

**An Operations Management Strategy for the  
Canadian Forces Maritime Warfare Center**

by

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Administration

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## **Abstract**

“An Operations Management Strategy for the Canadian Forces Maritime Warfare Centre,” by James Allen, submitted 8 April 2013.

This paper identifies some of the strategic challenges that the Canadian Forces Maritime Warfare Centre (CFMWC) has faced over the past decade, and provides Operations Management based recommendations to surmount them. The paper also provides recommendations to the firm in order to better align production processes with corporate strategy in order to enhance CFMWC’s position as an international product leader. The most important aspect of production to recognize is the fact that operations are limited by the available number of personnel, and as such the firm would benefit significantly from focusing upon increasing employee productivity, particularly in the automation of the more mundane aspects of the value chain.

## Executive Summary

While the Canadian Forces (CF) are skilled at conducting operations, its missions are normally of short duration. Members of the CF are not normally trained on how to optimize production of goods and services for the long-term, and this lack of Operations Management (OM) focus has caused challenges for the Canadian Forces Maritime Warfare Centre (CFMWC), a strategic business unit of the Royal Canadian Navy. Over the past decade, CFMWC has had to justify its existence, defend its location strategy, has had frequent reorganizations, and due to financial pressures has had to consider reducing service offerings. Despite these pressures, CFMWC is still pursuing a horizontal growth strategy to further improve upon its position as an international product leader. This paper provides an overview of the Unit's strategic challenges and then derives OM-based recommendations to support CFMWC's growth strategy.

Operations at CFMWC suffer from three primary chokepoints, the most important of which is the fact that the Unit's production of services is limited by its available number of personnel. CFMWC therefore needs to address this as the core tenet of its OM strategy, increasing employee productivity and automating the more mundane aspects of the value chain. The second major chokepoint is finances. Over the course of the fiscal year, CFMWC starts off with funding unequal to its level of demand, and while there is generally ample money available in the final quarter due to slippage of activities within the Navy, there is generally inadequate time remaining with which to fully capitalize upon it. This paper makes some recommendations in order to make better use of potentially available funds throughout the fiscal year. These recommendations also

address the challenges associated with the third major chokepoint to operations, that of a lengthy and generally unresponsive mandated procurement process.

The paper subsequently provides recommendations based upon the ten principles of OM success as described by Heizer & Render (Heizer & Render, 2011). Through this lens it becomes clear that assuming an Information Systems strategy to production design, by optimizing the alignment of business strategy, IT, and organizational structure will prove to be an essential foundation upon which to build the Unit's service offerings. CFMWC would be best positioned to counter its financial pressures by offering goods and services primarily aimed at helping the Modernized Halifax Class frigates and the Canadian Surface Combatant ships to achieve operational readiness. Product offerings should also be designed to draw upon sources of external funding as baseline allocations of funding have been, and will likely to be, insufficient to fuel all desired yearly activities and development. By addressing these issues, CFMWC will be able to derive greater value from the production process, which will support the Unit's growth strategy.

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## Chapter 1 - Introduction

Operations Management (OM) is a discipline of *production*, the creation of goods and services, and is defined as “the set of activities that creates value in the form of goods and services by transforming inputs into outputs” (Heizer & Render, 2011, p. 4). While members of the Canadian Forces (CF) are skilled at planning military operations and attaining objectives, personnel are not specifically trained in the discipline of OM. Military personnel are trained in how to conduct operations, defined as “the carrying out of service, training, or administrative military missions; the process of carrying out combat (and non-combat) military actions” (National Defence and the Canadian Forces, 2013). In contrast to the civilian use of the term OM, in the military context operations are normally short-lived series of events often conducted in a unique set of external conditions in order to reach a desired outcome.

Although economy of effort and logistics/administration are principles of war by which the CF abides (Department of National Defence, 2009, p. 2.5), the Canadian military is designed to perform in continually evolving circumstances, which does not foster a production line planning mentality. For example, after an operational objective is attained, such as “flood waters contained” or “sufficient security established to permit Non Governmental Organizations to operate freely within an area,” military planners will either normally adapt their existing solutions to the constantly changing variables of the day, or will shift focus completely towards the next mandated challenge. Thus while CF members may be able to solve a time-sensitive problem once, or for a short duration of time, they do not normally approach problems with the need of achieving long-term



efficiencies for an enduring set of products and/or services because that is not the nature of their work. This observation is especially poignant for the Canadian Forces Maritime Warfare Centre (CFMWC), located in Halifax, Nova Scotia, as it has had to contend with major strategic issues over the past thirteen years; problems for which an OM approach would provide clarity.

## 1.1 Need for Study

Some of the problems that CFMWC has encountered over the past thirteen years include:

- A major new service, Operational Test & Evaluation, was introduced in 2000 and set up as its own functional directorate within the unit. But, in 2008 the entire firm was realigned so that work was focused on warfare domain (versus the previous functional-based structure), principally Above Water and Under Water Warfare. The new organization brought employees to work together under the themes of optimizing for defeating threats above the sea surface, and threats that operated below it. Since 2008, there has been an organization shuffle nearly each year as CFMWC has tried to find the right alignment of control and resources. *Problem: how should CFMWC be organized?*
- In 2007 it was postulated that CFMWC should relocate to Ottawa in order to be more effective contributors to the Navy. The issue has since passed however there remains a section of CFMWC that works as a satellite in

Ottawa while the remainder of the unit is based in Halifax. *Problem: where should CFMWC conduct operations?*

- The IT section has largely been ineffective in achieving strategic business unit goals, and strong animosity has developed, out of frustration, between the providers of the hardware with the group of high-end users who require a certain baseline of infrastructure with which to do their jobs. *Problem: IT provision of services.*
- In 2009, the Navy considered shutting down the emerging *modelling and simulation cell* due to budget cuts. Ironically, it is the author's opinion that modelling and simulation is the single largest key to success for the Navy for the coming decades. As such, modelling and simulation (M&S) needs to be firmly embedded into existing processes in order to ensure future success. *Problem: service process design.*
- Many of CFMWC's workers are only one-deep in that there is only one subject matter expert who is able to answer highly specialized questions. While financial pressures are mounting on the unit, the chokepoint to operations is in fact the number of skilled personnel in the given positions. Added to all this, a large number of personnel working at CFMWC are very close to retirement, which means that critical skill sets could be lost which would have devastating repercussions for operations. *Problem: personnel management.*

These issues clearly indicate that there are production issues that need to be addressed in order to foster long-term success.

## 1.2 Statement of Problem

Over the past thirteen years CFMWC has struggled to articulate clearly its value proposition as well as its strategic objectives. Now that these items are fairly well defined, as are the marketing and financial functional strategies, CFMWC requires a complementary operations management plan. This paper will describe the key challenges that CFMWC faces and then develop an operations management functional strategy for the unit, which will help to resolve a number of production issues, such as those identified above, in order to attain greater value per dollar expended on the provision of goods and services.

## 1.3 Approach

In order to derive the operations management strategy, Chapter Two of this paper will provide situational context by presenting an overview of the firm, as well as identifying CFMWC's key stakeholders and competitors. Chapter Three will present the most critical strategic issues that will steer the firm's operations over the next three to twenty years, and provide a prediction about how external financial pressures will shape production plans. Chapter Four will review CFMWC's business strategy selection, as well as to identify the services that are either fueling growth or consuming resources with no appreciable return. Chapter Five will draw upon the previous chapters in order to derive an operations management strategy that will support the firm's growth aspirations, and Chapter Six will address implementation, monitoring and review of the new functional operations strategy.

## Chapter 2 - Overview of CFMWC and Critical issues

What has grown to become the Canadian Forces Maritime Warfare Centre (CFMWC) started off as a concept at the end of World War II as a mechanism to capture best practices in countering Axis submarines. In 1950, a unit was formed to achieve this aim, and was called the Joint Anti-Submarine Tactical School. Its mission was to teach the hard lessons of the 2<sup>nd</sup> World War; the most important lesson being that maritime forces [ships, aircraft and friendly submarines] must have detailed knowledge of one another's tactics and procedures if they are to achieve that cooperation that leads to success. Appropriately, the unit's motto became *In Cooperation Lies Success*.

The school's name evolved into the Canadian Forces Maritime Warfare Centre, and its mission and mandate grew over the decades and is now stated to be:

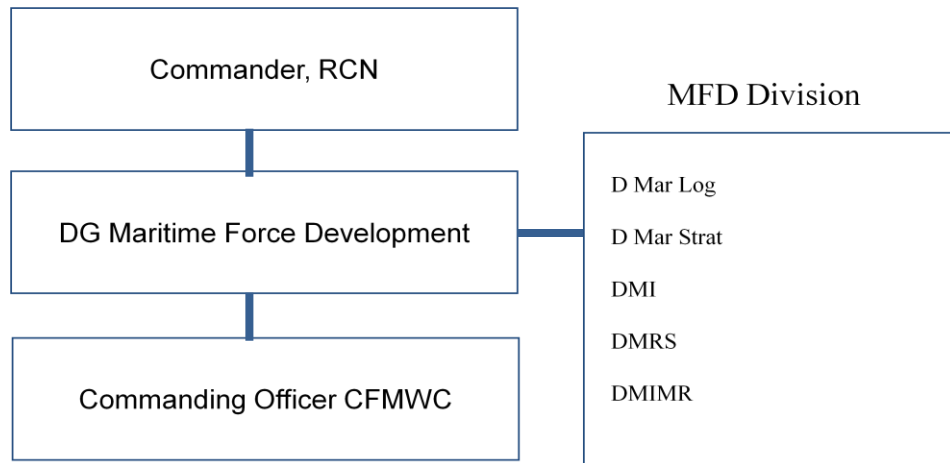
CFMWC is the CF Centre of Excellence for the development and delivery of maritime tactics and operational manoeuvre doctrine in support of Canada's maritime forces. This is achieved through our expertise in operational analysis, operational test and evaluation, modelling and simulation, war gaming, and naval experimentation; our cadre of maritime warfare experts; and our close working relationships with national and international partners. These capabilities enable CFMWC to support the development of future maritime forces (CFMWC, 2013).

As part of its mission, CFMWC's two key outputs are the generation of *maritime tactics* and provision of *force development* [future procurement] *advice*.

In terms of governance, CFMWC is set up as a strategic business unit<sup>1</sup> of the Royal Canadian Navy. Prior to 2008, CFMWC reported directly to the second-in-command of the Navy, and as a unit that was positioned high up in the organizational hierarchy of the Navy it was generally well funded. In 2008, strategic staff decided to adjust the Navy's organizational chart and CFMWC was moved under the supervision of the Director General Maritime Force Development (DGMFD), who in turn reported to the commander of the Navy (through the second-in-command of the Navy). While CFMWC was moved down a level in the Navy's hierarchy, it can be argued that it gained effectiveness as a result. For, the Director Maritime Requirements Sea (DMRS) [the head of procurement for the Navy] and the Director of Maritime Strategy (D Mar Strat) also report to DGMFD, and those two organizations are the primary recipients of CFMWC's force development advice. With the amalgamation of all three units working under one Director General, stronger relationships between the member units ensued, and as such force development advice made by CFMWC more effectively worked its way into naval policy and procurement specifications. The new reporting chain is depicted in Figure 1 below.

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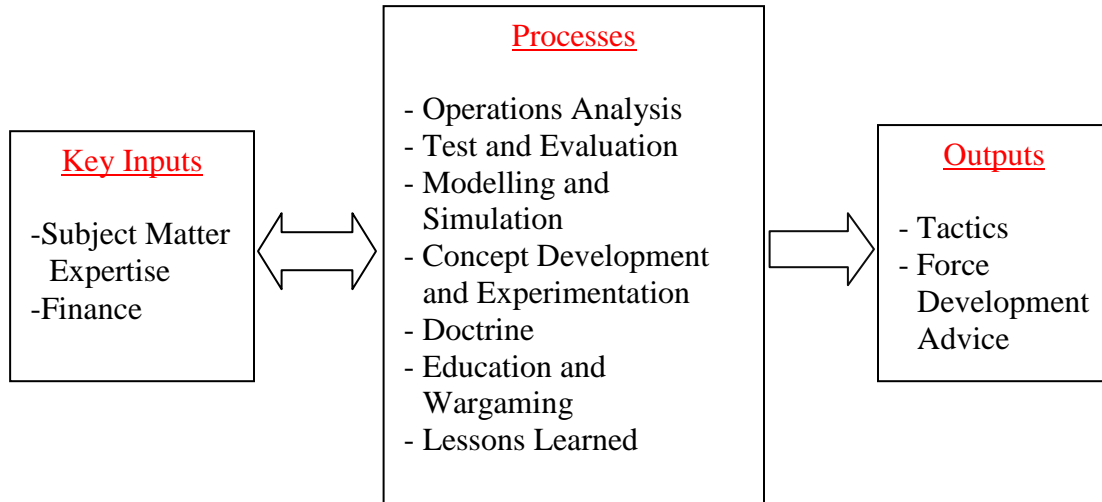
<sup>1</sup> A Strategic Business Unit is defined as "an autonomous division or organizational unit, small enough to be flexible and large enough to exercise control over most of the factors affecting its long-term performance" (BusinessDictionary.com, 2013).



**Figure 1.** CFMWC's Reporting Chain

## 2.1 Product and Services

In terms of understanding CFMWC's product offerings, it is better to focus upon the seven key product *processes* than on the actual outputs, as the form of the outputs can change drastically to meet the customers' needs. Whatever the output may be, however, it will be arrived at by at least one of the seven processes. It should additionally be noted that the seven processes also affect one of the two main inputs, subject matter expertise, as personnel become more knowledgeable in their field by working through problems. The input, processes and outputs are captured pictorially in Figure 2 below.



**Figure 2.** CFMWC Inputs, Processes and Outputs

At the time when the Test and Evaluation process was added as a new service, in 2000, CFMWC was organized functionally around the two key process offerings: there was an Operations Analysis Group and a Test and Evaluation Group. Complementary to those two groups that collected and analyzed data was a Tactics Group that was responsible for devising and publishing new tactics and procedures based upon the findings of the other two groups. The tacticians were also core to the doctrinal process. There was additionally a Training Group that was responsible for the education and wargaming functions. The remaining three processes began to be introduced in the early- to mid-2000s under the construct of pilot programs, with minimal resources and an *ad hoc* reporting chain. These three new processes did not mature sufficiently until approximately 2011-2012, at which point they gained general acceptance by the Navy.

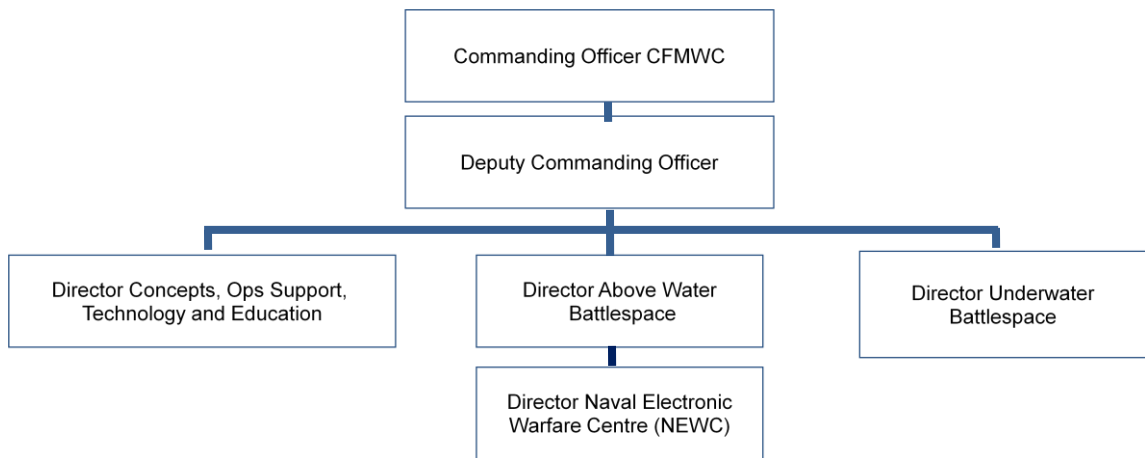
As part of the 2008 strategic reorganization that put CFMWC under the supervision of DGMFD, and formally gave it the mandate to generate tactics and to provide force

development advice, the unit did an internal reorganization as well in order to better align resources. After 2008, CFMWC was primarily organized around the two major domains of Above Water Warfare (anything related to naval operations above the water) and Under Water Warfare (anything related to operations under water). These two domains became directorates within CFMWC and encompassed the operations analysis, test and evaluation, and the majority of the doctrinal functions. There additionally was a Joint Littoral Operations Battlespace that was created, to conduct CD&E work specifically on the topic of amphibious operations, but this battlespace was cut in 2009. The Education and Wargaming section remained in 2008, but the following year its personnel were trimmed back to just two individuals, and the team became a section reporting to the Director of Planning and Concepts. The IT section reported to the Deputy Commanding Officer (DCO).

While the above and underwater directorates have remained fairly stable, the Directorate of Planning and Concepts changed names to Concepts, Doctrine and Education in 2011, and in so doing cut the project management responsibilities that had been a pilot project but which did not yield significant added value. In 2012, in order to find synergy between the modelling and simulation cell (who are high-end users of software) and the IT section (who provide the required hardware for the M&S cell), the IT section was transferred to this third directorate, whose name changed to the Directorate of Concepts, Ops Support, Technology and Education (DCOSTE). At the same time the Doctrine and the now-mature Lessons Learned sections were transferred to the DCO's control as the span of control and the total workload of managing five out of the seven processes



were too much for just one director to manage. The main take-away from these last three paragraphs is that CFMWC has struggled to properly align processes and reporting chains in order to maximize both efficiencies and effectiveness; a sign of the need for an improved operations management strategy. The current organization of CFMWC is depicted in Figure 3 below.



**Figure 3.** CFMWC Internal Organization

The majority of CFMWC is located in Halifax, however the Naval Electronic Warfare Centre (NEWC), now a semi-autonomous organization reporting to the director of the Above Water Battlespace is located in Shirley's Bay, Ottawa. NEWC shares the expensive, highly specialized facilities of the Communications Research Centre (CRC), another governmental department, and develops joint products with the Canadian Forces Electronic Warfare Centre, and the Canadian Forces Air Warfare Centre - Electronic Warfare Operations Support, both of which are co-located as well (Department of National Defence, 2013).

## 2.2 Key Stakeholders/Customers and Competitors

To complete the background understanding of CFMWC it is important to appreciate its key stakeholders and competitors. CFMWC's direct stakeholders/customers are comprised of:

- Immediate supervisor, DGMFD, located in Ottawa;
- Two sister organizations, Directorate of Maritime Strategy [naval strategy] and Directorate of Maritime Requirements Sea [naval procurement] are both located in Ottawa;
- The Canadian Forces Naval Operations School, whose mandate includes teaching naval tactics during career coursing is located in Halifax; and
- Ten major warships are located in Halifax, and seven are located in Esquimalt, BC;

The following list identifies CFMWC's key competitors, as well as provides a brief description as to how they compete:

- Other allied tactical development centres and navies, particularly those of Australia, the United Kingdom, and the United States, and to a lesser degree those of NATO. These organizations can generate and share with the Navy some tactics that might be comparable, or better, than those organically developed. It should be noted that sharing tactical information between countries is not always an open process, and some tactics are very dependent upon the type of equipment possessed by a navy;

- Other Canadian warfare centres. There are three Canadian warfare centres located in Ontario [that of the Canadian Forces, the Army and the Air Force] that perform functions similar to that of CFMWC. While their mandates are all different there is potential that their areas of research may overlap;
- National defence research organizations, such as Defence Research and Development Canada (Defence Research and Development Canada, 2013) or the UK's Defence Science and Technology Laboratory (Defence Science & Technology Laboratory, 2013). These organizations may make discoveries that lead to new tactical requirements, and they can provide informed, highly specialized force development advice;
- Defence Industry. There are a multitude of defence firms, such as the manufacturers of radars, torpedoes and missiles who can suggest tactics and provide procurement advice. The defence industry, however, will normally only provide information that makes their products sound favorable, and sharing some information between countries can be restricted by national governments; and
- Universities conduct research into new technologies which can render existing tactics obsolete, and can provide procurement advice.

## **Chapter 3 – Strategic Environment**

This chapter will summarize the high-level factors that affect both the CFMWC and the Royal Canadian Navy. It will cover major shipbuilding and modernizing projects, as well as detail the fiscal pressures that the Department of National Defence (DND) is experiencing and is expected to face in the near future. These factors are critical to CFMWC's selection of business unit strategy and must be considered in an OM functional strategy.

### **3.1 National Shipbuilding Procurement Strategy**

On 3 June 2010 the Canadian government announced what will be the major driving factor for the Navy for perhaps the next half century: the National Shipbuilding Procurement Strategy (NSPS). In this announcement the government pledged \$33 billion in order to develop two Canadian shipyards to construct the next generation of Canadian naval ships as well as a large number of smaller Coast Guard and police vessels (National Shipbuilding Procurement Strategy , 2013). As part of the warship build, the NSPS will provide a replacement for Canada's three destroyers that were built in 1972-1973, and twelve frigates that were accepted into service between 1992-1996 (National Defence and the Canadian Forces, 2013). This replacement project is called the Canadian Surface Combatant (CSC) and it is anticipated that the first hull will be ready in approximately a decade, and the ships will have an operating life of thirty to forty years. The CSC will thus provide the bulk of Canada's naval warfighting

capability over the coming decades, so it is arguably the most important strategic factor for the Navy.

### 3.2 Halifax Class Modernization

Canada's frigates, the Halifax class, are the workhorses of the Navy. They were designed in the late-1980s as Cold War ships that specialized in anti-submarine warfare in the North Atlantic (Modernized HALIFAX Class, 2013), but since then both their mandate and geographical operating areas have changed. Additionally, modern threats are faster, stealthier and harder to cope with than when the Halifax class frigates were conceived. In order to update their capabilities and to allow them to remain operational until the arrival of the Canadian Surface Combatant ships, the frigates are undergoing a modernization project which will make their radars, command and control, and other complementary systems more capable against contemporary threats. This project of work is called the Halifax Class Modernization, and work on the first frigate began in the Fall of 2010 (Modernized HALIFAX Class, 2013). With the arrival of a new sensor suite as well as its supporting computerized command and control system, new tactics and procedures will be required to help these ships to become fully operational.

<p><b>Deduction 1:</b> Canadian Surface Combatant (CSC) and Modernized Halifax Class Frigates (HCM) will have the greatest warfighting support requirements and largest supporting budgets, therefore they should be the focus of future work.</p>
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### 3.3 DND Financial Situation

On 12 May 2008 the Conservative Government announced the Canada First Defence Strategy (CFDS) in order to ensure that the Canadian Forces (CF) have “the people,

equipment, and support they need to meet the nation's long-term domestic and international security challenges" (Prime Minister of Canada, 2013). With over \$490 billion dollars of planned spending on new equipment and capabilities over a twenty year period, the CFDS was to go a long way to re-equip the Canadian Forces as for the previous decade the Canadian military had been suffering from a "rust-out of key equipment platforms, [and a] strain on personnel and other challenges arising from a high operational tempo" (National Defence and the Canadian Forces, 2013).

Unfortunately, after the announcement of the CFDS most of the western economies went through a major and lasting recession, and as a result the Canadian government has not been able to collect as much revenue as it might otherwise have wished.

Additionally, while the CFDS made strong promises, some have questioned whether or not the plan was actually affordable in the first place (Pugliese, Ottawa Citizen, 2012).

As a result of all of these pressures the government announced a Deficit Reduction Action Plan, where the 2011 Budget required Department of National Defence (DND) [and other departments] to submit deficit reduction plans that would cut direct program spending by between 5 and 10 percent. The results of this process, announced in Budget 2012, would reduce DND's operating budget by \$1.12 billion a year (roughly 7 percent) by fiscal year (FY) 2014/2015 (Perry, 2012).

On top of the DRAP, DND also underwent a periodic Strategic Review (SR) in 2010, where savings through 56 different divestments were additionally identified. SR cuts would be implemented over a two year period, beginning in April 2012, which would

reduce DND's budget by a further \$525 million in 2012-13 (Maple Leaf, 2013). As a consequence of both DRAP and SR, DND would have to cut \$1.6 billion over the following three years. Of that amount, \$445 million would have to come from cutting private contractors, and some of the savings would also come from reducing civilian public service jobs and cutting the number of reservists who are doing full-time jobs (Pugliese, Global National, 2012).

**Deduction 2:** budgets likely to be tighter through to end of FY 2014-2015.

**Deduction 3:** Fewer contractors, public servants and reservists will be available to do work in the near future.

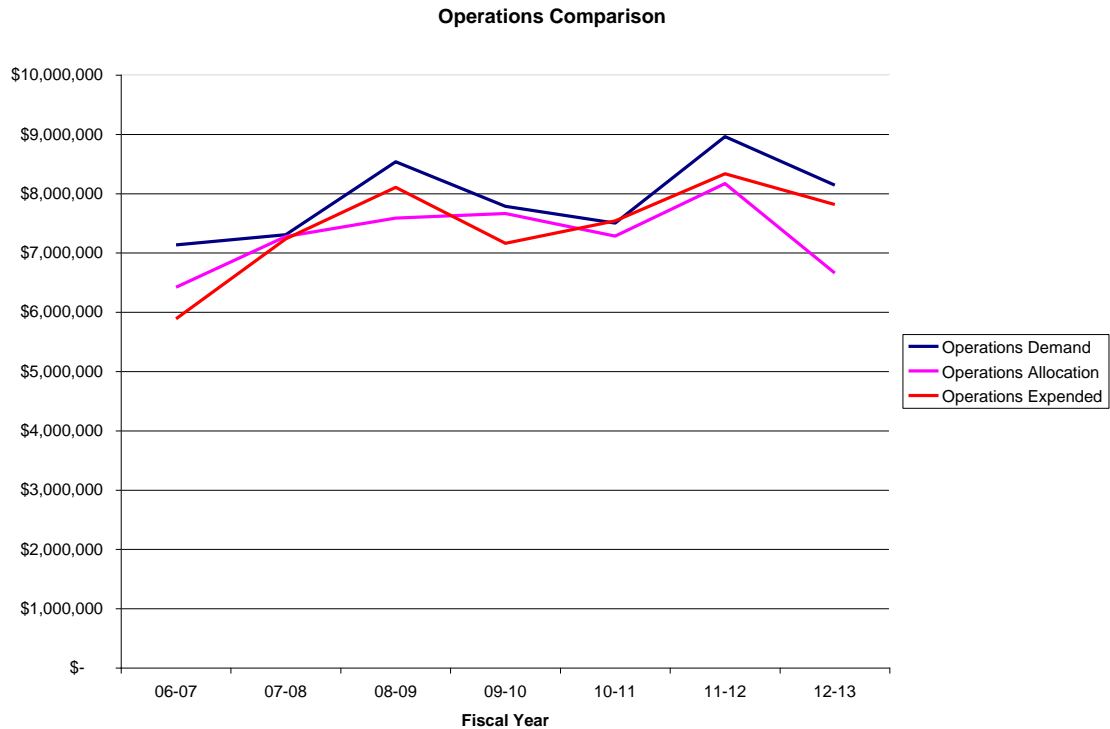
As a final fiscal pressure, in October 2012 the Treasury Board announced a new measure to help ensure the prudent use of public funds for use in the areas of hospitality, travel and conferences. Now, for any travel that is not for the purpose of training or operations, deputy ministerial permission is required for events whose cumulative cost for *all* government participants is between \$5,000 and \$25,000, and ministerial permission is required for events that are more expensive than that (Treasury Board of Canada Secretariat, 2013). Permission to travel must now be sought up to 65 days in advance. Several other nations, such as Australia and the United States also have significant bureaucratic restrictions / hurdles for travel.

**Deduction 4:** While the government is not denying travel, the bureaucratic hurdles are not insignificant, and the process is not responsive to short-notice events. As such, it is likely that travel for conferences, meetings, etc will be restricted in the future.

### 3.3.1 CFMWC Financial Predictions

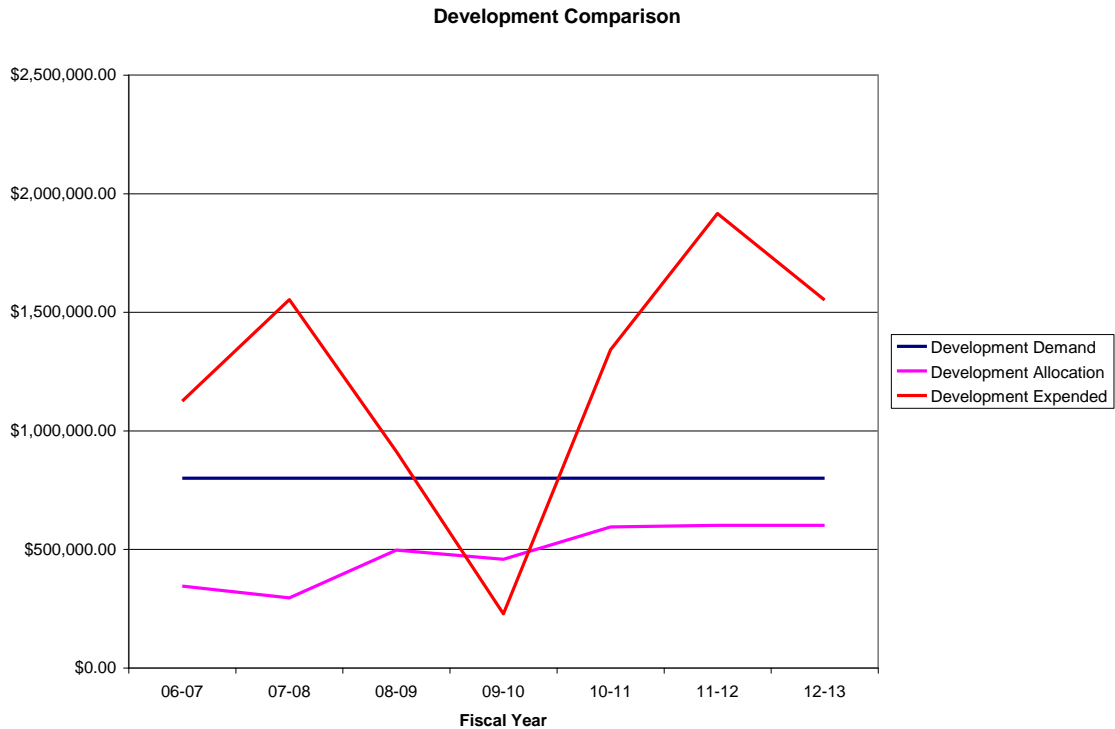
CFMWC's budget can be essentially broken down into two main categories: operations and strategic development. Figure 4 below shows the financial trend for operations from fiscal year (FY) 2006-2007 until FY 2011-2012. The graph also plots anticipated expenditures for FY 2012-2013, which is almost complete. Three trends clearly present themselves. First of all, CFMWC's demand for funds always exceeds the initial allocation. Secondly, in five of the past seven years, CFMWC has been able to expend funds in excess of its initial allocation, particularly in the past two years where CFMWC was able to find slippage funds from the Navy as well as external funding from stakeholders to the order of \$1 million per year. The third trend that is clear is that CFMWC is experiencing the effects of DRAP and SR, with its FY 2012-2013 allocation falling to approximately FY 2006-2007 levels, but without the benefit of indexing for inflation. The only year that CFMWC spent less than its allocation was FY 2009-2010, when the Navy executed a clawback of \$479,000 mid-year.





**Figure 4.** Comparison of CFMWC Operations Spending

Figure 5 shows two similar trends, in that demand for strategic development funds always is significantly higher than the initial allocation, and that given enough lead time CFMWC can conduct three times as much development per year than it is allocated for. Once again, this extra development is funded from slippage within the Maritime Force Development organization as well as from external funding by stakeholders. FY 2009-2010 also shows the dip in investment due to the clawback, but the overall level of developmental funding has increased since then. FY 2011-2012 stretched the supply chain’s ability to deliver product within the fiscal year, and levels of development dropped slightly the following year as CFMWC focused efforts in new developmental areas, which took longer to contract for the first time than for more traditional activities.



**Figure 5.** Comparison of CFMWC Strategic Development Spending

Taken holistically, if funding levels remain steady over the coming few years CFMWC should have enough funds to continue operations, but any further cuts would begin to eat away at core assets, namely the retention of all of its subject matter experts. While CFMWC made minimal use of external funds prior to FY 2010-2011, outside funding now accounts for approximately \$2.5 million of a \$9 million budget; CFMWC would be equally as affected were external funds be reduced in coming years.

## Chapter 4 – CFMWC’s Business Strategy

CFMWC’s mission statement has been detailed above, which calls upon the unit to be the Navy’s centre of excellence for maritime warfare, and to provide the two outputs of tactics and force development advice. To achieve this mission, CFMWC is following a horizontal growth strategy (Wheelen, Hunger, & Wicks, 2005, p. 145), looking to enhance and expand its product offerings into new areas as a form of concentric diversification. One such example can be observed through CFMWC using its existing tactical modelling and simulation capabilities in order to inform procurement personnel *quantitatively* (as opposed to just subjectively) of what types, and how many, new radars and weapon systems future ships will require. This notion has caught on well with naval procurement personnel, and in 2016, CFMWC will host a synthetic evaluation of CSC proposals as a form of risk mitigation for the shipbuilding project. This type of activity is new to both the Navy and to the Department of National Defence as a whole, and is likely to be a key activity in future procurement projects.

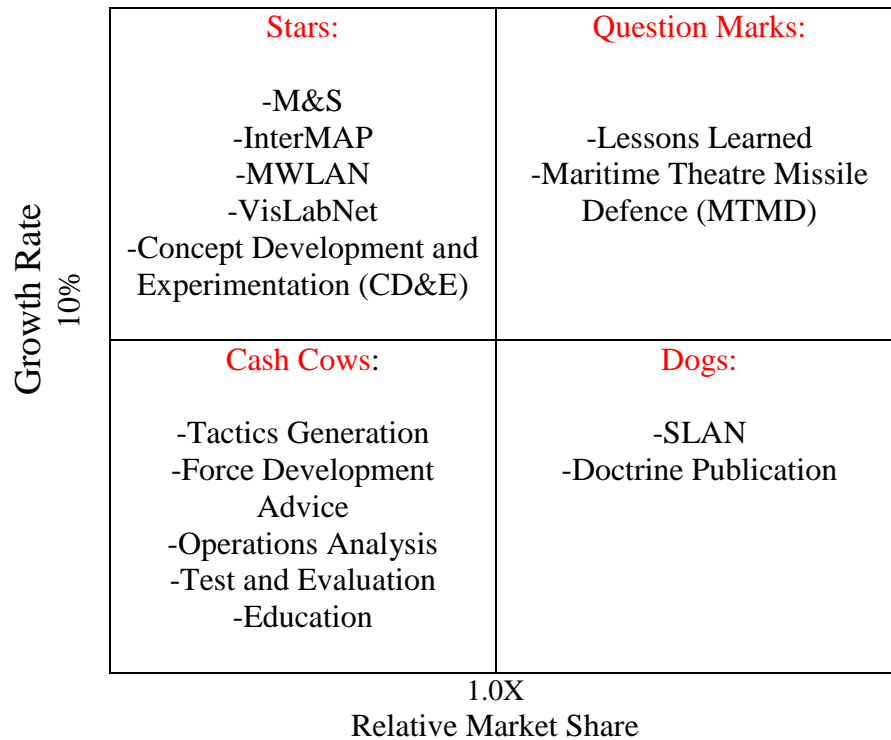
As part of its growth, CFMWC is following a *focused differentiation* competitive strategy (Wheelen, Hunger, & Wicks, 2005, p. 121), providing tailored advice to a few procurement and policy-making officers in Ottawa, while also providing the best possible tactics to the Navy’s surface warships.<sup>2</sup> CFMWC has begun to widen its target market to include defence research and development scientists who could make use of the Warfare Centre’s simulation and analysis tools, but the total segmentation remains

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<sup>2</sup> As of 2012, submarine doctrine is no longer a part of CFMWC’s mandate.

fairly narrow. What differentiates CFMWC from other allied warfare centres and the defence industry at large is that CFMWC possesses unique knowledge and software tools that give it the best insight into how Canadian ships (with its unique combination of hardware, software and doctrine) should perform under given conditions, and unlike defence companies, who at times may have better information but are still driven to market their products, CFMWC is viewed as an inherently trusted agent by Canadian decision makers. The Warfare Centre is thus significantly differentiated from its competition.

In terms of building blocks, Figure 6 depicts how the unit's seven processes, three organic classified network services [SLAN, MWLAN and VisLabNet] that it provides its employees, and one trademarked program, InterMAP, are performing. The results are displayed in the form of a BCG Growth-Share Matrix, which identifies items as being high growth *Stars*, reliable *Cash Cows*, underperforming *Dogs*, and the costly but uncertain *Question Marks* (Henderson, 2013). The horizontal axis represents the degree of market share relative to the largest competitor, with the items to the left of the centre line holding the greatest proportion. As there is no quantitative data to indicate market share relevant to its next largest competitor a subjective determination has been made. The vertical axis represents growth rate, with the centre line indicating a rate of ten percent per year.



**Figure 6.** CFMWC BCG Growth-Share Matrix

From Figure 6 it is clear that CFMWC has a number of successful “cash cow” operations and it has a number of star products that can fuel CFMWC’s growth plans. While one might suggest that CFMWC has too many product offerings and that it should reduce the number and just focus upon a select few, the product offerings are nearly all complementary to one another. Collectively they nearly all generate value in the production chain leading to tactical doctrine and procurement advice, and the loss of one product, such as Operations Analysis, could significantly negatively impact other services.

In terms of the items on the right hand side of the graph, the Lessons Learned process is new, is quickly gaining corporate acceptance, and is likely to either migrate into either

the Cash Cow or Star categories. The Maritime Theatre Missile Defence project is a nine nation effort aimed at enhancing the interoperability of the members' air defence ships in order to achieve a higher level of coordination and cooperation in maritime air and missile defence (IABG, 2012). CFMWC is responsible for the project's analysis needs, and is working to integrate its computer-based models into the multi-national simulation federation. It is not yet clear into which category MTMD will move, but it is likely that some technical elements will be spun off either into the Cash Cow or Star quadrants, with the remainder being dropped upon completion of the project. As for the dogs, the SLAN classified network will be decommissioned later this year; and the Doctrine Publication process is a required function as part of international relationships with NATO partners and therefore cannot be discarded.

## **Chapter 5 - CFMWC Operations Management Strategy**

The purpose of this chapter is to develop an OM strategy based primarily upon eight of the ten factors presented by Heizer and Render (Heizer & Render, 2011), looking forward with a primary focus of up to the end of FY 2016-2017. This chapter will not delve into tactical aspects of operations, such as where personnel should be located within the building, or touch upon short-term control issues, such as scheduling of shifts, but will layout higher-level recommendations in order to use the entire production process to support CFMWC's competitive strategy and growth intentions (Chase, Aquilano, & Jacobs, 1998). This chapter will begin with one last element of idea generation, using an adapted SWOT analysis; will identify the three major chokepoints

to operations; then will provide recommendations in an eight-step approach to achieve operations excellence.

## 5.1 SWOT Analysis

A strength, weakness, opportunity and threat (SWOT) analysis is normally conducted for the purpose of determining a firm's distinctive competencies (Wheelen, Hunger, & Wicks, 2005, p. 116). Although normally used to set a corporate strategy, the SWOT framework is still valuable for capturing a number of the factors that need to be considered in developing an operations management strategy. Therefore, Figure 7 below summarizes the major points in each SWOT area, and Figure 8 shows how the four factors can be paired up to develop potential future success options that can be attained through OM practices.

<b>Strengths</b>	<b>Weaknesses</b>
<ul style="list-style-type: none"> <li>- Strong subject matter experts in the realm of maritime tactics</li> <li>- InterMAP interfacing software tool</li> <li>- Modelling &amp; simulation capability</li> <li>- Powerful and flexible MWLAN internal computer network</li> </ul>	<ul style="list-style-type: none"> <li>- Personnel are one-deep and ageing</li> <li>- Not enough IT personnel to design, build and maintain computer hardware</li> <li>- Not experts in assessing all non-tactical areas of M&amp;S</li> <li>- Existence of two internal production processes, both of which are not fully aligned with IT assets</li> </ul>
<b>Opportunities</b>	<b>Threats</b>
<ul style="list-style-type: none"> <li>- Defence technical experts at DRDC</li> <li>- Number of cutting edge, stove piped models used by DND</li> <li>- Strong information sharing with Australia, UK, US and New Zealand</li> <li>- Strong computer networking experience held in the Base IT section</li> <li>- Generally there is slippage money available at the end of the year</li> <li>- HCM work will soon be in high demand and will have high visibility</li> <li>- CSC project just went into “definition” phase and as such there is multi-year money available</li> </ul>	<ul style="list-style-type: none"> <li>- Trend towards tighter budgets</li> <li>- Trend towards downsizing</li> </ul>

**Figure 7.** SWOT Quad Table



	Strengths	Weaknesses
<b>Opportunities</b>	<ul style="list-style-type: none"> <li>- Assimilate high quality, high-demand, stove piped models from DRDC and/or allies into organic M&amp;S environment</li> <li>- Use strong positioning to draw on external sources of funding</li> <li>- Leverage multi-year demand (and associated funding) to develop more complex items that cannot easily be funded and completed within one fiscal year</li> <li>- Provision of InterMAP and M&amp;S tools to DRDC (and some Allies) could position the software products as industry standards</li> </ul>	<ul style="list-style-type: none"> <li>- Partner with Base IT section to develop and maintain infrastructure</li> <li>- Partner with DRDC to develop and validate physical environments in M&amp;S</li> <li>- Use forthcoming HCM and CSC work to standardize production processes within the Unit</li> <li>- As part of forthcoming work, strive to hire new, younger workers and/or automate functions to improve productivity as well as to serve as a form of knowledge capture</li> </ul>
<b>Threats</b>	<ul style="list-style-type: none"> <li>- Focus on high profile work, such as key HCM and CSC functions in order to minimize coming fiscal pressures</li> </ul>	<ul style="list-style-type: none"> <li>- Increase productivity in order to make more efficient use of employee's time while also reducing overall costs</li> </ul>

**Figure 8.** Potential OM Strategy Options

Figure 8 presents a number of options that CFMWC could potentially use in order to capitalize upon its strengths and opportunities, and to compensate for its weaknesses and/or threats. Some of these items will be expanded upon in the OM strategy chapter as they become recommendations to improve CFMWC's production efficiency.

CFMWC's business unit strategy is to compete on focused differentiation. A complementary OM functional strategy would therefore be to focus on production aspects that help the firm to differentiate itself from its competitors. That is not to say that the other two OM strategic competitive alternatives, *response time*, and *cost* (Heizer & Render, 2011, p. 34) are not important but based on the market segment, what

customers want the most is a clear, reliable answer to their questions. CFMWC does have competitive elements of speed and cost in its operations: contracting CFMWC services does not require its customers to tender requests through Public Works and Government Services Canada (PWGSC), which can cause delays of up to months when dealing with the private sector, and because CFMWC does not look to turn a profit from other governmental organizations its costs can be quite low (sometimes customers are not even charged). But despite these two factors, it is CFMWC's ability to provide a reliable answer to complex problems that is at its core.

In conducting operations, there are three major choke points that limit CFMWC's ability to do work. The first and most significant one that has been identified several times already is that CFMWC is *personnel limited*, or put another way it does not have enough people with the right skill sets in order to do a greater quantity, or wider scope of work. Put in the terms of military vernacular, CFMWC's operations are PY<sup>3</sup> limited.

**Deduction 5:** CFMWC's operations are PY limited.

The second most important choke point is that of finances, and the lack of sufficient and timely funds can restrict operations in several ways. Up until fiscal year 2011-2012, CFMWC has been able to fund all of its people positions organically, but starting in FY 2012-2013 the Unit had to begin to look for external agencies/customers to directly fund some of the PY costs. With the full effects of DRAP and SR still left to be felt, it is

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<sup>3</sup> PY stands for personnel year, which refers to 12 months full-time employment of one person; 12 persons employed for one month; two persons employed for six months; or any similar combination equal to one personnel year (Department Of Finance, 2013).

likely that CFMWC will feel further pressure with respect to its personnel funding envelope. Losing employees/contractors would certainly negatively affect production as operations are already PY limited.

While CFMWC has had sufficient funds with which to support operations, funding availability can vary significantly within each fiscal year. For the past three years, prior to the start of the fiscal year DGMFD has generally indicated that funding would be less than the total requested for the year. As a result, some desired work was immediately turned off. Last year [FY 2012-2013], as DRAP and SR effects began to be felt, nearly the entire first quarter passed with CFMWC only receiving a notional budget but not a confirmed one, which further slowed down the pace of work because there was no guarantee of funding.

At the start of the year, money is essentially allocated into two classes of expenditures: capital development and operations. Within the former envelope, significant strategic investment can be done providing that it is started early enough to go through contracting (if required) and that all work can be completed by 31 March of the following year (the end of the fiscal year). As a general trend, for the first half- to three-quarters of the fiscal year cash flows are inadequate for the desired level of activity, and then for the final portion of the year as slippage in internal projects, and external programs within the Maritime Force Development organization frees up money, CFMWC scrambles to capitalize on the newly-available funds before the end of the year. At the end of the year, all non-expensed money is returned to the government and

a new budget is issued. As a trend, it can be said that significant strategic development activities can transpire each year provided that they are started early; and that **CFMWC operates as if it has insufficient liquidity for at least the first half of the year, after which it has ample cash but not enough time to spend it before the end of the fiscal year.**

The final major chokepoint to operations is that of the procurement system. In some cases CFMWC can purchase goods directly, but most of the time it needs to let contracts to industry, and the contracts themselves frequently need to be reviewed by a contracting cell on the base, and then by PWGSC before the potential contracts are made public to industry. This process, designed to ensure fairness within the market place, has value, but the trade off is that frequently large purchases/contracts cannot be done quickly. As well, in the case of procuring IT hardware, purchasing is done by the Base's IT section, with some minor buys done periodically throughout the year, and most major purchases done at the very end of the fiscal year. If the Base's IT section does not have the capacity to handle a purchase order within a fiscal year, CFMWC cannot go around them and purchase items directly. This cycle means that IT purchases on the scale of workstations and monitors may only happen once or twice a year, and larger purchases can easily miss one fiscal year and not end up being purchased until approximately the twenty-four month mark, or even longer. As a trend, it would be safe to state that **CFMWC, more often than not, cannot make quick purchases** and therefore has to put in its requests well in advance of the intended need.

## 5.2 Eight Steps to Operational Management Success

### 5.2.1 Design of Goods and Services

For one year now, CFMWC has been following a new product strategy of interfacing existing, high-value models that were developed in a stove-piped manner with either Ship Air Defence Model (SADM) or ODIN. The purpose for this is that both SADM and ODIN have significant growth potential to allow them to better answer a greater scope of questions by including new data sets and algorithms. CFMWC identified that it was more cost effective to develop interfaces, which can also be done quickly, than to recreate the entire body of knowledge in one of its two main models. Being that there is a large body of corporate knowledge that remains in stovepipes of operations within the Department of National Defence, CFMWC should be able to continue its new product strategy to at least the end of FY 2016-2017, reaping quick, cost-effective returns.

Given that personnel support and finances are limited, CFMWC should adopt a tag line of **Helping HCM and CSC to achieve Initial Operational Readiness** as it would not only have marketing value, but it would also serve to focus operations on getting the two new main classes of ship to be fully ready to conduct missions anywhere in the world. Since these two classes of ships are critically important to the Navy, they will likely receive a disproportionate amount of funding support in the future.

<p><b>Recommendation 1:</b> CFMWC should adopt a tag line of Helping HCM and CSC to achieve Initial Operational Readiness</p>
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A second major thrust of new product design needs to be increased personnel productivity in order to counter the main chokepoint of operations. CFMWC currently has a few emerging products that will help in this endeavour. The MWLAN will have a very powerful computational cluster that will offer approximately 800 processing cores to users, and should be fully operational by the end of 2013. This means that shortly the MWLAN would be able to solve problems approximately 800 times faster than a standalone computer. This increase in processing power will allow users to generate answers significantly faster than the *status quo*.

A second powerful product that has surfaced from one of CFMWC's question marks, MTMD, is automated, real time data analysis for warfighting events. The automated analysis feature allows computers to fuse data and to monitor and update key performance indicators and generate alerts **in real time**, so that at the end of a missile firing, a torpedo engagement, or a modelling and simulation run a large amount of analysis has already been done. In this manner analysts can immediately start to focus on what happened, and why, and not have to spend time crunching numbers after the fact before they can begin to add the value that comes from their unique subject matter expertise. A related example of this type of product offering was demonstrated during a missile firing exercise in 2012 where a DRDC product [co-sponsored by CFMWC] called CORALS did a real time assessment of the ship's performance, and instead of doing a formal initial report to the ship, it would have been possible to simply select "print screen" immediately after the event and leave the ship with this paper copy. This

scheme of operation clearly offers productivity advances while concurrently shortening production cycles.

**Recommendation 2:** CFMWC should further develop automated data analysis products, removing the mundane fusion and calculation aspects of analysis in order to allow analysts to more quickly focus on answering *what* happened that was important and *why* events transpired.

### 5.2.2 Process design

As it is clear that information technology plays a major part in the product offerings, CFMWC should orientate its process designs on the best practices of Information Systems (IS) usage, which requires the alignment of business strategy, the hardware and software, processes, and the organization of the workforce (Pearlson & Saunders, 2013) in order to derive the maximum value. Although there has been some divergence in production processes between the Above Water, Under Water, and the Modelling and Simulation directorates, in 2012 all parties agreed to a standardized development process which facilitated the creation of the purpose-built MWLAN information system. This new production paradigm appears to be well grounded in IS best practices and should be maintained.

One aspect of information technology that needs to be addressed, however, is the scope of work assigned to the IT section: the three computer science experts and the one administrative clerk who service the Unit. The IT section currently supports 12 different computer networks within the building; four of which are internal networks that staff are 100% responsible for, and the remaining eight are managed externally but require some onsite support from CFMWC IT staff for maintenance, repairs, etc. In addition,

CFMWC carries over 140 laptop computers for the approximate 100 employees in the unit. In order to be successful in the future, CFMWC needs to focus its attention on improving IT Services' productivity as well as reducing its scope of work in order to better balance demand with available personnel numbers.

Table 1 summarizes the percentage of users who perform work on a given network at least once per month, as indicated by a 2011 unit survey. Although a large number of the networks are used infrequently, the vast majority of them cannot be shut down as they are periodically important for operations.

<b>Network</b>	<b>Percentage of employees who use the network monthly</b>
DWAN	99%
CSNI	33%
SLAN	49%
	*Will be decommissioned in 2013
MWLAN	*New Network as of 2013
GPNET	35%
NSWAN	4%
VisLabNet	9%
CFX-Net	0%
Centrix	1%
NCTE	0%
BattleLab	4%
Dev/Exp-Net	3%

**Table 1.** Monthly Network Use Per Employee

As for the laptops, many users have multiple harddrives and highly customized software setups which essentially takes up one PY of effort, leaving only two PYs to manage the twelve networks. For the four internal networks, the three individuals are responsible



for network design, maintenance, operations, and troubleshooting, and none of the individuals are specialists in any of the core networking functions. Clearly the scope of work is too great for three individuals, and they do not possess the required skills to manage all aspects of network operations themselves.

As was recommended by an independent team of MBA students, CFMWC should form a closer partnership with the Base IT section as they have experts in all areas of network operations, and they could potentially handle higher-level issues while CFMWC staff could focus more on day-to-day operations (Shears, Nainiappan, Pham, Lee, & Habboush, 2012). Additionally, CFMWC should reduce the number of internal networks for which they have the most responsibility for managing. More specifically, the BattleLab network could conceivably be absorbed into the MWLAN, as could most of the functionality of the VisLabNet. This, coupled with the pending SLAN decommissioning, would reduce the number of internal networks from four to essentially one. With one main internal network, IT staff could focus their efforts on the one system to ensure that it runs well instead of dividing their time on several networks.

The number of laptops available for use should also be reduced in order to free up IT personnel resources. As the old primary internal network, the SLAN, was generally perceived as being unreliable, a large number of employees started to do the majority of their work on laptops, only transferring information to/from the SLAN when absolutely required. With the new, reliable MWLAN internal network it is likely that a number of those users could be coaxed to give up their notebooks as they would no longer be

required. A second major demographic of laptop users are those employees who travel, but who do not travel more frequently than a few times a year. One potential way to further reduce the number of laptops and the number of custom software builds, is to implement a pool of “travel” laptops that have, say, one of five images that could be standardized for use by various key demographics of users. As such, by reducing the total number of assets while also minimizing the requirement for frequent custom laptop builds, the scope of work for the IT section can be reduced while concurrently improving their productivity.

As IT is an essential enabler for all CFMWC operations, reliable information systems are critical to success. As it is not likely that additional IT personnel can be hired, CFMWC needs to capitalize on higher-level IT support from the Base, while also focusing organic staff on the reliable operation of the MWLAN. This can best be achieved by reducing the total scope of work for the IT section while also improving their personal efficiencies.

### **5.2.3 HR and job design**

Due primarily to the large proportion of personnel at CFMWC who are approaching retirement age, the unit needs to attempt three major items on the HR front. First of all, it should look to push the limits of personnel caps / hiring restrictions in order to get a few additional, younger employees who could apprentice the key, older employees. Secondly, the automation of components of the value chain represents an opportunity to capture knowledge from the more experienced workers and embed it in the form of algorithms. As such, even if someone were to leave, elements of their experience would

be embedded into production and would be of use to others in the future. Finally, a standardization of production processes for Above Water, Under Water, and Modeling and Simulation testing and analysis will simplify training future replacements as there will be a template to follow, and someone in one of the other battlespaces would be able to mentor new individuals on the procedures of the position.

Aside from job design, as CFMWC cannot use pay incentives to help motivate employees, management needs to ensure that hard work and accomplishments are recognized informally, such as a pat on the back, as well as formally in Unit gatherings. In general, most employees are proud of their work and like to be recognized for their accomplishments. This is a no cost item that can reap large returns, and a significant dissatisfier if not done.

#### **5.2.4 Location Strategy**

Firms are normally faced with the choice of locating close to suppliers, close to consumers, or in an area that gives them a competitive advantage, such as near a source of cheap electricity for energy-intensive production, i.e. for smelting ore (Cronk, Kirkwood, Ryan, & Stanley, 1994, pp. 53-54). As the majority of CFMWC's supplies are generic in nature there is no need to be located near any one particular supplier, although it would be useful to remain located near to Base IT support, in order to maximize the level of assistance that could be had.

The majority of CFMWC's force development advice is in support of organizations in Ottawa, and that city is certainly closer to the other Canadian warfare centres (in

Ontario), and is in a more central location for travelling nationally and internationally, therefore one could argue to relocate the entire unit to Ontario in order to help curb some travel costs. However, CFMWC conducts frequent briefs to the Canadian Forces Naval Operations School as well as to the East Coast Fleet in Halifax; briefings which would not ideally be done via a video teleconference (VTC). Additionally, CFMWC's educational courses are normally filled by a majority of students coming from the East Coast. CFMWC does provide two sets of tactical briefs (and some training) to the West Coast each year, but there is less time spent on briefing in Esquimalt, BC than in Halifax, NS.

Based on the smallest requirement to be on the West Coast, that location seems to be less ideal than being close to either Halifax or Ottawa, with whom the majority of business is conducted. While moving the unit to Ottawa would give greater proximity to DGMFD and its sister organizations there are two major downsides to that decision. The first of which is that the majority of CFMWC's employees are settled in Halifax, with their families, and could retire on fairly short notice. If CFMWC were to relocate out of province it is likely that a significant number of one-deep personnel would choose not to move, the loss of which could set back operations easily between three to five years as new subject matter experts were groomed and indoctrinated.

The second major downside is that CFMWC would lose proximity to the ships that it supports with tactics, and there could be the real risk of trading a proven warfighting culture for a bureaucratic Ottawa culture instead. Taken holistically, unless operations

were going to significantly slow for a period of a few years it would be wiser to maintain CFMWC in Halifax. There would be, however, benefits to changing buildings to a more modern, more IT-friendly building closer to Base IT support as the current building's age stymies IT growth, and the foundation underneath the server farm is cracked and leaks water into that space. While remaining in Halifax, CFMWC can foster the feel of closer ties with personnel in Ottawa by increasing its use of teleconferences and VTCs.

In terms of NEWC, the satellite section in Ottawa, that organization enjoys economies of scale by sharing resources and production with CDC and some of the other warfare centres, and its highly specialized, one-deep personnel would also likely not want to be relocated out of province. NEWC's outputs directly support CFMWC's tactics, therefore it is recommended that the satellite organization continue to report to CFMWC and that it remains in Ottawa.

### **5.2.5 Layout Strategy**

As CFMWC's work is knowledge-based, layout strategy is not as important as say for a manufacturing line, but it still needs to be considered. Laying out services along the lines of battlespaces (versus by functionality, such as tactics, analysis, etc) arguably offers greater value in that employees are co-located such that they can discuss matters more easily from initial observations to final products. Additionally, due to their own individual levels of knowledge, oftentimes employees who normally handle front-end work can provide very strong ideas as to what should be included in the final reports. Therefore, keeping battlespace workers working in proximity fosters greater interaction

amongst domain experts that would not happen as frequently were they grouped on different floors by functionality, and the interaction of members within a battlespace domain offers the most added value from a layout point of view.

One significant chokepoint to operations caused by facilities layout at CFMWC has been previously identified, and the issue has already begun to be addressed. Prior to the implementation of the MWLAN, most computer-intensive calculations were done on the workstations in the Maritime Warfare Development Lab (MWDL), a physical space within the building with fourteen high-end computer workstations and many large-screen displays to allow for group analysis and team training. Due to its many screens and workstations, the MWDL is also the prime location for conducting VIP briefs, as well as the only spot in the building where team training and computer based experimentation can be done with external partners distributed around the world. The MWDL is therefore a chokepoint as many of the key uses of that space cannot be run concurrently with others. Therefore, if one key event was started, the other work would have to be put off, which obviously causes scheduling conflicts and affects workers' productivity.

The MWLAN now offers better computational processing access than what is available in the MWDL, and users will have access to it from their own office desks (which also eliminates wasted time of employees having to move to a separate part of the building in order to conduct their normal work). Over the next two fiscal years, CFMWC will look to push external team training and experimentation functions out of the MWDL and into

the large area used for internal team training. In the end, the MWDL will be freed up primarily for VIP visits, hosting of VTCs, and collaborative analysis, all of which happen on a periodic basis. Under this scheme, the vast majority of competition for the physical real estate will have been removed.

### **5.2.6 Inventory, Materiel requirements planning and Just-In-Time**

Based upon procurement uncertainties, long timelines, and the fact that funds cannot be carried past the 31<sup>st</sup> of March of each year, CFMWC has no choice but to carry high levels of inventory and to stay clear of a Just-in-Time paradigm. There are, however, three things that CFMWC can do to optimize itself for operational success from a procurement point of view. The first of which is to try to better prepare for the coming fiscal year. Instead of waiting for a confirmed budget each year and then drafting statements of work for industry, employees could conceivably draft the required work documents and submit them to industry in February or March of the previous fiscal year, requesting a quote for the desired work that would remain valid for 60 to 90 days. By making this adjustment, as soon as budgets were confirmed for the new fiscal year, CFMWC could immediately accept the quotes that it could fund, and work would start without further delay. This improvement could add two to three month's room for procurement work to be done for each fiscal year.

Linked to the previous recommendation, CFMWC needs to be aggressive with its over-programming, commencing on the very first day of the fiscal year. Based on historical spending trends, CFMWC should be seeking at least \$1.5 million dollars for strategic development at the start of the year, either fully funded or over-programmed on

DGMFD's budget. Over-programming with operations funding is more complex, especially since different cost centres, such as spending on contractors, or travel, may be individually capped and therefore there is no option to spend additional funds on the designated areas. Starting in FY 2012-2013, however, in contracting with various DRDC labs to do strategic modelling and simulation developments, it was learned that while the activities represent "development" activities for CFMWC, they are processed as normal operational work by the labs, and they therefore needed to be paid in operations funds. As CFMWC looks to further integrate DRDC products, using their labs for support, CFMWC should look to get immediate over-programming authority for \$200k-\$300k of operations money on the first day of each new fiscal year in order to permit the labs to commence work early, to ensure that new products are developed and delivered by 31 March of the following year.

As a final recommendation to facilitate the success of procurement, by November of each year, just over halfway through the fiscal year, CFMWC should seek quotes (valid for 90 days) for potential end-of-year procurements in order to capitalize on slippage from within the Maritime Force Development organization. The challenge with year-end slippage is that while it generally is ample, there is little time in which to secure the funds, contract with industry, and receive the product by the end of the year. Having a number of valid quotes ready prior to Christmas of each year will maximize CFMWC's ability to capitalize on financial slippage in order to directly support its own operations.



### **5.2.7 Supply Chain Management**

Due to government procurement regulations which require fair competition within the marketplace it is hard to make any lasting relationships with providers of hardware/physical goods. However, CFMWC has, and can, foster good working relationships with a few of the major software providers that own the key models that are used for production. These relationships have been formed as a result of multi-year umbrella contracts, which allows CFMWC to discuss the direction of model development in the medium- and long-term. The multi-year contracts also allow the producers of models targeted to a very narrow market segment to have sufficient year-on-year work and developmental opportunities which will help to keep the key suppliers healthy and supportive of the key products CFMWC needs.

### **5.2.8 Managing Quality**

Providing reliable, credible answers to stakeholders' questions is at the heart of CFMWC's value proposition, therefore managing quality is of critical importance to the unit. Ensuring that tactical recommendations and force development advice are in fact correct is mostly accomplished by direct observation during exercises and live-firing events (such as missile shoots). The challenge, however, is that live-firing events are normally very expensive, infrequent, and not all aspects of naval engagements are possible to test. In order to generate more data in order to better inform recommendations, as well as to test potential future equipment that has not yet been physically created, CFMWC has developed fairly capable modelling and simulation resources.

While it is reassuring that CFMWC's models correspond well to what is observed in real life, it must be recognized that the models that are being used are likely only valid under a certain range of conditions. George Box pointed out that "all models are wrong but some are useful." (Box, 2013) What he was stressing was that models are designed to predict future outcomes, but as nature is very complex, most models are only valid over a certain range of conditions. When the models are used outside of their ranges of validity they will still provide results, but the predictions will be inaccurate. If one does not know the ranges of validity in advance, it is conceivable that incorrect outputs could unknowingly be deemed to be accurate predictions.

CFMWC has not done a rigorous analysis of all of its models, and mostly relies upon comparing M&S results with observations made from exercises. This technique allows CFMWC to state that its models are "fit for purpose," in that they fairly reliably correspond to observations in controlled environments, but this assertion may be incorrect when the models are applied to future threats (that do not yet exist) or in very dangerous scenarios. In both these cases predictions could not be directly compared with real-life observations, and as such they could not be validated. To address this issue, CFMWC should perform a systematic analysis of its M&S toolset, validating that its models properly conform to the laws of physics, and determining within what ranges of conditions they perform accurately. After validating the physics behind the models and their interactions with one another, CFMWC will have greater credibility in making predictions that are not easily tested in real life.

## Chapter 6 – Implementation, Monitoring and Review

As was previously introduced, the three CFMWC directorates have agreed to a common, best-practice-based production process, striving to exploit the most value out of the use of modelling and simulation. The three directorates have also been intimately involved in defining requirements of the new internal network (MWLAN), discussing the matter on a weekly basis. As such, due to the already high level of cooperation and buy-in of the new network, it should be fairly simple to implement reforms to associated production processes and the design of services.

The powerful and versatile MWLAN, even though it is not yet fully completed, has already increased employees' productivity in conducting synthetic testing. The implementation of this "fourth" internal network however has the negative, temporary, consequence of stretching the limited IT personnel resources even further. The set-up of the new network is not an inconsequential amount of work. It is therefore assessed that the IT section is at the greatest risk of having a major disruption to routine services until the old SLAN network is fully decommissioned, so that the majority of IT efforts can be focused primarily towards supporting just one internal network. Management therefore has to set the close-out of the SLAN network as priority, and needs to monitor the progress of this work until it is complete.

Receiving additional financial resources during a period of DRAP- and SR-induced restraint will likely prove to be challenging. CFMWC should therefore stress that their

overall budget is significantly smaller than its much larger sister-unit, the Director of Maritime Requirements (Sea), and therefore the predictable slippage in naval procurement should be able to be leveraged in order to give CFMWC more financial freedom. Additionally, the firm should stress that it has closed out the financial year within one percent of its budget allocation for four years in a row, therefore CFMWC can be counted upon to be good stewards of the financial resources provided to them.

As the largest chokepoint to operations is personnel resources, management at CFMWC should more closely track signs of employee productivity. Perhaps the easiest and most informative metric would be the length of time taken to perform the various aspects of generating reports. Taking the length of time for the various activities, such as generating a quicklook message, conducting reconstruction of the event, performing analysis, and drafting the final report from FY 12-13 would provide a good baseline for future comparison. Improvements in productivity during FY 13-14 would likely be attributable to the MWLAN and associated production changes, as that would be the only major variable changed over the course of the year. Given that it would likely take at least a year to leverage software improvements to allow for automation of parts of the analysis process, these effects would likely be noticed in FY 14-15 and beyond. By commencing to track these items now, management will be able to review changes in productivity, ensuring that trends move in a favorable direction.

## Conclusion

Since discussion of possibly disbanding the Unit in FY 2007-2008 because of its lack of perceived value, CFMWC has developed a compelling strategy of leveraging its tactical subject matter expertise and modelling and simulation capabilities to position itself as an international product leader in the generation of tactics and provision of force development advice. It has also developed a successful marketing functional strategy in order to demonstrate the value of CFMWC's wide range of activities to key naval and departmental leadership, and educating stakeholders on how they can exploit the Unit's powerful toolsets in order to help themselves to be more effective in their own job. Perhaps the greatest testament to the marketing strategy's success was the CSC project's decision to use CFMWC's resources to conduct a synthetic evaluation of the various proposals in order to assess the strengths and weaknesses of the \$25 billion designs.

While CFMWC has been able to hire additional personnel and has significantly increased the rate of strategic development activities over the past few years, FY 2013-2014 to FY 2016-2017 are likely to be very challenging for both financial and political reasons. In order to maintain its horizontal growth strategy, CFMWC is going to have to increase productivity, doing even more work but with fewer resources. To succeed, CFMWC must focus more attention on its operations management functional strategy, otherwise the Unit will likely find itself either short of personnel resources or funds with which to progress operations. While the next few years will challenge CFMWC's ability to meet all of its objectives, at the end of the crucible the Unit should emerge

leaner, more efficient, and with a well-developed, complementary OM functional strategy that will make the best use of resources, positioning CFMWC for rapid, effective growth once funding and hiring restraints are lifted.

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