Developing Digital Literacy Across CAF Officers Through Training and Education

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Service Paper

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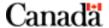
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PATHWAY TO DIGITALIZATION: DEVELOPING DIGITAL LITERACY ACROSS CAF OFFICERS THROUGH TRAINING AND EDUCATION

AIM

1.   This service paper exposes the need to integrate digital literacy into the core curriculum of Canadian Armed Forces (CAF) officers pending a wider pan-departmental initiative towards digitalization. In addition, the document also investigates how the officer common training plan could evolve in terms of training and education in order to address this requirement. The analysis discusses officer development exclusively as their upskilling is deemed most critical given their greater relative influence on the institution, its culture, and its future initiatives.

INTRODUCTION

2.   The Fourth Industrial Revolution is upon us, and it is defined by a global economic shift, demographic changes, resource scarcity, and a palpable acceleration towards both digitization and digitalization.[1] These developments are interconnected, they affect every state, and they disrupt every discipline, including defence.[2]

3.   While Canada has not embraced pan-domain operations per se, its national defence policy – *Strong, Secure, Engaged* (SSE) – acknowledges the elements of the Fourth Industrial Revolution,[3] state competition, and the importance of the newly recognized space and cyber domains.[4] Consequently, SSE pledges Canada's commitment to "employing new technological capabilities in a manner that rigorously respects all applicable domestic and international law."[5] Among the various emerging–and arguably *disruptive*–technologies that characterize this global revolution, most analyses highlight the critical importance of artificial intelligence (AI).[6] Achieving the SSE objectives pertaining to the integration of such technologies however, presupposes that DND/CAF employees are able to discern emerging technologies, understand their potential, make a

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[1] Both terms should not be confused. Digitization is merely the conversion of previously analog data to a digital form; digitalization implies a deliberate change in organizational processes to harness digital technologies. For additional details, see Business Tech Weekly, "Digitalization vs. Digitization – Knowing the Difference," last updated 22 June 2021, last accessed 21 January 2022, https://www.businesstechweekly.com/operational-efficiency/digital-transformation/digitalization-vs-digitization/.

[2] Foreign Affairs, "The Fourth Industrial Revolution: What it Means and How to Respond," published December 2015, last accessed 13 January 2022, https://www.foreignaffairs.com/articles/2015-12-12/fourth-industrial-revolution.

[3] This is most apparent in SSE's description of the global security environment as "one that is marked by the shifting balance of power, the changing nature of conflict, and the rapid evolution of technology." See Canada, DND, *Strong, Secure, Engaged: Canada's Defence Policy*, (Ottawa: DND, 2017): 14, http://dgpaapp.forces.gc.ca/en/canada-defence-policy/docs/canada-defence-policy-report.pdf.

[4] *Ibid.*, 50.

[5] *Ibid.*, 55.

[6] Kelly John Ward, "Educating Senior Service College Students on Emerging and Disruptive Technologies," *Joint Force Quarterly* 103, no. 4 (October 2021): 67, https://ndupress.ndu.edu/Media/News/News-Article-View/Article/2808080/educating-senior-service-college-students-on-emerging-and-disruptive-technologi/.

case for their acquisition, and employ them ethically, effectively, and efficiently. In other words, successful digitalization hinges on the ability of Canada's civil servants and military to operate comfortably in an increasingly digital environment–a basic foundation upon which to build further competencies. The sum of these skills is known as *digital literacy.*

4.　　　In light of the Department's existing and growing reliance on technology, SSE's vision of the global security environment, and in consideration of the lengthy timeframes associated with evolving attitudes, reforming the institution, and acquiring capabilities, the CAF cannot delay in generating a digitally literate workforce. As an initial step, this service paper recommends a number of changes to the officer common training plan within the domains of training and education. It does so by examining the Officer General Specifications (OGS), considering current US initiatives towards digitalization, and proposing a learning journey towards digital literacy.

DISCUSSION

Canada's Commitment towards Digitalization

5.　　　First, it is worth highlighting the governmental commitment to evolving digitally. This is evident from the creation of a *Minister of Digital Government of Canada* portfolio in 2018, that is entirely dedicated to the issue.[7] This resolve is further demonstrated by the Government's participation in the creation of a *Digital Nations Charter*,[8] and the subsequent release of *Canada's Digital Government Strategy* in 2021.[9] This is relevant for three reasons:

   a. clearly, digitalization is not contingent on a CAF adherence to a pan-domain approach to operations,

   b. the pan-governmental digitalization effort naturally extends to DND/CAF; yet,

   c. the accompanying roadmap remains relatively broad as it pertains to education and training, with the majority of the efforts being focussed on information technology systems.[10]

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[7] Canada, Prime Minister of Canada, "Minister of Digital Government Mandate Letter," published 13 December 2019, last accessed 16 January 2022, https://pm.gc.ca/en/mandate-letters/2019/12/13/archived-minister-digital-government-mandate-letter.

[8] Canada, "Digital Nations Charter," last modified 18 November 2021, last accessed 16 January 2022, https://www.canada.ca/en/government/system/digital-government/improving-digital-services/digital-nations-charter.html.

[9] Canada, "Canada's Digital Government Strategy," last modified 12 March 2021, last accessed 16 January 2022, https://www.canada.ca/en/government/system/digital-government/digital-government-strategy.html.

[10] Canada, "Canada's Digital Government Strategy: Roadmap for a more Digital Government," last modified 10 June 2020, last accessed 16 January 2022, https://www.canada.ca/en/government/system/digital-government/digital-government-strategy/roadmap.html.

6.   Upskilling the force however, does not happen on its own. Since the CAF continues to experience long-standing recruitment problems[11] while facing a "global war for talent",[12] the answer must necessarily involve professional development.

The State of Digital Literacy in the CAF

7.   Digital literacy encompasses an "individual's skills for successfully using information and communications technologies and interacting with digital information ecosystems."[13] It is about understanding ethics, responsibilities, and rights surrounding technology, acknowledging digital trends and their relevance, discerning information in a digital environment, and communicating effectively within it; as a discipline, it "cultivates [the] key 21st century goals of critical thinking, collaboration, creativity, communication, and building resiliency."[14] While a digitally literate employee may not be intimately familiar with every technical aspect behind the technologies at their disposal, they understand enough of them to employ them appropriately, coordinate their use by subordinates, convey their potential, and account for them in the organizational vision. Like any set of competencies, digital literacy cannot be assumed. Moreover, because digital literacy is concerned with interactions, the requirements for competencies naturally evolve along with the ecosystems and the technologies that shape them; hence, digital literacy is ephemeral. Thus, *digital literacy demands skills, knowledge and attitudes to interact in the present, while relying on a more general set of intellectual skills to evolve in the future*. This is precisely what training and education seek to achieve.

8.   The CAF is committed to developing its workforce through its professional development framework–the CFPDS.[15] This framework includes four pillars: education, training, experience, and self-development; these are supported by doctrine, which outlines the fundamental principles of leadership and war fighting, as well as containing the professional body of knowledge. Central to this analysis are the first two pillars, which the CFPDS defines as follows:

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[11] This issue forced the involvement of the Auditor General and the eventual creation of an as-of-yet unfulfilled action plan by the CAF. The detailed action plan is available at the following link: https://www.ourcommons.ca/content/Committee/421/PACP/WebDoc/WD8148750/Action_Plans/43-DepOfNatDef-e.pdf.

[12] United States, JAIC, DOD, "2020 Department of Defence Artificial Intelligence Education Strategy," published September 2020, last accessed 13 January 2022, https://www.ai.mil/docs/2020_DoD_AI_Training_and_Education_Strategy_and_Infographic_10_27_20.pdf.

[13] Juan D. Machin-Mastromatteo, "Information and Digital Literacy Initiatives," *Information Development* 37, no.3 (September 2021): 329, https://journals-sagepub-com.cfc.idm.oclc.org/doi/pdf/10.1177/02666669211031695.

[14] Elizabeth Barrett-Zahn, "Digital Literacy," *Science & Children* 58, no. 5 (May 2021): 6, https://web-s-ebscohost-com.cfc.idm.oclc.org/ehost/pdfviewer/pdfviewer?vid=1&sid=92666093-0ad0-4e8a-bf2d-17c639a577f5%40redis.

[15] Canada, DND, "Canadian Armed Forces Professional Development Framework," last accessed 13 January 2022, https://www.canada.ca/en/department-national-defence/services/benefits-military/education-training/professional-development/framework.html.

a. <u>Education</u>. "The provision of a body of knowledge and intellectual skill sets, upon which judgement among competing facts, information and ideas can be critically examined, assessed and interpreted."[16]

b. <u>Training</u>. "The provision of specific skills, knowledge and attitudes required to perform assigned tasks and duties."[17]

9. Specific to the development of officers, the OGS "describe the structure and the common requirements applicable to all officers in the CAF."[18] The OGS also "provide the foundation for the development of required skill-sets and competencies to meet common current tasks to all officers."[19] Considering that the entirety of the public service ought to become digitally literate as per Canada's Digital Government Strategy, digital literacy competencies should feature in the OGS unless their specificity makes them only applicable to certain elements, branches or trades. In their present version however, the OGS do not fulfill that requirement. Rather, familiarity with current and emerging technology is implicit: officers at various ranks are required to "maintain communication with subordinates, peers, and superiors," or to "implement the vision" without necessarily having an awareness of the increasingly digital environment through which these tasks are to be accomplished.[20] In the best case, the CAF teaches skills related to a specific technology on a platform-by-platform basis, which is known to be insufficient;[21] in the worst case, it either assumes that its members will have developed an understanding of the necessary technologies prior to joining the organization, or that the concepts can be learned on the job. While this may have appeared adequate in past decades, there is now a growing body of evidence pointing to the contrary.

The American Approach to Workforce Digitalization

10. Canada is not alone in its transition efforts towards digitalization. Faced with similar challenges, the US Department of Defense (DOD) released its *Digital Modernization Strategy* in 2019, which it describes as "the cornerstone for advancing [the] digital environment [through] innovation for advantage, optimization, resilient cybersecurity, and cultivation of talent."[22] This largescale initiative was accompanied by the 2018 creation of the Joint Artificial Intelligence Center (JAIC). The JAIC "provides a

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[16] *Ibid.*

[17] *Ibid.*

[18] Canada, DND, *The Canadian Armed Forces Military Employment Structures Manual, Volume 2: Profession of Arms – Officer General Specifications* (2020): 6.

[19] *Ibid*, 6.

[20] *Ibid*, Annex B.

[21] Garry Falloon, "From Digital Literacy to Digital Competence: the Teacher Digital Competency (TDC) Framework," *Educational Technology Research and Development* 68 (2020): 2450. https://link.springer.com/article/10.1007/s11423-020-09767-4.

[22] United States, DOD, "DOD Digital Modernization Strategy: DOD Information Resource Management Strategic Plan FY 19-23," published July 2019, last accessed 16 January 2022: 3, https://media.defense.gov/2019/Jul/12/2002156622/-1/-1/1/DOD-DIGITAL-MODERNIZATION-STRATEGY-2019.PDF.

critical mass of expertise to help the [DOD] harness the game-changing power of AI"[23] in a holistic way, beginning with the implementation of an education program. Contrary to popular belief, AI is an immensely broad discipline, the applications of which have become so mundane that many of us take them for granted. In fact, modern militaries already rely on AI due to "the convergence of large quantities of sensors, communication networks, and an accelerated stream of data and information."[24] They also depend on AI in many ways that are not specifically military, particularly as it pertains to resource management, human or otherwise, and this reliance will grow still.[25] Consequently, though it might be dismissed as a document aimed at a minority of experts in the field, the resulting *DOD AI Education Strategy* speaks to all, and accounts for the need to develop digital literacy as a pre-condition to AI success.[26]

11.   The value of the AI Education Strategy lies in its specificity, and the fact that familiarity with AI encompasses digital literacy. It is therefore possible to extract digital literacy competencies from its curricula for the benefit of our analysis. The strategy includes lines of efforts, performance indicators, a listing of competencies, and the establishment of six archetypes–each with a tailored curriculum to upskill them accordingly. The following aspects are particularly relevant to the CAF's own development of digital literacy:

    a.   <u>Competencies</u>. Competencies are grouped in eight topics, including 'foundational concepts', 'the opportunities and risk associated with AI', 'data management and visualization', and 'responsible AI' (i.e. ethics), to name a few. Each topic encompasses a number of specific competencies, which are used as building blocks for tailored curricula. Various examples taken from the aforementioned topics are 'understanding AI', 'applying AI', 'identifying trends', 'identifying risks', 'managing data', and 'data preparation'.

    b.   <u>Curriculum Depth</u>. The depth of upskilling is scalable, such that works may gain a basic, intermediate, or advanced level of knowledge in each competency.

    c.   <u>Definition of Worker Archetypes</u>. While the DOD believes that all employees require some AI awareness, the depth and breadth of knowledge needed varies between job descriptions. To enable the appropriate matching of competencies to professional needs, the strategy

[23] United States. Chief Information Officer, DOD, "Joint Artificial Intelligence Center." Last accessed 10 January 2022. https://dodcio.defense.gov/About-DoD-CIO/Organization/JAIC/.

[24] War on the Rocks, "Intellectual Preparation for Future War: How Artificial Intelligence will change Professional Military Education," published July 2018, last accessed 13 January 2022, https://warontherocks.com/2018/07/intellectual-preparation-for-future-war-how-artificial-intelligence-will-change-professional-military-education/.

[25] United States, JAIC, DOD, "Understanding AI Technology," last accessed 10 January 2022: 3, https://www.ai.mil/docs/Understanding%20AI%20Technology.pdf.

[26] United States, JAIC, DOD, "2020 Department of Defence Artificial Intelligence Education Strategy . . .

establishes six archetypes that differentiate workers who *lead*, *drive*, *create*, *embed*, *facilitate*, or simply *employ* AI.

12.   The result is a three-dimensional matrix assigning a tailored selection of scalable competencies to each worker archetype. Overall, the approach appears sound and is made simple by its modularity.

Upskilling Digital Literacy across the CAF

13.   A common learning journey for CAF officers inspired by the US DOD AI Education Strategy approach is proposed in Table 1. The table displays selected digital literacy competencies gathered across a multitude of sources, and assigns them by developmental period, which were used as the basis for four archetypes. Competency levels range from 1-3, with a lower value denoting more basic skills. The two noteworthy differences from the US model that inspired it are:

     a.   The table does not include an archetype for the *technology creator*. Workforce sizing would be too small to justify its inclusion. This is better addressed through specific job descriptions and attendance at civilian learning institutions.

     b.   The table also does not include an archetype for the *technology supporter*. A number of technical competencies would have to be added beyond the common curriculum, which are better managed by individual elements, branches, or trades.

14.   While the addition of digital literacy competencies to the CAF officer core curriculum represents the main recommendation towards digitalization, the initiative could be bolstered in various ways:

     a.   <u>Upskilling Non-Commissioned Members</u>. While officers wield comparatively more influence on the institution than non-commissioned members, the latter represent the bulk of the workforce, and therefore account for the majority of technology users. Furthermore, many non-commissioned officers also manage or facilitate the use of technology, making it critical for them to be digitally literate as well. Besides, non-commissioned members offer unique and relevant perspectives which would benefit analyses with a technology nexus. It is therefore highly recommended to extend digital literacy competencies to their general specifications as well, once the officer program has been sufficiently refined. A significant overlap in competencies is expected, which would offer valuable efficiencies.

Table 1 – Proposed Digital Literacy Journey across the OGS

DP	Officer Common Qualifications	Digital Archetype	Role pertaining to Technologies	Macro Cognitive Challenge	Outlook	Understand terminology surrounding technologies	Understand rights & responsibilities regarding technologies	Apply safety & security surrounding technologies	Apply ethics relative to technologies	Access current technologies	Integrate current technologies to routine tasks	Operate in the absence of current technologies	Locate and access information	Assess information & sources	Pool knowledge	Synthesize knowledge	Manage data (collect, store, monitor, prepare)	Visualize data (structure, display)	Learn with technology	Communicate using current technologies	Understand networking	Collaborate with current technologies	Perform routine maintenance of technologies	Manage lifespan maintenance of technologies	Manage product development	Dispose of technologies	Manage digital competencies	Integrate new technologies	Report issues with current technologies	Define and express technological needs	Understand technological trends and emerging technologies	Plan the acquisition of future technologies	Define and formulate a technology-enabled vision
	Basic Military Office Qualification (BMOQ) (Common)	Technology User	Uses current technologies, identifies questionable outputs, vocalizes shortfalls.	Achieve & Employ	Present	1	1	1	1	1	1	1	1	1	1	1			1	1	1	1	1				1						
1	P Res Basic Military Officer Qualification (BMOQ) (P Res)	Technology User	Uses current technologies, identifies questionable outputs, vocalizes shortfalls.	Achieve & Employ	Present	1	1	1	1	1	1	1	1	1	1	1			1	1	1	1	1				1						
	Basic Military Officer Qualification (CHAPLAIN-BMOQ)	Technology User	Uses current technologies, identifies questionable outputs, vocalizes shortfalls.	Achieve & Employ	Present	1	1	1	1	1	1	1	1	1	1	1			1	1	1	1	1				1						
2	CAF Junior Officer Development Qualification	Technology Facilitator	Enhanced familiarity with current technologies, awareness of tech trends, relays tech requirements, integrates new tools.	Achieve & Employ	Mixed	1	1	1	1	2	2	2	2	2	2	2	1	1	2	2	2	1	2	1	1	1	1	1	1	1	1	1	1
3	Senior Officer - CAF Common Intermediate	Technology Driver	Drives development and adoption of technologies as a manager or senior staff member.	Maintain & Manage	Future	2	2	2	2	3	3	3			3	3	2	2	3	3	3	2	3	2	2	2	2	2	2	2	2	2	1
3	P Res - Senior Officer - CAF Common Intermediate	Technology Driver	Drives development and adoption of technologies as a manager or senior staff member.	Maintain & Manage	Future	2	2	2	2	3	3	3			3	3	2	2	3	3	3	2	3	2	2	2	2	2	2	2	2	2	1
4	Officer DP 4 - National Security Programme	Technology Leader	Leads adoption of technologies, establishes institutional vision, plans for future technologies.	Maintain & Manage	Future	3	3	3	3						3	3							3		3	3	3	3	3	3	3	3	2

b. <u>Adding AI-specific Competencies</u>. Digital literacy is the underpinning of digitalization, but it should not be considered an end in itself. There are good reasons why the US DOD has both a Digital Modernization Strategy *and* an AI Education Strategy. As briefly explained above, modern militaries already rely on AI, and yet, the US DOD determined that "many officials throughout the [DOD] are asked to make decisions about AI before they have an appropriate understanding of the technology's basics."[27] Repercussions are felt in the drafting of policies, selection of strategies, capability acquisition and their employment. While developing an AI-capable force is less urgent than a digitally literate one, it is a natural next step. A separate analysis of this issue would lay important groundwork for subsequent training initiatives, while strengthening interoperability with our allies.

c. <u>Creation of a Digital Transformation Centre of Excellence (COE)</u>. The challenge of digitalization is significant, the stakes are high, and the window of opportunity is diminishing as fast as technology evolves. To be

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[27] United States, JAIC, DOD, "Understanding AI Technology . . ., 3.

successful, digitalization must be sufficiently resourced, adequately supported, expertly managed, and tied to judiciously selected measures of performance and effectiveness. This management requires a dedicated team able to oversee content development, monitor and report on the delivery, gather feedback, evolve the program, and provide expert support to units and formations. To that end, the creation of a staff dedicated to digitalization under the Director Digital Transformation is strongly recommended.

d.   <u>Sponsoring Post-Graduate Programs</u>. Multiple units already sponsor post-graduate programs aimed at developing technical expertise at the Capt/Lt(N) and Maj/LCdr ranks. Many of these programs would greatly benefit an expert cadre within the aforementioned COE; examples include computer software management, computer network security, and computer systems design programs. While the employment of the incumbents within the COE beyond their service at the sponsoring unit presents an appealing cost-saving prospect, it would also be unreliable and upsetting to career management. The allocation of funding to Director Digital Transformation for the sponsoring of appropriate post-graduate programs should therefore be considered.

e.   <u>Leveraging Self-Development</u>. Digitalization of the CAF hinges on formal training and education. However, this effort can benefit substantially from workforce access to curated resources and structured self-development programs. While existing resources of interest abound–including articles, publications, academic papers, and online courses–their reach is generally limited due to their unknown value, high cost, and dispersion. To ensure ease-of-use and accessibility, the licensing and curation of existing resources by knowledgeable staff, complemented with the creation of succinct self-contained professional development lessons for managers' use made accessible through a single, widely advertised website would be beneficial. This website and accompanied *app*, built in a similar style as the Canadian Army's original *Mission Ready* website would act as a portal towards all digital literacy resources, by archetype, including internal and external content.

CONCLUSION

15.   The Government of Canada has committed to digitalization, which extends to the DND/CAF. However, success in this venture hinges on an acceptable level of digital literacy across the force in order to optimize the use of current technologies, understand trends, and incorporate them in the vision of national defence. Digital literacy is not an end in itself, but it is a necessary stepping-stone to develop the expertise, acquire the capabilities, and maintain the interoperability needed to remain relevant. In light of the existing CAF dependency on technology, the absence of adequate training in this field, and the time needed to implement new programs, this paper argued that the CAF cannot

delay in including digital literacy competencies in he OGS. Officers were specifically targeted by the initiative due to their greater relative influence on the institution, its culture, and its future initiatives; nevertheless, it is critical to acknowledge that all members of the CAF must develop digital literacy to some degree, and that upskilling must extend over the course of one's career.

16.   While this paper proposed a digital literacy journey for inclusion in the OGS, other pathways could bolster the initiative to maximize its effectiveness. Implementing the sum of the recommendations below will ensure that the CAF address the human element of digitalization, in line with our national strategy.

RECOMMENDATIONS

17.   In light of the above research, this service paper recommends the following:

a.   Recommendation 1. Modify the OGS to include the competencies listed in Table 1.

b.   Recommendation 2. Conduct a similar analysis for non-commissioned members while maximizing overlap with the OGS to strengthen command teams, enable standardization, and gain efficiencies.

c.   Recommendation 3. Extend analysis to determine those specialist competencies needed for *technology creator* and *technology supporter* archetypes, working with individual elements, branches, and trades as required.

d.   Recommendation 4. Develop AI-specific competencies with inspiration from the US DOD AI Education Strategy to sharpen digital literacy skills further.

e.   Recommendation 5. Create a Digital Transformation COE under the Director Digital Transformation to champion and enable the initiatives proposed herein.

f.   Recommendation 6. Resource the Digital Transformation COE with expertise through the funding of sponsored post-graduate programs, the selection of which should result from a separate analysis; and

g.   Recommendation 7. Enable self-development by creating a single, well advertised repository of curated digital literacy resources for each digital archetype.

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