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SUSTAINED RELEVANCE: THE NEED FOR A STRATEGIC APPROACH TO LOGISTICS INNOVATION FOR THE CANADIAN ARMED FORCES

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JCSP 48

Service Paper

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CANADIAN FORCES COLLEGE – COLLÈGE DES FORCES CANADIENNES

JCSP 48 – PCEMI 48
2021– 2022

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LOGISTICS INNOVATION FOR THE CANADIAN ARMED FORCES**

Major Kevin Davis

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THE NEED FOR A STRATEGIC APPROACH TO LOGISTICS INNOVATION FOR THE CANADIAN ARMED FORCES

AIM

1. The aim of this service paper is to propose the development of a more strategic approach to logistics modernization for the Canadian Armed Forces (CAF). To date, no such overarching strategy has been promulgated nor has the ensemble of organizations involved in the conduct of sustainment across the Department of National Defence (DND) been aligned towards a common vision of future sustainment. Yet, this paper argues that a vision centered on radical innovation will certainly be required if our armed forces are to maintain their combat effectiveness in the future operating environment.

INTRODUCTION

2. Relative to private industry, the CAF has long been struggling keep up with pace of technological innovation occurring in the domain of supply chain management and distribution which is at the core of all sustainment activity. In addition to the normal inertia that impedes change initiatives in general, the lag between cutting edge innovation and adoption within the CAF context is exacerbated, in the view of this author, by a lack of dedicated resources, the challenges associated with defense procurement and the preponderance of a policy-focused culture that favors process compliance over effectiveness of outcome.

3. Fortunately, numerous overdue efforts are ongoing to modernize the CAF's enterprise resource planning (ERP) system in view to benefiting its end-users. In fact, current initiatives to revamp the Defense Resource Management Information System (DRMIS) are so overlapping and numerous that progress is being delayed by the sheer lack of available human resources within the CAF. Even where significant outside help has been enlisted from across the Department and from Industry, projects are limited to the speed-of-engagement whereby numerous stakeholders must be brought in on projects from across the CAF. From problem definition to options development to implementation across multiple diverse military services, engagement is a heavy lift and must be carefully prioritized and sequenced. Yet, these discreet projects do not appear to be guided by a clear strategic roadmap that truly addresses the scope of the challenge at hand.

CONTEXT

4. Political Context. Largely motivated by political goals unrelated to national defence, such as lowering greenhouse emissions and improving Canada's technological competitiveness, the Canadian government has announced that it intends to create a new organization to drive "radical innovation"¹. Referred to as "CARPA"² in the Liberal Party platform, the Minister of Innovation has been directed to adopt an approach akin to the American Defense Advanced Research

¹ Liberal Party of Canada, "A New Advanced Research Agency," last accessed 22 January 2022, <https://liberal.ca/our-platform/a-new-advanced-research-agency/>.

² *Ibid.*

Projects Agency (DARPA) but with a scope beyond national defence.³ With due respect for the Assistant Deputy Minister of Defence Research and Development Canada, it seems that ADM(DRDC) has been eclipsed by these new developments. One journalist writes: "National defence is neither a comparative advantage for Canada, *nor a galvanizing problem requiring technological solutions in the Canadian context*."⁴ If this is accurate, the CAF is truly on its own when it comes to championing innovation in the sphere of military logistics. Even within DND, initiatives aimed at modernizing military logistics are few and far between. Notably, DRDC has no dedicated focus area concerning logistics or sustainment and has only recently funded two competitions to solicit ideas from private researchers on related topics. One of these targets solutions for "getting vital supplies to troops using autonomous vehicles"⁵ and the other addresses "fast and adaptive logistics planning for military missions"⁶. However beneficial, outsourcing our innovation challenges to private industry is a far cry from developing a sustained strategy for the modernization of sustainment logistics into the future.

5. Policy Context. Regrettably, *Strong Secure Engaged* (SSE) does not make any direct commitments to the modernization of Defence Logistics beyond acquiring logistics support vehicles.⁷ Consequently, the CAF is forced to draw dotted lines to other initiatives in order to justify the resource allocations required for cornerstone projects like DRMIS Modernization (DRMIS Mod). This is highlighted in the language of the draft the DRMIS Mod business case, which reads:

Indeed, the investments in equipment and materiel necessary to underwrite Canada's future force that have been identified in the SSE will require a complimentary modern information system capable of providing their maximum availability and improved interoperability with Allies. The outcomes of DRMIS Mod will improve the results of (and reporting on) any of the SSE initiatives that require or anticipate more efficient processes, stronger policy, improved data sharing, or increased integration. As a sustainment capability, this modernization activity will be essential to support the asset management, contract management, financial management and enable the operational capabilities identified in SSE.⁸

³ Liberal Party of Canada, "A New Advanced Research Agency," last accessed 22 January 2022, <https://liberal.ca/our-platform/a-new-advanced-research-agency/>.

⁴ Robert Asselin and Sean Speer, "Time for Ottawa to make good on its bipartisan commitment to 'radical innovation'," *Financial Post*, 10 January 2021, <https://financialpost.com/technology/time-for-ottawa-to-make-good-on-its-bipartisan-commitment-to-radical-innovation>

⁵ Department of National Defence, "Essential deliveries: Getting vital supplies to troops using autonomous vehicles," last modified 6 July 2021, <https://www.canada.ca/content/canadasite/en/department-national-defence/programs/defence-ideas/element/competitive-projects/challenges/essential-deliveries-vital-supplies-autonomous-vehicules.html>

⁶ Department of National Defence, "Spring into Action – Fast and adaptive logistics planning for military missions," last modified 6 July 2021, <https://www.canada.ca/en/department-national-defence/programs/defence-ideas/element/competitive-projects/challenges/spring-action-fast-adaptive-logistics-planning-missions.html>

⁷ Department of National Defence, *Strong, Secure, Engaged: Canada's Defence Policy*, <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/canada-defence-policy.html>

⁸ Canada. Department of National Defence. Defence Resource Management Information System Modernization Business Case, n.d.

The absence of a clear investment line in SSE renders all such efforts to modernize Defence Logistics as secondary and in competition for resources with the very projects they intend to enable. Future policy should carve out a more concrete commitment to modernizing the logistics capabilities of the CAF. This will require significant bottom-up championing. Leaders in CAF logistics must be able to define and articulate a strong business case for substantial, long-term investments in continuous improvements in Defense Logistics. Like other projects centered on exquisite weapons systems that brief well to the media, the CAF will need to find compelling ways to present its logistics capability requirements to sustain forces in future operating environment.

DISCUSSION AND ANALYSIS

6. Strategic Deficit. Organizational innovation begins with sound strategic foresight. The 2017 review of the Defence Capability Development Program (DCDP) provides a very useful summary of why strategic concepts are absolutely critical for guiding capability development:

Fundamental concepts, whether for current operations or future challenges, are needed to underpin capability development at all levels... Incorrect or undeveloped conceptual choices can be a great detriment to future combat effectiveness. Understandably, it is important that concepts be published to encourage debate and the dissemination of common perspectives. Some of this debate occurs in the professional journals of the CAF and, to an extent, among defence intellectuals in Canada. Stakeholders require an ability to develop concepts to ensure that capability gaps in current and future operations can be identified.⁹

The report noted the efforts of each of the services to address this requirement through the development of capstone doctrines to address the future operating environment relative to their respective domains but noted a shortfall in work concerning joint enablers. The report states:

Generally, the DND/CAF has faced challenges developing higher-level operational concepts in areas such as targeting, information operations and use of UAS. The CAF could benefit from consolidating strategic-level concept development to prioritize and more fully explore critical emerging capabilities.¹⁰

One could easily add “joint sustainment” to this list of areas in desperate need for a clearer strategic vision to compliment the rapid shifts in operational concepts.

⁹ Department of National Defence, “Evaluation of Defence Capability Development Program” (Ottawa: November 2017), <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/audit-evaluation/evaluation-defence-capability-development-program.html>

¹⁰ Department of National Defence, “Evaluation of Sustainment of Operations,” (Ottawa: May 2021), <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/audit-evaluation/evaluation-defence-capability-development-program.html>

7. The Pan-Domain Force Employment Concept calls for a paradigm shift in how warfighting is conceptualized to account for the anticipated challenges of the future operating environment. The draft capstone document reads:

Our concept of the military professional must be deliberately tuned for the information age, including how our people interact with each other and with the environment. This will necessarily trigger an evolution of how we recruit, train, and employ our people. The realities of the contemporary environment dictate that we must be agile, innovative, and evolving at the Speed of Operational Relevance to remain an effective instrument of national power. We must become adaptive in our thinking, learn continuously from past experiences, and be creative in our problem-solving approaches to match novel frameworks of understanding with an increasingly complex, opaque, and volatile environment.¹¹

8. The journey towards this vision is described as “an iterative undertaking that will use thorough research, logic, deep thinking, design, modelling, and simulation as well as experimentation to adapt the CAF to face this challenge.”¹² Anticipating the resistance that the CAF would encounter, it further states that “barriers to integration – be they cognitive, procedural, organizational, or technical – must be removed and linkages must be fostered through habitual integration.”¹³ All said, however, PFEC merely signals new operational concepts for which little, if any, commensurate logistical concepts have been developed.

9. In a recent article for *Joint Force Quarterly*, Paul Christian van Fenema et al. highlight the imbalance of effort that tends to exist between the development of operational and logistical concepts (and correspondingly, in innovation). Though commenting from an American perspective, their observations surely apply in the Canadian context as well. They write:

Military logistics innovation lacks a cross-service strategic picture. It hardly enjoys the backing of a strong military academic research community, with the exception of historical logistics studies. The operational domain by comparison performs better in this respect, with multiple think tanks, [Department of Defense] units, and universities constituting a vibrant intellectual community. To sustain relevance in the digital era, we need insight into effective strategic logistics innovation processes, including instruments for stimulating and synergizing micro-innovations.¹⁴

Depicted below in Figure 1, their model depicts innovation in operations and logistics as occurring separately but in parallel. This model implies the requirement for a distinct “logistics strategy” to drive the development of distinct “logistics concepts” that, in turn, synthesize

¹¹ Department of National Defence, “Pan-Domain Force Employment Concept (Draft),” (Ottawa, CJOC: 2020), 28-29.

¹² *Ibid.*, p. 6.

¹³ *Ibid.*, p. 17.

¹⁴ Paul Christian van Fenema et al., “Sustaining Relevance: Repositioning Strategic Logistics Innovation in the Military,” *Joint Force Quarterly* 101, 2021, 60

emerging innovations with contemporary operational requirements.¹⁵

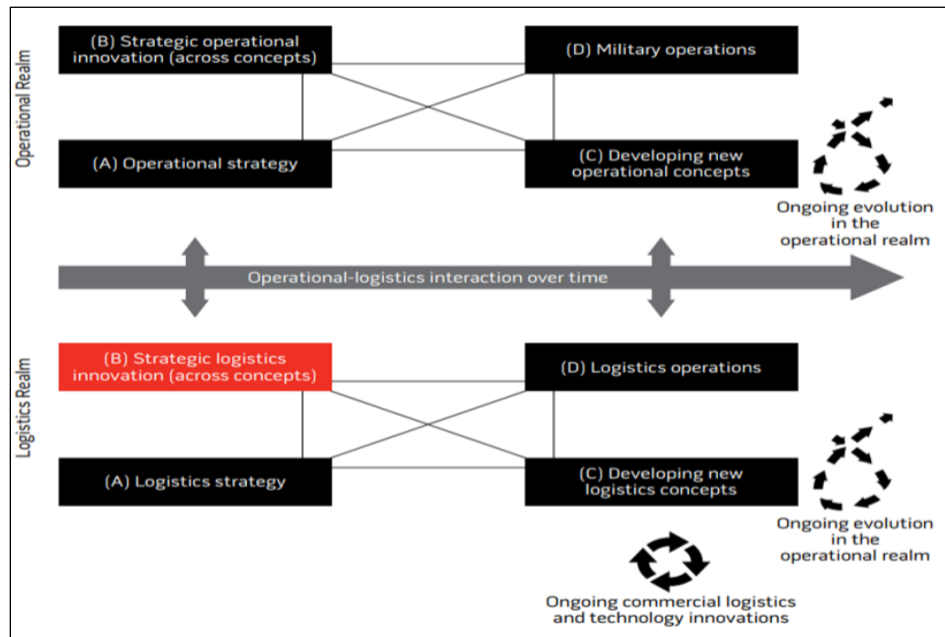


Figure 1 – Positioning Strategic Logistics Innovations

Source: van Fenema et al., *Positioning Strategic Logistics Innovations*, p. 60

10. Indeed, innovation in logistics goes beyond the simple on-boarding of technical gadgetry. It requires the development of entirely new concepts for sustainment that *incorporate* technology to meet the demands of future operations (ie. adaptive dispersed operations; pan-domain conflict). The persistence of potentially outdated concepts in current doctrine (ie. logistics echelons, dumping programs, commodity points, et cetera) is testament to fact that conceptual change is slow and difficult. As Lieutenant-General Lyons, Deputy Commander United States Transportation Command, has stated:

...innovation is more than just technological advances. Overcoming these challenges and the many that will follow requires innovation and critical thought on how to conduct operations in the joint operating environment. Technology by itself will not be our salvation. To succeed on future battlefields, we... must always be willing to think differently, challenge our processes, and expand our minds about concepts not previously accepted.¹⁶

11. Adapting to the Digital Age. The CAF logistics enterprise is behind the curve in terms of adapting to the age of mass digitalization. To gain momentum in this area, leaders in the field

¹⁵ *Ibid.*

¹⁶ Stephen R. Lyons (Lt. Gen), “Sustaining Military Operations in the Emerging Joint Operating Environment,” *Army Sustainment* (July-August 2017), p. 21.

must first understand and articulate the true future sustainment needs of the CAF. This requires foresight and the ability to apply a design-thinking mindset to break free from the cognitive shackles of past processes and out-dated solutions. As illustrated in Figure 2, “business needs drive technological development, but *technological development* facilitates business solutions.”¹⁷ This is not simply an exercise in bolting on new gadgetry, but rather of crafting new approaches made possible by existing and anticipated technologies. Where there is no clear requirement, or where requirements are not well understood, available technologies will be under-leveraged. Suffice it to say that some technologies will prove more viable for adoption in the military context than others and along different timelines from industry. Figure 3 presents a prediction of the adoption-rate of certain existing technologies based on their value-proposition in commercial contexts. Contrary to the post-war trend, DND should expect to invest in the development of certain logistics technologies *ahead of industry* in order to accelerate the improvement of the CAF’s sustainment capabilities and, by extension, its relative force projection and combat power. As it stands, the CAF is a late-adopter in almost every respect.

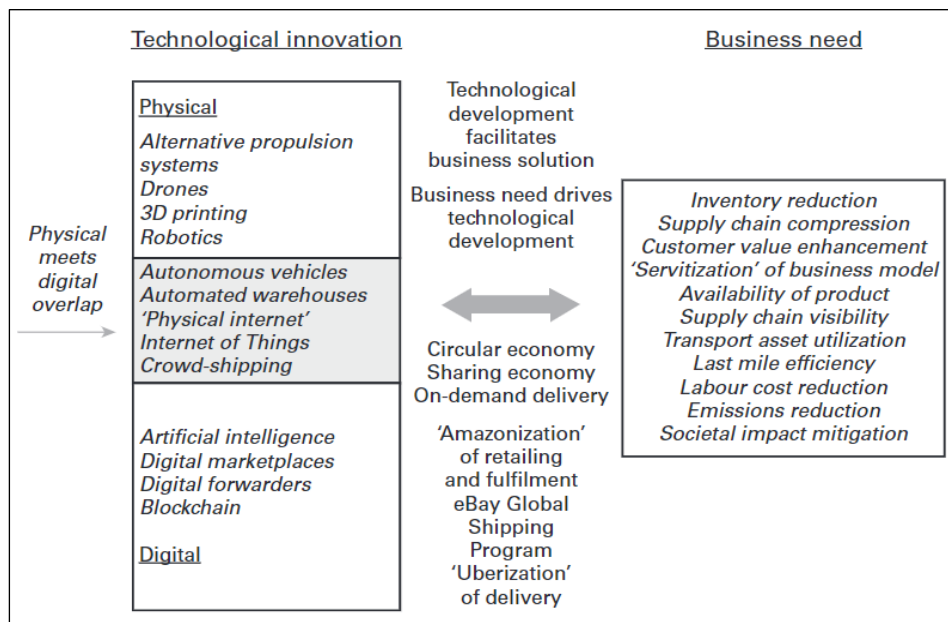


Figure 2 – Business Needs Drive Technological Innovation

Source: Manners-Bell and Lyon, *The relationship between technological innovation and business needs*, p. 8.

¹⁷ John Manners-Bell and Ken Lyon. *The Logistics and Supply Chain Innovation Handbook: Disruptive Technologies and New Business Models* (New York: Kogan Page, 2019), p. 9.

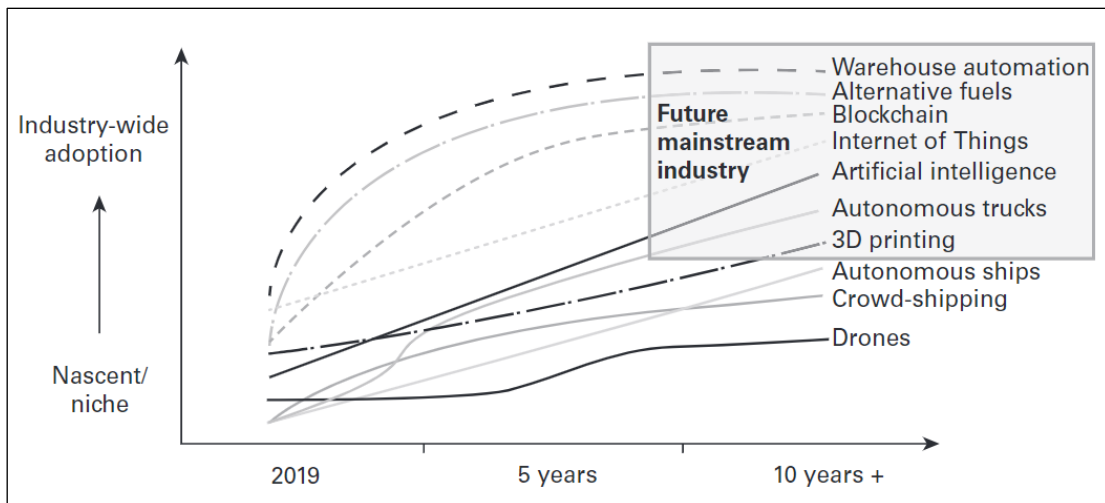


Figure 3 – Forecasted Industry-Wide Technology Adoption

Source: Manners-Bell and Lyon, *Industry-wide adoption or niche application?*, p. 244.

12. The Modernization and Integration of Sustainment Logistics (MISL) project—despite what may be assumed from its name—does not seek to implement new physical technologies as such. Rather, it aims to consolidate disparate enterprise systems into one integrated suite. This will serve to achieve some process efficiencies and will enhance logistics planning efforts across the CAF by improving the reliability and availability of logistics data but it is not a panacea. It does not, for example, include within its scope the adoption of technologies such as robotics, autonomous vehicles, additive manufacturing devices, augmented reality devices, smart-tracking devices, and the like. Likewise, the DRMIS Modernization project currently in development aims to significantly upgrade the CAF’s SAP architecture but it does not envision the onboarding of any physical hardware that would fundamentally change how materiel is stored and distributed along the supply chain. One noteworthy exception is the Automatic Identification Technology (AIT) Project which aims to “determine a solution that will provide a more accurate picture of the quantity, location and condition of material”¹⁸ and anticipates the fielding of barcode scanners—“new technologies”¹⁹—to units, bases, and wings across Canada between 2023 and 2028.²⁰ To say nothing of the project’s timeline, it is simply noted that barcode readers have been in widespread use in industry since the late 1980’s.²¹

13. While existing initiatives *will* construct a solid digital foundation for other technological solutions down the road, there is currently no clear strategic roadmap to guide efforts beyond these projects and towards that which is implied in the draft PFEC. The CAF cannot hope to remain at pace if it is not engaging conceptually with the latest technologies and aggressively evaluating where, when and how they may contribute to enhancing the sustainment capabilities of the CAF in 10-, 15-, and 20-years time. Such determinations will require rigorous trialing, prototyping and stakeholder engagement long before capital procurements can be initiated. To

¹⁸ Canada, “Spring 2020 Reports of the Auditor General. Report 3: Supplying the Canadian Armed Forces – Appearance of the Deputy Minister of National Defence Before the Public Accounts Committee.”

¹⁹ *Ibid.*

²⁰ *Ibid.*

²¹ Jody Costa, *The History of the Barcode*, 1 June 2021, <https://www.barcoding.com/blog/barcode-history>

that end, greater collaboration across all services is required, in addition to partnership with entities like ADM(S&T) and ADM(DRDC), to develop and test use-cases for such technologies. Furthermore, innovation must be realized beyond the narrow confines of existing capital projects. It seems patently obvious that the true needs of military logisticians will forever outspan and outpace the imaginations of those directly charged to lead logistics capability development on behalf of the CAF. As such, efforts must extend to promoting innovation at all levels of the institution and across all ranks.

14. Fostering a Culture of Innovation. The “sustainment culture” of the CAF is strongly influenced by the bureaucratizing forces of government policy. In such a climate, innovation can easily be stifled as room for creativity is written out of the margins by increasingly codified regulations and processes that aim to bring coherence and standardization to the system in the name of compliance, accountability, and resource stewardship. Likewise, doctrine and procedural manuals bring conformity to how the workforce understands and conducts Defence Logistics. Such instruments, however, are meant to guide current operations and should not be allowed to inhibit efforts to continuously re-imagine new and better ways of doing business. Yet, militaries tend to go in this direction. Citing earlier work by Edwards and Eden, Rutner et al. restate that three pervasive attitudes — or “groups” — tend to impede the evolution of logistics capabilities in military contexts:

The first group believes that ‘The current processes are performing about as well as one can expect and that there simply is no room for dramatic improvement.’ The second group ‘Acknowledges that dramatic improvement may be possible, but believes that it can occur only through a major infusion of resources, such as more money and more people, which will not be forthcoming in the foreseeable future.’ Finally, a third group states that ‘Dramatic improvement may be technically feasible, deep-rooted organizational and cultural barriers to change inevitably prevent the Army from achieving it.’²²

While it is unclear how pervasive these attitudes are amongst CAF logisticians in today’s context, it is likely that a certain degree of apathy or pessimism abounds concerning the state of the CAF’s current logistics capabilities. As prescribed in PFEC, it is high time to overcome such cognitive barriers and to embark on a path of radical innovation.

15. Researchers of organizational culture and innovation have observed that *hierarchical* cultures tend to adopt an internal orientation favoring control which, unsurprisingly, runs contrary to fostering innovation.²³ Conversely, organizations with a *developmental culture* adopt a more external orientation and favor flexibility, growth through risk-taking, and high knowledge

²² Thomas J. Edwards and Rick Eden, "Velocity management and the revolution in military logistics", *Army Logistician* 31:1 (1999): 52-57, as cited in Stephen M. Rutner, Maria Aviles, and Scott Cox, "Logistics evolution: a comparison of military and commercial logistics thought," *International Journal of Logistics Management* 23 (2012): 96-118.

²³ Thorsten Büschgens, Andreas Bausch, and David B. Balkin, "Organizational Culture and Innovation: A Meta-Analytic Review Organizational Culture and Innovation: A Meta-Analytic Review," *Journal of Product Innovation Management* 30 (2013):

acquisition through extensive engagement with external audiences.²⁴ Figure 4 presents these archetypes in a competing values framework. As noted by the authors, organizations are not wholly one or the other, but exist somewhere on a spectrum. It is likely, for example, that elements within the CAF have differing orientations; the special operations units, for example, may well exhibit a more developmental orientation. The critical point is to note the interplay between cultural values and innovation. To adapt to the future operating environment the CAF will need to move towards a more developmental orientation, ensuring to maintain a healthy balance between looking outward (ie. recognizing threats and opportunities) and focussing inward (ie. refining internal processes) and between tightening control (ie. enhanced visibility and reporting) and maximizing flexibility (ie. mission command, radical innovation).

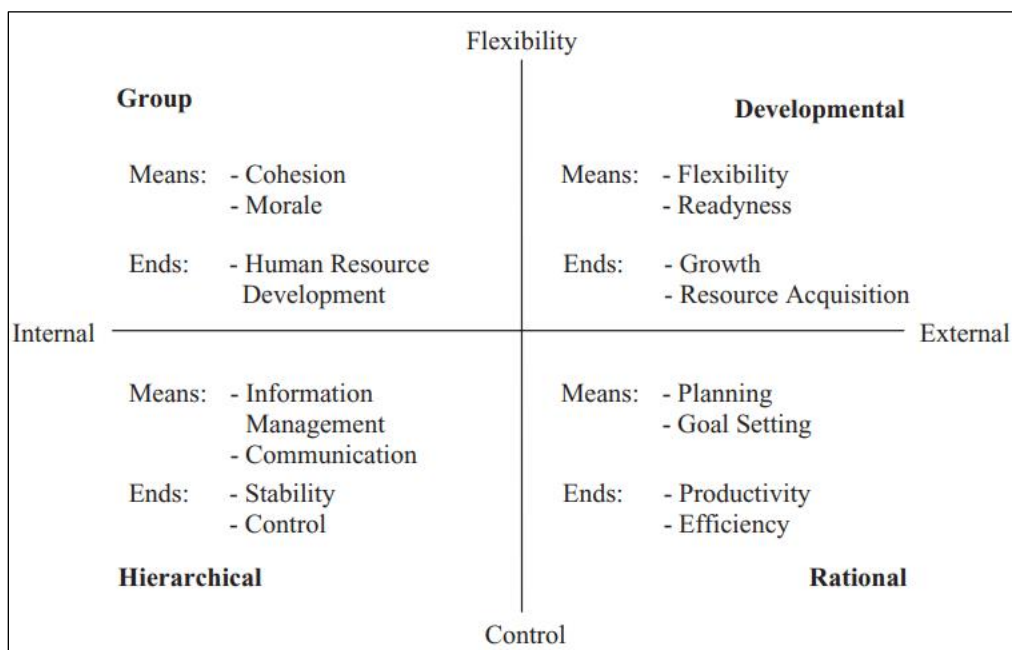


Figure 4 -- Competing Values Framework

Source: Büschgens et al., *Competing Values Framework*, p. 767

CONCLUSION

16. Leaders in the CAF recognize that the future operating environment is rapidly changing and that new warfighting concepts are required to harmonize and integrate combat capabilities from across all domains. Likewise, new logistical concepts will be required to match this evolution and to provide sustainment solutions for faster-paced and more highly-dispersed operations. Critical to meeting this requirement will be the development of a clear strategy for logistics modernization that looks beyond current projects and sets benchmarks on a 20+ year horizon. The CAF must drastically increase its efforts to evaluate and, where viable, adopt new physical technologies that will fully exploit the CAF's upgraded digital infrastructure. Finally, underpinning all of these efforts is the requirement for CAF leaders to foster a higher degree of

²⁴ Ibid, 768.

innovation across the sustainment community, promoting a design thinking mindset at all levels and shifting the culture away from a process-driven mindset towards a more outcome-oriented mindset with a singular focus on mission success.

RECOMMENDATIONS

17. A strategic roadmap must be articulated to guide the holistic evolution of the CAF logistics enterprise along a 20+ year timeline, to include all aspects of intended cultural, organizational and technological change. In addition to providing an overall vision, the roadmap would identify known capability gaps to be resolved or mitigated.
18. Ensure that operational and logistics concepts relative to future warfighting are developed in parallel to ensure synchronization and integration at the strategic, operational and tactical levels. Rigorously test and evaluate concepts through war-gaming and simulations that fully account for logistical constraints and requirements.
19. Continue to revise and update Joint Sustainment Doctrine (5-year cycle) to reflect new logistics concepts. In line with recent audits, broad input from across the sustainment community should be harnessed to better support the efforts of the Joint Doctrine Board.
20. Lastly, a culture of innovation must be fostered across the sustainment community at large through a multitude of parallel initiatives, such as:
 - a. Professional Development. Afford training in design thinking and forecasting to commissioned and non-commissioned officers to promote a higher degree of creativity and cognitive flexibility;
 - b. Prototyping and Experimentation. Provide distinct resources to tactical units for prototyping of experimental capabilities (i.e. 3D printing) and introduce design challenges that reward individuals and groups for the development of innovative solutions to common operational challenges;
 - c. Enhance the Strat J4/ADM(Mat) partnership with ADM(DRDC) to research and develop viable solutions to contemporary and emergent logistics challenges;
 - d. Enhance the Strat J4/ADM(Mat) partnership with ADM(S&T) and industry via the Sustainment Initiative (SI). Expand the scope of the existing program in view to developing viable business cases for the adoption of emergent technologies to best leverage the digital information available through DRMIS Mod.

BIBLIOGRAPHY

- Büschgens, Thorsten, Andreas Bausch, and David B. Balkin. "Organizational Culture and Innovation: A Meta-Analytic Review Organizational Culture and Innovation: A Meta-Analytic Review." *Journal of Product Innovation Management* 30, no. 4 (2013): 763–81.
- Canada. Assistant Deputy Minister Review Services Report. *Evaluation of Defence Capability Development Program* (DND, Ottawa: November 2017), <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/audit-evaluation/evaluation-defence-capability-development-program.html>
- _____. *Evaluation of Sustainment of Operations*. (DND, Ottawa: May 2021) <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/audit-evaluation/evaluation-defence-capability-development-program.html>
- _____. *Evaluation of the Sustainment Initiative*. (DND, Ottawa: May 2021). <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/audit-evaluation/evaluation-sustainment-initiative.html>
- Canada. Department of National Defence. *Pan-Domain Force Employment Concept: Prevailing in an Uncertain World (Draft)*. Ottawa: CJOC, 2020.
- _____. *Defence Resource Management Information System (DRMIS) Modernization: Business Case Analysis (Draft version 0.5)*. (DND Ottawa: 2022), 1-129.
- Canada. Standing Committee on Public Accounts. "Spring 2020 Reports of the Auditor General. Report 3: Supplying the Canadian Armed Forces – Appearance of the Deputy Minister of National Defence Before the Public Accounts Committee." 19 November 2020. <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/proactive-disclosure/supplying-the-caf.html>
- Canada. Strong, Secure, Engaged: Canada's Defence Policy. Last modified 31 May 2019. <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/canada-defence-policy.html>
- Costa, Jody. "The History of the Barcode." *Barcoding*, 1 June 2021, <https://www.barcoding.com/blog/barcode-history>
- Edwards, Thomas J. and Eden R. "Velocity management and the revolution in military logistics." *Army Logistician* 31:1 (1999): 52-57.
- Henzler, Eric (Maj). *Logistics Innovation for the Future Operating Environment: Train Like You Will Fight* (Canadian Forces College. 2019), 1-27. <https://www.cfc.forces.gc.ca/259/290/308/305/henzler.pdf>

- Liberal Party of Canada. "A New Advanced Research Agency," accessed 18 January 2021, <https://liberal.ca/our-platform/a-new-advanced-research-agency/>
- Lyons, Stephen R. (Lt. Gen). "Sustaining Military Operations in the Emerging Joint Operating Environment," *Army Sustainment* (July-August 2017), 19-21.
- Manners-Bell, John, and Ken Lyon. 2019. *The Logistics and Supply Chain Innovation Handbook : Disruptive Technologies and New Business Models*. New York: Kogan Page.
- Rutner, Stephen M., Maria Aviles, and Scott Cox. "Logistics evolution: a comparison of military and commercial logistics thought." *International Journal of Logistics Management* 23 (2012): 96-118.
- van Fenema, Paul Christian, Ton van Kampen, Gerold de Gooijer, Nynke Faber, Harm Hendriks, Andre Hoogstrate, and Loe Schlicher. "Sustaining Relevance: Repositioning Strategic Logistics Innovation in the Military," *Joint Force Quarterly* 101, 2021: 59-68.