

# Smart Technologies, Digital Competencies, and Workforce Development: An Examination of the Government of Canada's Current and Future Capacities

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## ABSTRACT

A mixed methods case study of the Government of Canada provides a lens through which the skills development and training and development challenges confronting the public sector in an era of digitization and smart technologies can be examined. Findings related to four key inter-related themes emerged from the analysis of survey and interview data: 1) current skills sufficiencies will be challenged by coming demands; 2) digital transformation is recognized as critical, but requires significant cultural and organizational change; 3) employees are uncertain about the use of smart technologies; and 4) there is a demand for expanded training opportunities to address these challenges. These findings reflect the broader context, in particular the increasing importance of hybrid skill sets that transcend traditional boundaries between technical and non-technical functions and skills, and the need for more open and integrative venues for discussion of and training regarding digital initiatives.

## KEYWORDS

Artificial Intelligence, Canadian Digital Service, Digital Government, Digital Transformation, Government of Canada, Smart Technologies, Training, Treasury Board Secretariat, Workforce Development

## INTRODUCTION

Governments around the world are seeking to leverage digital technologies and online platforms as a basis of service delivery improvement and innovation. The emergence of digital government – defined by the OECD as ‘the use of digital technologies, as an integrated part of governments’ modernisation strategies, to create public value’, is thus closely intertwined with electronic service delivery – with service performance viewed as an important determinant of not only government efficiency but also public trust (Roy, 2017). However, government’s performance in the realm of digital services has been decidedly mixed due to a myriad of technological, organizational, institutional and societal factors (Clarke and al. 2017; Roy, 2017; Clarke 2019). Within such a context, the importance of skills and training for public servants has been widely recognized (ibid.; Androsoff 2019).

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Over the past two decades, technological change has quickened and created further opportunities and challenges for the public sector. The emergence of web 2.0, for example, brought with it participative and interactive venues such as social media that have incentivized governments to seek to leverage new forms of public engagement as basis of participative service design and the co-creation of public value. Mobile devices have further accentuated the emphasis on user-design methodologies while also creating new cleavages between traditional online processes (often via personal computers including desk tops and laptops) and mobile devices and channels. More recently, the emergence of smart technologies – notably artificial intelligence (A.I.) adds additional layers of complexity in potentially automating various aspects of service interactions on the one hand, while making usage of new sources of data-based analytics and behavioural insights on the other hand.

Across this rapidly evolving service architecture, public servants are called upon to design strategies, implement new systems and solutions, and manage existing and emerging forms of interactions with a diverse citizenry in terms of digital literacy and service needs and expectations. In such an environment, the public sector workforce is a critical determinant of service innovation and performance – even as one strand of the A.I. debate suggests that automation may ultimately supplement the human role in specific functions and roles. Accordingly, governments must ensure an adequate supply of skilled workers in order to design and execute smarter government in a way that is continually evolving. Skills development and workforce training are thus critical enablers of service innovation and public value, as is the functional roles required to adapt technological changes.

Within such context, the purpose of this article is to examine the skills development and training and development challenges confronting the public sector in an era of digitization. To investigate this challenge, this article draws on research conducted in collaboration with the Government of Canada (GOC) as an empirical case study, focusing on three key objectives: i) to examine workforce trends in terms of digital skills availability and deficiencies within the GOC at present; ii) to identify and explain skills gaps and inter-related workforce training deficiencies both present and anticipated; and iii) to offer new insights into the challenges of creating skills training and development capacities capable of underpinning an intelligent and adaptive public sector. While all governments are grappling with this complex problem, this article takes advantage of the unique data collected in collaboration with the GOC through the creation of a purpose built survey, and consultations with senior management to provide rich contextual data to help better understand and measure the digital capacity within the government, and links between digital skills and transformation.

The article is organized as follows. Building on this introduction, the background section reviews the main contours of digital government and smart technologies and the impacts of both on the public sector workforce. The third section presents our methodology for the GOC case study – including survey analyses and senior leader consultations. Section four then presents the most salient findings to help understand the digital skills landscape. The discussion section provides the synthesis and analysis of these findings, with consideration given to the sorts of responsive and proactive actions likely to be required by the GOC in order to ensure both sound and adaptable digital capacities going forward. In closing, the final section offers a brief conclusion with key lessons learned and potential research directions going forward.

## BACKGROUND

Digital government’ has become an umbrella term for the ‘application of digital technologies to the functioning of the public sector’ (Clarke & Francoli, 2016; Clarke and al. 2017; Clarke 2019). Within this broad perspective, digital and electronic government (used interchangeably in this article) have been porous concepts since their inception, with a myriad of definitional approaches attempting to capture the many facets of individual, organizational, and institutional reforms associated with technological change – and the advent of the Internet. A slightly revised OECD definition (2017) states that “*Digital government relies on and enables an ecosystem that connects government,*

*non-governmental organizations, businesses, citizens' associations and individuals to support the production of and access to data, services and content through interactions with the government”.*

In addition to adding public value, the OECD definition explicit encompassing of data also denotes an important shift. within a scope of multi-faceted transformation entailing both internal and outward elements. While digital (or electronic) government focused primarily on the former early on, the more recent emergence of ‘Gov 2.0’ models are more squarely rooted in the latter and how public sector actors interact and engage with a more informed and technologically-savvy citizenry (Roy, 2013; Gascó, 2014).

O’Flynn proposes three components of public value: i) the direct provision of services; ii) high-order public interest outcomes stemming from governmental action (often overlapping with service delivery processes but accounting for wider and more collective aspirations and consequences); and iii) trust, legitimacy and confidence in government (O’Flynn, 2007). In a 2011 study focused on the digital transformation of the public sector, the World Economic Forum (WEF) adopts a public value management (PVM) framework for better understanding and assessing evolving public sector governance. For the WEF and likeminded scholarly undertakings, trust in government, enjoins PVM and Gov 2.0 within an open and participatory logic consistently emphasizing new forms of public engagement and more networked-based governance systems (Clark, 2019; Clarke, 2013; Mergel, 2015; Gasco, 2014; Roy, 2013).

Innovation and public value creation rests not on technology itself but on the synergies and actions of various public sector actors orchestrating themselves in new ways: “information technologies are merely an enabler for networked organizations, here defined as ministries and agencies with strong capacity to work across boundaries to solve important challenges”(Fountain 2017, p.10). At the centre of such capacities are individual public servants whose skill sets have tended to be aligned much more closely with the contours of traditional public administration (TPA) than digital government and PVM. With respect to service delivery, for example, one study by Canadian researchers draws from the UK experience in highlighting the need for a shift in skills and approach with design thinking and data sharing as two main areas underlined as key enablers of digital adaptation (Johal & Galley, 2014).

In its own recent launching of digital government consultations, the Government of Canada recognizes workforce development and digital literacy (both inside and outside of government) as foundational pillars of digital transformation. Two specific pledges illustrate such contours: ‘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; and 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 (Government of Canada, 2017).

More recently, the Public Policy Forum’s report, *Developing Canada’s Digital-Ready Public Service* highlights the ways in which Canadians are demanding a digital transformation (Cukier, 2019). Citizens and businesses expect and want the same digital and seamless experience from their government that they have in all other aspects of their lives. Similarly, public servants both want and require a suite of digital tools and technologies that will allow them to work more effectively, collaboratively and productively. One of the challenges to implementing an integrated strategy is the political will to build a digital ready public service, innovative efforts to build a digital ready and inclusive organizational culture, and a commitment to new and innovative approaches to training (Cukier, 2019). Additionally, a more digitally-enabled public service is an important enabler of digital literacy for society at large (Shepherd and Henderson 2019; Eynon 2020).

Currently, much of digital government has been based upon evolving technological and human infrastructures where at least primarily, people make decisions and organizations design and control their decision-making systems. The emergence of Artificial Intelligence (A.I.) creates potential future scenarios where human decisions and actions are complemented, supplemented and in some cases, displaced by computer-generated algorithms and automated decision-making tools with the ability to think and learn. The potential for A.I. to improve government operations encompasses a myriad

of dimensions, ranging from service automation and data analysis and integration to recruiting and improvements in cyber-security and public safety (Forbes Technology Council, 2018; Criado and Gil-Garcia 2019).

However, the emphasis on service automation and data analytics for a smarter government is a key tension with the human-centric focus of user design within Gov 2.0-inspired models of service innovation. While governments are already struggling with the workforce demands and new skill requirements of the former, the latter adds yet another layer of complexity and even calls into question many of the core attributes of what is required of a public sector workforce in an era of automation and analytics (ibid.).

Building upon the UK experience, Canadian Digital Service (CDS) was created in 2017 to facilitate a user-centric service design mentality that is human oriented in not only its focus on service outcomes for service recipients but also the nature of the work and workplace of CDS itself – with a more open and participatory culture encouraging interaction and experimentation and innovation through dialogue (all key facets of public value management). In 2019 the GOC issued a formal directive on automation decisions through A.I. and began initial procurement initiatives to deploy A.I. within specific elements of its service apparatus. Despite the potential for tensions between both perspectives for our purposes the point is not to suggest that they are not both legitimate pursuits that can potentially co-evolve and be aligned with one another, but rather that the workforce development demands – in term of skills development and training and retention, are considerably heightened in attempting to accommodate both currents of reform. This point is especially salient when the GOC has little information as to its own digital skills inventory (a key impetus for this research undertaking).

## **RESEARCH METHODOLOGY**

The research methodology is a mixed-methods case study of the GOC. Sensitive to context, case studies are known for their flexibility of application (Ridder, 2017), with a growing recognition of the range of methods such studies may encompass (Harrison et al., 2017). While case studies are associated with a strong, interpretive and qualitative tradition (Stake 1995, Stewart, 2014), and recent efforts to codify or prescribe particular approaches and methods (Yin, 2014), there has also been a stream of mixed-method approaches to case studies, particularly in the study of government and international organisations (George & Bennet 2004; Bennet & Elman, 2007). As the promotion of digital skills is a whole of government project, we deemed it reasonable to treat the GOC as a “case” for the purposes of our enquiry.

The choice of method was pragmatic. Choice of tools was based on a combination of data needs, degrees of access available to us via our partner organization, and the inherent limitations imposed in terms of time and resources. The two main elements deployed include an employee survey of key departments in the GOC, and consultations with senior leaders from across these same departments. The research is unique in the ability to access GOC employees broadly, to design a survey tool to provide clear evidence and measures of digital skills, as well as to have in depth conversations with the key leaders in charge of digital transformation projects.

## **Survey Development**

The critical feature of the survey and it’s development was the collaborative nature of our relationship with government partners. The resulting survey, along with the process which developed it, strongly reflected the priorities and organizational considerations/limitations of our government partners. We developed a survey in partnership with CDS and in consultation with key stakeholders<sup>1</sup>, addressing population demographics, training preferences and needs, and aspects of knowledge, use, and training demand for 30 digital disciplines defined through a process of stakeholder consultation, and broader research on digital competencies. The survey went through multiple iterations, and its final form significantly reflected the priorities and desires of our partners, along with the need to respect

restrictions imposed by the organization itself. The eventual list of competencies included a set we proposed, derived from the existing digital skills literature, modified and supplemented by other suggestions offered by CDS and their consulting partners. At the request of our partners, the survey (Appendix A) focused on the differences between CS (computer systems) designated employees and their non-CS peers. For more details, the full report of the research (Anonymous, 2019) is available at *link to be inserted after blind review*.

The population for the survey (N=53,824) consisted of the employees (excluding senior officials) of the following federal departments, identified by our CDS partners as of particular relevance and interest in that they represented a reasonable cross-section of government departments, characterized by a solid complement of CS and non-CS skills, and a strong focus on service delivery. Accordingly, the following organizational units are included in our survey coverage: Canada Revenue Agency; Employment and Social Development; Immigration, Refugees and Citizenship Canada; National Defence; Shared Services Canada; Transport Canada; and Veterans Affairs Canada.

A random sample of 5,500 was drawn from this population, stratified both by CS / non-CS designation and department (as departments ranged in size from 468 to 23,713). As the novelty of the survey meant we were unsure of the likely response rate, we decided to generate a relatively large sample. The survey was launched on November 1<sup>st</sup>, 2018 and ran until November 19<sup>th</sup>. Prior to launch, our CDS partners implemented their 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 response rate was relatively low, introducing the possibility of a non-response bias, the proportions of CS to non-CS respondents to the survey meaningfully reflects the distribution of the two in the larger population.<sup>2</sup> Data reliability was difficult to establish due to the novelty of the study. To the best of our knowledge, no comparable survey has been conducted in the GOC, or in fact in any country.

Survey questions were framed, based on a self-assessment model, and the need to respect contractual and legal limits encountered as a consequence of our partnership with CDS. Self-assessment was chosen because the team lacked sufficient skill across all 30 disciplines to develop “skill testing questions”. This challenge has been faced by other researchers, and a self-assessment in similar large surveys has been an emerging trend (Curtarelli et al., 2017; Chinien & Boutin, 2011). Self-assessment also allowed for the inclusion of softer/ organizational skills, a critical element if technical skills were to be understood in their organisational context. Questions were framed primarily through consultation with our CDS partner, who in turn consulted with a range of other units inside the GOC, to establish a list of priority skills for assessment, along with a set of concerns about training (including availability, interest, and other factors). Due to legal and contractual constraints emerging from our partnership with CDS, questions were framed in categorical terms; and the phrasing of several questions had to be adjusted to meet internal regulations. The final form of the survey was heavily influenced by these constraints. While this imposed certain limitations on the forms of analysis available, it also resulted in useful feedback via comments, discussed in the analysis section.

Although the full survey included thirty digital disciplines, for this article we are focusing on the six disciplines most related to smart technologies as outlined in **Table 1**. The disciplines were chosen because they were most relevant of the thirty to our focus on the potential transformative impact of digital technology on service provision.

In addition to surveying employees about these disciplines and their familiarity and self-perceived usage abilities within them, we also included a number of questions pertaining to training and development accessibility and delivery methods within the GOC. Specifically, we posed questions about the nature of training experiences (and whether they were provided and paid for in-house within government or externally), the main motives for seeking skills training, as well as the sorts of learning resources and channels (i.e. online versus in-person) most commonly used in training initiatives. The survey also sought to ascertain the major barriers encountered by employees in terms of undertaking skills training and professional development.

**Table 1. Digital Disciplines Related to Smart Technologies**

Digital Discipline	Definition
Artificial Intelligence	Characteristics of human intelligence, such as problem solving and learning, exhibited by computers or other machines
Cloud Computing	The on-demand delivery of services through a network of online remote servers collectively known as a cloud.
Machine Learning	The ability of a computer to use examples or past experiences to predict outcomes in new situations.
Data / Social Media Analytics	The interpretation of data, often for decision-making purposes, such as human behavior on social media sites or apps.
User Experience Design	Enables designs and developed to prioritize people's emotions, attitudes, and end-to-end journey, while using a 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.

## Senior Leader Consultations

We conducted consultations to provide insights from a senior strategic and organizational perspective on the current and emerging digital skills and competencies. We interviewed twenty-three senior managers from across ten organizations (from the aforementioned federal departments and agencies). These consultations took place between November 20<sup>th</sup> and December 20<sup>th</sup>, 2018. The authors of this article conducted these consultations, accompanied by CDS officials: one hour was booked with each manager in order to enable a wide-ranging discussion with an exploration of issues and themes based upon but also going beyond the scripted questions (provided below) shaping the interview. Interview subjects were chosen based on a range of factors. Key criteria included belonging to a department with a strong service orientation, organizational leadership roles in CIO/IT. Interview subject selection also reflected the assessment of our government partners.

These perspectives complement the formal, documentary, and official “voice” of published documents and strategic plans assessed in the environmental scan, in that they offer insight into the informal, operational understanding of the expected impact of technology, and the anticipated demands of such impacts. In addition, assessing the range of options across senior managers allowed us to establish what range and diversity of opinion exists below the level of the GoC as a whole. The following four questions were used as a starting point in semi-structured interview format: i) do you believe that there is a coherent and distinct set of “digital skills” that are emerging within the GOC and how would you describe these in your own words; ii) what do you see as the key emerging digital skill demands / needs in the public service; iii) what do you see as the critical existing digital skill gaps in the public service; and iv) do you believe that there are sufficient (internal / external) training resources to meet these needs (both in terms of their existence, and access to them)? Probes and supplementary questions were added as required, based on the full and open conversation. During the meeting the list of thirty digital disciplines was used as a prompt, and participants were invited to highlight priorities and gaps for their departments, as well as identify any missing disciplines.

Responses were thematically analyzed in aggregate. Specifically, we were looking for trends across different departments, and how the consultations confirmed or extended findings from the surveys. This analysis contributed to answering our key questions related to which digital skills are essential, the presence of these skills within the GoC, and the perception of current training capacities.

## MAIN FINDINGS

Integrating both the results related to the six disciplines from the random survey, and the senior leader interviews, we found four key, inter-related themes. First, while there likely exists a sufficiency of skill and capacity in our six disciplines at the present time, there is also a fairly limited understanding of what “sufficient capacity” means, and a recognition that what defines current needs is likely to be challenged by coming demands. Second, while a broad recognition exists within the organization that transformation is needed, and that emergent technologies will likely drive and create demand for change, there is also an awareness that this transformation requires significant cultural change, and that this factor is more critical than technical expertise. Third, part of what drives the confusion about how best to apply/respond to the impact of new technologies is the lack of certainty about how they can be used. While a nominal sufficiency of basic competence with the six disciplines exists, there is a growing recognition that in addition to a basic quantitative sufficiency of skill, there are qualitative differences between forms of skill with technologies. The relative absence of this broader qualitative range of competencies is part of what is driving “path ambiguity” in transformation, and part of what accounts for current and future competence shortfalls. Fourth, there likely exists demand for expanded training opportunities. Such opportunities could address the concerns noted above.

### Finding One – Ready for Now, but is That Enough?

One overall and reassuring findings of the project was that, at an aggregate level, there is generally a sufficiency of skill and capacity. For both the CS / technical worker component, and the non-CS component, more people reported having at least basic knowledge of the disciplines investigated, than reported requiring training in that discipline for their position (**Figure 1**). A comparison of responses is made for both CS and non-CS respondents in response to questions about their level of knowledge / competence, whether their position required training in, and their use of, our six disciplines. There is a consistent pattern of more respondents reporting having skill than requiring training in it, and more reporting their position requires training than reporting use.<sup>3</sup>

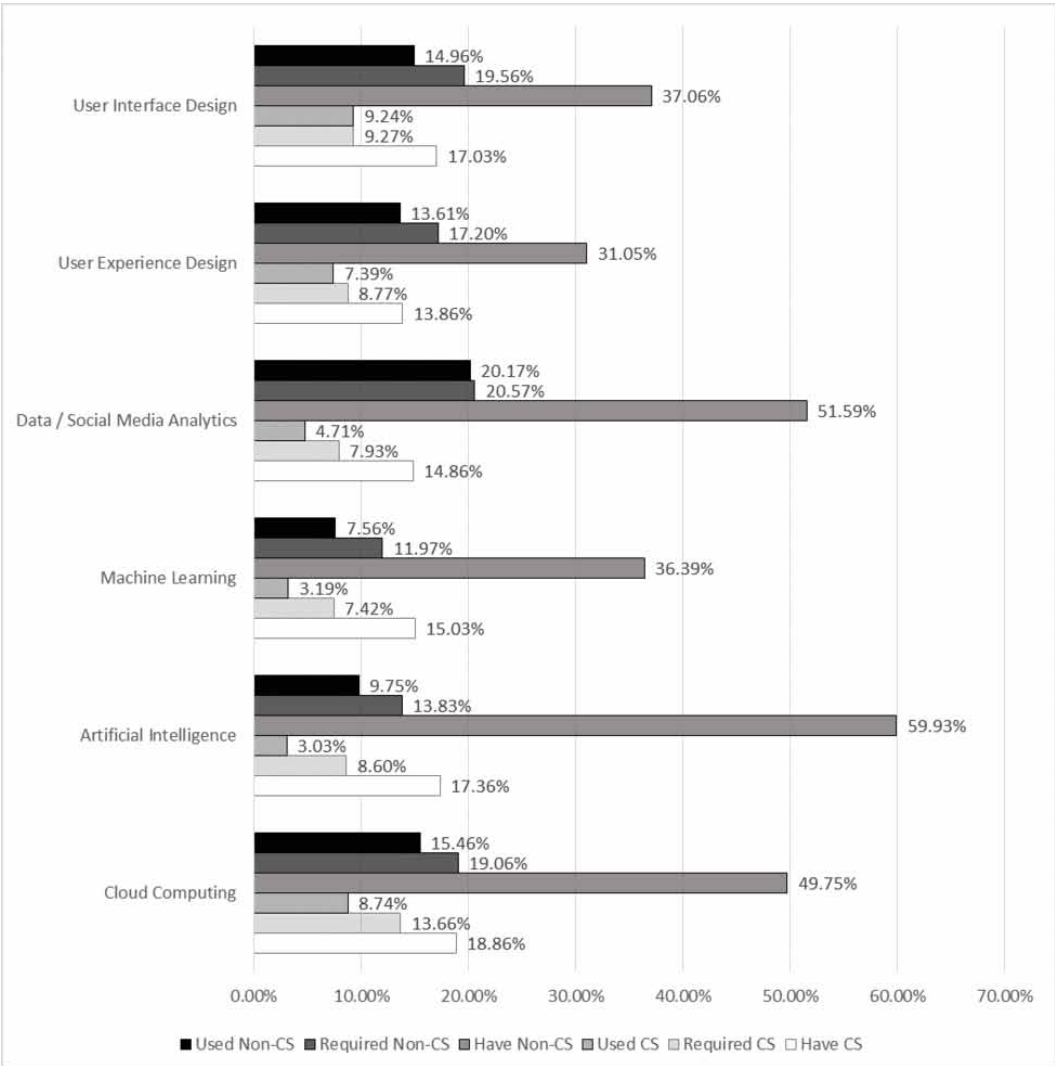
The finding of sufficient capacity, however, is conditioned by several factors – most notably that the sufficient capacity implied is limited by the fact that respondents only indicated if training was required in their current position. Such requirements reflect past assessments of current needs, not future considerations. Additionally, the findings include results showing both “Basic” (defined as understanding the subject well enough to explain it to others) and “Advanced” knowledge (understanding it well enough to train others). **Figure 2** demonstrates that when the “basic” category is removed, the stock of existing capacity drops significantly.

With “Basic” knowledge removed, some shortfalls (i.e. more reported requiring the skill than having it) emerge, and the degree of “excess capacity” drastically reduces. It should be pointed out that our survey did not directly ask about complexity levels in terms of use (we asked about frequency of use, not whether skills were employed at a basic or advanced level). However, given that our second chart shows use rates that exceed rates of advanced knowledge (i.e., more responded that they used the discipline than report advanced knowledge in the discipline), it is reasonable to conclude that at least some forms of use are at a basic level.

### Finding Two – A Clear Vision of Transformation, but How to Get There?

The need for different levels and kinds of skill across the organization was born out by the results of our interviews with senior leaders. A recurring theme from respondents was the difference between “hard” capacity in the skill (the ability to “do” A.I., etc.), and “soft” skills that enable the ability to see how the technology could be applied. These skill types (“hard” and “soft”) were generally viewed as distinct, but interdependent; one senior leader commented they wanted their technical-minded staff to have more business intelligence, and their managers to have more technical capacity. Moreover, a

Figure 1. Have-Require-Use Rates CS vs. Non-CS (% of total responses, basic included)

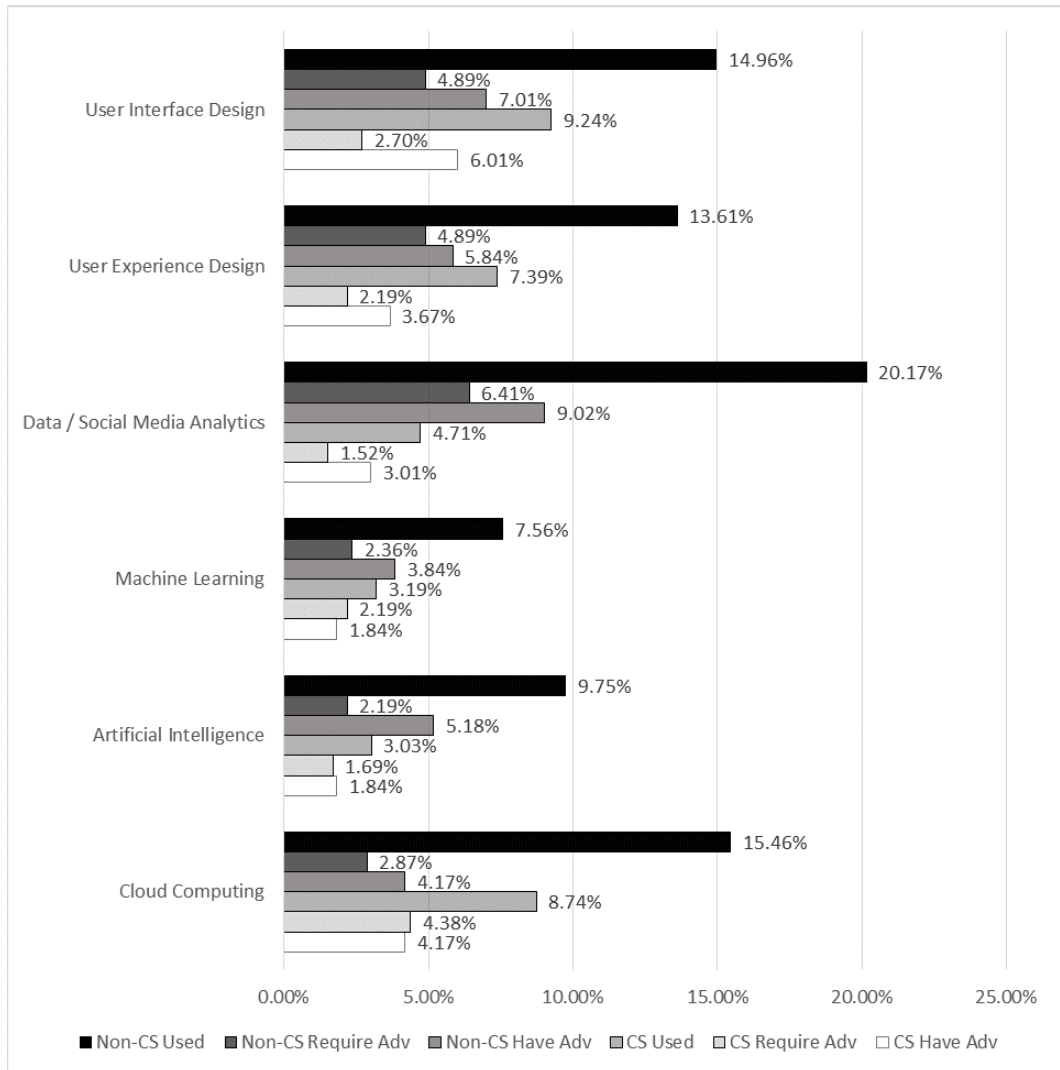


sufficiency (taking into account some of the challenges inherent in determining “sufficiency” noted above) of both was seen as critical to the goal of service transformation. One respondent noted:

*“So, it’s a bit of a dichotomy for the technical people I want them to see more of the business side. I would want them to learn some of the skills that might change the way we do our business to be more digital. The flipside of this is with the rest of the organization and I want to send executives or leaders on training on digital...what digital means, so a digital government school would be a great thing and maybe where leaders could get some examples from other industries that have already become much more successful with digital ....”*



Figure 2. Have-Require-Use Rates CS vs. Non-CS (% of total responses, basic excluded).



The end state envisioned by senior leaders represents a dramatic shift. One of the interviewees noted that it would involve a complete rethink of how services were delivered: “For me it’s a complete wipe of what we thought was okay and doing in government and starting over...to fundamentally change our approach to delivering services”. Critical to this change was a culture shift in the organisation, partly in terms of the relationship to the service used, and the need to be more people-centric, with technology as an enabler, and partly in terms of internal relationships between tech and non-technical staff, and managers and workers. This change requires a new mindset, for all to embrace the question - what can be done differently with technology. It was also recognized by senior leaders that the incoming technical workers have the skills and expertise needed, while they do not know the government context, while the more seasoned CS employees know government, but are not used to smart technologies and agile work processes. The need to bring everyone within the GOC, regardless of their current levels along on the digital transformation journey was noted.

The goals are relatively clear: redesign what services are provided, and how; integrate technical capacity into the operational culture of the organisation; develop the capacity for both using technology, and identifying potential, transformative uses; and reshape the relationship between actors in the organisation, and between government and citizens, to create room for transformation, and celebrate it when it occurs. What was notable, however, was the degree to which the “path to transformation” was still being formalized.

Most leaders had a common vision of what was wanted, were excited and energized by the possibilities, but were equally aware of the challenges of shifting. They spoke to the need for culture change, recognizing the complexity inherent in such. One respondent highlighted the necessary changes: *“Organizational culture needs to be user central, and agile, and within an open workspace, and not just focussed on IT system development” and that employees need to “innovative, accept failure, be curious and question everything versus traditional skill sets”*. Similarly, the need for innovation was recognized by all, with a call for more support. Several interviewees called for more space for discussion of innovation, structured time to support, as well as a new accountability framework that allows for failure, and considers the risks and ethical and privacy implications of smart technologies. Interviewees consistently spoke to moving to a different model of service delivery, but acknowledged that this new model was still emerging.

### **Finding Three – A Need to Use Skills, but How?**

One of the interesting features of Figure 2, is that for all six of the disciplines investigated, the number of respondents reporting knowledge of a discipline outnumber those who require training, and the number requiring training outnumber those reporting actually using the skill in their work. In other words, at the organisational level, far more report having at least enough knowledge of disciplines to explain it coherently to others, than report actually using the skill in their work. This becomes particularly interesting when one considers the close association between use, and the perception of relevance, in the organisation. We ran Chi Squares on the relationship between use-reporting (collapsing all use categories) and relevance, and for all six disciplines and found that there is a non-random relationship. In other words, using a discipline is correlated with seeing the discipline as relevant to your work. This was consistent for both CS and non-CS employees.

Disciplines are thus viewed as relevant to the extent one uses them. This has implications for both the “path ambiguity” discussed above, notably the need for organisational literacy on the part of digital workers, and digital literacy on the part of managers, and for the limited assessments of “sufficient capacity” noted in our first finding. Many staff have skills, but aren’t necessarily looking for ways to apply them, either because they don’t see them as relevant (i.e., can’t find / image potential applications), or because they identify applications, but don’t see opportunities to change how things are done (organisational barriers to change), or because those who have skills and do use them lack broader knowledge of organizational operations, and hence where else in the organisation their skills might be applied.

It is perhaps unsurprising, then, that four of the six disciplines discussed here (A.I., Machine Learning, Data/Social Media Analytics, Cloud) were classified as “Ambiguous” in our larger report, meaning that they were broadly recognized (more than half reported at least basic familiarity), but of those reporting expected use, more than half could not determine a precise time-frame (they expected to use it, but were unclear on when and how). The other two disciplines (User Interface Design, and User Experience Design) were classified as Emergent, in that they were well known to technical / digital specialists, but not the wider, non-technical audience. While these skills are being used, and in some cases are recognized as having transformative potential, precisely how they will be used to generate this transformation is still unclear.

The search for answers was well reflected in the comments from senior leaders. Several spoke of looking to other units in the organization for ideas. Transport Canada for example, is seen as further advanced on their digital journey. Over the past year they have created a digital roadmap for change,

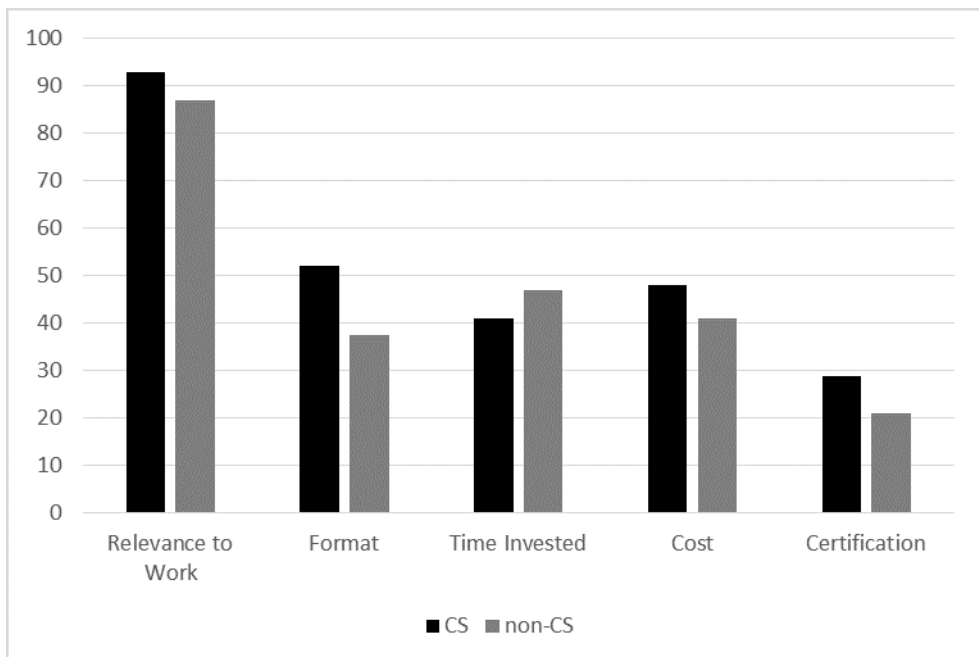
which they describe as a “people-centric” vision for the future. They hosted a two day digital strategy workshop, which provided a basis for their digital strategy which prioritizes providing services that are easy to use and assessible anywhere, open and access data, and use of new technologies to increase innovation (Transport Canada, 2018). Veterans Affairs has been piloting and adapting My VAC as a single portal for all services, with tremendous success, and CRA has been implementing A.I.

As noted above, others spoke to the need for collaboration, sharing ideas and successful practices. Many spoke to the need for connection and communication between technical / digital staff and managers, to help identify opportunities for change. Overall, though, most leaders consulted recognized the importance of smart technologies, but raised questions of large scale implementation in practice. As one respondent noted “*specialized online media analysis is key – who are we looking at? What are the privacy implications, what are the ground rules?*” There is a commitment to change, but still questions about the best ways to implement smart technologies within a public organization, and a recognition that there are specific ethical issues about the use of these technologies that still need to be balanced.

### Finding Four – Training Opportunities, Preferences, and Barriers

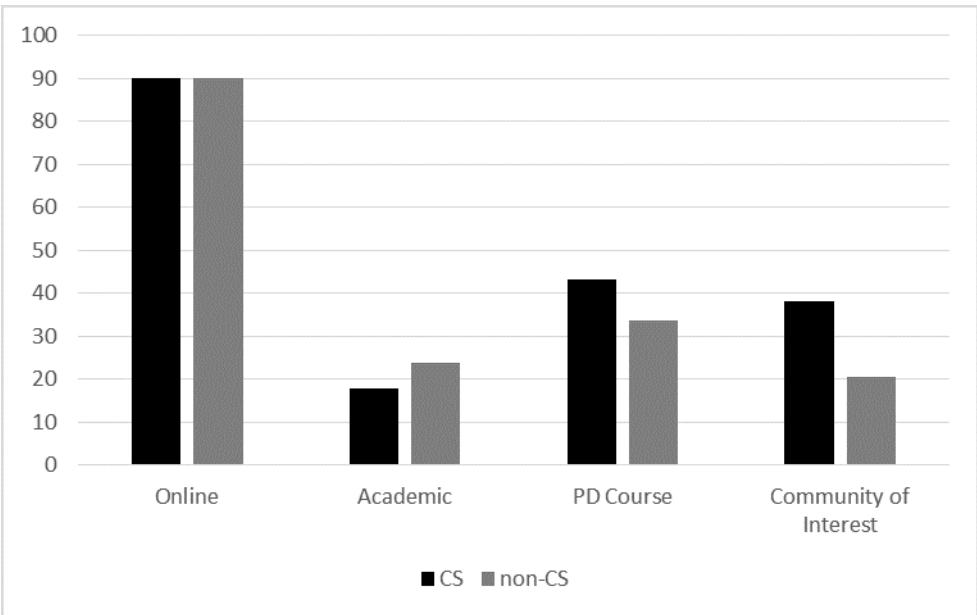
CS Designates are more likely to have received training paid for by an employer, more likely to have received training from a private provider, and more likely to have sought independent, outside of government training than a non-CS designate (**Figure 3**). They are also more likely to find lack of funding a barrier to training that their non-CS colleague. Work relevance is a primary motivator for seeking training: 93% of CS, and 87% of non-CS respondents indicated that the relevance of the training to their work was a consideration. In both groups, this was approximately twice the reporting level for the next most common factors (time, format, and cost).

Figure 3. Motivators for Training (% responses by designation).



With respect to training resources and delivery channels (**Figure 4**), online training was overwhelmingly the most commonly used channel / 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% use rate for CS, and 33% for non-CS staff.

**Figure 4. Learning Resources Used (% of responses by designation) here !>**

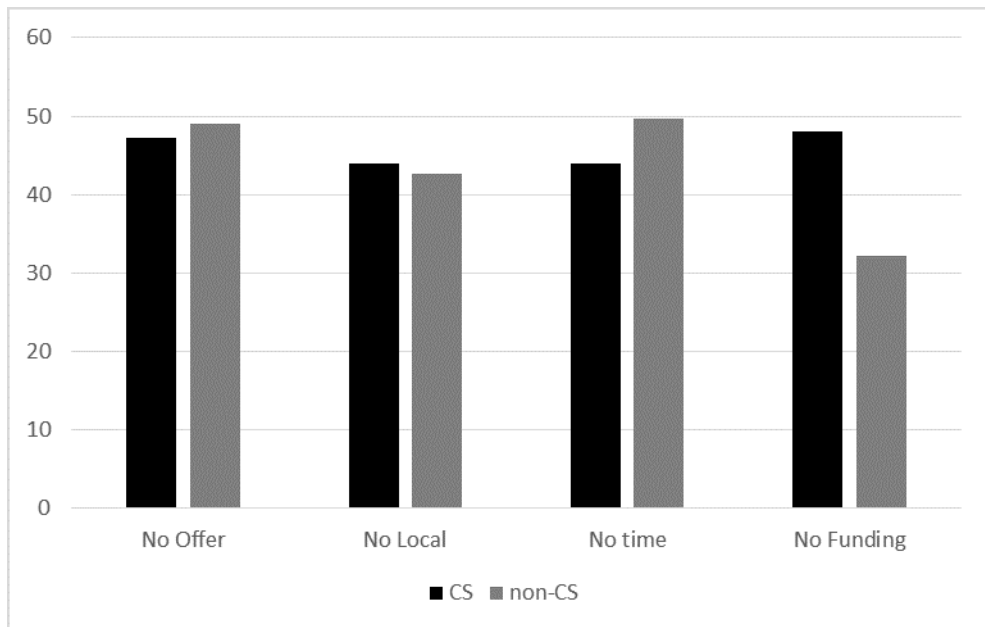


With respect to barriers to training (**Figure 5**), both CS and non-CS report that lack of offerings, lack of local opportunity, and lack of time are the most important barriers to training (with percentages in the mid-to high forties reporting, as illustrated below). A lack of funding is more likely 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.<sup>4</sup> A lack of knowledge about training opportunities is also an important consideration: 49% of CS, and 60% of non-CS respondents, indicate that they don't know the amount of their learning budget allowance (Figure 5).

While the organization is in reasonable shape in terms of its current amount of technical capacity, there is a lack of redundancy. This makes it potentially vulnerable should demand increase, or capacity losses occur. The relative age of the CS community, 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 organization needs to develop a broader skill base before the cadre of CS designates begins to retire. It is important to note that not all of the disciplines are understood in similar terms. Some disciplines are recognized and familiar outside the CS community, others are not, while others carry the expectation that they will need to be. As such, ensuring not only a sufficient amount of advanced technical capacity, but also a sufficient familiarity within the larger organization for the potential of such capacity, needs to be a priority in the coming years.

The proportion of people who say a discipline matters to them closely mirrors the proportion that says they use the discipline. In addition, demand for training is most often driven by perceived work relevance. Taken together with the demographic distinctiveness of CS designates, this has implications for how skills are understood within the organization. The association of use and relevance

Figure 5. Main Barriers to Training (% of responses by designation) here!>



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. Even where this barrier doesn't 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. Given that some skills are recognized as having larger organizational relevance than their immediate application, and the frequency with which we saw comments to the effect that technical skills were not relevant to a respondent, the close association of relevance to active use might be a focus for training and cultural change.

## DISCUSSION

One important element of our findings is the extent to which perceptions of relevance, mixed usage patterns, and fluid and often ambiguous transformational ambitions are closely inter-related. The absence of a clear path to a common vision of change is based, in part, on uncertainty about how emerging skills, capacities, and technical disciplines will permit changes in operational practice at a systemic level. This uncertainty, in turn, drives concerns about whether the current "stock" of capacity in the organisation is sufficient. Use correlates with relevance, but people are less likely to actively seek out new uses for skills they don't see as relevant. In other words, until people are able to think abstractly about how skills might be used (instead of primarily in terms of how they are currently used), they are unlikely to adopt their use.

This finding reflects many earlier themes of the literature review – notably the rising importance of hybrid skill sets that transcend traditional boundaries between technical and non-technical functions and skills (Capgemini, 2017). Additionally, the organizational complexity of cross-organizational governance structures and collaborative teams – hallmarks of public value creation through a citizen-centric focus, necessitates individuals with incentives and abilities to see beyond their specific and present job task, and to think and act more creatively in linking actions to outcomes in novel ways. As Cukier explains, a new brand of digital-savvy leadership training is called for in such an

environment: ‘While engineering and computer science remain important foundational disciplines, there are increasingly more roles for “hybrids” – those that combine technology with an understanding of organizations, processes, human behaviour, and service delivery’ (Cukier 2019, 19). There is also a need, as highlighted by Clarke (2019) to ensure consideration of the need for additional ethical training to support these hybrid roles.

Accordingly, a second and closely inter-related element of our findings is the widening recognition of the need for hybrid skill sets within organizations (and across them) of the sort called for by Cukier and others. Currently, within public sector organisations such as the GOC, technical capacity is thought of in fairly “hard” terms. Technical skills are understood in terms of the ability to “do” A.I., Data Analytics, etc., and much of the attention (as well as training resources, etc.) has been dedicated to building up the number of technical specialists with these skills. There is a growing recognition, however, at least among senior leaders, of a need for different, but related forms of skill, including a capacity to see how technical skills, and their new capacities / ways of doing things they facilitate, could allow organisational / service processes to function differently. This form of skill demands understanding of both technical and organisational realities; it means seeing what is possible in both technical and organisational terms, and seeing how the two flow together. Ideally, both “knowledge” would reside in the same organisational actors (hence the comments that managers should get better at tech, and tech workers should learn about the organisation and its culture), but failing that, more constructive lines of communication and planning need to be developed.

There are challenges inherent in assessing “sufficiency” of skills in the organisation, especially in a complex and hybrid-driven environment. For example, there are very different data gathering processes to assess “hard” and “soft” skills, and questions suitable to one category are not always effective for the other. The tendency for “hard” technical skills to be concentrated within particular job classifications, coupled with the use-relevance relationship, also means there is the potential for broad groups to see questions on these topics as irrelevant (we received comments to that effect on the survey, with some respondents asking outright why they were being asked to fill out a survey that had no relevance to their work). The presence of “surplus” basic knowledge in the organisation, a group of people familiar with what the six disciplines are, and some sense of what they’re for, but who do not “do” the disciplines, indicates that “soft” skills go beyond a simple familiarity with emerging digital technologies. Some form of applied training that combines basic knowledge of how to “do digital”, coupled with sensitivity to how new options for how things could be done might be applied to organisational tasks and processes, seems to be in order.

A third element of our findings is the seemingly fluid nature of how GOC are employees accessing and paying for skills development and professional and educational training resources within and outside of the workplace – and the ramifications for government-wide digital readiness and performance. A shift to online channels is both unavoidable and unsurprising, though it raises questions of relevance, quality control, and whether sufficient blended opportunities exist to leverage online resources with in-person venues and methodologies that are often critical to organizational relevance and coherence and collaboration with other employees in seeking more integrated outcomes.

A key challenge for the GOC as a whole lies in not only seeking to better understand the potential for – and consequences of, individual variation in terms of quality and relevance of training but variances across organizational units, but also the appropriate balance between coordination and centralized initiatives on the one hand, versus greater empowerment and flexible experimentation on the other hand. The GOC’s creation of entities such as Canadian Digital Service and the Digital Academy (within the federal government’s Canada School of Public Service) are indicative of most efforts to promote the former, at least in terms of cultural awareness and basic foundational elements of government-wide responses (such as this survey exercise sponsored by CDS in order to take stock of the GOC’s entire digital workforce across a range of service providing entities and transcending CS and non-CS categories). Nonetheless, departments and agencies continue to be responsible for

much of their own training and development capacities – and how such capacities are funded and which skills are prioritized and why.

A fourth and final element of our findings pertains to so-called smart and emerging technologies and perhaps most notably the advent of A.I. A.I. has emerged as the most ‘ambiguous discipline’ in so far as many employees are aware of its importance and expect to use it at some point in the future, but a much larger proportion of respondents believe they will use it than are confident in their abilities to do so<sup>5</sup>. This notion of ambiguity is not surprising given the widening awareness about A.I.’s disruptive potential – particularly in the realm of service delivery.

## CONCLUSION

Three overall take-away lessons from this study are: First, there is deepening awareness around digital within the GOC that reflects both the messaging and commitments of senior leaders within the GOC in making digital transformation a priority. Secondly, the current workforce of the GOC is both educated and keen but also uncertain about their individual and collective capacities to adapt to anticipated disruptions stemming in particular from smart technologies such as A.I. Thirdly, as with all organizations the GOC will be increasingly challenged to adapt workforce training and development strategies in order to address demographic trends, competitive marketplace pressures, and accelerating technological change. 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 must adapt accordingly.

The workplace culture of tomorrow will be predicated upon 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 provides the richest of source of innovation for current and future investments into ensuring the digital readiness of the public service. An essential aspect of creating a culture of digital readiness for the GOC will be cultivating more confidence in the usage of emerging smart technologies – and reframing the notion of disruption into an enabling role of such technologies to improve work processes and create public value. Several antidotal comments from participants encouraged the GOC to embrace such experimentation on a wider scale. Such a shift is all the more important in fields such as A.I. where the GOC’s relatively aging workforce will be challenged to compete for skills and competencies in an environment with shortages anticipated.

Going forward there will be a growing diversity of training platforms and channels available to GOC staff, and that the requisite mix of content and delivery will vary considerably for different sorts of individuals based upon a range of factors such as age, experience, professional background, and work-home balance. 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 GOC is thus essential. Strengthening capacities for knowledge sharing amongst public servants across the GOC (and other government levels) 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 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 public sector organizations to forge more inter-disciplinary and collaborative teams to address integrative challenges.

An important role for the Digital Academy should be to provide an open and integrative venue for cross-governmental conversations as to the holistic challenges confronting the GOC in light of the mounting digital imperative. While the Academy remains in its infancy, there are some early signs of such directions taking shape, particularly the notion of fostering a government-wide culture

of digital readiness (through a Digital Foundations offering for all public servants accompanied by Digital Premium and Digital Leadership offerings for more specific segments of the workforce). In light of the Covid-19 pandemic and the acceleration of digitization both within government and across societies, the importance of deepening digital literacy and improving skills development for public servants has only grown in importance since our own study was undertaken – and the findings and implications should be of interest to governments everywhere going forward (Allman and Blank 2021).

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## REFERENCES

- Allmann, K., & Blank, G. (2021). Rethinking digital skills in the era of compulsory computing: Methods, measurement, policy and theory. *Information Communication and Society*, 24(5), 633–648. doi:10.1080/1369118X.2021.1874475
- Androsoff, R. (2019). *The public service's digital literacy problem*. Policy Options. Retrieved from <https://bit.ly/3hKCNBb>
- Bennett, A., & Elman, C. (2007). Case study methods in the international relations subfield. *Comparative Political Studies*, 40(2), 170–195. doi:10.1177/0010414006296346
- Capgemini Digital Transformation Institute. (2017). *The digital talent gap: are companies doing enough?* Retrieved from <https://bit.ly/36JKS2o>
- Chinien, C., & Boutin, F. (2011). *Defining essential digital skills in the canadian workplace*. Human Resources and Skills Development Canada. Retrieved from <https://bit.ly/3kX26Q7>
- Clarke, A. (2013). *Exploiting the web as a tool of democracy: New ways forward in the study and practice of digital democracy*. World forum for Democracy.
- Clarke, A. (2019). *Opening the Government of Canada: The federal bureaucracy in the digital age*. UBC Press.
- Clarke, A., & Francoli, M. (2014). What's in a name? A comparison of 'open government' definitions across seven open government partnership members. *JeDEM-eJournal of eDemocracy and Open Government*, 6(3), 248–266. . 10.29379/jedem.v6i3.227
- Clarke, A., Lindquist, E., & Roy, J. (2017). Understanding governance in the digital era: An agenda for public administration research in Canada. *Canadian Public Administration*, 60(4), 457–475. doi:10.1111/capa.12246
- Criado, J. I., & Gil-Garcia, J. R. (2019). Creating public value through smart technologies and strategies: From digital services to artificial intelligence and beyond. *International Journal of Public Sector Management*, 32(5), 438–450. doi:10.1108/IJPSM-07-2019-0178
- Cukier, W. (2019). *Developing Canada's digital-ready Public Service: Attracting and retaining a highly skilled, diverse workforce to support the Government of Canada's Digital strategy*. public policy forum. Retrieved from <https://bit.ly/3kZXrNg>
- Curtarelli, M., Gualteiri, V., Shater Jannati, M., & Donlevy, V. (2017). *ICT for work: Digital skills in the workplace. A study for the European Commission*. Retrieved from <https://bit.ly/345IaEo>
- Eynon, R. (2021). Becoming digitally literate: Reinstating an educational lens to digital skills policies for adults. *British Educational Research Journal*, 47(1), 146–162. doi:10.1002/berj.3686
- Forbes Technology Council. (2018). 11 Ways AI can be used by the Government. *Forbes*. Retrieved from <https://bit.ly/3aun5Vj>
- Fountain, J. (2017). *Fostering cross-agency collaboration and networked governance*. White Paper. Global Agenda Council on the Future of Government. Retrieved from <https://bit.ly/2DOBK20>
- Gascó-Hernández, M. (Ed.). (2014). *Open government: Opportunities and challenges for public governance* (Vol. 14). Springer Science & Business Media. doi:10.1007/978-1-4614-9563-5
- George, A. L., Bennett, A., Lynn-Jones, S. M., & Miller, S. E. (2005). *Case studies and theory development in the social sciences*. MIT Press.
- Government of Canada. (2017). *Beginning the Conversation: A made-in-Canada Approach to Digital Government*. *Canadian Digital Service*. Retrieved from <https://bit.ly/2Fv8IEY>
- Harrison, H., Birks, M., Franklin, R., & Mills, J. (2017, January). Case study research: Foundations and methodological orientations. In *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research* (Vol. 18, No. 1). Retrieved from <https://bit.ly/2Y9vfOa>
- Johal, S., Galley, A., & Molson, M. (2014). *Reprogramming government for the digital era*. Mowat Centre for Policy Innovation.

- Mergel, I. (2015). Opening government: Designing open innovation processes to collaborate with external problem solvers. *Social Science Computer Review*, 33(5), 599–612. doi:10.1177/0894439314560851
- O'Flynn, J. (2007). From new public management to public value: Paradigmatic change and managerial implications. *Australian Journal of Public Administration*, 66(3), 353–366. doi:10.1111/j.1467-8500.2007.00545.x
- Organisation for Economic Co-operation and Development (OECD). (2017). *OECD Digital Economy Outlook 2017 - En - OECD*. Retrieved from <https://bit.ly/30YF57i>
- Organisation for Economic Co-operation and Development (OECD). (2021). *The OECD Framework for digital talent and skills in the public sector*. Retrieved from <https://bit.ly/3BajRTN>
- Ridder, H. G. (2017). The theory contribution of case study research designs. *Business Research*, 10(2), 281–305. doi:10.1007/s40685-017-0045-z
- Roy, J. (2013). *From machinery to mobility: Government and democracy in a participative age* (Vol. 2). Springer Science & Business Media. doi:10.1007/978-1-4614-7221-6
- Roy, J. (2017). Digital government and service delivery: An examination of performance and prospects. *Canadian Public Administration*, 60(4), 538–561. doi:10.1111/capa.12231
- Shepherd, T., & Henderson, M. J. (2019). Digital Literacy in Digital Strategy. *Canadian Journal of Communication*, 44(2), 51–56. doi:10.22230/cjc.2019v44n2a3491
- Stake, R. E. (1995). *The art of case study research*. Sage.
- Stewart, A. (2014). Case study. In *Qualitative methodology: A practical guide*. Sage.
- Yin, R. K. (2009). *Case study research: Design and methods* (4th ed.). Sage Publications.

## ENDNOTES

1. Including The Canada School of Public Service, the Treasury Board Secretariat (TBS) Office of the Chief Human Resources Officer (OCHRO), the TBS Strategic Communications and Ministerial Affairs (SCMA), the TBS Access to Information and Privacy (ATIP), and the TBS Office of the Chief Information Officer.
2. On the CS/non-CS split, the “expected” proportion of CS was 21.2%. The actual proportion in the sample was 21%, making the sample meaningfully reflective of the CS / non-CS distribution in the overall population.
3. Both the following graphs have been generated from the results of Q11, 13, and 15 of our survey. Q11: What do you know about each of the following disciplines? (n=599), Q13: How often do you use the following disciplines in your work? (n=595) and Q15: What job-specific training is required for your current job? (n=593). Chart 1 (figure 1) compiles “Beginner: Have explained it to others” and “Can apply: Have trained others” responses for Q11, “Once or twice a year”, “On a monthly basis”, and “On a weekly basis” responses for Q13, and “Basic: General understanding” and “Advance: Thorough knowledge and use” responses for 15. Chart 2 excludes the “Basic” responses for Q11 and 15, but is otherwise identical.
4. 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).
5. 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., among respondents who indicated the possibility of use, the proportion who indicated they might use it vs. those confident of use). For each indicated discipline, the “Familiarity” value represents the proportion (among all respondents) of responses which indicated some knowledge (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, more think they might use it than are confident they will, and more know about it than do not.

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