements.

- **Continually Measure and Refine Digital Training Across Disciplines:** the process of creating and testing the 30 digital disciplines has generated a foundational tool and benchmark statistics, which can be used to continuously frame and measure digital competencies and training. Based on ongoing feedback and review, these disciplines should be expanded to incorporate non-technical aspects of digital performance including softer-skills such as collaboration, ethics, and change management.
- **Create Differentiated Training Streams:** building on the preceding recommendation, we suggest using such information to devise streams of training offerings and channels that account for different training priorities that will evolve and shift over time. These differentiated streams should include:
 - “Familiarity training” intended not to develop hard skills, but to recognize the potential application and utility of skills with emerging importance.
 - “Ground-level” training at an intermediate level between familiarity and job-deployable competency, to create a pool of individuals who could rapidly be brought up to speed in order to meet impending shortfalls in technical or specialist skills.
 - “Hard” technical training or certification will be required for deep knowledge of disciplines such as data science.
- **Learn by Doing:** The GC should seek to leverage the current excitement of digital permeating today’s public sector and translate this enthusiasm into expanded and novel opportunities for both personal and professional development. As part of a holistic workforce development strategy, there should be more opportunities to learn by doing, and public servants should have opportunities to use new skills in their work.

Conclusion

This study is an opportunity to open and expand the conversation around digital disciplines and training in the GC. It revealed a growing excitement around digital within the GC that reflects both the messaging and commitments of its senior leaders in making digital transformation a major priority. It also highlighted that all organizations the GC will be

increasingly challenged to adapt workforce training and development strategies in order to address demographic trends, competitive marketplace pressures, and accelerating technological change. Looking ahead, these challenges will necessitate systemic and holistic reforms that involve organizational structures, human resource policies, and workplace culture.

The study should serve as a platform for ongoing research on the themes addressed in the report, including how public sector competencies are likely to evolve in the future, and how training and development should adapt accordingly. Further research is necessary to better understand particular segments of the wide audience of GC employees and on how organizations can facilitate individualized training and learning processes, while ensuring a cohesive workforce and a basic level of digital literacy across government.

Strengthening capacities for knowledge sharing amongst public servants across the GC (and other governments) through shared digital platforms is another promising direction for additional research in order to better understand the incentives and impediments to such sharing, and how such participation can be best leveraged into improving job performance and overall organizational outcomes. At the same time, undertaking research into the sorts of hybrid skill sets combining hard technical skills and softer behavioural skills is essential in order to transcend the constraints of traditional human resource policies and job specifications, and enable public sector organizations to forge more multidisciplinary and collaborative teams to address integrative challenges.

Lastly, the GC should make every effort to continually engage the workforce in an open and meaningful dialogue on the potential for training and development improvements across both individual and corporate levels. Training should not be developed without the input of those who will participate in, and ultimately apply it. This study is a starting point for this conversation, and can facilitate discussions, further research, and the creation of training and professional development opportunities for a digital public service. There is widespread recognition that the workplace culture of tomorrow will be predicated upon human empowerment and creative forms of in-person and virtual interactions. Listening to, and learning from the experiences and insights of public servants across all organizational levels provides the richest source of innovation for current and future investments into ensuring the digital readiness of the public service.

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Scope and Context

The Schools of Public Administration (SPA) and Information Management (SIM), in the Faculty of Management (FOM) at Dalhousie University, and the Canadian Digital Service (CDS) team worked together to conduct a broad-based Training Needs Analysis (TNA) of federal employees to better understand and empirically assess the current training needs for digital capacity across the Government of Canada (GC). The main objective of this work is to provide insights to how the GC can both develop digital disciplines and adapt training and skills development capacities for a more modern and digital workplace. Additionally, the work aims to directly inform the development of digital training programs for public servants. The immensity of employees across the Federal Government presents an enormous task — one that had never been tackled before — and is a critical component of the ongoing process of continuously framing and measuring digital competence and training needs.

The scope of this work includes:

- Public servants who design or deliver digital services or solutions (e.g., Computer Systems (CS) group);
- Public servants who impact digital service delivery in policy or operational positions (non-CS); and,
- Senior leaders and decision makers (e.g., Chief Information Officers [CIOs]).

The research is guided by the following questions which will be highlighted within this report:

1. What are the key digital disciplines necessary for governments to thrive in a digital era?
2. To what extent are skills in digital disciplines present within the GC?
3. How are digital training capacities perceived at present by GC employees at present?
4. How can training capacities be improved going forward?
5. In an era of constant technological disruption, what are some of the medium to long-term challenges on the horizon in terms of skills development, training capacities, and workforce development?

Context for the Digital Imperative

In a 2015 study of the digital skills gap in the British civil service, the National Audit Office identified that:

“Digital” is more than just technology, websites, internet — it requires radical, flexible operating models, designed around users and data; with a much lower cost base.”

Furthermore, the report points out that in the absence of increased efforts to ensure a skilled digital workforce (a challenge exasperated by digital skills gaps across the UK economy as a whole), government transformation initiatives will fall short:

“There is a risk of unsustainable cost reduction or service deterioration if government is unable to deliver transformation to any significant degree over next 5 years. Major transformation programmes are underway in most departments, with some digital service successes. But the focus to date has been mainly on the “front end”. The change required is complex. The civil service needs to secure different skills and capabilities”.

A more recent Deloitte (2017) survey of 815 British civil servants reveals the impact and risks of technological developments, as well as identifying that progress is underway. However, the public-sector appears to be struggling to ‘keep pace’ in some key areas. Findings include:

- Civil servants appreciate the potential of technology developments in supporting their work.
- The more ‘mainstream’ technology developments are the focus for exploration and adoption.
- Though online interaction with citizens is seen as crucial for the majority of civil servants, less than half have explored training in this area.
- Lack of budget, perceived high costs, and skills shortages are the top barriers to technology adoption.
- Only 19% of respondents feel that their organization is in line or ahead of private-sector organizations when asked about technology adoption.

- Cybersecurity is accepted as a present risk, however, almost half of respondents are not sure or not confident of their organization’s ability to deal with a cyber-attack.
- Skills gaps exist and there is an over-reliance on learning digital skills ‘on the job’.

In response to the challenges that such findings identify, the Government Digital Services (GDS) Academy (housed within the UK’s GDS unit since May 2017) “teaches civil servants the digital skills they need to transform public services”. The GDS Academy offers a range of courses, with introductory sessions for non-specialists, specialized courses for people in digital roles, and training for leaders responsible for digital services.¹

As the aforementioned Deloitte study underscores, similarly pressing challenges are apparent in the private-sector. For example, a 2017 Capgemini survey across a range of industries concludes that the “digital talent gap is widening” and that current training capacities of most organizations are falling well short of employee expectations.

Key findings from the Capgemini survey include:

- Every second organization surveyed acknowledged that the digital gap is widening. Moreover, over half (54%) of the organizations agreed that the digital talent gap is hampering their digital transformation programs and that their organization has lost competitive advantage because of a shortage of digital talent.
- The talent gap in soft digital skills is more pronounced than in hard digital skills. More employers (59%) say that their organization lacks employees who possess soft digital skills than hard digital skills (51%). The two soft digital skills in highest demand are ‘customer-centricity’ and ‘passion for learning’; the two hard digital skills in most demand are ‘cybersecurity’ and ‘cloud computing’.
- Overall, 29% of employees believe their skill set is redundant now or will be in the next 1–2 years. Close to half actually describe the training as “useless and boring”.

A critically important lesson from this survey is the need to transcend traditional boundaries between so-called ‘hard’ and ‘soft’ skills and to think more holistically about the

¹ See <https://gdsacademy.campaign.gov.uk/> for further information about the GDS Academy.

transformational digital imperatives facing organizations — especially in a customer (or citizen) centric world.

In their own government perspective on skills for a high performing public service, the Organization for Economic Co-operation and Development (OECD, 2017) echoes this sentiment in calling for a widening of skills sets and new alignment between traditional and new competency areas in order to create public value:

“The digital transformation provides opportunities to understand the complex interactions of the policy sphere as never before through, for example, bigger and more interlinked data sets and opportunities to engage the public and crowdsource insights. This suggests skill sets related to data science, network analysis, social networking and social media, crowdsourcing and foresight techniques, in addition to more traditional methods of analysis, forecasting, and community outreach and consultation”.

Accordingly, in its own recent launching of digital government consultations the GC recognized workforce development and digital literacy (both inside and outside of government) as foundational pillars of digital transformation. Stakeholder discussions emphasize a “Made in Canada” approach to digital government, as illustrated by two specific perspectives:

1. Harnessing the IT workforce already in government by enabling innovation from within and addressing skills gaps in the areas of user-centric design and agile development.
2. The need for broader digital literacy across government at all levels, to support informed decision-making as increasingly all policy issues, programs and services have digital components.²

Consultations with stakeholders led to the creation of the Canadian Digital Service (CDS), and helped inform other initiatives such as the launch of the Digital Academy. The Digital Academy is hosted at the Canada School of Public Service (CSPS), and has a mandate to ensure public

² Source: <https://digital.canada.ca/beginning-the-conversation/>

servants have access to the digital skills and training they need to modernize operations, and deliver the digital services Canadians expect.³ This study will provide critical information to CSPS, as they proceed with their digital curriculum.

The recent Public Policy Forum (PPF) report, *Developing Canada's Digital-Ready Public Service* (Cukier, 2019), highlights Canadians' demands for a digital transformation. Citizens and businesses expect the same seamless digital experience from their government, that they have in other aspects of their lives. Similarly, public servants desire and require a suite of digital tools and technologies that allow them to work more effectively, collaboratively, and productively. The PPF report commends the GC for a leading digital strategy, but calls attention the current lack of infrastructure to support this shift to digital which challenges the strategy's implementation.

The PPF report⁴ calls for an integrated strategy to address the infrastructure challenge, and includes the following principles:

- Demonstrate the political will to build a digital ready public service;
- Build a digital ready and inclusive organizational culture; and
- Commit to new approaches to training.

The current training needs analysis (TNA) of the GC is created in concert with CDS. The research and subsequent report aims to support the needs of the evolving and diverse workforce as it confronts the opportunities and challenges associated with a modern, digitally enabled world.

Organization of this Report

The report is organized as follows: Methods; Summary of data collected; analysis in What we Found and What we Heard; and Recommendations.

³ Source: <https://www.canada.ca/en/treasury-board-secretariat/news/2018/10/government-of-canada-launches-digital-academy.html>

⁴ Executive Summary, p. 4. Source: <https://ppforum.ca/wp-content/uploads/2019/03/DevelopingCanadasDigital-ReadyPublicService-PPF-MARCH2018-EN.pdf>

Methods

The methods section includes the outline, discussion, and reflection on the methods used to complete this research. It concludes with an explanation of data synthesis, and a summary.

Summary of the Data Collected

Following the description of methods, we provide a summary of the data collected throughout the stages of research.

What We Found

In the “What We Found” we provide the analysis of quantitative data from the Randomized Survey and compare the quantitative data from the Randomized and Open Surveys. This data addresses questions related to: understanding the key digital disciplines necessary for governments to thrive in a digital era; the extent to which these skills are present within the GC; and identifying training preferences and trends. It provides information for two of our identified audiences: those who design or deliver digital services or solutions (e.g., CS designation) and those who impact digital service delivery in policy or operational positions (non-CS).

What We Heard

We examine the thematic analysis of the qualitative data collected in the “What We Heard” section. This includes the interviews from the Senior Leader Consultations, as well as the data collected from the Open-Ended Questions in the Randomized and Open Surveys. This data expands on the findings from the quantitative analysis, and provides additional perspectives on: the digital disciplines necessary for governments to thrive in a digital era; the presence of these disciplines within the GC; the perception of current training capacities; and needs for the future.

Recommendations

The final section summarizes the finding and provides recommendations for improving, and in some cases recasting, the training and development capacities within the GC. The recommendations consider the medium to long-term challenges on the horizon in terms of skills development, training capacities and workforce development.

Methods

Overview

To move forward with a Canadian digital strategy, it is imperative to gather empirical data to describe and illuminate the current state of the digital awareness and understanding. The methods chosen for this research and the way the research progressed is based on a commitment to work collaboratively, transparently, and with a user-centred approach, to ensure that the survey and the interview questions reflect the digital priorities of the GC. In addition the FOM team worked with CDS and key stakeholders used iterative rounds throughout all the stages of work. The research complies with legal and ethical standards within the GC and does not include any Public Opinion Research (POR) questions. Additionally, all efforts were made to make the research tool accessible. The survey was beta tested with key stakeholders.

As highlighted above, there are three key groups of interest (both potential participants and audiences):

1. Public servants who design or deliver digital services or solutions (e.g., CS);
2. Public servants who impact digital service delivery in policy or operation positions (Non-CS); and
3. Senior leaders and decision makers.

While research on digital competencies is growing, to date no single framework has emerged to guide the federal government. In addition to assessing competencies and identifying gaps, the goal is to collect and organize sufficient data, both qualitative and quantitative, to ensure statistically relevant and valid analysis.

To accomplish these objectives, the following research activities were launched:

1. An **Environmental scan** of existing digital training and learning programs in the GC as well as, other jurisdictions and sectors within Canada, and internationally;
2. The development and implementation of a **Survey** — which was:

- a. distributed to a randomized population (**Randomized Survey**) to allow for statistical accuracy, and
 - b. released openly (**Open Survey**) to encourage broad participation across all federal public servants; and
3. **Consultations with Senior Leaders**, CIO's, and senior administrators from key departments.

Each of the research activities is described below.

Environmental Scan of Digital Training and Learning Programs

To assist with the creation of the survey and interview guide, and to ground and complement the internal data collected, a scan of emerging digital training initiatives throughout Canada and key International jurisdictions was compiled and analyzed. This scan informed the research process — from the survey design, through to the recommendations.

Survey Development

To answer the foundational question **“What are the key digital disciplines necessary for governments to thrive in a digital era?”** a survey tool was developed. The survey tool included questions regarding the 30 digital disciplines, which were established based on foundational research on digital competencies. The research was completed in consultation with the CDS team and Key Stakeholders including:

- The Canada School of Public Service (CSPS);
- Office of the Chief Human Resources Officer (OCHRO) Treasury Board of Canada Secretariat (TBS);
- TBS Office of the Chief Information Officer (CIO).

To meet our goals of both statistical relevance, as well as open participation, we decided to distribute the survey in two ways: Randomized and Open. The Randomized Survey targeted randomly selected individual in seven departments. Following the closing of the survey, an

Open version launched, to allow all interested employees across the Federal Government to participate. Based on the commitment to collaboration, the survey developed through a series of iterative stages, in consultation with our stakeholders. As noted, designing a survey to understand the digital training needs of the GC was an ambitious task, as such our methods evolved.

1. **Establishing need:** An initial challenge was how to establish how we could measure “need”. Two basic approaches were considered: *hard-test assessments* of granular skills (coding, etc.) or *self-assessment*. The latter was chosen for three reasons:
 - the team lacked the resources to develop and implement “skill testing questions”;
 - the literature indicated self-assessment as a reasonable inference; and
 - self-assessment allows for inclusion of softer/ organizational skills that do not lend themselves to hard-test assessments.
2. **Assessment rounds:** The survey went through multiple rounds of assessment. Based on an analysis of the prior literature and our environmental scan, a set of five core skill areas, with four sub-skill categories each were identified (Technical Security and Human Safety, Information and Data, Collaboration and Innovation, Content and Community, and Client-centric and Contextual). These were intended to capture categories of hard skills and the supporting organizational capacities. To allow for flexibility and comparability in analysis, respondents were asked to self-assess their capacity for each skill on a 5-point Likert scale. Each sub-capacity was accompanied by two categorical questions asking if respondents had requested or received training in that capacity in the last two years. Finally, we developed a small number of questions dealing with the logistics of training — frequency, source, format, and funding.
3. **Development of tool:** Through our collaborative process, the survey evolved to the final tool used, which incorporated the 30 digital disciplines identified as critical to digital service design and delivery. These 30 disciplines were related to the following key areas:
 - Agile Development;
 - Product Development;

- Privacy and Security;
- Data; and
- User Experience.

Based on feedback from CDS consultation partners the skills to be assessed narrowed from the broad, organizational skills in the first draft, to a set of specific, technical “disciplines”. After initial trials indicated that most respondents did not recognise the disciplines in question technical definitions were embedded in the online survey for the reference of respondents. These 30 disciplines are included below (See Appendix A for the full survey).

#1	Agile development: An approach to software development that encourages multi-disciplinary teams to build things quickly, test what they’ve built, and iterate their work based on regular feedback with users.
#2	Continuous deployment: A process that relies on infrastructure that allows developers to test and deploy new code automatically.
#3	Automated-testing: Quality testing that is done automatically via computer, as opposed to manual testing by a human being.
#4	Accessibility audits: Evaluation to ensure a product or service meets minimum accessibility standards (typically the Web Content Accessibility Guidelines 2.1) and works with common assistive technologies.
#5	Assistive technologies: Hardware or software intended to compensate for or alleviate an injury, disability or illness or to replace a physical function.
#6	Cloud computing: The on-demand delivery of services through a network of online remote servers collectively known as a cloud.
#7	Artificial Intelligence: Characteristics of human intelligence, such as problem solving and learning, exhibited by computers or other machines.
#8	Open source coding: Software code that is made freely available for others to modify and share and complies with the Open Source Definition.
#9	Open source standards: The set of criteria software must meet in order to receive an open source license.
#10	Secure coding standards: A set of best practices in programming aimed at minimizing security vulnerabilities.

#11	Development operations: A software development model in which development and operations teams work together in a closely collaborative manner.
#12	Cyber security: Technologies, processes, practices, and response and mitigation measures designed to protect networks, computers, programs and data from attack, damage or unauthorized access.
#13	Vulnerability assessments: An evaluation to determine the susceptibility of critical assets to attacks or interference from threats and hazards.
#14	Intrusion detection: Gathers and analyzes information from various areas within a computer, or a network to identify possible security breaches, including both internal and external intrusions (from within and outside of the organization).
#15	Identity / access management: Tools, such as passwords that allow a system to identify users and grant them the appropriate access.
#16	Recognizing private information: The ability to identify information that is protected by privacy legislation.
#17	Privacy procedures / policies: A set of protocol on the responsible collection and handling of private information.
#18	Recognizing privacy threats: The ability to identify common privacy threats, including phishing, spear phishing, pharming and vishing scams.
#19	Addressing privacy breaches: The unauthorized access and use of personal information.
#20	Data / social media analytics: The interpretation of data, often for decision-making purposes, such as human behaviour on social media sites or apps.
#21	Business intelligence tools: Software or systems that are used to process data for decision-making purposes.
#22	Data visualization: The use of images such as graphs to present data.
#23	Machine learning: The ability of a computer to use examples or past experiences to predict outcomes in new situations.
#24	Sanitizing data: Checking data to neutralize the potential danger, to render it harmless.
#25	Data science: An interdisciplinary field using scientific methods, processes, algorithms and systems to extract knowledge and insights from data in various forms (both structured and unstructured). This is similar to data mining that includes the act of identifying patterns and relationships within large data sets.

#26	Design-thinking: A multidisciplinary process to tackle complex problems by understanding human needs and testing prototypes with users.
#27	User research: Inquiry into the needs, context, and behaviours of service users, which seeks to understand a person’s goals and needs in order to identify a problem to be solved.
#28	Content design: The planning and creation of content for user-centred products and services, including hierarchy, flow, and structure of information.
#29	User experience design: Enables designers and developers to prioritize people’s emotions, attitudes, and end-to-end journey while using a particular product or service.
#30	User interface design: Focuses on anticipating what users might need to do, ensuring that a product is easy to access, understand, and use.

4. **Not public opinion research:** During the development of the survey, the team worked with the TBS Public Opinion Research (POR) unit to ensure questions requiring self-assessment of competence or that asked respondents to predict the relative likelihood of future activity were not included.

5. **Accessibility:** All efforts were made to ensure the survey was as accessible as possible, given current tools and technologies. We worked with SimpleSurvey, as they provide more accessibility features than competitors, while also meeting privacy standards. Accessibility testing was done through the survey development process, and changes made based on recommendations. The survey design also accounted for usability across multiple platforms including computers, phones, and tablets.

Process for the Randomized Survey

The population for the Randomized survey consists of the employees (excluding senior officials) identified by CDS as of particular relevance / interest.⁵ The departments were selected based on the criteria that they represent a reasonable cross-section of government, with a solid complement of CS and non-CS skills, and a strong focus on service delivery.

⁵ Canada Revenue Agency, Employment and Social Development, Immigration, Refugees and Citizenship Canada, National Defence, Shared Services Canada, Transport Canada, and Veterans Affairs Canada.

The survey was tested with representatives from these seven departments. Participants in the test survey were removed from the random sample.

The total population for the Randomized survey was 53,824. To gain understanding of the differences between the CS and non-CS designates in the population, the proportions were considered for the randomized strategy. To allow for the possibility for analysis at the departmental level, and the disproportionate size of the departments involved (ranging between 468 and 23,713), we decided to stratify the sample by both department and CS/non-CS designations.

One challenge of the survey process was ambiguity around the response rate. We decided to oversample as a way to compensate for a below-expected response rate. A final random sample of 5500, stratified by both designation (CS/non-CS) and department was determined.

The survey launched on November 1st 2018 and ran until November 19th 2018. Prior to launch, CDS implemented a communications strategy. Emails were monitored for any issues accessing the survey and three reminder notices were sent to participants. 600 surveys were fully completed and submitted, for a response rate of 10.9%. While the relatively low response rate introduces some risk of a non-response bias, it is important to note that the CS/non-CS split had 21.2% as the “expected” proportion of CS. **The actual proportion in the sample was 21%, making the sample meaningfully reflective of the CS / non-CS distribution in the overall population.**

Analysis of the Randomized Survey

1. **Identifying differences** between CS and non-CS populations, as well as considering differences across the disciplines were core aspects of the analysis. For demographic and training questions, where the bulk of questions produced categorical data, analysis consisted of a preliminary scan of the raw data via contingency tables. Subsequently the relationships were tested (using Excel) via chi square tests in doing so a possible relationship between designation and a possible dependent variable was observed. While the n for this survey was relatively high (n=600), it falls within acceptable limits for a chi square test.
2. **Descriptive relationships:** Further analysis focuses on descriptive relationships between questions, and on observed differences in responses between the CS and non-CS populations. Critical areas of focus include relationships between reported levels of knowledge, use, and training across the 30 digital disciplines surveyed.

Subsequently classification was applied to identify discipline groups showing common features. This was done to provide insight into the different kinds of training that might be useful to respondents. For further analysis see **“What We Found”**.

3. **Separation of Qualitative and Quantitative data:** The answers to the Open-Ended Questions were separated from the quantitative data. Thematic analysis of these questions determined themes. The findings from this analysis are included in **“What We Heard”** section.

Process for the Open Survey

In addition to the random survey, an open-access survey was made available to all federal employees. This survey opened on November 20th 2018, after the Random survey closed, and remained open until November 30th 2018. The open survey produced 990 completed surveys, which may be prone to self-selection bias, as an open survey in this field may motivate participation by those who are skilled in digital disciplines.

Analysis of the Open Survey

Without a random design we could not determine statistical confidence in the responses for the Open Survey.⁶ Instead the following analysis was undertaken:

1. Summary graphs and tables, similar to those for the Randomized survey, were created. These two sets of summary graphs were compared, and points of difference between the graphs from the survey were identified and examined. This analysis is included in the **“What We Found”** section of the report.
2. The answers to the Open-Ended Questions from the Open Survey were separated from the quantitative data. Thematic analysis of these questions determined themes. The findings from this analysis are included in **“What We Heard”** section.

⁶ The calculations which to establish statistical confidence assume a random sample, (i.e., that every respondent was selected randomly from a known population, with a chance of being selected equal to that of any other member of the population.) The Open survey involved a process of self-selection, and as such, does not allow for calculations of this type.

Development and Process for the Senior Leader Consultations

To supplement the survey data, we conducted consultations with senior leaders. These consultations were completed to provide insights from a senior strategic and organizational perspective on the current and emerging digital skills and competencies. The consultations took place between November 20-21, 26, as well as Dec 20, 2018. FOM Researchers, accompanied by CDS, conducted these consultations. Up to an hour was booked with the senior leaders to allow for fulsome discussion.

The following four questions were the starting point in semi-structured interview format:

1. Do you think there is a coherent and distinct set of “digital skills” that are emerging within the Public Service, and how would you describe these in your own words?
2. What do you see as the key emerging digital skill demands / needs in the public service?
3. What do you see as the critical existing digital skill gaps in the public service?
4. Do you think there are sufficient (internal / external) training resources to meet these needs (both in terms of their existence, and access to them)?

Supplementary and probing questions were added as required to facilitate full and open conversations.

Analysis of the Consultation Data

Consultations with senior leaders were thematically analyzed in aggregated to add to the perspectives gained through the other research activities (environment scan and surveys). In particular, the goal of the analysis is to identify trends across different departments, as well as establish how the consultations confirmed or broadened findings from the surveys. This analysis contributed to a better understanding of: which digital skills are essential; the presence of these skills within the GC; and the perception of current training capacities. Together with the analysis of the Open-Ended questions from both surveys, this analysis is incorporated in the “**What we Heard**” section.

Reflections on the Methods

This is the first comprehensive survey to collect both qualitative and quantitative data related to training needs of digital competencies that has been sent to a broad section of federal employees. The research process represents our commitment to collaboration and openness. As such, it represents a unique opportunity to reflect on the survey process and to learn for future initiatives. Four key aspects of the methods invite further reflection.

1. **Clarity of terminology:** Some participants the survey felt it was too “technical”. This view was shared particularly, though not exclusively, by respondents from the non-CS community, the survey was viewed as too “technical”. To provide a sense of scale, 6% of the participants of the Randomized survey included a comment to the final open question that stated they did not feel the survey reflected their needs in their jobs. The perception that the survey was “too technical” was impacted by the definitions included, which emphasized technical aspects of the disciplines. For example, Agile Development a key discipline investigated, is more than a set of technologies, it is also method for working differently. Similarly, the term Open Source represents a set of standards, as well as a way of working. Once faced with the table of 30 Digital Disciplines, participants of the Open Survey appeared to drop off.
2. **Predefined categories:** Using pre-defined categorical options in responses, rather than scaled or self-assessed options, meant that questions were less flexible, and potentially reduced their applicability to the broad range of respondent experiences and circumstances. Respondents commented on this and found the way of asking questions confusing or awkward. The need to use categorical questions also restricted the options available for data analysis. The addition of the Open-ended Questions was helpful for providing a broader context, however, opinion-based questions would have added valuable insight.
3. **Data analysis:** The iterations of this survey and the changes to the questions and scales meant that the data analysis was developed after collection, and limited by the largely categorical nature of the variables we assessed.
4. **Missed opportunity:** While important and useful analysis was possible from the survey, not performing Public Opinion Research may have resulted in a missed opportunity.

Summary of the Methods

The goal of this research, as noted above, was to better understand and empirically assess the current training needs for digital capacity across the Government of Canada (GC). To accomplish this complex and multifaceted goal, we followed a mixed-methods research design. The outcomes have been integrated in the following sections of this report.

The **Environmental Scan** informed the entirety of research, from its design through to the resulting recommendations. The data collected from the surveys and the Senior Leader Consultations has been organized into two sections.

What We Found includes the analysis of the Quantitative analysis of the Randomized Survey, as well as comparative analysis with the Open Survey Data. This data provides empirical evidence in response to the following research questions:

- What are the key digital disciplines necessary for governments to thrive in a digital era?
- To what extent are the skills in these disciplines present within the GC?
- How are digital training capacities perceived at present by GC employees?

What We Heard incorporates the Qualitative data from across the research, including the analysis of the Open-Ended questions of the completed respondents in both surveys, and the Consultations with Senior Leaders. This data provides key qualitative data related to the following research questions:

- What are the key digital disciplines necessary for governments to thrive in a digital era?
- To what extent are the skills in these disciplines present within the GC?
- How are digital training capacities perceived at present by GC employees?
- How can training capacities be improved going forward?

Together these three methods (environmental scan, surveys (randomized and open), and consultation interviews) helped us define the current state of digital training needs.

The synthesis of the findings informs our Recommendations and addresses the final question:

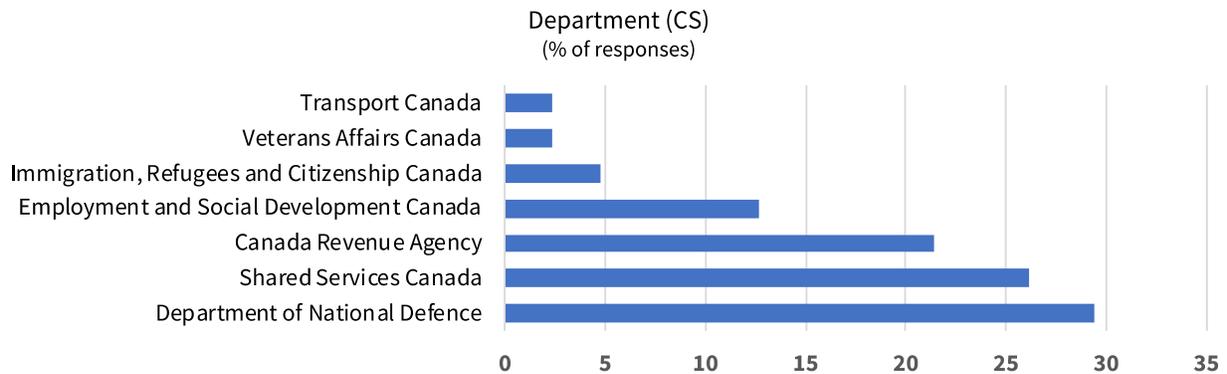
- What are some of the medium to long-term challenges on the horizon in terms of skills development, training capacities and workforce development?

Summary of the Data Collected

Randomized Survey

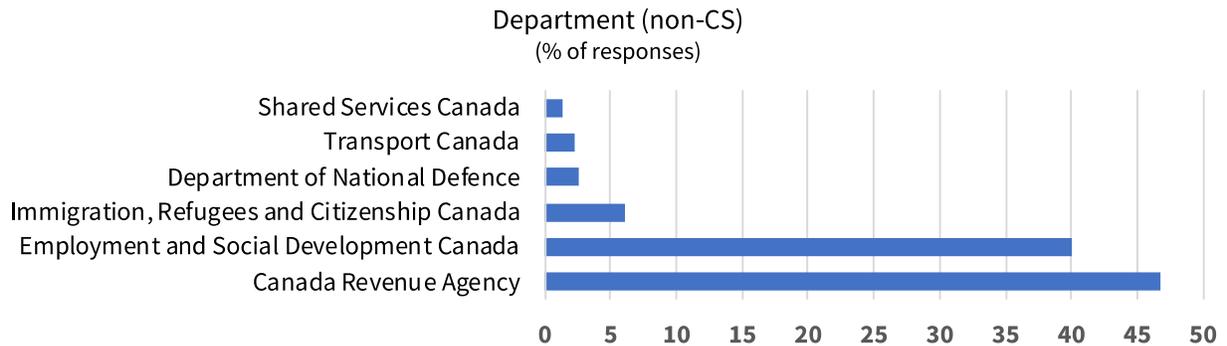
Completed	600
Partially completed	385
Response rate	10.61%
Completion rate	51.68%

CS Completed Responses by Department (over 1%)



Note: (n=126). Also noted – category “other, please specify” (0.79%).

Non-CS Completed Respondents by Department (over 1%)



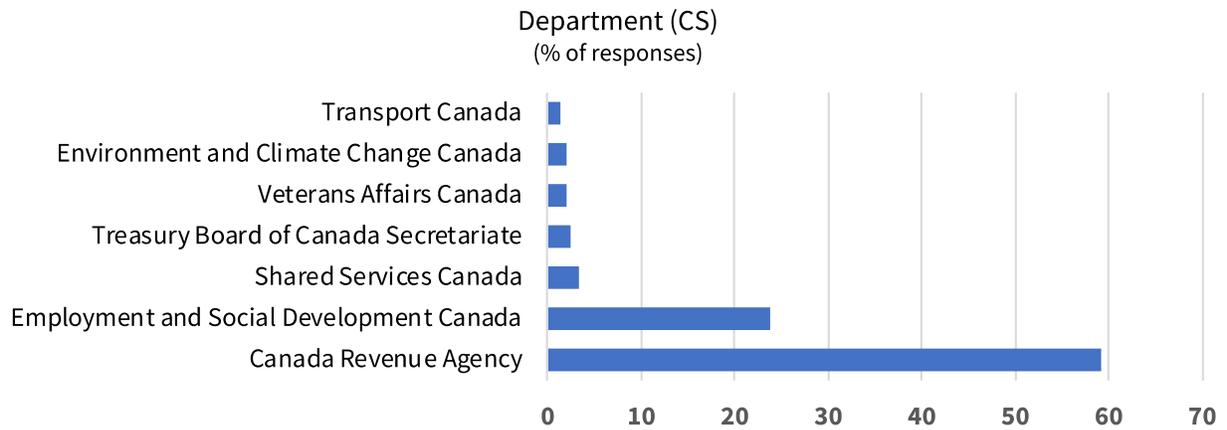
Note: (n=474). Also noted — Veterans Affairs Canada (less than 0.21%) and category “other, please specify” (0.79%).

Open Survey — Responses from 30 Departments

Completed 990

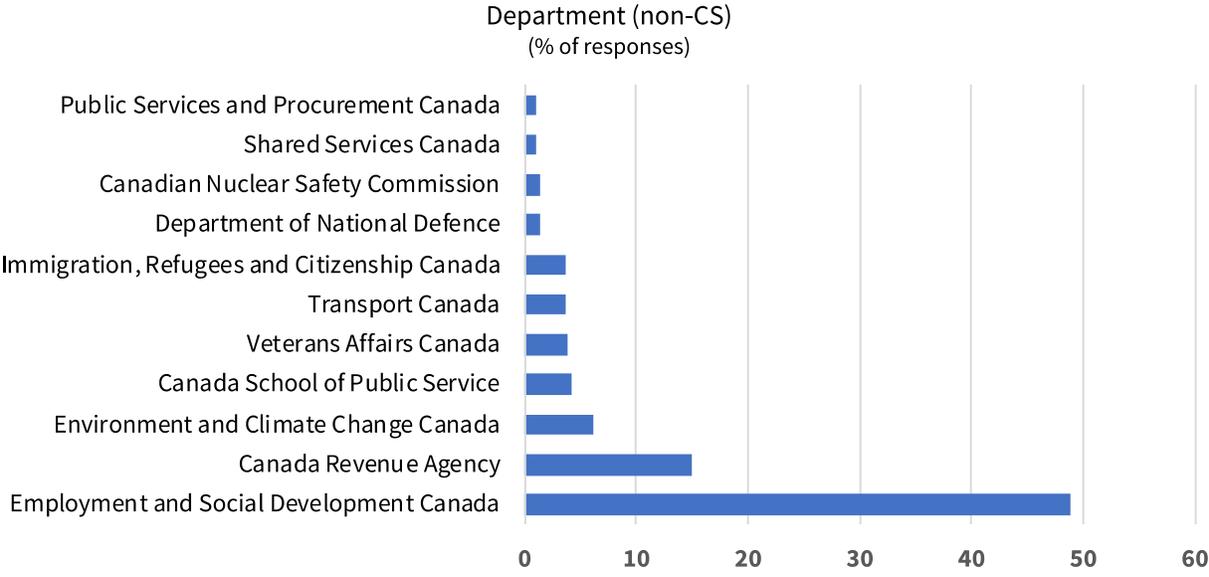
Partially Completed 1187

CS Completed Respondents by Department (over 1%)



Note: (n=206). The following departments had less than 1% responses (Agriculture and Agri-Food Canada, Department of National Defence, Immigration, Refugees and Citizenship Canada, Statistics Canada, Canada Border Services Agency, Health Canada and Transportation Safety Board of Canada). Other responses noted - I cannot find my department or agency (0.49%).

Non-CS Completed Respondents by Department (over 1%)



Note: (n=784). The following departments had less than 1% responses (Innovation, Science and Economic Development Canada, Treasury Board of Canada Secretariat, Natural Resources Canada, Public Service Commission of Canada, Agriculture and Agri-Food Canada, Immigration and Refugee Board of Canada, Health Canada, Privy Council Office, Royal Canadian Mounted Police, Department of Justice, Public Health Agency of Canada, Statistics Canada, Veterans Review and Appeal Board, Administrative Tribunals Support Service of Canada, Atlantic Canada Opportunities Agency, Canada Border Services Agency, Canadian Environmental Assessment Agency, Canadian Food Inspection Agency, Correctional Service Canada, Indigenous and Northern Affairs Canada, Infrastructure Canada, Library and Archives Canada, National Research Council Canada, Natural Sciences and Engineering Research Council, Parole Board of Canada, Public Prosecution Service of Canada, Social Sciences and Humanities Research Council, and Transportation Safety Board of Canada). Other responses noted - I cannot find my department or agency (1.79%) and non-response (1.02%).

Senior Leader Consultations

We interviewed 23 senior leaders from 10 departments.

Senior Leaders Consultations

1. **Immigration, Refugees and Citizenship Canada (IRCC):** Zaina Zovani, CIO
2. **Shared Services Canada (SSC):** Liz McKeown, CIO

3. **Public Service Commission (PSC):** Elizabeth Rhodenizer, CIO
4. **Transport Canada:** Julie Leese, CIO, and Grahame Rivers, Director, Digital Services Enablement
5. **Former President CSPS, CBSA, CRA Commissioner & CEO:** Linda Lizotte-MacPherson
6. **Veterans Affairs Canada (VAC):** Lisa Campbell, Associate DM; Mitch Freeman, CIO; Suzanne Levesque, CoS to Associate DM; Sandra Williamson, Senior Director, and Kelsey MacDonald, Online Services Directorate; Kiran Hanspal, DG Human Resources
7. **Department of National Defence (DND):** BGen Andrew Jayne, Col Jason Walkling, and LCol James Carter, DG Cyber Security
8. **Canada Revenue Agency (CRA):** Annette Butikofer, Assistant Commissioner & CIO; Susan Snow, Director, Business Management; Amanda McMahon, Learning consultant
9. **Employment and Social Development Canada (ESDC):** Peter Littlefield, CIO; Julie Lacroix, Director, EI Processing Automation; Dennis Skinner
10. **Canada Border Services Agency (CBSA):** Genevieve Binet, A/DG, Information, Science and Technology Branch, and Christine Maathuis Quinn

What We Found

In this section we focus on the analysis of the data from the Randomized survey, to assess the statistically significant results. We highlight the key insights related to people (demographic patterns); identify four categories within the digital disciplines (Established, Emergent, Specialized, and Ambiguous); assessed current capacities across disciplines; and highlighted training preferences and trends.

Our primary concern is assessing overall conditions at the organizational level. While asking questions about individual capacity (knowledge and ability to use) in certain disciplines, we are assessing levels of knowledge, and the capacity to implement technical disciplines, at the level of the GC as a whole. This broad assessment helps us understand the extent to which the key digital skills necessary for governments to thrive in a digital era are currently present within the GC, and what training strategies could be employed to address gaps.

Key Insights — People

To help us understand distribution of digital skills across the GC, the study observes differences between the CS and non-CS designates in the federal work force. Traditionally, IT and digital skills have been associated with the former; however, there is increasing awareness both in- and outside government that digital skills need to be distributed broadly across the federal workforce. Some of the differences we observed are demographic in nature:

CS designates:

- Are far more likely to identify as male than their non-CS colleagues. 67.5% of the CS population self-identified as male, compared to only 32.6% of the non-CS population.⁷

⁷ Performed a Chi Test of the distribution of CS/non-CS vs. M/F (n = 588 p = 2.27 E-13). Responses of “non-binary” and “prefer not to say” were dropped from the sample population for the purposes of the test. We also tested binary / non-binary, vs. designation category separately, and found no significance to distribution. We also

- Are far more likely to be located in the national capital region (NCR) than their non-CS colleagues. 67% of CS respondents are located in the NCR, compared to only 28.7% of their non-CS colleagues.⁸
- Are more heavily weighted towards the end of their career; they tend to be older, and more established in their positions. CS designates have:
 - a larger proportion of older workers (60.31% of CS are 46+, vs.45.9% of non-CS), and;
 - a lower proportion of young workers (7.14% of CS are 35 or younger, vs. 23.05% of non-CS).
- Represent a larger proportion of workers with more than 10 years of federal service (70.6% of CS have 10+ years, vs. 55.8% of non-CS).
- Represent a smaller number of workers new to their role (28.6% of CS have spent less than 2 years in their current position, vs.40.3% of non-CS)⁹

Compared to their non-CS colleagues, CS workers are more likely to: have spent a longer time in federal service; be more established in their careers; be male; and work in the national capital region (NCR).

Key Insights — Disciplines

The Randomized survey provided insight to the categorical differences between the digital disciplines. We divided the 30 digital disciplines into four broad groups: Established, Emergent,

tested for a relationship between CS/non-CS and self-identifying as Indigenous, living with a disability, or a member of a visible minority group, but found no relationship.

⁸ Performed a Chi Test of the distribution of CS/non-CS vs. M/F (n = 600 p = 2.43 E-7).

⁹ Performed Chi Tests for the distribution of CS/non-CS vs +/- 46 (n=586, p=0.0022), vs. +/- 35 (n=596, p=7.83 E-5), vs. <10 / 10+ years of service (n = 599, p=0.0027), and vs. <2 / 2+ years in current position (n=600, p=0.0159).

Specialized, and Ambiguous. Based on the survey results we provide an analysis of the current capacity within government across the disciplines.

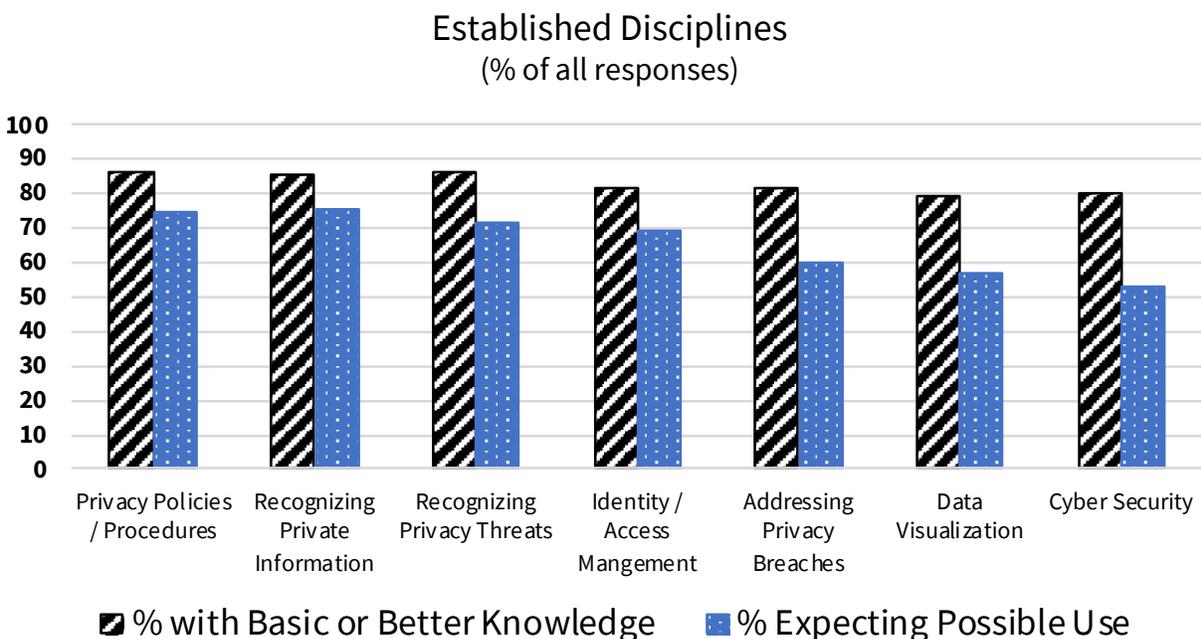
Discipline categories

Category	Features	Definition	Disciplines	Implications
Established	People across the organization, and across designations, know of, and expect to use, the discipline	More than half of all respondents have at least some knowledge, more than half of all respondents expect some use in the upcoming year	Privacy Policy / Procedures, Recognizing Private Information, Recognizing Privacy Threats, Identity / Access Management, Addressing Privacy Breaches, Data Visualization, Cyber Security	Build on existing knowledge of, and enthusiasm for, positive impact of disciplines in the organization
Emergent	Technical specialists know of, and expect to use the discipline, but non-technical staff are unfamiliar with it	More than half of CS indicate they expect to use in the coming year, more than half of non-CS report no knowledge	Agile Development, Development Operations, Intrusion Detection, Vulnerability Assessments, Sanitizing Data, User Experience Design, User Interface Design	Need for broader awareness of discipline, its potential implications, and applications, among non-technical staff
Specialized	Even among technical staff, knowledge and use of the discipline is limited / concentrated	Less than 50% of CS expect to use, more than 33% of CS have no knowledge	Design Thinking, Continuous Deployment, Data Science, Accessibility Audits	Ensure that the small pool of specialized capacity doesn't fall below critical threshold
Ambiguous	People across the organization know about the discipline, but unsure of how it will be used	Of those who indicate use, more indicate the possibility than clear expectation; in addition, more respondents indicate some knowledge than no knowledge	Artificial Intelligence, Machine Learning, Open Source Coding, Cloud computing, Assistive Technology, Data / Social Media Analytics, Automated Testing, Content Design	Better communication / integration between those who have technical capacity, and those able to apply potential applications

Established Disciplines

Established disciplines are present across both CS and non-CS designations, with a relatively high degree of recognition and expected use. Not only is there a capacity for high-level activity within the discipline, there is also a relatively high, and relatively distributed, degree of familiarity with the discipline; even people who cannot conduct the activity, have a basic understanding of what it is, and what it is for.

Established disciplines demonstrate both widely distributed knowledge of the discipline, and wide expectations of use. Of the 30 digital disciplines we surveyed, seven disciplines showed this combination. At least half of responses show a basic knowledge of the discipline, and the reasonable possibility of use in the upcoming year. Only four disciplines, all of which are related to core privacy and security concerns, show two-thirds of responses meeting these criteria.



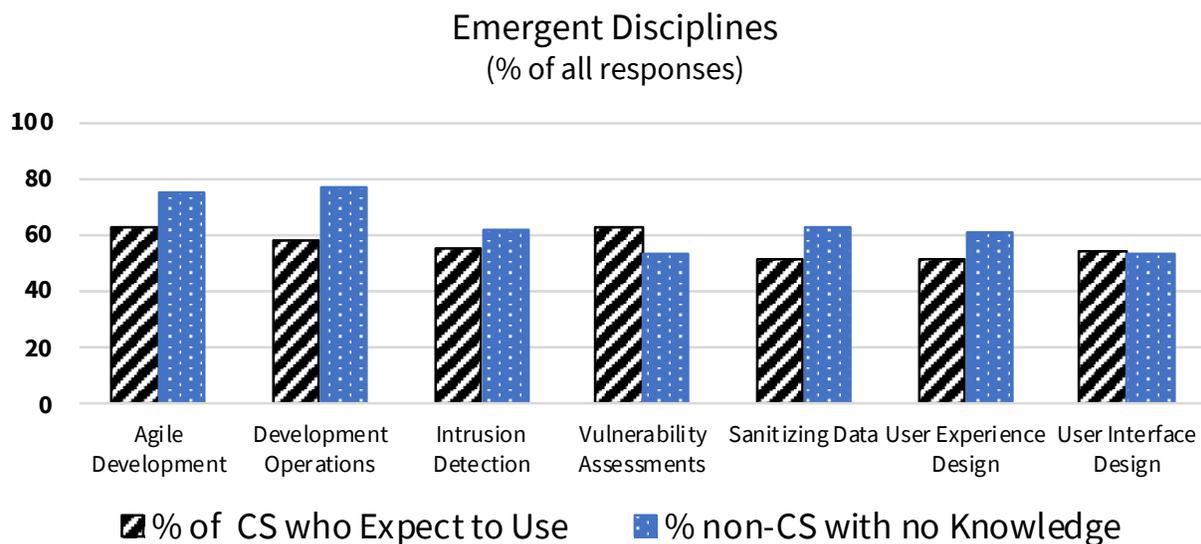
For all seven of the listed disciplines, more than 50% of all responses indicated they had at least a basic knowledge of the discipline, and that there was a possibility of use in the upcoming year. For the first four disciplines (L-R) more than 67% of respondents made the same indications.

Emergent Disciplines

Emergent disciplines demonstrate relatively high levels of use or use-expectations among CS designates, but are not widely recognized across the GC. While the government has a growing

capacity for these skills, the role and utility of these disciplines may not be widely appreciated due in part to their relative novelty.

Emergent disciplines show a relatively broad level of use expectation among CS designates / technical specialists, but relatively low levels of knowledge / recognition by non-CS / non-technical staff. Of the 30 digital disciplines we surveyed, seven showed this combination, with more than half of CS responses showing the possibility of use in the coming year, and more than half of non-CS respondents showing no knowledge of the discipline. Unlike with the Established category, no Emergent discipline met our higher threshold (more than 2/3 CS expecting use, more than 2/3 non-CS showing no knowledge). Agile development came closest, with 62.4% of CS reporting an expectation of use, and 74.9% of non-CS showing no knowledge of the discipline.

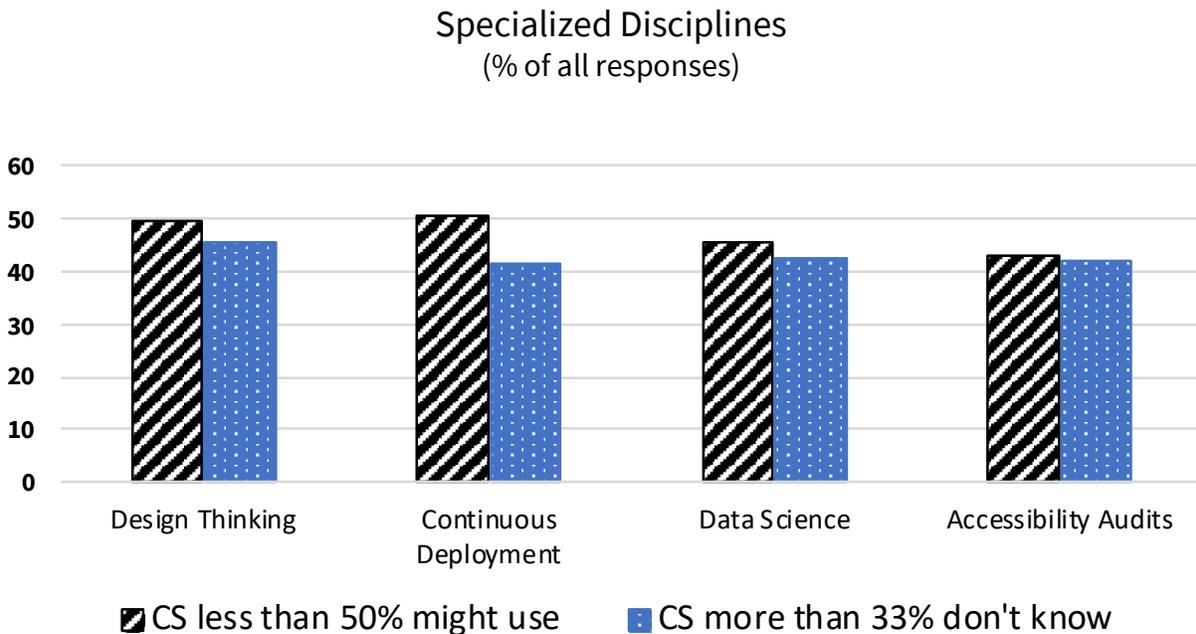


For all of the listed disciplines, more than 50% of all CS responses indicated some possibility of use for the discipline in the next year (combining “expect to use immediately”, “expect to use within a year”, and “don’t know” responses). In addition, all the listed disciplines showed at least 50% of non-CS respondents reporting “no knowledge” for the discipline.

The identification of this category of discipline has implications for the kind of training that might be useful across the wider GC; not necessarily for the recruitment and training of specialized workers, but rather for broader education about emergent skills and their pending importance to the organization as a whole.

Specialized Disciplines

Specialized disciplines show limited to moderate levels of expected use among CS designates, but also relatively low levels of familiarity among CS designates.



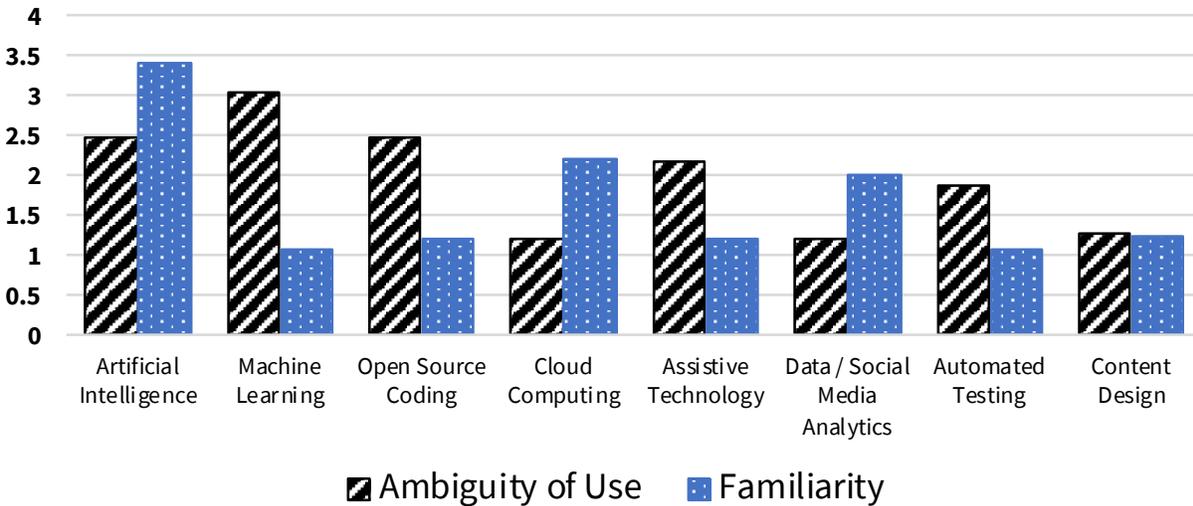
All Disciplines show less than 50% of CS respondents indicating possible use (sum of “use immediately”, “use within one year”, and “don’t know”. In addition, all disciplines show more than 33% CS respondents showing “no knowledge” of the discipline. Interestingly, no discipline showed more than 50% of CS respondents with “no knowledge” as a response; specialization is a matter of degree.

Unlike Emergent disciplines, Specialized disciplines, though present, are relatively unknown among the technical community, and are known primarily to those who use the discipline. They represent a set of skills aimed to fulfill sufficiency of technical capacity in the organization rather than creating conditions of utility or use within the organization. Broader “capacity implication” training, of the kind associated with Emergent disciplines, is likely less necessary.

Ambiguous Disciplines

In addition to the categories noted above (Established, Emergent, Specialized), there are also disciplines that, while recognized across the organization, also have a degree of ambiguity associated with their use. Respondents are familiar with the discipline but are less certain about how it might be put to use in their work.

Ambiguous Disciplines (% of all responses)



For each indicated discipline, the “**Ambiguity of Use**” value represents the proportion (among all respondents) of “Don’t Know” to the sum of “Use-Immediately”, and “Use-Within a Year” responses (i.e., meaning among respondents who indicated the possibility of use, the proportion who indicated they might use it vs. those who are confident of use). For each indicated discipline, the “**Familiarity**” value represents the proportion (among all respondents) of responses who indicate *some knowledge* — a combination of basic and advanced responses — vs. those who indicated *no knowledge*. Note that all values exceed 1, i.e., among those who indicated a possibility of use, all values exceed 1, more think they might use it than are confident they will, and more know about it than do not.

It is worth pointing out that one discipline, **User Interface Design**, also meets the **Ambiguous** category criteria, but we have placed it in the “**Emergent**” category (the criteria for which it also meets). For the User Interface Design digital discipline, levels of familiarity among CS designates were disproportionately high (i.e., the reason more than half of all respondents indicated familiarity was that so many CS designates did so). We judge it as a better fit in the Emergent category as the category represents disciplines with a growing recognition of importance among the CS population, but a relatively low profile for the non-CS population.

Training priorities for disciplines in this category might focus on issues of finding application, or foresight exercises to determine the implication such disciplines might have for the organization. Artificial Intelligence (A.I.) is the exemplar in this category. Many people know about it, many people expect to use it, but a much larger proportion of people think they might use it than are confident that they will.

NOTE: The following four disciplines do not fit into any of these categories: **Open Source Standards, Secure Coding Standards, Business Intelligence Tools,** and **User Research.**

Analysis of Capacity by Discipline

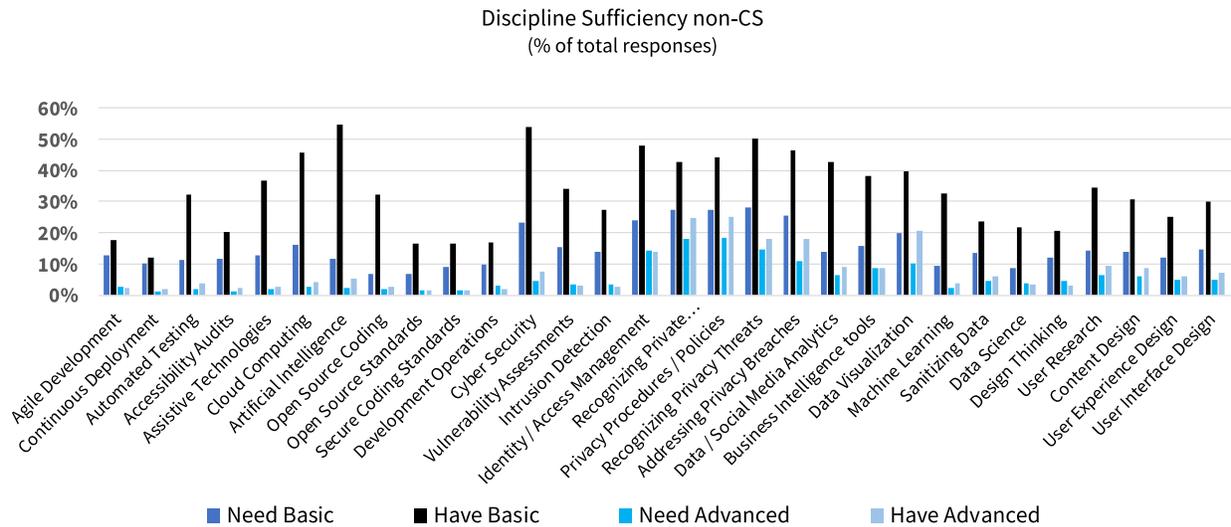
The analysis of the survey data provides insights to the extent to which skills in the key digital disciplines are present in the GC. At the level of the organization as a whole, we can say two things about the current presence of skill / capacity among our surveyed population.

1. There appears to be a sufficient presence of knowledge and skills at the **Basic level, for both CS and non-CS staff.**
2. While the GC may have enough knowledge and skills at a more Advanced level, **the GC does not have excess capacity.**

In terms of the current appraisal of digital discipline capacity in government, the overall trend is a sufficient amount of basic knowledge across the organization. There are some potential deficiencies in both the CS and non-CS populations for certain disciplines — particularly at the level of Advanced knowledge and Advanced capacity. This is one of the areas where the relatively low response rate of the survey has an impact. Although we are able to identify certain digital disciplines where smaller numbers reported having skills at a level more advanced than needed, the overall rate at which respondents indicate a need for Advanced skills is relatively low. This means that the difference between those reporting having Advanced skills, and those reporting needing them, tend to fall within the confidence interval for the question.

Attention needs to be paid to maintaining and enhancing the total presence of capacity within the GC as there is the potential of broad capacity insufficiency.

Non-CS: Areas of Potential concern



Sufficiency of Basic capacity is found within the non-CS community. Respondents did not indicate the need for basic skills when they did not possess them in any of the digital disciplines. In two cases, **Agile Development** and **Continuous Deployment**, the gap between those who have skills and those who require them fell within the confidence interval for their respective response rates. Based on the survey, we cannot be confident that a sufficiency of capacity exists for these two disciplines.

A number of digital disciplines show a degree of deficiency in Advanced knowledge. These include:

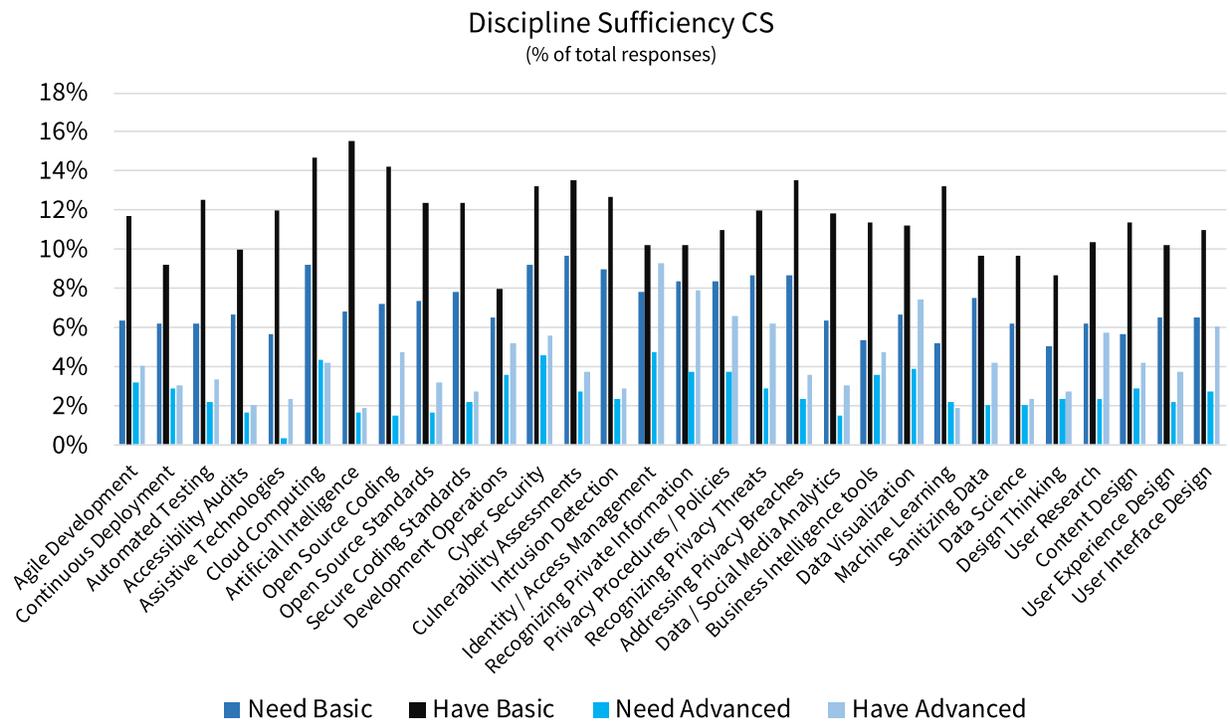
<i>Discipline</i>	% Reporting advanced need	% Reporting advanced capacity
<i>Design Thinking</i>	4.72	3.2
<i>Development Operations</i>	3.04	1.85
<i>Agile Development</i>	2.87	2.19
<i>Intrusion Detection</i>	3.37	2.87
<i>Vulnerability Assessments</i>	3.37	3.04
<i>Identity / Access Management</i>	14.17	13.83
<i>Data Science</i>	3.71	3.37
<i>Secure coding Standards</i>	1.69	1.52

In addition, two other disciplines, **Open Source Standards** and **Business Intelligence Tools**, are **at risk of deficiency**.

However, the gap between reported need for and possession of Advanced skills, fell within the confidence interval of the responses for almost all disciplines at the Advanced level. The exceptions are: **Private Information, Privacy Policies and Procedures, Addressing Privacy Breaches**, and **Data Visualization**.

We can only be confident of excess capacity at the advanced level in the non-CS population for the above mentioned four digital disciplines.

CS: Areas of Potential Concern



The overall capacity pattern in the CS population mirrors that of the non-CS, in that it shows sufficiency of Basic capacity — with deficiencies — at the Advanced level. In the group of CS respondents, only **Cloud Computing** and **Machine Learning** show fewer respondents with Advanced knowledge than required. However, the compounded effects of the relatively small proportion of the population CS designates represent, and the relatively low levels of reporting for both need for and possession of, advanced capacity across all respondents, meant that for most disciplines at both the basic and advanced level, the gap between reported need, and possession, of capacity fell within the confidence interval for the survey.

This means there is only a relatively short list of disciplines where we can confidently assert a sufficient degree of competency across the CS community.

Disciplines where we can **confidently assert a sufficient level of Basic competency** in the CS community include:

<i>Discipline</i>	% Reporting Basic Need	% Reporting Basic Capacity
<i>Artificial Intelligence</i>	6.84	15.53
<i>Machine Learning</i>	5.18	13.19
<i>Open Source coding</i>	7.18	14.19
<i>Automated Testing</i>	6.18	12.52
<i>Assistive Technology</i>	5.68	12.02
<i>Business Intelligence Tools</i>	5.34	11.35
<i>Content Design</i>	5.68	11.35
<i>Cloud Computing</i>	9.18	14.69
<i>Data / Social Media analytics</i>	6.34	11.85
<i>Agile Development</i>	6.34	11.69
<i>Open Source Standards</i>	7.35	12.35

Disciplines where we can **confidently assert a sufficient level of Advanced capacity** in the CS community include:

<i>Discipline</i>	% Reporting Advanced Need	% Reporting Advanced Capacity
<i>Identity / Access Management</i>	4.72	9.27
<i>Recognizing Private Information</i>	3.71	7.93
<i>User Interface Design</i>	2.7	6.07
<i>Assistive Technologies</i>	0.34	2.36
<i>Open Source coding</i>	1.52	4.72

The relative shortness of these lists should not cause alarm. However, they do emphasize a critical point:

The number of people who are required to have Advanced knowledge of digital disciplines forms a minority of the overall population; Advanced capacity is concentrated in the organization.

Though the data indicates the GC contains enough capacity to meet current needs, there is little to “cushion” in the organization in the form of Advanced digital skills.

Additionally, we found an interesting pattern regarding questions of relevancy (Q 12. Are the following digital disciplines directly related to your current work?) and use (Q 13. How often do you use the following disciplines in your daily work?). More non-CS respondents identify a digital discipline as relevant than report using it; while for CS, the pattern is reversed.

The difference between “Relevant” and “Used” falls within the confidence interval; with the exception of three disciplines in non-CS (Secure Coding Standards, Intrusion Detection, Addressing Privacy Breaches), where relevance is marginally, but confidently higher. While our numbers indicate the trends above, we cannot be sure of the patterns or difference between designations.

Based on our findings, relevance of digital disciplines seems tied to use. As opposed to relevance being based on the organizational importance of the skill, etc., the degree to which a discipline is deemed relevant seems to closely mirror the degree to which it is used. Additionally, relevance being based on the organizational importance of the skill, etc.). Relevance seems linked to personal work experience. The implications of this are discussed in our **Recommendations** regarding training priorities.

Comparison of the Randomized Survey to the Open Survey

Summary tables for both surveys were created and assessed. We found that the overall pattern of answers in the two surveys is very similar. Specific numbers vary to some extent, but there are very few areas where there is a visible difference between the graphs (i.e., where a different answer becomes the majority, etc.). It is important to note that we did not run statistical tests on the results for the Open Survey due to lack of confidence in the responses.

The discrepancies between the Randomized and Open surveys are found in questions concerning relevance and training — whether it had been requested to be added to a learning plan. Differences appeared to be concentrated in two of the specialized disciplines (**Design**

Thinking and **Data Science**), especially in terms of higher rates of claims of relevance, requests for training, and presence in their learning plan. It appears that there may be a group of people who think these two disciplines (Design Thinking and Data Science) are becoming less technical, and more broadly relevant.¹⁰ The qualitative analysis of the Open Questions and the Senior Leader Consultations highlights a perceived need for training in “organizational use”, rather than specific how-to, and the view that digital disciplines are irrelevant to their work. There are also slight differences noted in some of the Ambiguous disciplines (Machine Learning, Content Design, Data / Social Media Analytics), though this was less consistent and pronounced.¹¹

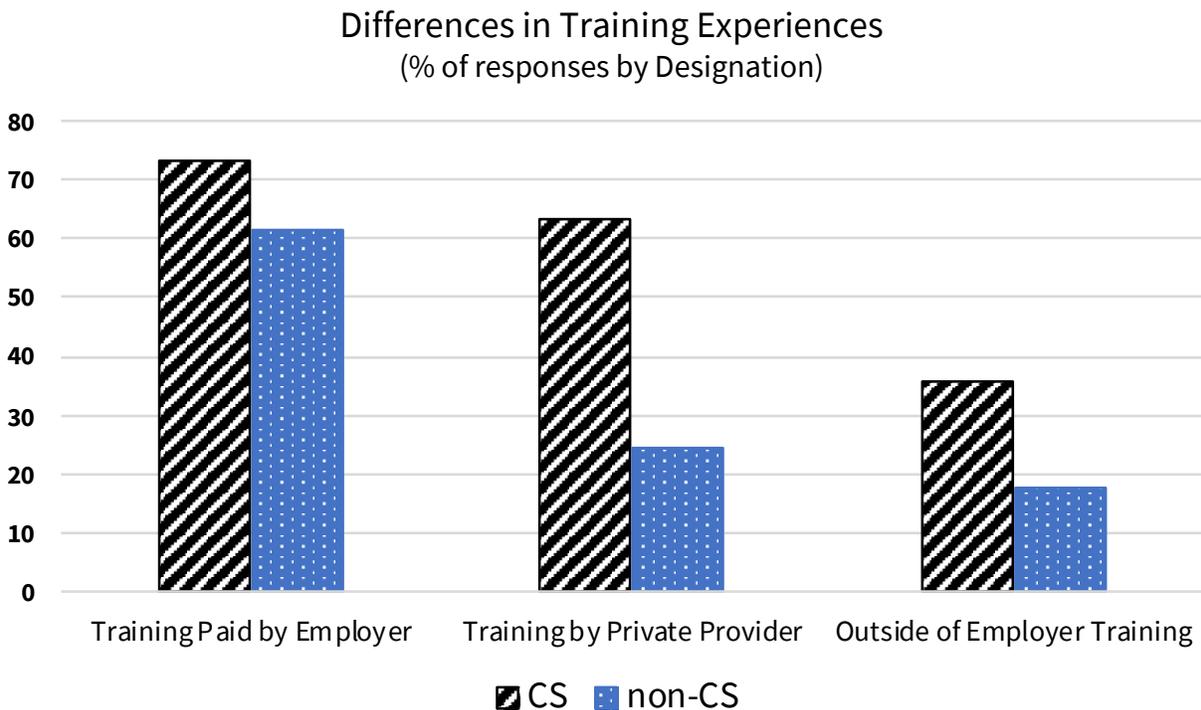
¹⁰ For further discussion of the qualitative comments see What We Heard.

¹¹ For further discussion see Key Insights.

Key Insights — Training Preferences and Trends

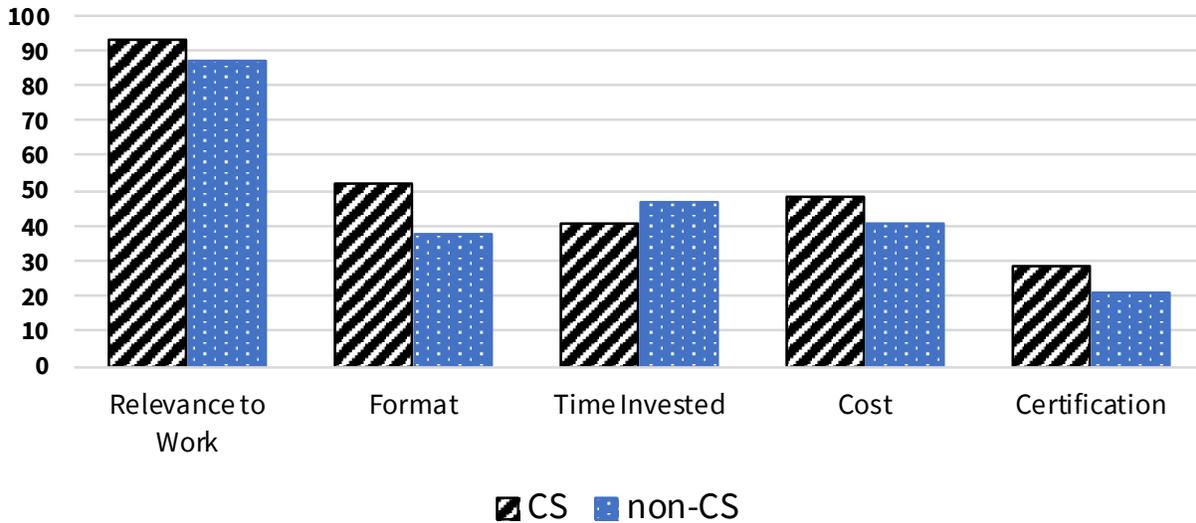
Existing patterns

Receive training: CS designates are more likely to have received training paid for by an employer; more likely to have received training from a private provider; and more likely to have sought training independently, outside of government than a non-CS designate. They are also more likely to find lack of funding as a barrier to training than their non-CS colleagues



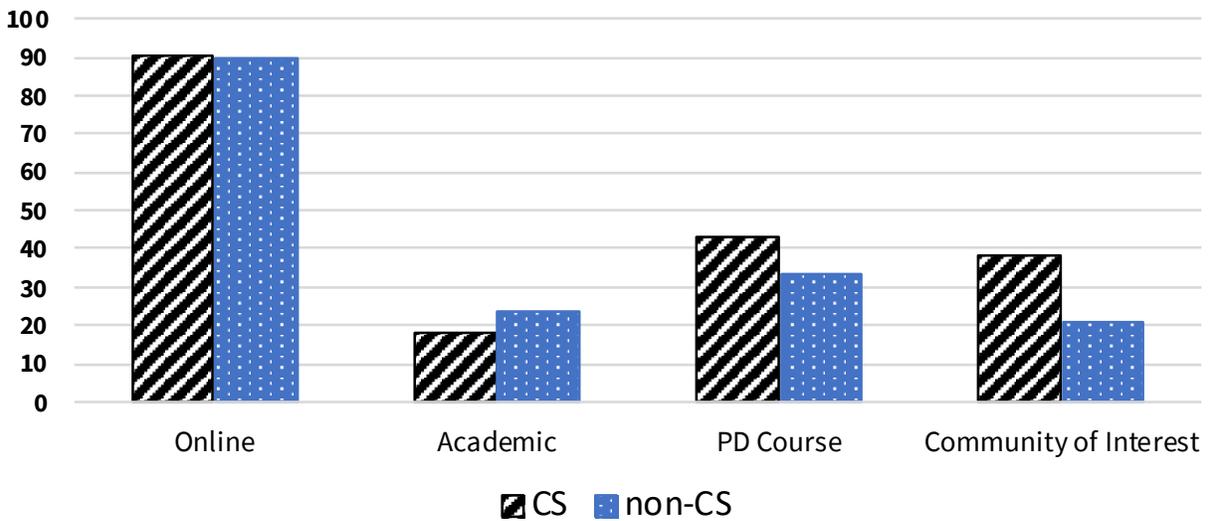
Relevance to work is a primary motivator for those seeking training. 93% of CS, and 87% of non-CS respondents indicate that the relevance of the training to their work is a consideration. In both groups, this is approximately twice the reporting level for the next most common factors (time, format, and cost).

Motivators for Training
(% responses by designation)



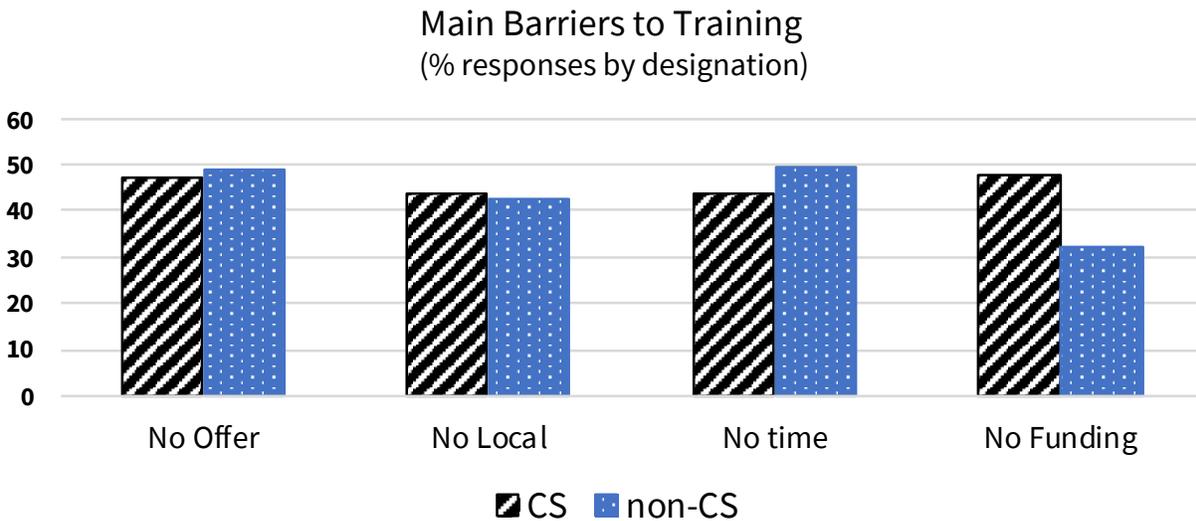
Format of training: Online training is overwhelmingly the most commonly used format, with 90% of both populations reporting having used online channels for training. The next most common for CS designates was Professional Development Courses at 43%, and 33% for non-CS.

Learning Resources Used
(% of responses by designation)



Possible Barriers

1. **Lack of knowledge:** 49% of CS, and 60% of non-CS respondents, indicate that they do not know the amount of their learning budget allowance.
2. **Lack of offerings, local opportunity, and time:** Both CS and non-CS (with percentages in the mid- to high 40s report that those three are important barriers to training.
3. **Lack of funding:** is more likely to be a barrier to CS than non-CS respondents, although it is worth noting that only 48% of CS and 32% of non-CS reported funding as a barrier.¹²



¹² Performed Chi Test for the distribution of CS/non-CS vs y/n funding as barrier (n=586, p=0.0022), vs. +/- 35 (n=596, p=7.83 E-5), vs. >10 / 10+ years of service (n = 590 p=0.0011).

Summary of What We Found

Within the What We Found section we present the analysis of the quantitative data from the Randomized Survey, as well as a comparison between the data collected in the Randomized and Open Survey.

In response to the question: *To what extent are skills in the key digital disciplines present in the GC?* the survey suggests that though the organization has an acceptable level of digital capacity at the basic level for non-CS respondents. At the advanced level, and for CS respondents as a whole, **there are possible insufficiencies, and there is a lack of excess capacity.**

Should demand increase, or capacity losses occur, the lack of excess capacity puts the GC in a potentially vulnerable position. The relative age of the CS designate population, the association of many of the disciplines examined with this community of technical specialists, and the cultural association of skill relevance with skill use, means that **the GC needs to develop a broader skill base before the cadre of CS designates begins to retire.**

Finally, it is important to note that not all digital disciplines are understood in the same way. Some digital disciplines are recognized and familiar to those outside the CS designation, while others are not.

Based on the data, we recommend building not only a sufficient amount of Advanced technical capacity, but also a sufficient familiarity within the larger organization for the potential of such capacity.

More specifically we draw attention to the following areas:

1. **Excess capacity:** While we can be reasonably confident that a sufficiency of skills / discipline capacity exists at the basic level across the organization, at the advanced level, even where we are reasonably sure we have enough capacity, **there is little in the way of a “cushion”.**
 - “Sufficiency”, in terms of this finding, means a number of individuals having capacity at a given level greater than the number formally required to have it. In other words, it is based on current, formal, skill requirements, NOT the anticipation of future trends.
 - Capacity, in terms of this finding, is evaluated here at the level of the organization as a whole. Having more people with skills than required to at this

level does NOT preclude shortfalls of capacity with departments or other sub-units.

The lack of a cushion / excess capacity makes the organization vulnerable to either a sudden loss of capacity (lay-offs, retirement, etc.), or to a sudden spike in the demand for a given capacity.

2. We identified four broad groups of categorical differences between the digital disciplines:
 - I. differences between skills broadly understood and used;
 - II. skills prevalent in CS but expected and are expected — by CS — to have broader implications;
 - III. skills the organization is largely aware of, but whose full use is yet to be determined; and
 - IV. skills that are concentrated in a very small community of dedicated experts.

Differences of these types have implications for the potential market for, and relative urgency of, different forms of training.

3. **Demographic differences in the CS community:** it is older, has spent more time in their positions, is predominantly male, and located disproportionately in the NCR. The CS community is a distinct group of technical specialists demographically different than the norm for the public service as a whole, and their relative age has implications for loss of capacity as this cadre retires.
4. **Use and relevance:** The proportion of people who say a discipline is relevant to them closely mirrors the proportion that says they use the discipline. Additionally, demand for training is most often driven by perceived work relevance.

Perceived work relevance and the demographic distinctiveness of CS designates, has implications for how skills are understood within the organization. The association of use and relevance may prove to be a barrier in convincing people of the need for knowledge of skills they do not use, or the utility of training *about* skills, rather than *in* them. Even where this barrier does not emerge, the association of work relevance with training requests could inhibit those seeking training in skills that are not immediately used in the work, but are relevant to the larger organization.

The close association of relevance to active use might be a focus for training and cultural change.

5. **Lack of opportunity:** as well as lack of knowledge of opportunity, were commonly reported barriers to training to build capacity. CS designates are more likely to report lack of funding as a barrier, but are also more likely to have training paid for by an employer. Online training was by far the preferred channel for training provision.

What We Heard

In this section we provide highlights from the thematic analysis of the Open-Ended Questions from both the Randomized and Open Surveys, as well as the Senior Leader Consultations. The thematic analysis identifies that the context of **digital disciplines involves people enabled by technology driving change**. Furthermore our analysis identifies **soft skills including collaboration, negotiation, adaptability, change management, and problem solving as equally important to the technical expertise**.

All the senior leaders expressed enthusiasm and a keen interest in digital disciplines and their application. The range of initiatives discussed and examples of digital strategies (e.g., Transport Canada) indicate there has been significant progress within some departments. Linking digital leaders with departments in the early stages of development of their digital strategies is recognized as a good strategy. Time and space to showcase digital successes would help departments and employees see possibilities and learn from others. Understanding digital disciplines in a public-sector context, and the need for a range of types and levels of training are identified as important. The following themes are found within the What We Heard section: positioning of digital disciplines; spectrum of training needs; movement towards digital, identifying additional disciplines; training priorities; barriers to training; training preferences; and sharing and learning.

Position Digital Disciplines

Across all the senior leader consultations we heard that *digital training* is broader than *technical training*. While senior leaders confirm the 30 digital disciplines as appropriate and relevant, they want to start the conversation at a higher level. We heard that the first priority should be to help all employees understand why digital disciplines and their application is important and necessitates a change management agenda. This larger context is understood as critical, and training should begin at a broad level before specific, more granular technical training.

Senior leaders talked about a vision of digital disciplines that encompass a new way of thinking about the relationships between government and citizens, and a re-imagining of how services are delivered. This re-imagining includes business and organizational implications and how technology could change service delivery. In order to do so, employees need understand the possibilities and potential of digital disciplines, prior to in-depth technical skills.

All of the senior leaders commented that in order for digital strategies to work, the training needs to bring together the different stakeholders, and help them understand how the new technologies can be leveraged to enhance the business lines. Senior leaders commented on the need to mix these “two worlds”, business and technology, and for both to understand possibilities from a service perspective.

This view is reflected in the comments of the survey respondents, both in the Random and Open survey. For example:

“What’s often missing in the world of IM/IT are a mix of business and technical skills that can improve the design of an overall solution. Such as business analysis, process engineering and change.”

A Spectrum of Training Needs

Thinking of digital training needs on a spectrum also emerged clearly from the Senior Leader Consultations and the answers to the open questions in both surveys. At the highest level, there is a call for what could be considered a “digital primer”, which would act as a short introduction to digital disciplines and their application. Senior leaders commented that CS staff, who may have deep technical knowledge, could use training in business literacy regarding digital.

Representative comments from the survey include the following:

“I am a senior manager and want training on what and how to leverage these disciplines, not on the disciplines themselves.”

“A general overview training would be great for people not fully immersed in these elements but requiring general knowledge to support their team.”

“There needs to be a recognition that there are different types of training needs. Those that will be doing digital design and development and those leading in the area (more high-level understanding).”

“Training should be made available on a graduated level from basic understanding to application of the concept.”

Beyond a digital primer, there is a recognition that different levels and job classifications have different training needs, and that those outside NCR may have different and specific needs.

“More for the leadership level: ethics, change management. At the working level: foundational skills such as web writing/ digital communications, business analysis/process optimization.”

“Need training at the Executive level — to understand concepts and make decisions.”

And a reminder that Employees may still need support for current technologies.

“Need for training on existing technologies.”

Survey respondents also provide specific examples of technical training they would like to have, including: C, Java, Linux, Python, R, statistical packages like STATA or SAS, Cognos V11, Tableau, and MS BI.

Finally, some senior leaders and survey respondents note that a place to “play” with current and emerging technologies would be helpful. In addition to training, a technology sandbox was mentioned.

Towards Digital

While there are excellent examples of digital leadership and new technological initiatives which were identified during the senior consultations, they also indicate that the government still needs to keep legacy systems running, and that paper is still prevalent.

“We came from a paperbound environment, need to move along the spectrum from paper, through digitization, to digital utilization, and transformation.” (Senior Leader)

While digital training is required, the knowledge to maintain and run the legacy systems is necessary. Additionally, consideration must be given to the transition from paper to digital. Thus, *interoperability* surfaced as a critical issue. Digital training needs to help employees understand how to consider transformation throughout these stages.

From the analysis of the comments across both surveys, there are a group of comments related to the fact the digital disciplines outlined in the survey did not resonate. A group of non-CS respondents did not feel the digital disciplines related to the type or level of training they needed. A representative comment of this type is included below.

“These digital training tools are very useful and applicable to building a responsive workforce, but they do not apply to much of what front line staff do in their day to day.”

Others indicate a desire for training, in anticipation of need. The following comments highlight the range of needs.

“I would like to receive training in the areas noted in order to be the next generation of public servant.”

“In my position there could be many more opportunities for content design and user interface design.”

“The work I will be doing will be changing significantly in the next 2 years as processes are modernized in ways I don’t know about yet. Don’t forget to provide all training opportunities to Regions.”

Training in digital literacy would help employees feel connected to a digital agenda, and to better understand how the agenda impacts their work.

Reinforcing the quantitative findings from the Randomized survey, responses to the open questions from the CS community indicate avidity for more advanced and technical training. CS respondents name machine learning, blockchain, and A.I. as areas they would like to have more training.

“I think artificial intelligence assistant tools, are the future. I currently work in tax publication reviews and feel that A.I. can automate the process while we work on support/guideline functions.”

Additional Disciplines

All senior leaders confirmed during the consultations that the 30 Disciplines were relevant and important. However, all senior leaders wanted to extend this list to include soft skills, and to emphasize the disciplines included were not just about technology, but about a new way of working (e.g., Agile Development). Digital training should also focus on the following:

- Change Management
- Collaboration
- Negotiation
- Ethical considerations around social media, Big Data, and A.I.
- Relationship Management
- Client Engagement
- Working in the “Open”
- Business transformation

From both the surveys, similar suggestions surface:

“In my environment we work in silos. Any training that stresses collaboration and open access would be more than welcome.”

“Training is required on the effects of service transformation on policy development. What will policy development look like in a digital service delivery context? What will be possible in 2-5 years?”

Respondents also identify areas including Information Management as a discipline they expected to see included.

“Digital Training also needs to encompass Information Management in order to shift the mindset from ‘unlimited’ disk space that public servants bought into when they moved from paper to digital.”

“I am surprised to not see search engine optimization and information retrieval as one of the key digital skills. We need to understand how search environments work to improve them.”

Training Priorities

In addition to wanting a broadly applicable digital primer, senior leaders identified *data* as a key training priority. Data literacy is considered essential for all employees so they could understand how to work with data, and to empower them to understand data analytics and business visualization tools. In line with senior leaders, survey respondents identify data literacy, data governance, data stewardship, data science, and data analytics and predictive analytics as important data topics.

Agile development and other new methods for product and service development also appeared as priorities. Senior leaders commented on waterfall methodology being ingrained in the culture, and how that needs to shift to *agile*. Along with agile development, design thinking, and the disciplines related to user research and user experience, are highlighted as critical skills that are needed now. Similarly, survey respondents highlighted that they feel they could be doing more, including receiving training, to be user centered.

While the results from the survey indicate that most training focusses on job specific disciplines, respondents indicate they would like to have training on skills they may need or anticipate needing. The open ended question responses clustered around wanting to use the cloud. Emerging areas such as A.I., machine learning, and blockchain are also topics of high interest.

Another issue that came to the fore from discussions with senior leaders is digital training that focuses on digital in a government setting. The concern is that many of the external training options do not provide digital transformation techniques within a public-sector context, where there are different ethical, privacy, and budget considerations.

Further, many senior leaders note feeling overwhelmed by the increasing amount of digital training options. They would appreciate a curated and vetted list (e.g., from the Canada School of Public Service) so they know which training options are worth the investment.

Barriers to Training

The answers to the open-ended questions add more depth to the quantitative data showcased in What We Found. A diverse range of comments recorded under “Other” in response to Q 27 (*In general, what barriers have you faced in accessing training and learning opportunities?*) also provided a greater understanding of barriers perceived by employees.

In response to factors that have affected training decisions in the past, respondents provide answers in the following themes:

1. **Employer’s support/ approval:** Perceived lack of employer’s support/approval included both lack of support for training and budget management related issues. Employees suggested that they felt training was not a priority for management and/or that digital training was not aligned with their personal development plans (training for only job specific skills). Some employees felt a disconnect between national mandates and specific departmental practice following denied training requests at their departmental or office level due to operational requirements. Some employees felt travel restrictions discouraged conference attendance, experienced repeated denial of for training opportunities, and felt a general lack of buy-in by management. Employees also mentioned budget related issues (including a small training budget) and high management turnover as barriers to access.
2. **Training delivery** issues were also flagged as a barrier, including delivery of instruction and courses, availability, quality of the content and instructors, and technical issues. For example, some respondents identify that they had been encouraged or instructed to take online courses, which did not suit their learning style. Or they felt the job requirements were complex/specialised and needed more targeted discussion with the instructor. Respondents also commented that the courses they required were not available or were cancelled. The need for higher quality courses or instruction is also singled out as an issue.
3. **Technical issues:** Respondents highlighted technical difficulties related to training courses; at times they had not been able to join a webcast because of technical or

network difficulties. The government firewall also can prevent access to specific platforms. They also noted missing out on training opportunities because they were not able to use the online payment (PayPal) interface from work.

4. **Ease of access:** Barriers around the ability to access training were also noted. Employees noted that restrictions around travel and location of training opportunities (e.g. relevant conferences or courses only in the US, location of travel too far/costly). Length of time away from the office and whether the office was/would be short-staffed are also identified as barriers to access.
5. **Level of training:** Other barriers identified included courses not being available at the level that they were at (i.e. too introductory and not practical) and course design not integrating previous knowledge and training.

Training Preferences

Senior leaders spoke of the range of training available, and the need for training to fit with work. Flexible options such as online training and resources are of interest, but many also commented on the strength of bringing employees together from diverse departments and designations for training, where they could also learn from each other. Senior leaders discussed a mixed approach, where employees are brought together for training, share and implement learning in their workplace, and subsequently reflect and iterate. Having employees learn in interdisciplinary teams and modelling their work was also suggested.

From the survey respondents, comments to the “Other” category for Q 28 (*What resources do you rely on to learn a new skill or tackle a problem?!*) highlighted that respondents employ a range of creative strategies and resources to help themselves learn. In addition to the options in the survey four broad categories of resources were identified, in addition to the options in the survey:

1. Learning from other people/person,
2. Training Resources,
3. Coaching/mentoring/job shadowing, and
4. Professional contacts/associations.

Respondents indicate that they most frequently learn from their co-workers and peers. They seek out those known to be “experienced” to help with specific issues. Respondents also use their own personal networks, outside work, to learn. They use self-learning techniques, through training programs and courses, and free resources. Some free resources and videos are accessed through the internet or public libraries. A smaller number of respondents talk about how they have used personal coaching, mentoring from co-workers, and job-shadowing as ways to learn new skills. Professional associations, LinkedIn, and personal business contacts are also recognized as learning channels.

Sharing and Learning

A key opportunity for digital training that emerged from the consultations with senior leaders included the need to communicate better, as well as share and learn from the digital success stories across departments within GC. Ideas include having time to share experiences during the Monthly Deputy Minister breakfasts, or linking departments just starting their digital strategies with those who are more advanced.

Sharing and learning from others, is also determined as a way to resolve the potential tension between digital techniques and business constraints. Digital techniques necessitate agile strategies — such as prototyping and onboarding — but must exist within an environment with limited budgets and which clear outcomes. Digital transformation entails the recognition that the process itself is part of the change.

As highlighted in Training Preferences, respondents are currently using sharing and learning techniques to help gain knowledge. Formalized mentoring systems or access to experts would enhance the existing informal techniques.

Summary of What We Heard

From the qualitative data collected through the Senior Consultations and the responses to Open-Ended survey questions we gained a wider perspective on the key digital skills that were perceived to be necessary for governments to thrive in a digital era, the extent to which these disciplines were present, as well as perceptions of the current digital training capacity and needs, as well as how training needs can be improved going forward.

Key Findings from the Senior Leader Consultations

1. **Excitement for digital disciplines:** The conversations with senior leaders highlight a strong awareness of, commitment to, and excitement about digital disciplines and their application. Senior leaders identify digital strategies and projects that demonstrate the journey through digital transformation.
2. **Need for base understanding:** The first priority articulated by senior leaders is to provide all employees with an understanding of **why digital disciplines and their application are important, how it will be changing the way they work, and what they do**. This change management agenda is essential for the necessary transformation that digital will bring.
3. **Awareness of digital disciplines:** The senior leaders as a group confirmed that the 30 digital disciplines were relevant and important, and that they will help guide their training plans for their departments.
4. **Key digital disciplines:** Of the 30 digital disciplines, ones related to **Agile Development, Data, Product Development and Open** rose to the surface. Most leaders feel that specialists and procedures in privacy and security related disciplines are currently supporting needs.
5. **Importance of soft skills:** The senior leaders emphasize the importance of soft skills. The application of digital disciplines requires a workforce strong in problem solving, collaboration, interdisciplinary, negotiation, and agile development methods. Additionally, ethical use of digital strategies and tools is highlighted as an area of increasing significance.
6. **Gap in Training:** All the senior leaders are able to list off a range of technical training, at all levels — online training, full courses, programs on data analytics. They would

appreciate a curated and vetted list to help them determine what training is worth the investment, and is credible. Another key issue is to provide digital training for a public-sector organization. Many spoke to the need to position digital within the specific dynamics of government.

Key Findings from the Open-Ended Questions

From the responses to the open-ended questions, in both the Randomized and Open surveys we gained a more nuanced understanding of the statistics.

- The reaction to the 30 digital disciplines is diverse. There is clearly a group (at least 6%) within the non-CS respondents who could not relate to the digital disciplines and found them too technical.
- Interest in digital training and training related to data, as well as wanting to work in the cloud and with agile development methods.
- CS respondents, in particular, want training in emerging areas such as AI, machine learning, and blockchain.
- Some respondents expressed interest in digital training, but felt that the digital disciplines do not directly affect them in their jobs. Because of this lack of direct connection they feel that approval for training might not be given.
- Budgets are perceived a significant barrier to accessing training; this opinion is more prevalent among non-CS respondents.
- There is interest and enthusiasm for digital training, and the sense that many respondents want access to training to help them adapt and thrive in a changing workplace.
- Employees are currently using a range of informal methods to learn digital skills, as well as formal courses.

Main Findings and Recommendations

Based upon the preceding analysis of the environmental scan, the Randomized and an Open survey, and Senior Leader Consultations, it is apparent that the GC's training capacities for digital disciplines are at an important crossroads.

The GC's workforce represents a large, diverse talent pool that is a key asset for both current performance and the ongoing digital transformation. There is widespread recognition and use of the digital competency disciplines identified by the survey, widespread recognition and usage of such skills at the basic level, and significant commitments to ongoing training and adaption at both personal and organizational levels.

Bolstered by initiatives such as the creation of Canadian Digital Service, the GC's new Data Strategy Road Map, and the Digital Academy, there is also clearly excitement for digital disciplines and their application, and enthusiasm for the opportunities presented to public-sector organizations to become more agile and innovative. Delivering citizen-centric services in digital formats is at the heart of public-sector transformation.

There are, however, challenges rooted in demographic and professional cleavages across both technical (i.e., CS) and non-technical (non-CS) segments of the workforce. Furthermore, there is a growing awareness that effective digital strategies and execution capacities require integrative and collaborative actions across these traditionally distinct groups. At the same time, training is recognized. Training and professional development opportunities which would expand knowledge within public servants are fragmented and also elicit questions about quality and cost differentials across learning channels and venues, and different providers.

A heightened sensitivity to the fact that the digital skills required for many of today's jobs are not necessarily those that will be central to tomorrow's shows that training and development must be anticipatory, which is fundamental for ongoing digital skills adaption and relevance. This point is especially salient within an increasingly competitive and globalizing workforce, where public-sector organizations must compete with other sectors, as well as within itself, to recruit and retain talent.

The following high-level recommendations are meant to provide a more holistic and anticipatory basis for improving, and in some respects, recasting, training and development capacities within the GC — particularly as they pertain to the digital enablement of service delivery and government operations more widely.

Leverage the Excitement for Digital Development

The GC should seek to leverage the current excitement of digital discipline development and application permeating today's public-sector and translate this enthusiasm into expanded and novel opportunities for both personal and professional development. As part of a holistic workforce development strategy, every effort should be made to bridge such opportunities with tangible undertakings that facilitate public value creation through digital innovation.

Continually Embrace a Digital Vision

Building on recent initiatives, senior leadership in government should demonstrate a commitment to creating a digitally-enabled public service and to branding the public service as a cutting-edge workplace, where digital skills development and learning are pillars of organizational culture. Going forward, regular mechanisms for employee consultation and dialogue should be developed in order to engage employees in continuous efforts to refine and improve training and learning opportunities — and to strengthen ties across training, innovation and performance.

Broaden and Deepen Digital Literacy

This study reveals the importance that all employees have a broad understanding of digital challenges and opportunities; in particular, the emerging possibilities for transformation of service delivery, policy development, and connecting with citizens. A digital primer should be created to give all employees — especially new employees — a basic and shared conceptualization of a digital disciplines and their application. The digital primer could facilitate the alignment of training and development capacities across this shared cultural awareness and help employees gain a better understanding of digital transformation.

Create Digital Showcases

Recording experiences, showcasing progress, and devising shared platforms for knowledge generation and learning emerged as an important theme from survey comments and interviews. More frequent digital “Show and Shares” organized by CDS and partners could increase awareness, and highlight key successes throughout the government. Furthermore,

departments who are further ahead on their digital journey could be partnered as mentors with departments who are in the initial stages of digital development. Stories of successful digital discipline application should be articulated, highlighted, and shared; for example, during dedicated time at Deputy Ministers meetings.

Embrace Agility and Design

The creation of the Canadian Digital Service (CDS) is predicated upon the creation of a citizen-centric approach to digital service innovation that necessitates new digital design competencies on a government-wide basis. There is an increased recognition that infrastructure development, investments and systems integration needs to be agile. Similarly, human-centred service design (HCSD), an innovative approach to design, requires the integration of technical digital disciplines and as well as softer skills — such as empathy and critical thinking. Training and development capacities should reflect these over-arching principles. New pathways for existing public servants to cultivate a shared appreciation of the principles’ importance should aim to transcend specific job tasks and reflect more holistic and integrative outcomes.

Cultivate a Data-Based Culture

Data management and analysis are identified as critical skills by the environmental scan, surveys, and consultations. Understanding how to manage and work with data is essential to several of the digital disciplines including: data visualization, data science, and business intelligence tools. As the GC’s Data Strategy Road Map articulates:¹³

“How the Government of Canada collects, manages and governs data — and how it accesses and shares data with other governments, sectors and Canadians — should change. The Government of Canada has a responsibility to ensure its workforce has the skills and tools it

¹³ Executive Summary, p. 4. Source: http://publications.gc.ca/collections/collection_2018/bcp-pco/CP22-170-2018-eng.pdf

needs to ethically leverage data to support the public good, while protecting the sensitive and personal data of Canadians”.

Prioritize Gender and Diversity within Digital Inclusion

Our study shows that the CS cadre of workers within the GC is proportionally more male, white, and older than the workforce at large (and the Canadian population as a whole). Conversely, the senior ranks of the digital government community are increasingly diverse; women and minority groups are playing an increasingly prominent leadership role. While the survey results suggest that most respondents do not view gender as a barrier to accessing training opportunities and developing digital skills (even as some groups remain clearly under-represented), a diverse and inclusive workforce — encompassing both CS and non-CS cadres — should be a constant objective in order to be responsive to the varied service opportunities and requirements across the entire citizenry.

Create Innovative Digital Training Repositories

In order to foster ongoing awareness and interest in digital training, an online repository of key resources, trends, commentaries etc., should be created. Public servants could comment and discuss digital trends and issues — and help identify emerging challenges and priorities using a collaborative and open platform. Moreover, sharing of experiential learning from varied training opportunities across the public service can enhance organizational learning and competency-sharing across the public service.

Anticipating and Forecasting Emerging Skills and Workforce Capacities

Building on the work of the Digital Academy within CSPS, the GC and Canadian Digital Service (CDS) should work with key stakeholders (including academia, industry and other government levels) to devise a collaborative research strategy devoted to anticipating emerging patterns in digital competencies and skills and workforce development. The federal government’s Future

Skills Lab and the BC Government’s Innovation Hub are two examples of potential contributing partners. The Institute for Citizen-Centred Service (ICCS) should be leveraged as an inter-governmental venue to share insights and forge collaborative and holistic workforce development strategies for the public-sector as a whole.

Specific Training Reforms

In addition to the broad recommendations above, and within an organizational setting inspired and facilitated by the preceding recommendations, more granular reforms to existing and potential training and development capacities can be envisioned.

The following suggestions build on our analysis and provide a basis for future alignment across digital innovation, training and development, wider and more holistic human resource planning and investments.

Continually Measure and Refine Digital Training Across Disciplines

As highlighted in the recent Public Policy Forum report on building a digital-ready public service, there is a need to ‘Benchmark and Develop Accountability Mechanisms’. The process of creating and testing the 30 digital disciplines has generated a foundational tool and benchmark statistics, which can be used to continuously frame and measure digital competencies and training. Ongoing feedback and review of these digital disciplines should expand to incorporate non-technical aspects of digital performance including softer-skills such as collaboration, ethics, and change management.

Create Differentiated Training Streams

Just as employees experience differing utility, levels, and types of digital skills, the role the digital skills play in the organization differ. As an enhancement of the preceding recommendation (Continually Measure and Refine Digital Training), we suggest devising streams of training that account for different training priorities and can evolve over time. These differentiated streams should include:

- **Familiarity training** intended not to develop hard skills, but to recognize the potential application and utility of skills with emerging importance.

- **Ground-level** training at an intermediate level between familiarity and job-deployable competency, to create a pool of individuals who can rapidly be brought up to speed in order to meet impending shortfalls in technical or specialist skills.

Integrate Digital and Human Resources Processes

This research identifies a disconnect between digital skills and employees' understanding of its connection to their work, as well as a lack of awareness about funding for digital training as major issues. In order to holistically integrate digital disciplines and their application for all employees across the GC, an understanding of relevance and access needs to be embedded into key human resource processes. For example, assessing and adding the digital disciplines to job descriptions would increase understanding and awareness of digital disciplines and their application. Equally important is for learning plans to include a digital category; employees should have increasing yearly goals related to developing digital disciplines and learning about their application.

Foster A More Proactive Training Culture

Currently, training and skill relevance are closely tied to immediate work relevance. This emphasis on immediacy has the potential to inhibit broader training initiatives (where “soft” skills are harder to define in job-relevant terms), and in building anticipatory capacity. We recommend shifting from *reactive* to a *proactive* training culture. Rather than providing training strictly based on immediate work requirements, a proactive culture could include initiating pilot programs that make training more accessible on an anticipatory basis. Develop a Suite of Digital Training Options

To support the current and emerging digital training needs an adaptive framework for training, which incorporates different streams, channels, and modes, should be developed.

- **Online training:** Digital training online has many advantages. Both senior leaders and survey respondents indicated online allows for the greatest flexibility in training. It can be accessed by all regardless of location, can fit into schedules, and is always available (provided there is adequate infrastructure). However, the change management aspects of digital training may best be taught in other ways. Employees also comment that online delivery does not fit all types of learning. Therefore, online training options should also include interactive tools, allow for collaboration in groups, and incorporate “soft” digital skills.

- **Shared learning:** Bringing targeted employees together to directly experience the softer skills as well as the technical training, and subsequently share their own experiences, could serve to augment online training. Face-to-face training, which involves creating interdisciplinary teams of employees, to actively learn using human-centred service design or agile methods would create a group of digital discipline leaders, who could then train those within their departments.
- **Mix of training options:** Ultimately, a blended mix of online delivery and in-person venues will be optimal for the workforce as a whole.
- **Individualized learning:** Individual learning plans should enable staff across all levels to proactively select from a suite of training offerings and delivery channels and to pursue skills development for both current positions and anticipated needs.

Apply Gender-Based Analysis and Diversity Assessment Tools to Enhance Performance

Training and development strategies should account for demographic, diversity, and gender disparities across the existing workforce. As a new report published by the Public Policy Forum (Cukier, 2019) articulates: “Progressive, high-performing organizations value diverse perspectives at every level”. New tools, such as [Gender Based Analysis Plus](#), inclusive design tools, and the [Diversity Institute’s Diversity Assessment Tool](#), provide systematic approaches to open up the possibility of new approaches to “mainstream” inclusion.

Deepen Inter-Governmental Collaboration

As provincial and local governments devise their own digital service and operational digital discipline capacities, a significant risk of heightened competition for skilled workers between governments exists. An intensification of talent pools within the National Capital Regional (NCR) and major urban centres is likely to accompany this change. A multi-level framework for workforce development and digital skills training should be developed by the CDS and the CSPS’s new Digital Academy. The formation of collaborative, regionally-based, and multi-sector training initiatives that seek to bring together federal workers outside of the NCR and public servants from other levels of government would be key to success.

Conclusion

There are three overall take-away lessons from this study. First, there is a growing excitement around digital within the GC that reflects both the messaging and commitments of senior leaders within the GC in making digital discipline development and application a major priority. Secondly, the current workforce of the GC is both educated and keen to engage digital disciplines and their application to both internal operations and external service delivery. Third, as with all organizations, the GC has to adapt workforce training and development strategies in order to address demographic trends, competitive marketplace pressures, and accelerating technological change.

Looking ahead, these challenges will necessitate systemic and holistic reforms that involve organizational structures and processes, human resource policies, and workplace culture. Current GC innovations, such as the creation of the Digital Academy and Talent Cloud, are indicative of an openness to experimentation. Capturing and building upon the learning from such initiatives is essential going forward in order to develop GC-wide capacities for human capital recruitment, retention, and constant renewal.

It is also equally essential that this study serve as a platform for ongoing research on the themes addressed in the report including notions of anticipatory capacities for how public -sector competencies are likely to evolve in the future, and how training and development capacities should adapt accordingly. Going forward it is certain that there will be a growing diversity of training platforms and channels available to GC staff, and that the requisite will grow. The mix of content and delivery of training will vary considerably for different sorts of individuals based on a range of individual factors such as age, experience, professional background, and work-home balance (to name but a few). Additional research on how organizations can facilitate individualized training and learning processes, while ensuring a cohesive workforce and a basic level of digital literacy across the GC, is thus essential.

Strengthening capacities for knowledge sharing amongst public servants across the GC (and other government levels) through shared digital platforms is another promising direction for additional research in order to better understand. Gaining understanding of the incentives and impediments to information sharing and how training participation can be best leveraged into improving job performance and overall organizational outcomes will benefit the GC. Research into hybrid skill sets enjoining hard technical skills and softer behavioural skills is essential in order to transcend the rigidities and constraints of traditional human resource policies and job specifications, and to enable. Enabling public-sector organizations to forge more interdisciplinary and collaborative teams to address integrative challenges is vital.

The GC should make every effort to continually engage the workforce in an open and meaningful dialogue on the potential for training and development improvements across both individual and corporate levels. The workplace culture of tomorrow will depend on human empowerment and creative forms of in-person and virtual interactions and listening to — and learning from — the experiences and insights of public servants across all organizational levels. The public service workforce provides the richest of source of innovation for current and future investments into ensuring the digital readiness of the GC.

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Appendix A — Full Randomized Survey (English Version)

Digital Training Needs Survey

The [Canadian Digital Service](#) is working with the [Faculty of Management at Dalhousie University](#) to conduct a training needs analysis to help build digital literacy and capacity across the Government of Canada. Results from this research will help to inform the development of new training and learning opportunities for public servants that meet user needs.

As part of this work, this survey seeks to assess the digital training needs of public servants related to 30 emerging disciplines that were identified from leading-edge research and specialists in these areas.

You are being asked to complete the survey because your work shapes the delivery of key government services like filing tax returns or applying for Canadian citizenship. A random sampling approach is being used to select individuals across seven select service organizations to provide statistically accurate results.

While your participation is important to this work, it is voluntary and your responses will remain anonymous. By taking part in the survey you are consenting to your data being collected and aggregated. Aggregated results of the survey and other qualitative research on the digital training landscape will be shared publicly on digital.canada.ca.

Before you begin, please note that the survey will take approximately 15 minutes to complete, and will be available until 16:00 (Pacific Time) Monday, November 19, 2018. Thank you for participating.

For technical assistance, please contact dalcdsta@dal.ca.

For all other questions, please contact cds-snc@tbs-sct.gc.ca.

Privacy Notice

The information in this survey is collected by the Treasury Board of Canada Secretariat (TBS) under the authority of the *Financial Administration Act* for the purpose of building digital literacy and capacity across the Government of Canada and informing the development of new training and learning opportunities. The survey is being administered by Dalhousie University on behalf of TBS using the third-party online service [SimpleSurvey](#). For additional information on how SimpleSurvey stores and protects information, please see their [Frequently Asked Questions](#).

Completion of this questionnaire is voluntary. Any personal information collected in this survey will be used and protected in accordance with the *Privacy Act* and as described in Personal Information Bank PSU 938 (Outreach Activities) and PSE 905 (Training and Development).

Aggregated survey results will be shared publicly on digital.canada.ca, and results grouped by department and agency may be shared with your home organization for the purpose of learning and development program evaluation. Because survey responses are not attributed to any one individual, TBS will not be able to provide rights to access or correction of information you have submitted.

If you have any privacy concerns, please contact the TBS Access to Information and Privacy Coordinator by email at atip.aiprp@tbs-sct.gc.ca. If you are not satisfied with TBS's response to your privacy concerns, you may wish to contact the [Office of the Privacy Commissioner of Canada](http://www.priv.gc.ca).

START THE SURVEY

SECTION 1: DEMOGRAPHIC INFORMATION

In this section, you will be asked to provide demographic information. The information will be used to assess, at an aggregate level, where demand for training is currently found in the federal government. The information gathered is not intended, and will not be used, to identify specific respondents.

1. Please indicate your department or agency:

- a. Canada Revenue Agency
- b. Department of National Defence
- c. Employment and Social Development Canada
- d. Immigration, Refugees and Citizenship Canada
- e. Shared Services Canada
- f. Transport Canada
- g. Veterans Affairs Canada
- h. Other, please specify: _____

2. Please indicate your occupational group:

- a. CS
- b. EC (or ES)
- c. PM
- d. IS

e. SP

f. Other, please specify: _____

3. Please indicate your substantive level:

a. 1

f. 6

b. 2

g. 7

c. 3

h. 8

d. 4

i. 9

e. 5

j. 10

4. How many years have you worked in your current position?

a. Less than 2 years

b. 2 years up to 5 years

c. 5 years up to 10 years

d. 10 years or more

5. How many years have you worked in the federal public service?

a. Less than 2 years

b. 2 years up to 5 years

c. 5 years up to 10 years

d. 10 years or more

6. In what range does your age fall?

a. 18 to 25 years

b. 26 to 35 years

c. 36 to 45 years

d. 46 to 55 years

- e. 56 years or more
- f. Prefer not to say

7. What is the highest level of education you have completed?

- a. Secondary or high school graduation certificate or equivalent
- b. Diploma or certificate from a community college, CEGEP, institute of technology, nursing school, etc., or a trades certificate or diploma
- c. University certificate or diploma
- d. Bachelor's degree
- e. University certificate or diploma above the bachelor's level including a master's degree, a professional degree or an earned doctorate

8. How do you self-identify in terms of gender?

- a. Male
- b. Female
- c. Non-binary
- d. Prefer not to say

9. Do you self-identify with any of the following groups? (check all that apply)

- a. Indigenous
- b. Persons with disabilities
- c. Member of a visible minority group (persons, other than Indigenous)
- d. None of the above

10. Where do you work?

- a. National Capital Region
- b. Alberta
- c. British Columbia
- d. Manitoba
- e. New Brunswick
- f. Newfoundland and Labrador
- g. Northwest Territories
- h. Nova Scotia
- i. Nunavut
- j. Ontario
- k. Prince Edward Island
- l. Quebec
- m. Saskatchewan
- n. Yukon

SECTION 2: TRAINING NEEDS

Building digital skills is increasingly important to delivering services to Canadians. In this section, you will be asked to provide a response to each question that best describes your knowledge of and experience with each digital discipline as it relates to your work and your career development. Definitions are provided for each discipline to assist you with your responses.

KNOWLEDGE

11. What do you know about each of the following disciplines?

Discipline	No knowledge <i>First time reading this definition.</i>	General understanding <i>Have explained it to others.</i>	Can apply <i>Have trained others.</i>
<p>Agile development: An approach to product, service or software development that encourages multi-disciplinary teams to build things quickly, test what they've built, and iterate their work based on regular feedback with users.</p>			
<p>Continuous deployment: A process that relies on infrastructure that allows developers to test and deploy new code automatically.</p>			
<p>Automated testing: Quality testing that is done automatically via computer, as opposed to manual testing by a human being.</p>			
<p>Accessibility audits: Evaluation to ensure a product or service meets minimum accessibility standards (typically the Web Content Accessibility Guidelines 2.1) and works with common assistive technologies.</p>			
<p>Assistive technologies: Hardware or software intended to compensate for or alleviate an injury, disability or illness or to replace a physical function.</p>			
<p>Cloud computing: The on-demand delivery of services through a network of online remote servers collectively known as a cloud.</p>			
<p>Artificial Intelligence: Characteristics of human intelligence, such as problem solving and learning, exhibited by computers or other machines.</p>			

Discipline	No knowledge <i>First time reading this definition.</i>	General understanding <i>Have explained it to others.</i>	Can apply <i>Have trained others.</i>
Open source coding: Software code that is made freely available for others to modify and share, and complies with the <i>Open Source Definition</i> .			
Open source standards: The set of criteria software must meet in order to receive an open source license.			
Secure coding standards: A set of best practices in programming aimed at minimizing security vulnerabilities.			
Development operations: Software development model in which development and operations teams work together in a closely collaborative manner.			
Cyber security: Technologies, processes, practices, and response and mitigation measures designed to protect networks, computers, programs and data from attack, damage or unauthorized access.			
Vulnerability assessments: An evaluation to determine the susceptibility of critical assets to attacks or interference from threats and hazards.			
Intrusion detection: Gathers and analyzes information from various areas within a computer, or a network to identify possible security breaches, including both internal and external intrusions (from within and outside of the organization).			

Discipline	No knowledge <i>First time reading this definition.</i>	General understanding <i>Have explained it to others.</i>	Can apply <i>Have trained others.</i>
Identity / access management: Tools, such as passwords that allow a system to identify users and grant them the appropriate access.			
Recognizing private information: The ability to identify information that is protected by privacy legislation.			
Privacy procedures / policies: A set of protocol on the responsible collection and handling of private information.			
Recognizing privacy threats: The ability to identify common privacy threats, including phishing, spear phishing, pharming and vishing scams.			
Addressing privacy breaches: The unauthorized access and use of personal information.			
Data / social media analytics: The interpretation of data, often for decision-making purposes, such as human behaviour on social media sites or apps.			
Business intelligence tools: Software or systems that are used to process data for decision-making purposes.			
Data visualization: The use of images such as graphs to present data.			
Machine learning: The ability of a computer to use examples or past experiences to predict outcomes in new situations.			

Discipline	No knowledge <i>First time reading this definition.</i>	General understanding <i>Have explained it to others.</i>	Can apply <i>Have trained others.</i>
Sanitizing data: Checking data to neutralize the potential danger, to render it harmless.			
Data science: An interdisciplinary field using scientific methods, processes, algorithms and systems to extract knowledge and insights from data in various forms (both structured and unstructured). This is similar to data mining that includes the act of identifying patterns and relationships within large data sets.			
Design thinking: A multidisciplinary process to tackle complex problems by understanding human needs and testing prototypes with users.			
User research: Inquiry into the needs, context, and behaviours of service users, which seeks to understand a person’s goals and needs in order to identify a problem to be solved.			
Content design: The planning and creation of content for user-centred products and services, including hierarchy, flow, and structure of information.			
User experience design: Enables designers and developers to prioritize people’s emotions, attitudes, and end-to-end journey while using a particular product or service.			
User interface design: Focuses on anticipating what users might need to do, ensuring that a product is easy to access, understand, and use.			

RELEVANCE

12. Are the following digital disciplines directly related to your current work?

<i>Discipline</i>	<i>Yes</i>	<i>No</i>
Agile development		
Continuous deployment		
Automated testing		
Accessibility audits		
Assistive technologies		
Cloud computing		
Artificial Intelligence		
Open source coding		
Open source standards		
Secure coding standards		
Development operations		
Cyber security		
Vulnerability assessments		
Intrusion detection		
Identity / access management		
Recognizing private information		
Privacy procedures / policies		
Recognizing privacy threats		
Addressing privacy breaches		

<i>Discipline</i>	<i>Yes</i>	<i>No</i>
Data / social media analytics		
Business intelligence tools		
Data visualization		
Machine learning		
Sanitizing data		
Data science		
Design thinking		
User research		
Content design		
User experience design		
User interface design		

USAGE

13. Are the following digital disciplines directly related to your current work?

<i>Discipline</i>	<i>Never</i>	<i>Once or twice a year</i>	<i>On a monthly basis</i>	<i>On a weekly basis</i>
Agile development				
Continuous deployment				
Automated testing				
Accessibility audits				
Assistive technologies				

<i>Discipline</i>	<i>Never</i>	<i>Once or twice a year</i>	<i>On a monthly basis</i>	<i>On a weekly basis</i>
Cloud computing				
Artificial Intelligence				
Open source coding				
Open source standards				
Secure coding standards				
Development operations				
Cyber security				
Vulnerability assessments				
Intrusion detection				
Identity / access management				
Recognizing private information				
Privacy procedures / policies				
Recognizing privacy threats				
Addressing privacy breaches				
Data / social media analytics				
Business intelligence tools				
Data visualization				
Machine learning				
Sanitizing data				
Data science				

<i>Discipline</i>	<i>Never</i>	<i>Once or twice a year</i>	<i>On a monthly basis</i>	<i>On a weekly basis</i>
Design thinking				
User research				
Content design				
User experience design				
User interface design				

OUTLOOK

14. Over the course of the next year, will you use any of the following digital disciplines in your daily work?

<i>Discipline</i>	<i>No Not expected.</i>	<i>Yes Immediately.</i>	<i>Yes Within the year.</i>	<i>Don't know</i>
Agile development				
Continuous deployment				
Automated testing				
Accessibility audits				
Assistive technologies				
Cloud computing				
Artificial Intelligence				
Open source coding				
Open source standards				

<i>Discipline</i>	<i>No Not expected.</i>	<i>Yes Immediately.</i>	<i>Yes Within the year.</i>	<i>Don't know</i>
Secure coding standards				
Development operations				
Cyber security				
Vulnerability assessments				
Intrusion detection				
Identity / access management				
Recognizing private information				
Privacy procedures / policies				
Recognizing privacy threats				
Addressing privacy breaches				
Data / social media analytics				
Business intelligence tools				
Data visualization				
Machine learning				
Sanitizing data				
Data science				
Design thinking				
User research				
Content design				
User experience design				

<i>Discipline</i>	<i>No Not expected.</i>	<i>Yes Immediately.</i>	<i>Yes Within the year.</i>	<i>Don't know</i>
User interface design				

JOB-SPECIFIC TRAINING

15. What job-specific training is required for your current job?

<i>Discipline</i>	<i>None Not applicable, or already trained</i>	<i>Basic General understanding.</i>	<i>Advanced Thorough knowledge and use.</i>
Agile development			
Continuous deployment			
Automated testing			
Accessibility audits			
Assistive technologies			
Cloud computing			
Artificial Intelligence			
Open source coding			
Open source standards			
Secure coding standards			
Development operations			
Cyber security			

<i>Discipline</i>	<i>None</i> <i>Not applicable, or already trained</i>	<i>Basic</i> <i>General understanding.</i>	<i>Advanced</i> <i>Thorough knowledge and use.</i>
Vulnerability assessments			
Intrusion detection			
Identity / access management			
Recognizing private information			
Privacy procedures / policies			
Recognizing privacy threats			
Addressing privacy breaches			
Data / social media analytics			
Business intelligence tools			
Data visualization			
Machine learning			
Sanitizing data			
Data science			
Design thinking			
User research			
Content design			
User experience design			
User interface design			

CAREER DEVELOPMENT

16. Which of the following digital disciplines do you have in your Learning & Development Plan to support your career development?

<i>Discipline</i>	<i>Indicate all that apply</i>
Agile development	
Continuous deployment	
Automated testing	
Accessibility audits	
Assistive technologies	
Cloud computing	
Artificial Intelligence	
Open source coding	
Open source standards	
Secure coding standards	
Development operations	
Cyber security	
Vulnerability assessments	
Intrusion detection	
Identity / access management	
Recognizing private information	
Privacy procedures / policies	
Recognizing privacy threats	

<i>Discipline</i>	<i>Indicate all that apply</i>
Addressing privacy breaches	
Data / social media analytics	
Business intelligence tools	
Data visualization	
Machine learning	
Sanitizing data	
Data science	
Design thinking	
User research	
Content design	
User experience design	
User interface design	

TRAINING DEMAND

17. For each of the following disciplines, please indicate if you have requested training in the last 12 months.

<i>Discipline</i>	<i>Indicate all that apply</i>
Agile development	
Continuous deployment	
Automated testing	
Accessibility audits	

<i>Discipline</i>	<i>Indicate all that apply</i>
Assistive technologies	
Cloud computing	
Artificial Intelligence	
Open source coding	
Open source standards	
Secure coding standards	
Development operations	
Cyber security	
Vulnerability assessments	
Intrusion detection	
Identity / access management	
Recognizing private information	
Privacy procedures / policies	
Recognizing privacy threats	
Addressing privacy breaches	
Data / social media analytics	
Business intelligence tools	
Data visualization	
Machine learning	
Sanitizing data	
Data science	

<i>Discipline</i>	<i>Indicate all that apply</i>
Design thinking	
User research	
Content design	
User experience design	
User interface design	

COMPLETED TRAINING

18. Please select a response indicating whether you have taken training in each discipline.

<i>Discipline</i>	<i>No</i> <i>No training completed.</i>	<i>Yes (Introductory)</i> <i>Basic training to gain an understanding of the discipline.</i>	<i>Yes (Advanced)</i> <i>Training that requires a prerequisite to register (e.g., requiring certain experience related to the discipline to participate).</i>
Agile development			
Continuous deployment			
Automated testing			
Accessibility audits			
Assistive technologies			
Cloud computing			
Artificial Intelligence			
Open source coding			

Discipline	No <i>No training completed.</i>	Yes (Introductory) <i>Basic training to gain an understanding of the discipline.</i>	Yes (Advanced) <i>Training that requires a prerequisite to register (e.g., requiring certain experience related to the discipline to participate).</i>
Open source standards			
Secure coding standards			
Development operations			
Cyber security			
Vulnerability assessments			
Intrusion detection			
Identity / access management			
Recognizing private information			
Privacy procedures / policies			
Recognizing privacy threats			
Addressing privacy breaches			
Data / social media analytics			
Business intelligence tools			

Discipline	No <i>No training completed.</i>	Yes (Introductory) <i>Basic training to gain an understanding of the discipline.</i>	Yes (Advanced) <i>Training that requires a prerequisite to register (e.g., requiring certain experience related to the discipline to participate).</i>
Data visualization			
Machine learning			
Sanitizing data			
Data science			
Design thinking			
User research			
Content design			
User experience design			
User interface design			

MORE TO SAY?

19. Would you like to add anything else? ([Maximum 200 characters](#))

SECTION 3: LEARNING OPPORTUNITIES

How training is provided can be as important as the content. In this section, please tell us about training you have received in general. This will provide us with information on how to design learning opportunities to best suit your needs.

20. In the last two years, have you received formal training that was paid by your employer?

- Yes
- No

21. **(if yes) Who provided formal training you received in the last two years?** (Check all that apply)

- a. Federal government
- b. Other public sector provider
- c. Non-profit sector provider
- d. Private provider

22. **In the last two years, have you requested work-related training independently, outside of your employer?**

- Yes
- No

23. **How many days per year do you typically spend on work-related training and learning?** (7.5 hours equal one day)

- a. 0
- b. 1-5 days
- c. 6-10 days
- d. 11+ days

24. **In the past, what training formats have worked best for you** (check any that apply)?

- a. In-person classroom training (larger class including multiple sessions)
- b. In-person workshops (small class usually a half- or one-day event)
- c. Conferences (single day)
- d. Conferences (multi-day)
- e. Webinars (including webcast seminars)
- f. Podcasts
- g. Videos (YouTube or other)
- h. Meetups or community events

- i. Peer to peer learning (in person)
- j. Peer to peer learning (virtual)
- k. Online self-directed learning (e-Learning)
- l. Online self-directed learning (tutorials)
- m. Personal self-directed learning (reading)
- n. Personal self-directed learning (personal projects)
- o. Distance education (organised online class with multiple sessions)
- p. On-the-job training (including job shadowing and mentoring opportunities)

25. What is your personal approximate annual learning budget allowance at work?

- a. No budget allowances
- b. Less than \$500
- c. \$501-\$1,000
- d. \$1,001-\$1,500
- e. \$1,501 or more
- f. Don't know

26. When you considered training in the past, which of the following factors affected your decision (Choose any that apply)?

- a. Relevance of topic to your work
- b. Format
- c. Time investment
- d. Cost
- e. Certification offered
- f. Other, please specify (100 characters max): _____
- g. I have not considered training

27. In general, what barriers have you faced in accessing training and learning opportunities (Chose any that apply)?

- a. Course is not offered / no curriculum available
- b. Lack of local opportunities / remote options
- c. Lack of understanding of where to find training
- d. Course is not offered in the preferred official language
- e. Course is full
- f. Lack of funding
- g. Lack of time / operational requirements
- h. Course is not compatible with assistive technologies (for persons with physical disabilities)
- i. I have not faced barriers to training
- j. Other, please specify (100 characters max): _____

28. What resources do you rely on to learn a new skill or tackle a problem (Choose any that apply)?

- a. Online resources
- b. Academic institutions
- c. Professional development courses
- d. Communities of interest
- e. Other, please specify (100 characters max): _____