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Supply Chain Management in Support of Naval Operations

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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

Service Paper – Étude militaire

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SUPPLY CHAIN MANAGEMENT IN SUPPORT OF NAVAL OPERATIONS

AIM

The aim of this paper is to analyse how data analytics and advancements in Artificial Intelligence (AI) technology can be utilised in supply chain activities to reduce duplication of effort and resources required within business processes to support Royal Canadian Navy (RCN) operations. The supply chain in the Department of National Defence (DND) and the Canadian Armed Forces (CAF) must strive to be as efficient if not better than industry. The Royal Canadian Logistics Service (RCLS) must adapt to increasing demands to provide goods and services that meet operational requirements within CAF components with the resources available. Logisticians can and must find innovative ways to enable operational success now and in the future. Effective use of AI and data analytics in Supply Chain Management (SCM) has the potential to gain efficiencies and optimize capacity of logistical services in the RCN and CAF.

INTRODUCTION

Once a leader in logistics operations, the CAF has fallen behind industry over the last generation. Companies such as Canadian Tire, Walmart and Amazon have well-surpassed CAF's ability to deliver logistical services. Amazon, for example, has a global supply chain network that provides next day service on most items. For a Canadian warship that is deployed it can take weeks or even months to receive delivery of spares in some cases. Items that are deemed high priority can be delivered at a very high cost within 48 hours. Alongside home-port routine spares and parts are delivered to the ship to maintain readiness. When a ship is away from home port parts that were routine can and have become high priority potentially impacting the ship's ability to conduct operations. A multifaceted issue, there are multiple systems are used for the different logistics processes that don't communicate with each other. For example, a critical part that is routed to the ship can go through several processes involving systems for customs, supply, transportation, and specialty systems used for ammunition. Not having the ability to communicate with each other creates issues with visibility of the parts and identification of issues.

Limited resources and budgets do not appear to be increasing anytime soon. This means that logisticians across the CAF need to seek out innovation on how it sustains the force. The following will discuss measures that have already been taken to ensure the RCN is prepared to fight in the future. Methods for augmentation to current programs and the use of emerging technology to streamline logistical processes will be explored. The navy consists of more than just ships and submarines. There are bases and training establishments that support Force Generation as well as strategic establishments for force development. National procurement is the first step in the supply chain within DND for most materiel. The units and bases that comprise the RCN are interlinked and for the purpose of SCM they will need to be appropriately aligned to support and sustain forces in the next horizon.

DISCUSSION

The Digital Navy initiative released in 2019 by the Commander RCN encompasses 6 areas of naval business processes: finance and business, materiel management, supply chain, HR management, training, and warfighting. The first four of these functions are included in SCM. The goal is to use AI and machine learning and progress automation in data analytics.¹ Still in the infancy phase the RCN has stood up Command Analytics Support Centers (CASC) within the formations. Using the Defence Resource Management Information System (DRMIS) Business Objects (BOBJ) module the CASC teams have prepared automated reports of business processes for multiple levels of command. Information retrieved from DRMIS can be reported in real time. Information that is manually entered into BOBJ can't produce real time reports for command decisions. The RCN must trend towards using systems that are interoperable and can communicate in real time. If accomplished, it will meet one of the strategic objectives of this initiative "to improve the delivery of materiel sustainability for the RCN."² Realizing the digital navy will occur when the RCN can adapt and incorporate the practices to each of the business processes to enable success in the future challenges in a digital arena.

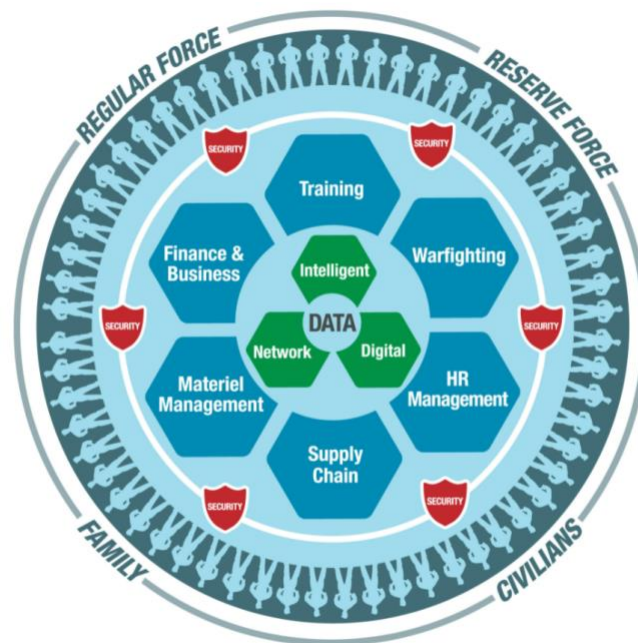


Figure 1 – The framework for the Digital Navy Initiative

Source; DND, Digital Navy: A Strategy to Enable Canada's Naval Team for the Digital Age <http://www.navy-marine.forces.gc.ca/en/innovation/digital-navy.page>

¹Canada. National Defence, "Digital Navy: A Strategy to Enable Canada's Naval Team for the Digital Age" (2019). Last viewed 23 January 2022 <http://www.navy-marine.forces.gc.ca/en/innovation/digital-navy.page>

²Ibid

The modernization and integration of sustainment and logistics (MISL) initiative moves the RCN towards amalgamating the business processes used in CAF logistics. The primary objective is to increase visibility of material across the supply chain.³ The figure below illustrates 6 systems that are currently used that do not communicate with each other. MISL seeks to integrate these systems within DRMIS. Short term issues should be expected for current users of these systems as they adapt to their new roles in DRMIS. On completion of MISL, sustainment of operational units will see an increase in efficiency and use of resources. Increased visibility of materiel produces a more complete common logistics operating picture at the strategic level. At operational and tactical levels end users will have an instant response on location and arrival times of the materiel and reduce the strain on the workforce. The MISL initiative will resolve 6 of the systems utilized in logistics but not all. An example is food and hotel services are still using systems that are stove piped and require duplication of effort for the workforce using them. Dual entries are made in DRMIS and these systems causing more work for the user and more room for errors to occur. Procurement of Food is one the largest expenses a ship or base unit encounters which is often overlooked. With logistics trades struggling to fill positions, gaining efficiency in systems, and balancing the workload on workforce needs to be addressed. Ideally, having all systems under the DRMIS umbrella makes sense. It will enable the enablers who support CAF core missions as laid out in Canada's defence policy.⁴



Figure 2 – Material Sustainment Capability - ERP Software
Source; DND, Strat J4 MISL Presentation

The RCN must first look to industry and where they have shown success integrating new technology in their SCM. After a tour of the Canadian Tire distribution center in Brampton Ontario one can see how much they have surpassed DND/CAF's supply chain. They have exploited technology of the day to maximise automation. When a shipment is received the products are equipped with radio-frequency identification (RFID), each pallet passes through a sensor that automatically enters the items as received by the

³Canada. National Defence, "Evaluation of Sustainment of Operations (2021). Last viewed 23 January 2022 <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/audit-evaluation/eval-sustain-operations.html>

⁴Canada. National Defence, "Strong Secure, Engaged: Canada's Defence Policy (2021). Last viewed 23 January 2022 <https://www.canada.ca/en/department-national-defence/corporate/reports-publications/canada-defence-policy.html>

distribution center. Received items are transferred by unmanned vehicles to the high or low bays for storage as applicable. The program used for their business process identifies a first in first out protocol. Similar items are stored in different locations in the event that the unmanned forklifts are out of service. If that happens the program will look at the subsequent location for items to be shipped. Orders received by the system which formulates the most practical plan to deliver the products to the stores. For the smaller items that require a human to pick them the software identifies the fastest route and then takes the operator to the bin that has the items for picking. The system maximises and organizes a loading plan of the shipment so that it can drop off the products to several stores efficiently. In contrast, warehouses within the RCN have little to no automation. Products received are manually entered into the system and more human resources are required to take products to and from storage areas for both shipping and receiving. If the RCN is going to be agile and efficient, it needs to adopt best SCM practices and learn from industry.

DRMIS is generally used as an enterprise resource planning system for finance, supply and human resources and as the CAF the system of record. CASC is using digital technology and AI with data analytics to provide commanders with performance measurement of business processes for them to make decisions. They are able to retrieve data from multiple sources. Ideally, AI would be employed to identify or anticipate problems in the supply chain. With the ability to analyse a large amount of data, it could help in the planning and forecasting in supply chain activities. Viewed as a “Fourth Industrial revolution,” or industry 4.0 the emphasis is on end-to-end digitization of business processes in SCM.⁵ Providers of goods and services in our supply chain network having the ability to communicate data digitally would improve our supply chain processes. More automation in the digital supply chain creates a flatter organization and seeks to enhance peer-to-peer connectivity.⁶ Supply Chains must continue to adapt to changes be open to business processes in a networking environment if they are to remain relevant. CAF decision makers need to accept some risk and be cognisant that staying current in the digital supply chain can be costly. The digital environment continues to evolve, CAF needs to adapt to changes in the environment to remain efficient in SCM.

Modern supply chain operations are complex organisations. AI is being used to find solutions that automate, assist in planning, risk assessments, inventory controls, transportation, and movements.⁷ AI can be leveraged to monitor and report on performance management and keep decision makers informed. In some cases, a fully automated decision could be made. For example, if goods and services are not meeting performance goals from the company A, AI could make the decision automatically to cancel the original order and order from company B. In the planning process AI can help select the appropriate supply chain partner by analyzing a vast amount of data to assess

⁵Pagano, Anthony M. and Matthew Liotine. *Technology in Supply Chain Management and Logistics: Current Practice and Future Applications*. San Diego: Elsevier. (2019) <https://go.exlibris.link/xlDK2rVY>.

⁶Ibid

⁷ResearchAndMarkets.Com Posts Report on the Artificial Intelligence (AI) in Supply Chain Management (SCM) Market." *Entertainment Close - Up*, Apr 19, 2019. <https://www.proquest.com/wire-feeds/researchandmarkets-com-posts-report-on-artificial/docview/2211258111/se-2?accountid=9867>.

the best candidate based on the decision maker's parameters. In risk assessment, it can review performance measurements to predict potential future behaviours. AI can automatically replenish or demonstrate when a product is not performing at mutually agreed upon metrics. AI can assist the operator with seeking the most efficient routes as well as diplomatic clearances, overflights, and movements of dangerous goods requirements. SCM solutions using enterprise systems (DRMIS) have made it possible to share large amounts of data with at all levels of the organisation globally. AI integration with SCM has the potential to improve business process automation and increased visibility of real time data from DRMIS.⁸

Today's supply chains are becoming more integrated internally and externally. By 2025, it is predicted that organizations using AI will account for 24% of global GDP.⁹ AI is becoming more integrated in SCM and does provide tangible benefits. However, it should be noted that there are many concerns that could hinder full implementation of AI. The RCN will need to generate an understanding of how AI will be used to inform decision makers. This needs to be clearly articulated to operators and supporters. There will be setbacks and a learning curve that employees will need to adapt too. As AI is relatively new in SCM most research is theoretical and not based on practical application.¹⁰ For example, the RCN will need to take lessons learned during the implementation of AI in SCM and adapt them in future SCM processes. Ongoing research will be required to understand both the positive and negative impacts of AI in RCN SCM processes. The actions will provide an improved understanding how we can bridge the human-machine interface in the SCM. This will provide a basis to discover and develop resiliency in new and existing supply chains as they become more integrated and complex.

As the supply changes to adapt to new technology so must the workforce working and managing the warehouses and depots. AI will change the way supporters are trained to provide logistics services. The use of AI creates opportunities for our systems to process data quickly and compensates for workforce lacking access or knowledge.¹¹ The AI is incorporated in the RCN; it will reduce the workload on personnel during staff shortages. Implementation of AI could also lead to rebalanced workforce and reallocate resources to other parts of the organization. The effective use of AI in SCM can also have a positive effect on goods and services to operational units. Potentially finding innovation in ways to reduce cost and ensure delivery of logistic services quickly and efficiently. If the RCN more specifically the RCLS does not adapt new technologies in SCM it will not be able to achieve the mission and motto "service second to none"

⁸Ibid

⁹Cadden, Trevor, et al, Gothenburg University, and School of Business, Economics, and Law. "Understanding the Influential and Mediating Role of Cultural Enablers of AI Integration to Supply Chain." *International Journal of Production Research* (2021): 2.

¹⁰Ibid

¹¹ Croom, Simon. "Being Wise about Supply Chain AI." *Material Handling & Logistics* (Dec 22, 2018). 1 <https://www.proquest.com/trade-journals/being-wise-about-supply-chain-ai/docview/2161077062/se-2>.

CONCLUSION

SCM in the RCN is currently behind industry in practice and how business processes are conducted. The Digital Navy initiative to adapt AI and machine learning and progress automation in data analytics will improve delivery of materiel sustainability for the RCN. As CASC creates automation in reporting of business processes decision makers will be better equipped to make decisions based on solid data. The MISL initiative to amalgamate the business processes in CAF logistics into one system is a good start point, but to be most effective it will need to encompass the other systems that logistics use on a daily basis. This will create some common areas for training and development and reduce duplication of effort entering the same data into multiple systems. When MISL is complete there may be opportunities to adjust the workforce and reallocate resources. Combining the SCM processes under one system will enable the enablers to better support CAF core missions. To stay relevant, the RCN needs to adopt best SCM practices and learn from industry to stay ahead of the technology curve. CAF decision makers must be prepared to accept risk and be cognizant that staying current in the digital supply chain can be costly. The digital environment continues to evolve, CAF must adapt to changes in the environment to remain efficient in SCM. DRMIS has made it possible to share large amounts of data. AI integration with SCM has the potential to improve business process automation and increased visibility of real time data from DRMIS.¹² AI should be leveraged to monitor and report on performance management and keep decision makers informed. Using data analytics to measure performance as well as implementing AI solutions across all business processes will optimize capacity and gain efficiency of the RCN's ability to support operations globally in the future.

¹²ResearchAndMarkets.Com Posts Report on the Artificial Intelligence (AI) in Supply Chain Management (SCM) Market." Entertainment Close - Up, Apr 19, 2019. <https://www.proquest.com/wire-feeds/researchandmarkets-com-posts-report-on-artificial/docview/2211258111/se-2>.

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