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THE DND SUPPLY CHAIN: HOW CAN WE BETTER INTEGRATE THE SYSTEM TO BE MORE EFFECTIVE AND EFFICIENT?

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Exercise *Solo Flight*

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It has been traditionally thought that the provision of effects within the military realm is a question of effectiveness rather than efficiency. Although we cannot argue that effectiveness is the most critical of these factors when national security matters are considered, it is not an excuse that effects should not be delivered in an efficient manner while cognitively considering the impacts it may have on effectiveness.

Logistics support, specifically the management of the CAF supply chain must be viewed as a capability just as a ship, an airplane or an armoured vehicle. In fact, a robust, well designed supply chain is a critical enabler. Based on the analysis presented, this enabler can be greatly improved by better integrating the functions of the supply chain. Organizations which have well aligned processes have shown to have much greater success in private sector organizations.[1] Not only has the alignment of processes contributed to the success of the organization, but it has also created a synergy in that it also increases people involvement (i.e. motivate the members of the organization) which further contributes to the accomplishments of the organization.[2] The benefits of process alignment also hold true in the defense sector. According the research performed by the Rand Corporation, the integration of supply chain functions has a direct impact on the effectiveness as well as the efficiency of the support provided.[3]

This paper provides a deliberate approach to analyzing the process alignment of the CAF supply chain, and how the supply chain could be optimized. This analysis of the integration of the supply chain will consider how well various militaries are aligned with respect to command and control, integration of IT systems, training of personnel and development of pertinent

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[1] Richard Yu-Yuan Hung. "*Business process management as competitive advantage: a review and empirical study*". Routledge, Vol.17, No.1, 1. Retrieved March 10, 2016. http://dx.doi.org/10.1080/14783360500249836

[2] *Ibid*,. 1.

[3] Eric Pelt and Marc Robbins. Integrating the Department of Defense Supply Chain. (Pittsburgh: The Rand National Defence Research Institute, 2012). iii.

performance metrics to provide more effective and efficient support to operations. Militaries examined will include the US, UK, Australia and Canada. The supply chain structures of these four militaries will be compared and then analyzed to propose a more optimal supply chain capability for the CAF. Private sector supply chain practices will also be detailed but it will be explain what limitations these practices have for certain types of military materiel and which practices may be leveraged to increase efficiency and/or effectiveness. For the purposes of this analysis, the supply chain is to include all steps of the materiel life cycle from acquisition, to warehousing, to distribution and finally disposition.

Command and Control

Command and control is critical when considering the integration of the supply chain within a military. This section will analyze and compare the command and control structures affecting the supply chains of various militaries. Although there are many factors which affect the effectiveness and/or efficiency, the effectiveness of command and control will be assessed by determining which militaries allow a single chain of command to control the supply chain functions.

US DoD

As the largest National Defence Department in the world, the US Department of Defence (DoD) supply chain management command and control is quite complex. Although there exists some joint logistics enablers, such as the Defence Logistics Agency (DLA) and US Transportation Command (USTRANSCOM), each service also has unique supply chain management capabilities. If we analyze DLA and USTRANSCOM, DLA has the responsibility

to acquire and warehouse materiel while USTRANSCOM has the responsibility for materiel distribution. The separation of these two functions is important and will be discussed at the end of the command and control.

DLA acts as a supplier to the four services (Navy, Marine Corps, Air Force and Army), other US Federal Agencies and partnered foreign armed forces[4]. This includes the procurement of consumable goods as well as spare parts for weapon systems.[5] Individual services are still responsible for the development and procurement of their own weapon systems.[6] With respect to the support of foreign militaries, DLA provides approximately $2 billion USD worth of materiel and services annually.[7] From a Canadian perspective, the CAF has used DLA for services such as the disposition of goods with equipment deemed no longer required for operations following OP ATTENTION and OP ATHENA, an example of this being the RG-31 fleet.

USTRANSCOM is quite unique in that it not only provides joint movement support to the services of the US military, it also owns and/or contracts for the planes and ships required to deploy personnel and materiel around the world.[8] The movement of materiel over land is the responsibility of the US Army as part of the Military Surface Deployment and Distribution Command (SDDC).[9]

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[4] The Defense Logistics Agency, "DLA at a Glance," last accessed April 10, 2016, http://www.dla.mil/AtaGlance.aspx

[5] *Ibid.*

[6] *Ibid.*

[7] *Ibid.*

[8] US Transportation Command, "Sealift," last accessed April 10, 2016, http://www.ustranscom.mil/mov/sealift.cfm and US Transportation Command, " Specific Airlift Assignment Missions," last accessed April 10 2016, http://www.ustranscom.mil/mov/airlift.cfm

[9] US Transportation Command, "Surface," last accessed April 10, 2016, http://www.ustranscom.mil/mov/surface.cfm

The Australian Ministry of Defense

Australia has a Joint Logistics Command (JLC), headed by the Chief Joint Logistics who is responsible for joint logistics capabilities.[10] As such, JLC is responsible for much more than the management of the supply chain and their roles includes: the training of personnel, providing logistic advice to Chief Defence Force (CDF) and the Secretary through the VCDF, planning, coordinating and delivering logistics support for operations and exercises and defining, implementing and monitoring the ADF's logistic processes and performance.[11] It is important to note that this includes both the warehousing and distribution functions of the supply chain.

The function of procurement is not part of the JLC responsibilities. Procurement in the Australian Defense Ministry is the responsibility of the Defense Materiel Organization (DMO).[12] It is important to note that unlike other Australian government departments, the DMO has a special status that allows it to control its own personnel and staffing processes (i.e. it does not adhere to civil service human resources provisions such as compensation, hiring processes, etc.).[13]

UK MoD

Recognizing the need to control supply chain processes, in 2007, the UK MoD formed the Defence Equipment and Support Organization (DE&S) as the owner of the supply chain. DE&S is an amalgamation of the former Defense Procurement Agency and the Defense Logistics Organization. Under the previous structure, the processes of acquisition and

[10] Joint Logistics Command, "Role of Commander Joint Logistics," last accessed 21 Arpil 2016, http://www.defence.gov.au/jlc/

[11] *Ibid.*

[12] Martin Auger, *Defence Procurement Organizations: A Global Comparison.* Economics, Resources and Foreign Affairs Division of the Library of Parliament, 14 October 2014. http://www.lop.parl.gc.ca/content/lop/ResearchPublications/2014-82-e.html

[13] *Ibid.*

warehousing and distribution were separated. DE&S also controls Defense Support Chain Operations and Movements (DSCOM). From a strategic perspective, what DE&S does is controlled by the Assistant Chief of Defence Staff (ACDS) Logistics Operations.

From 2007 until 2014, DE&S was structured as a government owned but privately operated organization.[14] This proved unsuccessful as in this process, the MoD attempted to transfer the risk involved in defence acquisition to a privately operated entity. DE&S was subsequently restructured as a bespoke trading entity (a form of publicly owned corporation).[15] As such, it is governed by a board of directors but is not limited by the human resources constraints of the civil service.[16] This allows DE&S the ability to offer performance based compensation packages for key personnel groups. Due to the recent restructure into a bespoke trading entity, it is not clear that these changes have been successful. DE&S introduced performance metrics in the summer of 2015 and has until 2017 to achieve the objectives that have been set for it by the MoD.[17]

Canadian DND

Prior to the CAF Transformation of 2006, the responsibility for supply chain rested largely with ADM(Mat). This included all elements of materiel support from acquisition, to warehousing, to distribution and disposal. The organization was the owner of supply chain operations including the physical distribution of materiel to operations. This included units such as 3 Canadian Support Unit (3 CSU) and 4 Canadian Forces Movements Support Unit (4

[14] Comptroller and Auditor General, *Reforming Defense Acquisition Summary* (London, England: National Audit Office UK, 20 February 2015), 1.
[15] *Ibid.,* 2.
[16] *Ibid.,* 4.
[17] *Ibid.,* 6.

CFMSU) which provided direct support to deployed and domestics operations.[18] This also included warehousing functions.

Since the CAF Transformation of 2006, there has been a separation of these responsibilities. ADM(Mat) still retains the responsibility within the department of the procurement of major end items, but is no longer responsible for warehousing, distribution and support to operations. In 2006, these latter functions became the responsibility of CANOSCOM (Canadian Operational Support Command) which has since amalgamated with CEFCOM (Canadian Expeditionary Forces Command) and CANADACOM (Canada Command) to form what is now CJOC (Canadian Joint Operations Command). However, the systems required to support the warehousing, distribution and support to operations are still the responsibility of ADM(Mat). This includes multiple systems for movement control, ammunition distribution and accountability, materiel accountability, finance, maintenance and fleet management. These systems will be addressed in the next section.

Analysis

When comparing the UK, AUS, US and Canada, several distinctions in the way that the command and control of the supply are noted. In the UK, DE&S controls all processes of the supply chain, while in the cases of Canada, AUS and the US, not all functions are grouped together. From a theoretical perspective, the separation of these functions may cause some issues as when distinct organizations are responsible for parts of the supply chain process. They may not act in a manner that is most effective and/or efficient for the organization it supports. For example, being responsible for procurement, while not being responsible for warehousing and

[18] Neville Russell, "Command and Control of the Canadian Forces Supply Chain" (Advanced Military Studies Course Paper, Canadian Forces College, 2003), 11.

distribution, may cause the procurement organization to ignore the costs of warehousing and distributing a particular capability over its life cycle. In this case, from a systems integration perspective, the UK would seem to have developed the more optimal solution.

This does not assume they are or will become the best defense supply chain provider, but it does offer a better probability of achieving greater effectiveness and efficiency. An interesting fact concerning the command and control is that the UK (DE&S) and AUS (DMO responsible for the procurement function) are allowed certain freedoms in their human resource processes. This would them more flexibility in the determination of their human resource requirements as well as to develop incentive packages that are related to specific performance related metrics.

IT Systems

IT systems have evolved rapidly and new versions of software are continuously being developed for both private sector and military use. The effectiveness of IT systems by the US, UK, ADF and the CAF will be evaluated based on to the degree which they integrate interdependent functions such as: inventory visibility, movement control, finance, engineer processes related to the maintenance of combat systems as well as business intelligence (BI) functions which assist the chain of command in decision making.

US DoD

It is not surprising that the US DoD has the largest and most complex supply chain management IT systems of any military. Although DLA uses a common system, each element (the Army, the Navy, the Air Force and the Marine Corps) utilizes their own supply chain

system(s).[19] This has rendered it very difficult to assess how effective US DoD supply chain management IT systems are, but from an integration perspective, it is quite clear that they are not integrated.

US DoD is currently in the process of integrating over nine supply chain management IT systems.[20] As previously mentioned each element has its own system and is currently at various stages of implementation of their own unique system. For example, the Air Force is was in the process of integration a common supply chain management software system, but it was abandoned due to cost overruns following a $1B investment and significant delays in development.[21] The US Army is currently in the process of rationalizing their current three supply chain operating systems into one[22]. Fortunately for the US Army, their three current systems are all SAP based which should make the integration of their systems simpler.[23] However, much like the Air Force and the Navy, the Army's attempt to integrate supply chain IT systems is plagued by delays and cost overruns. The US Navy is currently completing the introduction of a common supply chain and financial management system. The system was originally scheduled to cost $1.87B USD but it now estimated to cost $2.40B USD and the successful introduction of the system took two years longer than originally planned.[24] As there are different systems in each service, each considers its own BI functions separately from the

[19] Greg Slabodkin, "Military Struggles to Integrate Servicewide Planning Systems," Defencesystems.com. Last accessed 10 April 2016. https://defensesystems.com/Articles/2011/06/08/Defense-IT-1-ERP-systems-implementation.aspx?Page=1

[20] *Ibid.*

[21] Kris Kanaracus, "Air Force scraps massive ERP project after racking up $1B in costs," IDG News Services. Last accessed 7 April 2016. http://www.computerworld.com/article/2493041/it-careers/air-force-scraps-massive-erp-project-after-racking-up--1b-in-costs.html

[22] Greg Slabodkin, "Military Struggles to Integrate Servicewide Planning Systems," Defencesystems.com. Last accessed 10 April 2016. https://defensesystems.com/Articles/2011/06/08/Defense-IT-1-ERP-systems-implementation.aspx?Page=3

[23] *Ibid.*

[24] *Ibid.*

information requirements of DLA and USTRANSCOM, although there have been efforts to develop BI capabilities within the procurement function across the services.[25]

UK MoD

The UK MoD employed the JAMES systems developed by Lockheed Martin. The JAMES system was implemented in 2005 and integrates maintenance, inventory management and included a deployable (remote operating) capability, but unfortunately lacked to ability to track movements of materiel.[26] The JAMES system was replaced by the Future Logistics Information Services (FLIS) system (developed by Boeing) in 2014. The system was developed at a cost of £800M British Pounds (approx. $1.46B CAN).[27] Unfortunately, the system lacks business intelligence (BI) capability, so although there is a lot of information available, it cannot be collected in a manner which is useful for the MoD to make decisions to improve supply chain operations.

Australian Ministry of Defense

In 2010, Australia announced the acquisition of a fully integrated software package. The system, Military Integrated Logistics Information System (MILIS) integrates requirements such as asset visibility, movements, maintenance, financial data and the ability to program BI

[25] Business Wire. "Business Objects to Support Department of Defense Business Intelligence Solution Upgrade," Last modified 5 April, 2004. http://www.businesswire.com/news/home/20040405005305/en/Business-Objects-Support-Department-Defense-Business-Intelligence

[26] Lockheed Martin. "Joint Asset Management and Engineering Solutions (JAMES)," Accessed 5 April, 2016. http://www.lockheedmartin.co.uk/uk/what-we-do/products/JAMES.html

[27] Think Defense, "National Audit Office Gives the MoD yet Another Kicking (Logistics)," Last modified April 15, 2011. http://www.thinkdefence.co.uk/2011/04/national-audit-office-gives-the-mod-yet-another-kicking-logistics/

functions.[28] The objective was to fully employ the system by summer 2011. MILIS includes the ability to deploy the system and operate it remotely (without communications readily available) where the ADF may be operating.[29] The new MILIS capability is estimate to have cost the ADF $650M AUSD (approx. $638M CAN).[30]

Canadian DND

Currently DND has five separate enterprise systems that support various portions of supply chain operations. Brief descriptions of their functions are provided below:

a. DRMIS: Primary enterprise system for materiel accountability, contracting, finance and fleet maintenance. Has limited fleet management (transportation) capability;
b. AIMS: Primary systems for the management of ordnance. Although DRMIS also accounts for ordnance, it does account for critical data such as lot numbers, which is essential in ordnance safety;
c. Defence Customs and Brokerage System (DCBS): This system deals by movement personnel when dealing with materiel that must be imported and\or exported between Canada and other nations;
d. National Movements and Distribution System (NMDS): This system is currently used to track the movement of goods which is currently not offered in the current version of DRMIS. This system is employed almost exclusively by movement personnel.

[28] Business Wire. "Australian Defence Force Awards Multi-Million Dollar Contract to Mincom," Last modified February 1, 2010. http://www.businesswire.com/news/home/20100201005830/en/Australian-Defence-Force-Awards-Multi-Million-Dollar-Contract

[29] *Ibid.*

[30] Business Wire. "Australian Defense Force Successfully Deploys World's First Fully Integrated Military Logistics System with Mincom Ellipse," Last modified August 10, 2016. http://www.businesswire.com/news/home/20100818006437/en/Australian-Defense-Force-Successfully-Deploys-World%E2%80%99s-Fully

With respect to these systems, not one is integrated with another. For example, if a deployed Joint Task Force requested 5 widgets from a depot, supply personnel can confirm the availability of the widgets within the supply system, but once the item is ordered, they are unable to determine where it is and when it should arrive without exhaustive research. This information is available within NMDS (used exclusively by movements personnel), but as the CAF has little IT infrastructure to confirm the location of materiel (such as RFID or other technologies), unless the materiel is sent via a commercial courier (who typically offer tracking capabilities), asset visibility is lost.

There is another significant issue when considering the various systems that are being used by the CAF. Below the operational level, units do not have the capability to automate transactions. A simple procedure such as the reception of materiel by a unit (either in Canada or deployed) requires the SKU's and quantities to be entered manually (unlike the US, UK or Australia who have automated capabilities). There exists other significant non-value added processes within the CAF supply chain management system that result in a considerable amount of wasted effort from the strategic to the tactical level.[31] When all these non-value added processes are considered, several hundred positions could eliminated or reallocated to other priorities within the CAF and/or DND.[32]

As part of Defence Renewal Initiative 2.0, DND is currently working on a new sustainment capability that will integrate current systems and increase automation (barcode scanning, RFID capability, etc.).[33] This restructure includes complete integration of inventory

[31] Jeremy Lajeunesse, "The Canadian Forces Supply System and the Reinvestment of Positions to CAF Priorities" (Joint Command and Staff Program Service Paper, Canadian Forces College, 2016), 10.

[32] *Ibid.*, 10.

[33] Major Jeff Donaldson. Strategic J4 Implementation Team, Strategic Joint Staff, e-mail dated 3 February 2016.

management, movements, maintenance, finance and includes BI capabilities.[34] This new capability is estimated to cost in the order of several billion Canadian dollars.[35] Unfortunately, due to the elevated cost and with recent re-profiling of capital funding, it is unlikely that such a capability will enter the procurement process for the next five years.

Analysis of IT Systems

After reviewing the supply chain IT systems of the US, UK, Australia and Canada, it becomes quite clear that Canada is not the only western nation to experience frequent cost overruns and delays in the procurement of military capabilities (including ERP systems). These problems are common to all four countries. When considering the integration on systems, Australia has introduced a system that integrates all required functions. It is also interesting to note that Australia has also done that at a lower cost than the UK, US or what is being forecasted by the CAF at the moment. The smaller scale of the ADF could explain why their system was less costly than the US or the UK, but the size of the ADF (in terms of personnel and budget) is comparable to the CAF (more so than the UK or the US). It is difficult to explain how the ADF procured a system for $638M CAN while the CAF is considering a system that performs similar functions for over $2B CAN. As the ADF has only recently introduced MILIS, it is difficult to evaluate if their integration of results in a system that is superior to that of the US, UK or Canada. This being said, based on cost and integration, it is a model that the CAF should consider in the development of options for an integrated supply ERP.

[34] *Ibid.*
[35] *Ibid.*

Private Sector Supply Chain Practices

It can be argued that the private sector manages its supply chain in a more effective and efficient manner that militaries do. Although this is true if we apply certain metrics such as inventory turnover ratios, cost of distribution of goods, etc., such models are much more difficult to apply to military supply chain management, although certain practices could be adapted for certain requirements.

Costco can be considered the best supply chain manager in the retail sector as they have the highest inventory turnover in their industry and the lowest cost of distribution based on their sales volume.[36] For example, Costco experiences an inventory turnover ratio of 12 (annually) while Wal-Mart has a turnover ratio of 8 and Target's inventory turnover ratio is 6.[37] Based on these facts alone, why do not militaries base themselves on the Costco model to provide the most efficient supply chain?

There are a number of factors that enable retailers such as Costco to maximize their efficiency. Probably the most common reason why Costco's supply chain practices are able to succeed is that they are dealing with a consumer market that has predicable demand. As demand for common consumer commodities are predictable, this simplifies the determination of how much to buy and how often from the perspective of the retailer. Also as demand is predictable, Costco has been able to leverage its suppliers into taking on the risk of their supply chain. Their employment of a vendor managed inventory (VMI) system places the burden on certain suppliers

[36] Mark Wuulfrat, " The secret to Costco's success lies in supply chain efficiency", *Canadian Grocer* (blog), 13 May 2014. http://www.canadiangrocer.com/blog/the-secret-to-costcos-success-lies-in-supply-chain-efficiency-40691

[37] J.B. Maverick, "Who are Costco's Main Competitors", Investopedia, Last accessed 25 March 2016. http://www.investopedia.com/articles/markets/102715/who-are-costcos-main-competitors.asp

to keep Costco locations stocked.[38] An example of this is Kimberly Clark who provides diapers to Costco. Kimberly Clark sales representatives visit individual Costco locations and have access to Costco's inventory information on the products they sell to Costco.[39] In turn, based on their agreement with Costco, Kimberly Clark and many other major suppliers are often responsible for supplying individual Costco locations.[40] In cases where Costco delivers the inventory to retail locations, suppliers deliver their product to Costco operated cross-docking facilities which actually just separate the shipments in pallet form (if required) and then forward the product to individual stores. Another way in which Costco is able to achieve efficient management of its inventory is that it limits the number of unique items (commonly known as stock keeping units (SKU's)) that are held in inventory to 3,700 items.[41]

So can militaries structure their supply chains to duplicate the efficiencies that are achieved by the private sector? The answer is not a clear yes or no. First of all, military supply chains often involves supporting complex combat systems. These systems such as ships, airplanes and land based combat systems are not common commodities with predictable consumption rates. It takes years for DND or any military to determine its capability needs and then tender the developed statement of requirements to industry. What is purchased, how many, when and from whom are complex questions which involves many factors which are not even controlled by DND. Without knowing how much is required and when, it is impossible to optimize the supply chain through inventory and distribution management. Practices such as transferring the risk of inventory management for the provision of combat systems will not be

[38] Jiaqin Yan and Mike Whitfield, "Competition with both quality and quantity – a case study," Department of Management, Georgia State College, Downloaded on 21 March 2016: 2 http://www.aabri.com/SC2015Manuscripts/SC15032.pdf

[39] *Ibid,*. 4.

[40] *Ibid,*. 4.

[41] *Ibid,*. 5.

taken on by industry if they cannot forecast the requirement. Even a moderately sized military force such as the CAF holds over 400,000 SKUs[42] which causes an immense complexity even when compared to a very large retailer such as Costco (who hold 3,700 SKUs). With so many unique items with often unpredictable usage rates, it would be difficult to envision how the warehousing function could be eliminated or minimized as Costco has done.

Unlike combat systems, there are items within military system that may have predictable consumption rates. Examples of such items are clothing (such as combats, boots, etc.) and parts for combat systems. Militaries including DND have experimented with private sector provision of these items and in doing so, have sought to transfer the responsibility of supply chain management of these items to the private sector. This has resulted in greatly reducing the requirement for warehousing and in theory, could lead to an overall reduction in the cost of providing these items. For the DND one of the first of such arrangements is the provision of Distinctive Environmental Clothing (DEU) by Logistics Unicorps. In this contract, Logistics Unicorps provides the product directly to the users (CAF members) and bypasses the DND supply chain altogether. A similar project is being introduced to eliminate operational clothing from DND depots and again provide items such as combats and boots directly from the supplier to the CAF member. The project titled the Operational Clothing and Footwear Consolidation Contract (OCFC2) is estimated to cost between $250-500M CAD and the contract is expected to be awarded in 2016 and run until 2024.[43] As with the Logistics Unicorps DEU contract, the project was developed to reduce inventory holding and internal distribution costs as well as

[42] Mark Beare. "The Department of National Defense and Canadian Armed Forces Supply Chain: Public Administration Challenges and Opportunities" (Joint Command and Staff Program Service Paper, Canadian Forces College, 2015), 1.

[43] The Government of Canada, "Operational Clothing and Footwear Consolidation Contract," last accessed 30 April 2016, http://www.forces.gc.ca/en/business-defence-acquisition-guide-2015/joint-and-other-systems-517.page

simplify the procurement of numerous clothing items as it will be the supplier's responsibility to purchase and manage inventories.[44] Similar projects have been developed or are being implemented that also involve industry being responsible for the management of inventory. An example is the provision of parts to the Canadian Army's Tactical Armoured Patrol Vehicle (TAPV) which will enter service in 2016.[45]

Based on the information presented, militaries cannot simply mimic the private sector and seek to maximize the efficiency of their supply chains. Basic supply chain management metrics such as inventory turnover ratios and cost of distribution of goods with respect to sales (or value of goods) do not always make sense and will not function if inventory requirements cannot be accurately forecasted. As stated, militaries including DND do have certain items that have a predictable demand. In these cases, the metrics mentioned above could apply, but for various reasons including the simplification of the procurement process and fund programming, DND is moving towards outsourcing many functions of managing the supply chains for specific items.

Metrics for Military Supply Chains?

The most important criteria for success in the military is accomplishment of the mission. This being said, any metrics developed should focus primarily on the supply chain's ability to satisfy operational requirements therefore best enabling the accomplishment of the mission given the resources available. Such techniques have been developed by the RAND Corporation for the United States Marine Corps (USMC). The two variables they developed are called the "bootstrap

[44] *Ibid.*

[45] EODC. "Textron Systems and Rheinmetall Canada announce $205 Million Contract on Canadian Forces Tactical Armoured Vehicle Program," last modified 30 October 2012. http://www.eodc.ca/textron-systems-and-rheinmetall-canada-announce-205-million-contract-on-canadian-forces-tactical-armoured-vehicle-program/

re-order point" and "dollar banding".[46] The "bootstrap re-order point" allows inventory managers to set re-order quantities based on the risk of running out of an item.[47] This technique is common in the private sector however, to achieve "best value" in the management of funds, the technique is then combined with "dollar banding". "Dollar banding" considers the cost of an individual item to its operational importance (i.e. is it critical to a weapon system?) given finite financial resources.[48] Although the formulae developed and used in the USMC ERP system are too complex to explain within the scope of this paper, a simulation exercise has yielded promising results which have increased order fill rates, decreased the dollar value of the inventory held and has shown that to be effective, the USMC must stock more SKU's than they did in the past.[49] A summary of these findings is shown below:

Table 1 – USMC "Bootstrap and Dollar Banding Results"

	Projected Inventory Performance Under:	
	Actual Marine Corps Guidelines	**New Techniques**
Fill rate	72%	87%
Inventory value at RO	$24M	$17M
Number of lines stocked	13,159	32,537

Source: The Rand Corporation. "Reinventing Marine Corps Inventory Management," last accessed 15 March 2016. http://www.rand.org/natsec_area/products/bootstrap.html

In the development of its new supply chain ERP system, DND should consider the integration of such metrics as those that have been developed by the RAND Corporation. Although the

[46] The Rand Corporation. "Reinventing Marine Corps Inventory Management," last accessed 15 March 2016. http://www.rand.org/natsec_area/products/bootstrap.html
[47] *Ibid,.*
[48] *Ibid,.*
[49] *Ibid,.*

formulae are too complex for individual supply chain managers (either civilian or military) to calculate, they must also have some theoretical and practical knowledge of supply chains to understand how and why such metrics would be applied.

DND Training

Although military supply chains cannot strive to seek the same efficiencies or employ the same metrics as the private sector, there are not any reasons why personnel should not be trained to understand principles of supply chain management currently offered in various colleges and universities. The only training the CAF offered to officers on supply chain management was by the Canadian Forces Logistics Training Centre (CFLTC) however, it focused solely on complex procurement.[50] During training, both officers and NCM's have some basic training in how to set-up a warehousing[51] but very little information is available on the principles of managing a complete supply chain (from cradle to grave).

These weaknesses in the knowledge base of our personnel involved in the DND supply chain (officers, NCM's and civilian personnel) will also become apparent with the introduction of accrual accounting. Although logistics officers and DND personnel specializing in finance have an understanding of such practices, those involved with the management of the supply chain (specifically inventory management) have no or very limited training in accounting. When adjusting inventories, supply personnel have historically provided original cost as the basis for the value of the assets being taken on charge or written-off. The lack of application of

[51] Canadian Forces Logistics Training Centre, "Training Plan: Supply Technician QL5" last revised 13 May 2015 and Canadian Forces Logistics Training Centre, "Training Plan for Logistics Officers Common Course" last revised 20 June 2015.

acceptable valuation of assets by DND has been criticized in the past by both the Parliamentary Budget Officer (PBO) and the Auditor General (AG).[52]

An example of the type of professional development to educate logistics personnel has been developed by the USMC. Since 1998, the USMC in partnership with Penn State University have offered a program to logistics officers to provide them with a knowledge of private sector and military supply chain with the objective of improving the effectiveness of their logisticians.[53] The program titled the Marine Corps Logistics Education Program (MCLEP) was a two week program offered at Penn State and is now offered at Camp Pendleton in California.[54] A similar type of program could be developed for DND in partnership with a Canadian university(ies) and/or college(s) to allow our officers, NCM's and civilian personnel a better understanding of supply chain management principles. At present time, it is difficult to recommend providing such training within the CAF and/or DND, as personnel do not possess the requisite knowledge base.

Summary and Recommendations

Based on the analysis presented and a critical success factor of supply chain management being the integration of the process, several recommendations can be provided. If we consider the command and control function, our current structure is fragmented between ADM(Mat) (who controls procurement and disposition authority) and CJOC who is responsible for the warehousing and distribution functions. In this case, an integrated structure such as it exists in the UK under DE&S, would likely provide the best probability to ensure coordination in these

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[52] Jack Cunningham and Maley Dundurn, Australia and Canada in Afghanistan: Perspectives on a Mission (Toronto, Dundurn, 201), 155.

[53] Penn State University, "Beyond the Iron Mountain: Changing the Face of Marine Corps Logistics," last accessed 20 March 2016. http://www.smeal.psu.edu/psep/documents/u.s.-marine-corps-logistics-education-program

[54] Penn State University, "Marine Corps Logistics Education Program (MCLEP)," last accessed 20 March 2016. http://www.smeal.psu.edu/psep/open/mclep.html

functions. As mentioned, DND actually had these functions integrated prior to the 2005 CAF Transformation under General Hillier. When we consider the integration of supply chain management functions from an IT perspective, it is quite clear that the ADF has the most integrated system. The CAF's current five supply chain ERP systems greatly decreases the productivity of personnel and does not allow decision makers easy access to information from these systems that is required in decision making. The logistics community must be cautious with the scope of our current IT capability requirement definition as defined under the Defence Renewal Initiative 2.0 as options currently being considered are estimated to cost several billion CAD while the ADF has been able to introduce an integrated system for a fraction of the cost.

Although private sector practices are clearly able to manage supply chains more efficiently than military organizations, the nature of their business is much different as the inventories they hold have predictable consumption rates which is not the case for complex military combat systems. For the most part, DND cannot leverage suppliers to minimize inventory levels (and thus minimize costs) in the manner that Costco does. For certain items that have predictable demand, DND has started doing it. Metrics employed to define efficiency in the private sector such as inventory turnover ratios and cost of distribution of goods as a percentage of sales cannot be easily employed in militaries due to the complexity of combat systems and the number of unique SKU's that exist in the supply system. However, methods of inventory management that consider the complexity of military supply chain operations have been developed and tested by the USMC. DND can leverage such lessons learned by programming such functions within the future ERP system that is currently under development.

Finally and perhaps most importantly, for DND to better manage the supply chain, we must educate our people. Current training content of training for officers, NCM's and civilian

personnel does not adequately educate our members on supply chain management principles that would enable personnel at all levels to make more informed decisions.

Conclusion

In conclusion and upon reviewing the capabilities and structures of US, UK, AUS and Canadian militaries, it is clear none of these organizations is clearly superior to another when we consider the integration of the supply chain. Each has its own best practices and each has experienced failures in the development of capabilities and the supply chain is no exception. With Defense Renewal well underway, and with an abundance of information available from the private sector and defense industry practices, DND can be well positioned to greatly improve support to operations by restructuring and improving the supply chain. To do so will require a well-articulated and integrated proposal that will demonstrate the value of this capability to CAF/DND strategic leadership as well as the Canadian government.

BIBLIOGRAPHY

Auger, Martin. *Defence Procurement Organizations: A Global Comparison.* Economics, Resources and Foreign Affairs Division of the Library of Parliament, 14 October 2014. http://www.lop.parl.gc.ca/content/lop/ResearchPublications/2014-82-e.html

Beare, Mark. "The Department of National Defense and Canadian Armed Forces Supply Chain: Public Administration Challenges and Opportunities". Joint Command and Staff Program Service Paper, Canadian Forces College, 2015.

Business Wire. "Australian Defense Force Successfully Deploys World's First Fully Integrated Military Logistics System with Mincom Ellipse," Last modified August 10, 2016. http://www.businesswire.com/news/home/20100818006437/en/Australian-Defense-Force-Successfully-Deploys-World%E2%80%99s-Fully

Business Wire. "Australian Defence Force Awards Multi-Million Dollar Contract to Mincom," Last modified February 1, 2010. http://www.businesswire.com/news/home/20100201005830/en/Australian-Defence-Force-Awards-Multi-Million-Dollar-Contract

Business Wire. "Business Objects to Support Department of Defense Business Intelligence Solution Upgrade," Last modified 5 April, 2004. http://www.businesswire.com/news/home/20040405005305/en/Business-Objects-Support-Department-Defense-Business-Intelligence

Canadian Forces Logistics Training Centre, "Training Plan: Supply Technician QL5" last revised 13 May 2015

Canadian Forces Logistics Training Centre, "Training Plan for Logistics Officers Common Course" last revised 20 June 2015.

Comptroller and Auditor General, *Reforming Defense Acquisition Summary* (London, England: National Audit Office UK, 20 February 2015)

Cunningham, Jack and Maley Dundurn, Maley. "Australia and Canada in Afghanistan: Perspectives on a Mission." Toronto, Dundurn, 2015.

Donaldson, Jeff. Strategic J4 Implementation Team, Strategic Joint Staff, e-mail dated 3 February 2016.

EODC. "Textron Systems and Rheinmetall Canada announce $205 Million Contract on Canadian Forces Tactical Armoured Vehicle Program," last modified 30 October 2012. http://www.eodc.ca/textron-systems-and-rheinmetall-canada-announce-205-million-contract-on-canadian-forces-tactical-armoured-vehicle-program/

Kanaracus, Kris. "Air Force scraps massive ERP project after racking up $1B in costs," IDG News Services. Last accessed 7 April 2016. http://www.computerworld.com/article/2493041/it-careers/air-force-scraps-massive-erp-project-after-racking-up--1b-in-costs.html

Pelt, Eric and Robbins, Marc. Integrating the Department of Defense Supply Chain. (Pittsburgh: The Rand National Defense Research Institute, 2012).

The Defense Logistics Agency, "DLA at a Glance," last accessed April 10, 2016, http://www.dla.mil/AtaGlance.aspx

Joint Logistics Command, "Role of Commander Joint Logistics," last accessed 21 April 2016, http://www.defence.gov.au/jlc/

Lajeunesse, Jeremy "The Canadian Forces Supply System and the Reinvestment of Positions to CAF Priorities." Joint Command and Staff Program Service Paper, Canadian Forces College, 2016.

Lockheed Martin. "Joint Asset Management and Engineering Solutions (JAMES)," Accessed 5 April, 2016. http://www.lockheedmartin.co.uk/uk/what-we-do/products/JAMES.html

Maverick, J.B., "Who are Costco's Main Competitors", Investopedia, Last accessed 25 March 2016. http://www.investopedia.com/articles/markets/102715/who-are-costcos-main-competitors.asp

Penn State University, "Beyond the Iron Mountain: Changing the Face of Marine Corps Logistics," last accessed 20 March 2016. http://www.smeal.psu.edu/psep/documents/u.s.-marine-corps-logistics-education-program

Penn State University, "Marine Corps Logistics Education Program (MCLEP)," last accessed 20 March 2016. http://www.smeal.psu.edu/psep/open/mclep.html

Russell, Neville. "Command and Control of the Canadian Forces Supply Chain." Advanced Military Studies Course Paper, Canadian Forces College, 2003.

Slabodkin, Greg, "Military Struggles to Integrate Servicewide Planning Systems," Defencesystems.com. Last accessed 10 April 2016. https://defensesystems.com/Articles/2011/06/08/Defense-IT-1-ERP-systems-implementation.aspx?Page=1

The Government of Canada, "Operational Clothing and Footwear Consolidation Contract," last accessed 30 April 2016, http://www.forces.gc.ca/en/business-defence-acquisition-guide-2015/joint-and-other-systems-517.page

The Rand Corporation. "Reinventing Marine Corps Inventory Management," last accessed 15 March 2016. http://www.rand.org/natsec_area/products/bootstrap.html

Think Defense, "National Audit Office Gives the MoD yet Another Kicking (Logistics)," Last modified April 15, 2011. http://www.thinkdefence.co.uk/2011/04/national-audit-office-gives-the-mod-yet-another-kicking-logistics/

US Transportation Command, "Sealift," last accessed April 10, 2016, http://www.ustranscom.mil/mov/sealift.cfm

US Transportation Command, "Specific Airlift Assignment Missions," last accessed April 10 2016, http://www.ustranscom.mil/mov/airlift.cfm

US Transportation Command, "Surface," last accessed April 10, 2016, http://www.ustranscom.mil/mov/surface.cfm

Wuulfrat, Mark, " The secret to Costco's success lies in supply chain efficiency", *Canadian Grocer* (blog), 13 May 2014. http://www.canadiangrocer.com/blog/the-secret-to-costcos-success-lies-in-supply-chain-efficiency-40691

Yan, Jiaqin and Whitfield, Mike. "Competition with both quality and quantity – a case study," Department of Management, Georgia State College, downloaded on 21 March 2016. http://www.aabri.com/SC2015Manuscripts/SC15032.pdf

Yu-Yuan Hung, Richard. "*Business process management as competitive advantage: a review and empirical study*". Routledge, Vol.17, No.1, 1. Retrieved March 10, 2016. http://dx.doi.org/10.1080/14783360500249836