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Military Organizational Change and Emerging Technology: Lessons for Canada

by Alexander Salt

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The Canadian Armed Forces (CAF) are currently reacting to new threats from a global strategic environment that is becoming increasingly dangerous. Hostile adversaries such as China and Russia are pouring investments into their militaries, challenging Canada and its closest allies around the world. These challenges reaffirm the importance of military power and of the role that the CAF needs to play internationally and for continental defence. The CAF must modernize to respond to these new threats, and has recently recognized the need for such modernization and change.[1]

Change in a military organization raises several interconnected questions. When, why, and how do military forces transform during war and peacetime? Understanding the process of change helps to explain why militaries that are often portrayed as inherently conservative and resistant to change do nonetheless transform themselves under certain conditions.[2]

One of the most popular themes in the study of military change looks at how new technologies have forced military organizations to transform themselves. This process is often referred to as "innovation", and emphasizes how major organizational changes have occurred to a military's goals, force structure, strategies, or operational approaches.[3] The invention of nuclear weapons revolutionized the U.S. military during the late 1940s and 1950s. The resulting innovation led to major policy shifts in how defence resources were allocated, itself leading to the creation of new platforms like the ballistic missile armed nuclear submarines. Whole new visions of how war could be waged had to emerge.[4]

Today's threat environment is arguably the most disruptive it has been since the emergence of nuclear weapons in the early Cold War era. The United States is currently considering a new "Offset Strategy" to help guide its defence policy through the new global strategic environment. In the past, the U.S. developed defence strategies that have attempted to exploit various new technologies to offset the threat of international rivals and adversaries.[5] As the U.S. undergoes this process, Canada, as a close military ally, needs to keep pace to remain a viable partner. Falling behind would put Canada's alliances at risk. The U.S. will lead this transformation, but Canadian officials must understand the path of innovation to minimize gaps in technological capabilities. In an international strategic environment that is in a constant state of flux and uncertainty, states like Canada must plot a course to pursue innovation so we can avoid misusing resources and maintain a military that can be as lethal and effective as needed during future conflicts.

[1] Department of National Defence, *Pan-Domain Force Employment Concept: Prevailing in a Dangerous World* (Ottawa: DND Canada, 2023).
[2] Adam Grissom, "The Future of Military Innovation Studies," *Journal of Strategic Studies* Vol. 29, No. 5, (2006): 905-934.
[3] Harvey M. Sapolsky, Benjamin H. Friedman and Brendan Rittenhose Green, *US Military Innovation since the Cold War: Creation without Destruction* (London: Routledge, 2009).
[4] Lawrence Freedman, *The Evolution of Nuclear Strategy*, 3rd ed (New York, NY: Palgrave Macmillan, 2003).
[5] Rep. Rob Wittman, "Wittman: Why manned-unmanned teaming could be the Fourth Offset for America's military," *Breaking Defense* (30 May 2023), https://breakingdefense.com/2023/05/wittman-why-manned-unmanned-teaming-could-be-the-fourth-offset-for-americas-military/

Understanding the Change Process

Military organizational change is complex. That process cannot be simplified into a single theory or formula. Many factors emerging from a variety of external and internal sources can drive and shape the process of change to varying extents.

Innovation is not always a smooth or successful process. The introduction of emerging technologies into a military organization does not always lead to net positive outcomes. The German military radically innovated during the interwar era (1918-1938), integrating new generations of tanks, airplanes as well as other technologies such as radios, to enhance their ability to wage combined arms warfare. Germany was nonetheless still defeated by the end of the Second World War.[6] Later wartime technological innovations such as Germany's V1 and V2 missiles also failed to change the outcome of the war for the Axis Powers. Ultimately, even successful innovations are not the only factor that matter to military success, as factors such as poor strategy, decision-making, and tactical performance can undercut their effectiveness.

The adoption of emerging technologies by different militaries can increase the complexity of the organizations, which then hampers their overall effectiveness. Increased complexity means there are more elements that can be disrupted which can have a negative spillover effect on the rest of the organization.[7] Nonetheless, emerging technologies remain an attractive investment for contemporary militaries given their potential to give strategic and tactical advantages over current and future adversaries. The speed and relative ease in which the technologically advanced U.S. military swept aside the conventional Iraqi Army during the 1991 Gulf War in Kuwait and again in 2003 during the Invasion of Iraq shocked many international observers and demonstrated the importance that technological superiority can give one side over the other during war.[8]

Frequently, innovation is driven forward as a response to the emergence of strategic or operational challenges from the international threat environment. Assessments are made of active threats, and then necessary actions and changes unfold. For example, the U.S. military underwent a series of changes related to new technologies and doctrine during the 1970s and 1980s in response to the Soviet Union's perceived quantitative military advantage in the Central European front of the Cold War. Here, the U.S. military sought to leverage new technologies such as the creation of precision guided munitions (PGMs) and sensors to give their military a strategic advantage over the Soviets.[9] Research and development of new technology is frequently a driver of innovation; this can unfold either in a sustaining fashion where it allows the organization to continue its preferred standard operating procedures by enhancing existing capabilities, or it can serve in a disruptive role, where it radically reshapes elements of the organization. Traditionally, many modern military relevant technologies have often been funded and designed by a country's defence community; for example, guided missiles were engineered and developed under the

[6] Robert M. Citino, *The Path to Blitzkrieg: Doctrine and Training in the German Army, 1920-39* (Boulder, CO: Stackpole Books, 2008).
[7] Chris C. Demchak, *Military Organizations, Complex Machines: Modernization in the U.S. Armed Services* (Ithaca, NY: Cornell University Press, 1991).
[8] Keith L. Shimko, *The Iraq Wars and America's Military Revolution* (Cambridge, MA: Cambridge University Press, 2010).
[9] Richard Lock- Pullan, 'How to Rethinking War: Conceptual Innovation and AirLand Battle Doctrine", *Journal of Strategic Studies* Vol. 28, No. 4 (2005): 679-702.

watchful eye of the U.S. Department of Defense and various defence contractors during the early stages of the Cold War. This close cooperation between government and private sector allowed for the technology to be developed to meet specific needs of the military.[10] Sometimes technology emerges in the civilian sector before it is adopted for national security. These are often referred to as dual-use technologies given their joint civilian and military applications. Often civilian technologies are initially procured "off the shelf" by militaries from the commercial market, and so there is a degree of integrative efforts needed to conform the commercial technologies for military purposes.[11]

Alliance commitments can drive militaries to undergo innovations, including the adoption of new technologies. Following the U.S. military operational success during the Gulf War (1991) many other NATO members began to transform their militaries to maintain interoperability levels and avoid being left behind. Alliance politics can drive innovation either by allowing the diffusion of knowledge and technology from allied state to state, or by pushing a member of the alliance to innovate in order to maintain legitimacy in the eyes of the other members. Members of the alliance will either seek to emulate the successful changes of others in the alliance, or will be influenced via gradual socialization and professional networks to undergo changes.[12] Fear of defeat during an ongoing conflict can also drive military organizations to adopt changes; the U.S. military underwent a series of counter-insurgency reforms in the midst of the Iraq War (2003-2011) when it became clear that their initial approaches were unable to secure victory in a timely fashion.[13]

Internal sources can also help drive and shape the introduction of a military innovation. Leadership is frequently cited for its impact on military innovation. Civilian leadership can either direct changes, or provide the political consent and support needed for change to unfold. Senior military leadership will also play an important role in deciding if innovation is to occur, either by directly ordering it and then managing its integration into the organization, or by providing organizational protection for lower ranking officers to oversee the enaction of the change.[14] An often overlooked factor in the military change process is the role of midlevel officers, yet they are often the ones who have the most primary experience with the use of military technologies either via operations or field exercises, and so will often have the best understanding of the effectiveness or ineffectiveness of the changes.[15]

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[10] Robert J. Watson, *Into the Missile Age 1956-1960* Vol IV (Washington, DC: Historical Office, Office of the Secretary of Defense, 1997), https://history.defense.gov/Portals/70/Documents/secretaryofdefense/OSDSeries_Vol4.pdf

[11] Jake Chapman, "Reliance on Dual-Use Technology is a Trap," *War on the Rocks* (8 September 2022), https://warontherocks.com/2022/09/reliance-on-dual-use-technology-is-a-trap/#:~:text=As%20currently%20executed%2C%20the%20U.S.,technological%20advantage%20to%20its%20adversaries.

[12] Terry Terriff, Frans Osinga and Theo Farrell, eds. *A Transformation Gap? American Innovations and European Military Change* (Stanford, CA: Stanford University Press, 2010

[13] James A. Russell, *Innovation, Transformation, and War: Counterinsurgency Operations in Anbar and Ninewa, Iraqi, 2005-2007* (Stanford, CA: Stanford Security Studies, 2011)

[14] Barry R. Posen, *The Sources of Military Doctrine: France, Britain and Germany Between the World Wars*, (Ithaca, NY: Cornell University Press, 1984).

[15] Alexander Salt, *Processing the Lessons of War: Organizational Change and the U.S. Military* (PhD Dissertation: University of Calgary, 2023), https://prism.ucalgary.ca/items/96fdb5dc-b2d6-49fd-80d0-d5b0fdf442e7

Organizational dynamics are often a very important element in shaping how a military innovation unfolds. Military organizations often possess deeply ingrained normative preferences which will make certain courses of action more or less favorable depending on how it aligns with those preferences. Culture influences internal perceptions regarding how the organization interprets external challenges and attitudes towards certain technologies.[16] For example, for much of its history, the U.S. Marine Corps has often viewed heavy equipment such as tanks with a degree of disinterest, as the organization self-conceptualizes itself as a force that prioritizes rapid maneuver over heavy firepower.[17] There will often be divergences within a military too, as each traditional service branch (Army, Navy, Air Force) will have their own unique set of preferences regarding strategy, operational methods and technological procurements which is in part shaped by the geographic domain in which they primarily operate.[18] Further, these organizational cultural differences will often diverge considerably among different states; the military of each country is fundamentally shaped by their own unique history, geographies and national cultures.[19]

Militaries also exist in a bureaucratic context, and thus will develop a set of organizational interests that leaders will seek to preserve and protect; often these interests are tied to the amount of defence budget and resources that are allocated to them by civilian policy makers. This may push the military organization to adopt certain technological procurements and doctrinal preferences over others as a means of securing a larger budgetary allotment. During the mid 1950s, the U.S. Navy actively pursued the integration of nuclear technologies into its force structure as a means of maintaining its relevancy in the eyes of the Eisenhower Administration who was shifting the government's defence budgets to focus on nuclear related investments.[20]

Lessons for Canada

Emerging technologies in the contemporary period are developing at a rapid pace. Artificial intelligence, for example, is quickly changing the ways in which we gather and interpret data. The speed of many of these technological developments is being driven by global private industry and research.[21] Civilian developed technologies often lack initial input and oversight of the defence community during their early formation; civilian firms operate under a more rapid development cycle than what government bureaucracies are traditionally comfortable following. This means the CAF will need to think creatively, and quickly about how best to integrate them into the organization. Stronger ties, including formal and informal networks, will need to be built and

[16] Dima Adamsky, *The Culture of Military Innovation: The Impact of Cultural Factors on the Revolution in Military Affairs in Russia, the US, and Israel*. (Stanford, CA: Stanford Security Studies, 2010).
[17] Terry Terriff, "'Innovate or die': Organizational culture and the origins of maneuver warfare in the United States Marine Corps." *Journal of Strategic Studies* Vol. 29 No. 3 (2006), 475-503.
[18] Carl. H. Builder, *The Masks of War: American Military Styles in Strategy and Analysis* (Washington, DC: Johns Hopkins University Press, 1989)
[19] Colin S. Gray, *Nuclear Strategy and National Style* (Lanham, Mass: Hamilton Press, 1986).
[20] Harvey M. Sapolsky, *Polaris System Development: Bureaucratic and Programmatic Success in Government* (Cambridge, MA: Harvard University Press, 1972).
[21] Robert Engen, "When the Teeth Eat the Tail: A Review of Canada's Defence Artificial Intelligence," *Defense AI Observatory*, (Feb 2022), https://defenseai.eu/wp-content/uploads/2023/02/DAIO_Study2309.pdf

intensified between Canadian defence and the information-technology private-sector in Canada, which will allow for more up-to-date data on technical developments to be shared with the government, as well as allowing for the preferences of the military to informally shape the development cycle and outputs of these civilian firms.

This poses a particular challenge from an innovation standpoint, as militaries that are often slow to embrace change need to overcome those tendencies or else risk falling into a strategically disadvantaged position. Failure to adopt technologies means that the Canadian military risks being deployed in future operations against adversaries who have existing access to such modern technologies. Conversely, the rapid integration of a new technology may be highly disruptive to the military, which may run into friction with preexisting organizational preferences and dynamics which can potentially constrain operational effectiveness. The issue of resource availability will also affect Canada's military innovative efforts. Canada, as a smaller military power will have to make more complicated decisions regarding how and where it pursues newer technological investments than alliance partners like the U.S. who operate under a larger budget with more available personnel. Newer investments in software and hardware will involve costs in terms of money and human capital, however, such investments may also allow the CAF to follow their own offset approach where new technologies can alleviate the need for mass quantities of equipment and also free personnel from labor intensive tasks. Overall, the resource implications of new technologies may place further strain on the CAF's budget while also allowing them to reduce costs in other ways.

Technological innovation requires new methods of management to allow the CAF to meet the challenges of today, and tomorrow. Civilian and military leadership will need to engage in quicker decision-making cycles and reform the equipment procurement process in Canada to allow for the rapid acquisition of emerging technologies. This may involve turning to open-source solutions to overcome obstacles in the process.[22] Further, from within the military there needs to be a serious internal assessment of the organizational dynamics of the CAF in order to best integrate the new technologies. Questions that need to be discussed includes asking how does this specific emerging technology conform to how the CAF, and more precisely the individual services (the Army, Royal Canadian Navy and Royal Canadian Air Force), understands operations; and what internal sub-structures need to be constructed to ease that technology into the organization?

Technology is best integrated into a military if it conforms positively to ingrained institutional preferences. This can be streamlined by establishing the appropriate organizational conditions to allow for technological changes to be more readily accepted by its membership. Efforts, when possible, should be undertaken to build a tech-positive and digitally orientated culture among the different elements of the CAF to make it more receptive towards the current generation of emerging technologies. Having a personnel base that is already technologically inclined will make the integration of radical new technologies such as artificial intelligence unfold in a more rapid fashion. Transforming organizational culture is easier said than done; it will require considerable

[22] Robert Jay Glickman, "Acquisition of Innovations in a Time of Rapid Change: Some Observations," *Canadian Military Journal* (2008), http://www.journal.forces.gc.ca/vol13/no4/page66-eng.asp

effort from senior leadership to help drive the process, and will also require a concerted focus on midlevel officers who will eventually be tasked with overseeing the operational usage of these future technical procurements.

Technology will not revolutionize operations on its own, it will require new ideas about how it can be used. Senior CAF leadership should foster and maintain a feedback loop among officers concerning their views on the introduction of emerging technologies; this can occur through formal pathways such as organizational professional journals (including the creation of a technology specific journal), and the hosting of formal conferences and seminars to discuss related matters. It can also happen through informal pathways such officer-to-officer interactions. These processes will involve the concerted efforts of key individuals in the organization and the fostering of collectivist attitudes and preferences. One of the main outputs of a new technologically inclined organizational culture will be the generation of new ideas towards doctrine, strategies and operational methods. Essentially, leadership needs to enthusiastically embrace the introduction of the new technologies, but the organization will be much better off if leadership can get as many officers of different ranks as possible to buy in along with them.

Field experience is also an incredibly important element of the innovation process. This will unfold either during active operations or through major training and tabletop exercises. It allows officers to gain as much direct experience with the emerging technologies as possible, which in turn can help allow the officers build trust and acceptance about its usage. It can also help facilitate the diffusion of best practices as officers learn what works and what does not with the new technology during its incubation stages.[23] It is best if this can occur prior to the start of any major conflict as learning during combat operations carries the greater risk of causalities.

Overall, undergoing realistic field and tabletop exercises are the best way for a military to judge the success of innovation efforts during peacetime as they will provide CAF leadership with direct evidence and data. Success will be determined via analyzing the CAF's performance during the exercises to identify if the new technologies allowed for new or more effective operational methods to unfold in terms of lethality, speed, or other metrics of efficiency. To help evaluate the success of new technologies the CAF should also continue to participate in as many multinational allied field exercises as possible, as they allow the CAF to evaluate whether the new technologies have helped bolster their interoperability capabilities, which has been prioritized as a goal for the CAF.[24] Considerations beyond just operational effectiveness will always be taken into account when evaluating the impact of innovation efforts, as often states will be politically motivated by a broad variety of intentions, such as a desire to be seen as a more reliable ally. However, sometimes complicated situations may unfold where new technologies help the military meet certain goals, but not others. For example, new technological investments may create new interoperability opportunities which satisfy certain political considerations, but at the same time may also hamper

[23] Dave Perry, interview with Col. Horner, "Wargaming for Interoperability," *Defence Deconstructed Podcast*, podcast audio (8 Dec 2023) https://www.cgai.ca/wargaming_for_interoperability

[24] Canada, *Strong, Secure, Engaged: Canada's Defence Policy* (Ottawa, ON: Department of National Defence, 2017), 13.

the operational effectiveness of the military. Leadership will eventually need to articulate and prioritize which goals they want to use to measure the success of innovative efforts.

The current generation of technologies are continuously evolving, while militaries now also face a growing need to focus on pan-domain operations which blurs the lines between conflict and peacetime, and so faster solutions are required to meet the demands of these combined challenges.[25] To mitigate costs during complex innovative efforts under such circumstances, defence officials need to lay as much foundation for change as possible to avoid any organizational obstacles that can further constrain the integration process. By building such a foundation, it will allow the Canadian defence community to approach new technologies in a less risk-averse manner and quicken the decision-making cycle.

[25] Sara Ritchie, "Chief of defence staff says military must switch gears in increasingly chaotic world," *Toronto Star* (26 Oct 2023), *https://www.thestar.com/politics/federal/chief-of-defence-staff-says-military-must-switch-gears-in-increasingly-chaotic-world/article_7da32856-c150-5206-b926-dcaaccc092fa.html*

About the Author

Dr. Alexander Salt *has a PhD from the University of Calgary's Centre for Military, Security and Strategic Studies and an MA in Political Studies from the University of Manitoba. His dissertation explores to what extent has the battlefield experience of the U.S. military influenced post-war organizational innovation. His research has been awarded the Social Sciences and Humanities Research Council of Canada's Joseph-Armand Bombardier Doctoral Award, as well as a General Lemuel C. Shepherd, Jr. Memorial Dissertation Fellowship. He has published research relating to international security and defence policy with Strategic Studies Quarterly, Journal of Military and Strategic Studies, Canadian Foreign Policy Journal, and The Canadian Network for Research on Terrorism, Security, and Society. Previously, he was a Visiting Political Science Instructor with Macalester College and has also held positions with the Centre for Defence and Security Studies, as well as the Consulate General of Canada in Dallas, Texas, and the Consulate General of Canada in Minneapolis, Minnesota.*

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