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STEADYING THE COURSE: ENTERPRISE ARCHITECTURE IN THE RCN

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Exercise *Solo Flight*

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Steadying the Course: Enterprise Architecture in the RCN

Architecture enables you to accommodate complexity and change.

- John Zachman
  Inventor of Enterprise Architecture

INTRODUCTION

Paradoxically, the more an enterprise digitizes core processes, making them inflexible, the more responsive and flexible the organization can become.[1] It is counterintuitive, but the fact is that digitization unchains human resources from repeatable processes, allowing minds to focus on more complex matters not suitable for machines. For the Royal Canadian Navy (RCN), a strategy incorporating digitization might be needed to fulfill the Commander's strategic priority to *evolve the business of our business*, although a successful strategy would undoubtedly have to be more encompassing to include organizational and cultural dimensions of change across organizations, layers and functions of the institution. The desire to evolve a business is neither new nor trivial for both industry and government, and this paper will look at the popular concept of *Enterprise Architecture* (EA) as a possible means to increase the RCN's likelihood of achieving the desired strategic outcome.

Although it is unknown whether or not the RCN intends on pursuing an enterprise architecture, it will be shown that the strategic priority to *evolve the business of our business* includes many of the desired outcomes that enterprise architecture also intends

[1] Jeanne W. Ross, Peter Weill, and David C. Robertson. Enterprise Architecture as Strategy: Creating a Foundation for Business Execution, (Boston, MA: 2006): 4.

to achieve.[2] EA practitioners will recognize that the numerous EA methodologies, including the Department of National Defence's Architecture Framework (DNDAF) have roots as a means to achieve systems, information technology, information management, and business alignment, but this paper will confirm that various interpretations of the practice exist and some have evolved to more broadly target enterprise transformation. Disturbingly, through education or personal experience, many will also recognize that change initiatives and information technology projects are more likely to fail than to succeed. As EA initiatives have elements of both change activities and IT projects, they carry a particularly high risk of becoming boondoggles where extensive resources are consumed to produce little benefit. With these concepts and risks at the forefront, this paper aims to answer the question: could the RCN benefit from developing an Enterprise Architecture? Although the question will be impossible to definitively answer with quantifiable results, qualitative evidence from academia, industry and professional entities will show that the RCN stands to gain from judiciously adopting an accepted enterprise architecture framework that focuses on enterprise transformation. The paper will be divided into four main sections to cover the definition of enterprise architecture and the RCN's requirement, to compare specific enterprise architecture frameworks, to assess the benefits of an investment in enterprise architecture, and to provide recommendations for the RCN.

[2] Canada Department of National Defence, *DND/CF Architecture Framework, Volume 1: Overview and Definitions.* (Ottawa, ON: Department of National Defence, 2013): 1.

DEFINING ENTERPRISE ARCHITECTURE

The definition of enterprise architecture is elusive and not available from any single authoritative source. This is an issue that seventeen entities that form the Federation of Enterprise Architecture Professional Organizations (FEAPO) have wrestled with since 2011 and their conclusions in a published white paper were no less definitive. According to FEAPO, "Enterprise Architecture is a well-defined practice for conducting enterprise analysis, design, planning, and implementation, using a holistic approach at times, for the successful development and execution of strategy."[3] The paper continues for nearly ten pages covering attributes and themes of the practice of enterprise architecture without converging on a specific definition. DND's Directorate of Enterprise Architecture defines EA in the DNDAF by combining the Defence Terminology Bank definition with additional detail as follows:

> A collection of strategic information that defines a business, the information and technologies necessary to operate the business, and the transitional processes necessary for implementing new technologies in response to the changing needs of the business. It is represented through a set of integrated blueprints (source Defence Terminology Bank). It is a corporate asset that is both a practice and a tool. It is used to describe, understand and manage the complex relationships within an enterprise. It can be used to create a roadmap to achieve business objectives by providing a common communication platform to systematically and completely define current (as-is) and desired (target) environments. [4]

With these two definitions alone, notwithstanding the countless other interpretations of EA, it is evident that a single, precise definition does not exist. Janne J. Korhonen and Wolfgang Molnar, published authors at the Institute of Electrical and Electronic

[3] The Federation of Enterprise Architecture Professional Organizations, "A Common Perspective on Enterprise Architecture," Last accessed 10 May 2015, http://feapo.org/wp-content/uploads/2013/11/Common-Perspectives-on-Enterprise-Architecture-v15.pdf.

[4] Canada. Department of National Defence, *DND/CF Architecture Framework, Volume 1*, 2.

Engineers (IEEE) 2014 Conference on Business Informatics, argued that the definition of EA falls "on a continuum between polar notions" of being a "descriptive overview of the enterprise" to being a "prescriptive framework of principles and models" that assist to translate "business strategy to enterprise change."[5] This paper will embrace the complexity of EA, the concept of a continuum and the notion that it has different meanings to different people. Therefore, for the purpose of this paper EA will be defined broadly as the conceptualization of the interconnections between elements of an enterprise completed for the purpose of achieving a strategic aim.[6] This definition differs from the DNDAF definition on purpose, as the paper is attempting to analyze the opportunities for the RCN to leverage EA as a concept without the constraints or perceptions that potentially transfer from DNDAF.

There are two important concepts within this paper's definition of EA that require amplification. First, EA must be done for a purpose. For the RCN, an EA would be developed for the purpose of increasing the likelihood of successfully transforming the enterprise to meet the strategic goal of *evolving the business of our business*, which will be explored later in the paper. Second, the concept of an enterprise is fluid and can be interpreted differently across an organization. Although this can be useful in controlling the scope and complexity of an EA, it can also be a complicating factor when trying to

[5] James J. Korhonen and Wolfgang A. Molnar, "Enterprise Architecture as Capability," *2014 IEEE 16th Conference on Business* Informatics (2014), 175.

[6] For a literature review covering other definitions see F. Lin and H. Dyck, "The Value of Implementing Enterprise Architecture in Organizations" International Information Management Association, Inc. (2010): 1- 17. This article converged on a comprehensive definition as follows: "a complete model of the enterprise; a master plan which acts as an integrating force between aspects of business planning such as goals, visions, strategies and governance principles; aspects of business operations such as business terms, organization structures, processes and data; aspects of automation such as application systems and databases; and the enabling technological infrastructure of the business such as computers, operating systems and networks" (Lin and Dyck, "The Value," 3).

utilize EA to build a shared understanding of an issue that might span one or many enterprises. As Korhonen and Molnar note, EA "should not be conceived as unitary across the enterprise. Different levels of organization have distinctly different inputs, resources and outputs, information processing and decision-making needs, mental models and languages."[7]

A second definition that is important to this paper is Enterprise Architecture Framework (EAF), which is a framework intended to help organizations build, maintain and utilize an EA "by handling best-practice methods, models, [and] viewpoints."[8] There are numerous frameworks, such as the Department of Defense Architecture Framework (DoDAF), the Department of National Defence Architecture Framework (DNDAF), and The Open Group Architecture Framework (TOGAF).[9] Each framework has its own unique definition of its purpose, along with strengths and weaknesses. This paper will analyze some key differences between prominent frameworks, focusing mainly on DNDAF and TOGAF, which are sufficiently different frameworks to elucidate key themes. The final section of the paper will propose a potential framework for use in the RCN to maximize return on investment.

[7] Korhonen and Molnar, "Enterprise Architecture," 177.

[8] Matheus Hauder, Sascha Roth, Christopher Schultz, and Florian Matthes. "An Examination of Organizational Factors Influencing Enterprise Architecture Management Challenges." *ECIS 2013 Competed Research, Paper 175*, 8.

[9] For an overview of other frameworks see Cameron, Brian H., and Eric McMillan. "Enterprise Architecture Valuation and Metrics: A Survey-Based Research Study." *Journal of Enterprise Architecture* 9, no. 1 (February 2013). Accessed May 9, 2015, http://gotze.eu/2013/02/15/jea-xl-journal-of-enterprise-architecture-2013-1/. ; and, Thanos Magoulas, Aida Hadzic, Ted Saarikko, and Kalevi Pessi, "Alignment in Enterprise Architecture: A Comparative Analysis of Four Architectural Approaches," *Electronic Journal Information Systems Evaluation* 15, no. 1 (2012): 88 – 101.

RCN Strategic Priority: Evolve the Business of our Business

According to the RCN Executive Plan 2013-2017, a strategic priority for the RCN is to *evolve the business of our business*, which includes an evolution "towards a more functionally aligned "One Navy."[10] The Executive Plan also details the need for an E*nterprise Model* that "will integrate an automated planning, measuring, reporting and analytical process for all the resource components: personnel, financial, materiel, and infrastructure, including relevant performance measurement metrics and risk management processes."[11] While elaborating about the *Enterprise Model* during an interview with Vanguard magazine, Vice Admiral Norman, the Commander of the RCN, stated "like a lot of large organizations, [the RCN is] swimming in data. The challenge is how you extract information out of that data so you are actually measuring the right things. Ultimately, it is about using that information to make the right decisions."[12] Therefore, the strategic priority *evolve the business of our business* and the requirement for an *Enterprise Model* expand into at least four requirements: achieve alignment, drive efficiency, integrate and automate processes, and readily extract decision-quality information from information systems.

A close analysis of the purpose and benefits of EA will show that these requirements could be combined to a more singular requirement, which is the need for an *RCN Enterprise Architecture*. This is based on evidence from Lin and Dyck, who assessed the value of implementing EA as being an opportunity "to achieve strategic

[10] Canada. Department of National Defence. *Commander's Guidance and Direction to the Royal Canadian Navy: Executive Plan, 2013 – 2017,* (Ottawa, ON: Department of National Defence 2013), 5.

[11] *Ibid*, 9.

[12] Chris Thatcher, "One Navy: Writing a New Narrative." *Vanguard* (June/July 2014), accessed May 9, 2015, http://vanguardcanada.com/one-navy-writing-a-new-narrative-that-resonates/.

alignment, to consolidate infrastructure…and to build a foundation for strategy execution."[13] It is also supported by evidence from Jeanne Ross, the prolifically cited author of *Enterprise Architecture as Strategy*, who notes "enterprise architecture boils down to these two concepts: business process integration and business process standardization" and by the DNDAF that acknowledges a key benefit of EA as helping "decision makers to make solid decisions based on quality information."[14] The development and use of an EA might be the most cost effective means *to evolve the business of our business*, if one can be produced and maintained without the need for excessive resources. The concept is certainly worthy of a close analysis.

ARCHITECTURE FRAMEWORKS

There are numerous Enterprise Architecture Frameworks (EAF) to assist in the development of an EA, but some will be better than others for the specific requirement to fulfill the RCN's strategic priority. As noted by Ross, "many companies attack the enterprise architecture exercise with lots of drawings and analysis of both existing and hoped-for systems capabilities. But massive analytical efforts do not focus resources on what matters."[15] For the RCN, what matters are the stakeholders, processes, data, and technologies that are linked to the desired "One Navy" alignment, to the desired efficiency gains, to the costly processes ripe for integration and automation, and to the decisions that currently lack decision-quality information. Research from Xiao Xue Deng also suggests that understanding the motivation behind the desire for change is an important dimension that should be included in any architecture analysis and that the

[13] Lyn and Dyck, "The Value," 10.

[14] Ross, et al., *Enterprise Architecture,* viii; Canada Department of National Defence, *DND/CF Architecture Framework, Volume 1*, paragraph 2.2.

[15] Ross, et al, *Enterprise Architecture,* 47.

RCN would benefit from explicitly documenting rationales for desired goals, soft goals and dependencies.[16] In selecting an EAF, architects must also be cognizant of exactly what is desired from the EA or else any investment risks becoming trapped in the productivity paradox whereby increased investment in IT does not necessary lead to increased productivity.[17] In the words of R. Suter, "the objective is to develop "just enough" architecture to implement [the transformation] and not deliver an overly developed, but poorly focused architecture product."[18] This section will assess two common frameworks to determine if there are particular elements or themes within the frameworks that would make one better suited to meet the specific needs of the RCN.

Department of National Defence Architecture Framework

The DNDAF is surely a framework to consider for the implementation of an RCN EA. Stemming from the Defence Planning Guidance of 2001, the DNDAF is traced to the following priority requirement that was tasked to the Assistant Deputy Minister (Information Management):

> Develop, implement and maintain the business and supporting security and technical architectures required to provide the framework necessary for advancing IM, including the manner it is to be progressively employed as an enabler in support of enterprise business and CF operational functions. Collectively these architectures, together with the associated standards, are essential for the effective acquisition, integration and management of systems within a framework of modernization. Developing the Defense Enterprise Architecture is critical to providing

[16] Deng, Xiao Xue, "Intentional Modeling for Enterprise Architecture," Ph.D Thesis, University of Toronto, 2006): 138.

[17] Erik Brynjolfsson, "The Productivity Paradox of Information Technology," *Communications of the ACM* 36, no. 12 (December 1993): 67.

[18] R. Sutter, "Securing Strategic Benefit from Enterprise Architectures," *Defense Acquisition, Technology and Logistics* (January/February 2007): 21.

> clear direction for enabling IM to continue to meet enterprise and operational requirements for the present and into the future.[19]

Furthermore, in 2008, Canadian Forces General Order (CANFORGEN) 017/08 directed that the ADM(IM) generated DNDAF be used "in all architecture activities effective 8 Jan 08."[20] The fundamental reason for this requirement is that the "variety of frameworks, models and tools [being used in the CAF are] resulting in dispersed and non-sharable products that fall short of being able to provide the holistic view necessary to support our decision makers."[21] This begs the questions: who are the decision makers, what support do they require, and what is the scope of the holistic view?

On the question of decision makers, the primary consumers of the DNDAF architecture products are most likely resident in ADM(IM), as the framework emerged as a means to enable "IM to continue to meet enterprise and operational requirements."[22] Ross, however, argues that the key to successful EA is leadership from senior management outside the IT department.[23] For the RCN, the evolution of the business is to be led by decision makers who are not IM experts; consequently, if a framework is to improve the likelihood of a successful RCN transformation, then it must resonate with naval decision makers who view the world through a lens other than IM/IT.

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[19] Canada. Department of National Defence, *Defence Planning Guidance 2001*, (Ottawa, ON: Department of National Defence, 2013): Chapter 2, Table 2-5.

[20] CANFORGEN 017/08 as cited in Canada Department of National Defence, *DND/CF Architecture Framework, Volume 1*, 1.

[21] CANFORGEN 017/08 as cited in Canada Department of National Defence, *DND/CF Architecture Framework, Volume 1*, 1.

[22] Canada. Department of National Defence, *Defence Planning Guidance 2001*, (Ottawa, ON: Department of National Defence, 2013): Chapter 2, Table 2-5.

[23] Ross, *et al*., *Enterprise Architecture*, 65.

On the topic of support to decision makers, DNDAF Volume 2 identifies eight views that "represent architecture information about DND/CAF."[24] They are the common view, strategic view, capability view, operational view, system view, technical view, information view and security view. Together, these views provide what Korhonen and Molnar would describe as "a descriptive overview of the enterprise."[25] They are used to document and understand the interconnections between organizational entities across various dimensions and can be valuable to some decision makers.[26] Volume 3 provides even more detail with a highly descriptive DND/CAF Architecture Data Model (DADM) that "provides the logical basis for moving architectures from compendiums of documents, spreadsheets, and graphics to architecture data that can be stored in architecture data repositories and manipulated with automated tools."[27] Through the lens of the RCN, there are at least two problems with the detailed views and the data model of DNDAF. First, vis-à-vis IM decision makers, the detailed views may not be as valuable to the RCN leaders who have an inherent understanding of the RCN enterprise, including the multitude of organizational and cultural nuances that would not be easily documented. Second, developing and, more importantly, maintaining the views and the data model would come at a steep cost. Scott Bernard, a published EA author, found that the "significant level of cost for EA labor (*sic*) has caused some enterprises to pause in considering the implementation of an EA program."[28] Nonetheless, EA practitioners will be required, coming from either internal force generation or expensive external

[24] DNDAF Volume 2, paragraph 1.4.

[25] Korhonen and Molnar, "Enterprise Architecture," 175.

[26] An example of the detail included in the architecture views is found throughout Canada Department of National Defence, *DND/CF Architecture Framework, Volume 2.*

[27] Canada Department of National Defence, *DND/CF Architecture Framework, Volume 3,* 1.

[28] Scott A. Bernard, *EA3: An Introduction to Enterprise Architecture*, 3rd Edition. (AuthorHouse, 2005): 76.

professional services. Hauder and Schulz derived conclusions from an extensive literature review and noted that Lucke *et al*. found enterprise architectures are difficult to maintain due "to a lack of experienced architects, missing management commitment, problems for the EA management team in understanding the actual requirements, insufficient tool support, as well as rapidly changing environmental conditions."[29] Therefore, careful consideration of the value of the DNDAF architecture views vis-à-vis the needs of the RCN decision makers must occur and the development and sustainability costs must be accurately assessed. It is likely that the DNDAF products are not optimized to meet the needs of the RCN decision makers and, as supported by academic research, it is likely that a comprehensive RCN DNDAF EA would be costly to develop and maintain.

Finally, it is popular for EAFs to identify a goal of EA as being the production of a holistic view of the organization. As noted by Roth *et al*., who studied EA current practices and future directions, "an EA model covers business as well as IT aspects to provide a holistic view of an organization and supports decision makers with relevant information."[30] As inferred by CANFORGEN 017/08, DNDAF is intended to provide a framework to readily compile a holistic view. Nonetheless, holistic is relative and undefined. In the two references to holistic found in DNDAF, the term may be as broad as a whole of government perspective or as narrow as a view of the arbitrary "nodes under consideration."[31] For the RCN, holistic could be as broad as a Joint, Interagency, Multinational, Public (JIMP) perspective or as narrow as a set of business and IT processes impacting a single class of ships. As Korhonen and Molnar argue "just as

[29] Hauder , et al., "An Examination," 2.

[30] S. Roth, Hauder, M., Farwick, M., Matthes, F., and Breu, R., "Enterprise Architecture Documentation: Current Practices and Future Directions," *11th International Conference on Wirtschaftsinformatik (WI*), Leipzig, Germany, 2013.

[31] DNDAF Volume 1, page 3; Volume 2, page 41.

organizations are not monoliths, EA should not be conceived as unitary across the enterprise…a monolithic approach to EA would…serve the purposes of some stakeholders while being less useful to others."[32] For the RCN, using a framework with artifacts designed to scale to a holistic Whole of Government perspective will come at a cost in the resources required to produce and maintain compliant architecture artifacts, in the ability for decision makers to understand the standardized products, and in the effectiveness of the RCN EA to achieve its aim.

A final key matter to address with DNDAF is its roots, which also highlight some drawbacks. As noted in DNDAF Volume 1, the "framework was based on the Department of Defense Architecture Framework (DoDAF) to leverage the extensive architecture development work and lessons learned in the US." Although still largely based on DoDAF, version 1.8.1 has become somewhat bespoke, as it is "an amalgamation of frameworks, from various public, private and defence sources [that] represents a unique DND/CF perspective."[33] There are two considerations important to these facts. First, DoDAF might not be ideally suited to address enterprise transformation activities as it is an architecture primarily designed to reduce and manage the complexity in highly technical systems. According to Matthew Richards *et al*., published graduates from the Massachusetts Institute of Technology, DoDAF evolved from the 1996 C4ISR Architecture Framework that had its roots in lessons learned from the 1991 Persian Gulf War.[34] DoDAF was originally a system architecture intended to "relate operational

[32] Korhonen and Molnar, "Enterprise Architecture," 177.

[33] Canada Department of National Defence, *DND/CF Architecture Framework, Volume 1: Overview and Definitions.* (Ottawa, ON: Department of National Defence, 2013): 8.

[34] Richards, Matthew G., Nirav B. Shah, Daniel E. Hastings, and Donna H. Rhodes. "Managing Complexity with the Department of Defense Architecture Framework: Development of a Dynamic System

concepts and capabilities to technical architectures," which is juxtaposed against other enterprise architectures that "connect organizational goals to business activities."[35] Consequently, an architecture based on DoDAF might not be ideally suited to communicate the salient organizational and business information needed to generate alignment in the RCN. Second, the bespoke nature of DNDAF might make the evolution and maintenance of the framework susceptible to budget cuts. According to Gary Doucet, the former Chief Architect for the Treasury Board of Canada Secretariat, "the real value of enterprise architecture is not in making better architectures…it's in making a better enterprise."[36] To hedge for this possibility, the RCN could opt to build competency in EA via more popular industry standard frameworks, like TOGAF. Fortunately, DNDAF also makes some reference to TOGAF being complementary. In fact, DNDAF includes an Architecture Development Guide based on TOGAF to help architects follow a process, but it still leads to the creation of complex DNDAF artifacts that may be beyond the needs of the RCN.

The Open Group Architecture Framework

For the RCN's goal to *evolve the business of our business*, an EA designed to address business scenarios might be better suited to increase the likelihood of a successful transformation. The Open Group Architecture Framework (TOGAF) is one

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Architecture Model." Presented at the *Conference on Systems Engineering Research*, Los Angeles, California, April 2006, 3.

[35] Richards, Matthew G., Nirav B. Shah, Daniel E. Hastings, and Donna H. Rhodes. "Managing Complexity with the Department of Defense Architecture Framework: Development of a Dynamic System Architecture Model." Presented at the *Conference on Systems Engineering Research*, Los Angeles, California, April 2006, 3.

[36] Etienne Venter, "Agile and Enterprise Architecture," Last accessed 10 May 2015, http://www.ariscommunity.com/users/etienne/2015-03-18-agile-and-enterprise-architecture.

such model, among many to consider.[37] In comparison to DNDAF, TOGAF is more prescriptive than descriptive, and it also differs in that the framework stresses a process to produce the EA rather than stressing a taxonomy and data model to describe the EA. Roger Sessions, an expert in IT complexity management, argues that TOGAF is more of an architectural process than an architectural framework as it is focused on an eight stage Architectural Development Method intended to help businesses grow from a generic understanding to a specific understanding of their enterprise.[38] The eight cyclic and iterative TOGAF stages that lead an organization to an EA are architecture vision, business architecture, information systems architecture, technology architecture, opportunities and solutions, migration plan, implementation governance, and architecture change management. Therefore, the value in TOGAF is having a structured and repeatable method to produce an EA and build shared understanding in the enterprise, which would be beneficial to the RCN as the transformation of the business scales vertically and horizontally across multiple levels and geographic locations.

As Matthew Richards *et al*. note in their comparison of TOGAF against other common frameworks, "TOGAF is principally a tool for business organization."[39] Interestingly, like DoDAF, TOGAF also has its roots in the US Department of Defense as its predecessor was the DoD Technical Architecture Framework for Information Management (TAFIM).[40] The first TOGAF version was released in 1995 and the current version 9.1 was released in 2011. Throughout its evolution, TOGAF "has gradually

[37] Other models include the Zachman Framework for Enterprise Architecture, the Federal Enterprise Architecture, the Gartner Methodology, the UK Ministry of Defence Architecture Framework, and the Oracle Enterprise Architecture Framework.

[38] Rogers Sessions, "A Comparison of the Top Four Enterprise Architecture Methodologies," *ObjectWatch,* May 2007, accessed May 9, 2015, https://msdn.microsoft.com/en-us/library/bb466232.aspx.

[39] Richards, et al., "Managing Complexity," 3.

[40] The Open Group. "TOGAF," Last accessed 12 May 2015, https://www.opengroup.org/togaf/.

expanded its scope from strict IT management towards a broader business orientation."[41] For the RCN's needs, an IM-based framework with business focus, such as TOGAF, is likely better suited than a descriptive, systems-based EA like DNDAF.

With TOGAF, it might also be easier to find certified consultants and to train personnel in the concepts and mechanics of EA. As previously noted, Lucke *et al*. found that a lack of experienced architects is one reason why enterprise architectures are difficult to develop and maintain.[42] Any RCN EA initiative would therefore need a sustainable strategy both to help senior leadership understand the architecture concepts and to build competency in RCN EA practitioners. According to Jason Bloomberg in Forbes Magazine, "TOGAF is perhaps the most popular EA today, and its popularity is only increasing."[43] The Open Group maintains a directory and reports that 43,225 people are certified worldwide, and more than fifty companies are accredited to provide training, including many in Canada.[44] In comparison, DNDAF is a bespoke framework that lacks a specific certification program beyond internal DND training, although there are some DoDAF certifications available that would likely have overlap. In comparison to DNDAF, TOGAF also has a massive amount of free online training available in the form of videos, textbooks, academic articles, whitepapers and blog content. A Google search of DNDAF retrieves 4,000 results while a search of TOGAF retrieves 594,000 results.[45] In Google Scholar, the DNDAF and TOGAF search results are 93 and 5,290,

[41] Magoulas, *et al*., "Alignment in Enterprise Architecture," 95.
[42] Hauder, et al., "An Examination of Organizational Factors," 2.
[43] Jason Bloomberg, "Enterprise Architecture: Don't Be a Fool With a Tool," *Forbes Magazine* August 7, 2014, accessed May 9, 2015, http://www.forbes.com/sites/jasonbloomberg/2014/08/07/enterprise-architecture-dont-be-a-fool-with-a-tool/.
[44] The Open Group, Last accessed 10 May 2015, www.opengroup.org.
[45] This Google search was conducted on May 10, 2015.

respectively.[46] When one of the main barriers to EA adoption is building a critical mass of personnel who grasp the concept, TOGAF has an advantage over DNDAF in the amount of content, training, and certified professionals available to help.

Although there are many benefits to TOGAF, there are also some drawbacks. First, TOGAF is not the accepted DND architecture framework that has been mandated for use "in all architecture activities."[47] This is certainly problematic as the RCN is required to align with DND/CAF mandates and directives. Second, adopting TOGAF alone will only provide a methodology, akin to the CAF's Operational Planning Process, to build shared understanding of a complex problem and to explore solution alternatives. Since TOGAF does not have standard formats to document and share artifacts, there is the risk that collaboration and communication will be limited to spheres of personnel who are directly involved in the process. These problems were acknowledged by Toa and Gerz at a 2011 international command and control symposium held in Quebec City. They found that despite EA benefits, it is difficult to foster adoption and meet expectations, particularly because the semantics of information in artifacts "leaves room for interpretation that must be filled by the architects."[48] To remain cost effective, it is likely that the RCN could afford only a very small pool of architects, so this drawback would need careful consideration and mitigation via scope control and expectation management. A final note is that Toa and Gerz found that EA tools are important for the collaboration

[46] This Google Scholar search was conducted on May 10, 2015.
[47] CANFORGEN 017/08 as cited in DNDAF Volume 1.
[48] Daniel Ota and Michael Gerz, "Benefits and Challenges of Architecture Frameworks," Presented at the Sixteen International Command and Control Research and Technology Symposium, Collective C2 in Multinational Civil-Military Operations, Quebec City, June 21-23, 2011, 3.

and promotion of findings.[49] DND has adopted Qualiware as the DNDAF toolset, but it is unknown if it brings value to TOGAF or, more broadly, to the RCN problem space. Unfortunately, the analysis of EA tools will remain outside the scope of this paper and an area for future research.

Summary

This paper reviewed DNDAF and TOGAF as potential candidates to increase the likelihood of a successful RCN business evolution. The DNDAF was found to be highly descriptive and well suited to collect information about complex interconnections across an enterprise, but it might be too detailed and costly for the enterprise transformation needs of the RCN. TOGAF, in comparison, provides an intuitive process to analyze an enterprise and build shared understanding, but fails to have a deep taxonomy and data model to share information with IM/IT stakeholders. Research revealed evidence that DNDAF and TOGAF are "synergistic and complementary frameworks," which is actually acknowledged in a separate DNDAF/TOGAF Architecture Development Guide that aims to map the DNDAF views onto TOGAF stages.[50] The critical issue for the RCN, however, is that the DNDAF views and data model may not resonate with RCN decision makers. As such, it is likely more beneficial for the RCN to apply a TOGAF framework that does not necessarily lead to DNDAF compliant views and data models.

[49]Ota and Gerz, "Benefits and Challenges of Architecture Frameworks," Presented at the Sixteenth International Command and Control Research and Technology Symposium, Collective C2 in Multinational Civil-Military Operations, Quebec City, June 21-23, 2011, 3.

[50] Terry Blevins, Dr. Fatma Dandashi and Mary Tolbert, "The Open Group Architecture Framework (TOGAF 9) and the US Department of Defense Architecture Framework 2.0 (DoDAF 2.0)," The Open Group (July 2010): 4.

THE BENEFITS OF ENTERPRISE ARCHITECTURE

This paper is focused on answering the question of whether or not the RCN could benefit from implementing an EA. The question is complex and not unique to the RCN; academia, government and industry have all studied the matter to varying degrees. Foorthuis *et al*. attempted to identify how "EA can realize benefits" and recognized that "in the field of EA [there] is a lack of empirical research and, more specifically, quantitative studies on how EA delivers benefits."[51] Their research led to the realization that EA does not generate organizational benefits directly, but rather creates value through intermediate outcomes that include an increased adherence to organizational norms, increased understanding of the enterprise in both management and project teams, reduced complexity, and increased process integration.[52] These empirically proven intermediate outcomes are aligned to the benefits sought from the RCN's goal to *evolve the business of our business* and add weight to the argument that the RCN stands to gain from investment in EA.[53]

There is other corroborating evidence that the RCN stands to benefit from a modest investment in EA. Work from Tamm *et al*. acknowledged the limited research on the topic of how organizations benefit from EA and identified benefit enablers (organizational alignment, information availability, resource portfolio optimization, and resource complementarity) that lead to lower costs, higher strategic agility and a more

[51] Ralph Foorthuis, ,Marlies van Steenbergen, Sjaak Brinkkemper, and Wiel A. G. Bruls, "A Theory Building Study of Enterprise Architecture Practices and Benefits." *Information Systems Frontier* (2015): 2.

[52] Foorthius, et al., "A Theory Building Study," 17.

[53] As noted earlier, the goals of the RCN's priority to evolve the business of our business include achieving alignment, driving efficiency, integrating and automating processes, and readily extracting decision-quality information from information systems.

reliable operating platform.[54] Interestingly, like Foorthuis *et al*. proved, Tamm *et al*. posited that EA leads to benefits indirectly via intermediate outcomes and they structured their research around finding linkages between the EA quality, the four intermediate benefit enablers and the organizational outcomes. Of significance in their findings is that "large organizations with a complex IT environment, whose business model favours high levels of organisation-wide standardisation (*sic*) and integration, can expect to benefit the most from EA."[55] The RCN is certainly an organization that fits this description with the unique challenge of effectively having separate enterprises aboard every ship that are required to integrate with the enterprise ashore. Looking more closely at Tamm *et al*., two of the benefit enablers of EA, in particular, are directly related to the specific goals of the RCN's priority. First, it was found that EA has the potential to generate positive outcomes through increased organizational alignment that leads to efficiency from a "reduction of incoherent or duplicated efforts" and a requirement for less overhead to achieve strategic goals.[56] Second, it was found that EA frameworks can lead to better decision quality information being accessible by decision makers, which in turns delivers competitive advantage to business firms.[57] Although it is unknown whether the RCN will invest in EA, the evidence above has proven that EA and its frameworks can certainly lead to the exact benefits sought by the RCN when *evolving the business of our business*.

Unfortunately, EA can deliver little or no return. As such, the RCN must consider investment in EA through a skeptical lens with an eye for the pitfalls. First, the Foorthuis

[54] Toomas Tamm *et al*., "How Does Enterprise Architecture Add Value to Organizations?" Communications of the Association for Information Systems, Volume 28, Article 10, pp. 141-168 (March 2011): 142, 145 and 157.
[55] *Ibid*.
[56] *Ibid*., 152.
[57] *Ibid*., 153.

et al. literature review and empirical research showed that "an organization's EA in itself, as a set of documents, offers no value if it is not used in practice."[58] This finding resonates with Ross *et al*. who determined that the impact of EA was related to how effectively "new management practices formalized organizational learning about how to leverage IT capabilities and adopt business process change."[59] The implication for the RCN is that EA can create positive outcomes, but the benefit is largely derived from its ability to generate new understanding in decision makers rather than from its ability to consistently document interconnections. This pitfall stresses the importance of a process in fostering collaboration and building shared understanding, which is supported by the Foorthuis *et al*. finding that increased interaction between architects and stakeholders has a statistically significant influence on improving outcomes.[60] It also stresses the onus on leaders to utilize EA to create understanding, which is corroborated by a 2006 report from the US Government Accounting Office that stressed the need for sustained executive leadership.[61] A final negative aspect to EA is pertinent to the RCN and DND as Foorthuis *et al*. found that government agencies have more difficulty reaping the benefits of EA, potentially because they invest significantly less compared to private sector entities.[62] This infers a need for strict expectation management with stakeholders, as the promises found in academic and business literature may be more difficult to achieve in the RCN context. If expectations are not managed well or these pitfalls are not avoided, then EA development and maintenance will cost a lot, return little and create frustration.

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[58] Foorthuis *et al*., "A Theory Building Study," 3.
[59] Ross *et al*., *Enterprise Architecture*, 101.
[60] Foorthuis *et al*., "A Theory Building Study," 15.
[61] United States Government Accounting Office, *Enterprise Architecture: Leadership Remains Key to Establishing and Leveraging Architectures for Organizational Transformation*, Report to the Chairman, Committee on Government Reform, House of Representatives, August 2006: 3.
[62] Foorthuis *et al*., "A Theory Building Study," 15.

RECOMMENDATION FOR RCN

There is clear evidence supporting significant overlap between the positive outcomes that EA can provide and the business transformation outcomes that the RCN desires. To save resources, the RCN has the choice to not invest in EA, but that also carries a cost. Extensive analysis from the US Government Accounting Office has shown that the absence of an EA leads to "business operations, systems and data that are duplicative, incompatible and not integrated."[63] Consequently, it is recommended that the RCN utilize a cost effective Enterprise Architecture Framework to guide the analysis and transformation of the business areas that are targeted for evolution. In terms of potential frameworks, DNDAF has its merits and, in accordance with CANFORGEN 017/08, it is the selected architecture framework for DND/CAF. Nevertheless, without significant outside funding and human resources, it will most likely be too costly and difficult to generate meaningful, compliant architecture artifacts and leadership momentum to produce the desired RCN outcome in a timely manner. As such, if constrained to internal resources, the RCN should look to a simpler framework that, at a minimum, fosters a consistent methodology to analyze and document the evolution. TOGAF is a strong candidate framework, but it is weak in standardizing the output deliverables. Further analysis and collaboration with the Directorate of Enterprise Architecture should occur before committing to a way ahead. For the RCN, the first order of business should be building leadership acceptance that EA is a valuable means to create tangible, cost effective and beneficial organizational outcomes.

[63] United States Government Accounting Office, *Enterprise Architecture: Leadership Remains Key to Establishing and Leveraging Architectures for Organizational Transformation*, Report to the Chairman, Committee on Government Reform, House of Representatives, August 2006: 9.

CONCLUSION

This paper has demonstrated that the RCN can benefit from careful investment in enterprise architecture. The first key finding is that the positive outcomes promised by popular enterprise architecture frameworks align tightly with the Commander of the RCN's strategic goal to *evolve the business of our business*. The analysis of the RCN Executive Plan 2013-2017 and amplifying material demonstrated that the desired RCN goals are to achieve alignment towards "One Navy", drive efficiency, integrate and automate processes, and readily extract decision-quality information from information systems. A second key finding is that enterprise architecture does not contribute directly to positive organizational outcomes, but rather works through intermediate enablers that include organizational alignment, reduced complexity, increased process integration, and improved information availability, among others. These intermediate enablers nearly match the objectives of the RCN's goal to *evolve the business of our business*, thus strengthening the position that the RCN stands to gain from the application of enterprise architecture. Although this is positive, it is also problematic for the RCN as the specific subsequent organizational benefits remain undefined and open to interpretation. Consequently, a third finding, supported by evidence from Deng's doctoral research, is that the RCN stands to improve awareness of its problems and gain commitment to its solutions by explicitly documenting the motivation behind the need for change and by clearly articulating the desired organizational benefits vice their intermediate enablers.[64] If the RCN adopts enterprise architecture to enable its evolution then these matters should be included in the architectural analysis and documented in the resulting artifacts.

[64] Deng, "Intentional Modeling," 138.

The final key finding was that a structured process to analyze and develop an enterprise architecture is likely to be of more value to RCN stakeholders than a highly detailed set of architectural artifacts. The CANFORGEN mandated DNDAF, which is rich in taxonomy and structured data, acknowledges TOGAF as a strong framework to analyze and compile artifacts. Nevertheless, for the RCN, it is possible that the greatest return on investment would come from applying TOGAF without actually delivering DNDAF compliant material. This would be a friction point with the Directorate of Enterprise Architecture, but one that could be resolved with additional resources from outside the RCN. Finally, one area for future research is an assessment of the DNDAF Enterprise Architecture Toolset's ability to produce value for RCN stakeholders.

In summary, there is clearly opportunity for the RCN to benefit from adopting an enterprise architecture framework to *evolve the business of our business,* but leaders must assess the cost-benefit of every step, artifact and tool to ensure improvement is made to the enterprise and not just the architecture. Although time will tell how much the RCN will evolve its business, enterprise architecture would sure help to predict the future.

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