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Harnessing (The Right) Key Industrial Capabilities: Issues and Challenges

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Harnessing (The Right) Key Industrial Capabilities: Issues and Challenges

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Abstract. With the Canada First Defence Strategy (CFDS), Canada has put forth a major opportunity to reconcile national security imperatives and industrial policy. The scope of the procurement efforts required has been unmatched in recent history. The Jenkins Report (2013) sets out to examine ways to use that procurement effort to foster key industrial capabilities (KICs) that would put the Canadian defence industry at an advantage both nationally and internationally. This is a reasonable perspective since Canada is a leading global exporter of defence-related products and services. The Canadian defence industry should develop highly focused capabilities in targeted product or service niches, with a view to moving up global value chains. These capabilities are not products but sets of skills. As such, KICs that hold the best potential should be selected. Canada's KICs are: geographic expertise, software integration and computer security, specialized garment making and design, man-machine interaction, process design, situational awareness, experiential learning conception, and customer interaction. To sustain KICs, possible strategies are: to focus; to create and nurture a critical mass; to develop viable business models; to globalize the industry; and to promote industry-university-government linkages.

As such, policy gaps may be fixed through: 1) the promotion of KICs including creating Canadian integrators and shifting the mindset toward capabilities-based procurement; 2) a better synchronization of KICs and requirements by considering risk-sharing mechanisms for example; 3) making Canadian firms attractive by relaxing takeover regulations and looking beyond the North American market; 4) key policies like the reinforcement of Single Point of Accountability (SPA), security of supply, and market-based IRB practices. The result is a balancing act between the need to control intellectual property assets vs. accessing them in a world where national boundaries matter less and less. Finally, Canada's industry should target opportunities outside North America while continuing to focus on better integration with the North American industry.

Keywords. Industrial capabilities, defence procurement, Jenkins report, defence industry, defence industrial policy.

Notes: This document was prepared as a basis for discussion around Canada's military procurement efforts. It does not constitute a recommendation to buy or sell products, stocks, or any type of asset. The opinions expressed herein should not be interpreted as the official position of any organization to which the author may be a member. To the best of his knowledge, the author does not hold financial interests in the companies discussed. The usual caveats apply.

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1. Introduction

Since the Cold War, Canadian defence policy has shown loose linkages between defence-related matters and industrial policy. Up until the Canada First Defence Strategy (CFDS) [1] in 2008, defence white papers barely – if at all – mentioned the procurement and industrial implications of upcoming changes in the strategic posture of the Canadian military[2]. While it remains unclear whether the Defence Procurement Strategy (DPS) does efficiently promote the development and/or consolidation of Canada's Key Industrial Capabilities (KICs) in defence-related industrial activity, the DPS and its underlying processes will be intimately linked with – and ultimately (re)shape – those KICs beyond the usual debates on the implementation of Industrial Regional Benefits (IRBs).

As such, the Jenkins Report[3] published in February 2013 represents a welcome step in shaping the policy debate and future governmental actions with a view toward maximizing the benefits to Canada associated with future defence procurement activities. Specifically, its "principal objective […] is to outline an approach to maximize the overall benefit of the government's CFDS investment. This involves identifying and supporting key industrial capabilities (KICs) to enable Canada's defence-related industries to better meet the operational requirements of the Canadian Forces while generating sustainable economic growth"[4].

The purpose of this paper is to provide a business and management perspective into the complex relationship that exists between harnessing as well as developing KICs and the Canadian national industrial interests that underpin the DPS. Therefore, this paper is structured as follows. First, Canada's position and general trends in the global defence industry are examined. Second, the notion of capability is explained and tied into the concept of KIC. Third, the selection of KICs and their sustainment are discussed. Fourth, some policy gaps and their potential fixes are identified. This paper concludes by offering some insights into industrial and policy implications resulting from the adoption of a KIC approach.

[1] Department of National Defence, "Canada First Defence Strategy," (Ottawa, ON: Government of Canada, 2008).
[2] Yan Cimon, "Defence Policy and the Aerospace and Defence Industry in North America: The Changing Contours of the Post-9/11 Era," in *Game Changer: The Impact of 9/11 on North American Security*, ed. Jonathan Paquin and Patrick James (Vancouver, BC: UBC University Press, Forthcoming).
[3] Tom Jenkins, *Canada First: Leveraging Defence Procurement through Key Industrial Capabilities - Report of the Special Adviser to the Minister of Public Works and Government Services* (Ottawa: Public Works and Government Services Canada, 2013).
[4] Ibid., ix.

2. Canada in the global defence and security industry

According to a 2012 study by KPMG sponsored by the Canadian Association of Defence and Security Industries (CADSI), the Canadian defence industry is made up of around 2000 firms with varying degrees of defence-related activities collectively generating around $12.6 bn of revenues[5]. This industry is far from being homogeneous. At one end of the spectrum are "pure player" defence companies that have a sizable amount of defence-related contracts representing all – or the majority – of their business. At the other end are "mixed player" companies catering to other industries. In the Canadian industry, a number of significant players have activities that are well beyond traditional defence product and services. Historically, Canadian firms have demonstrated a competitive advantage in the maintenance of legacy systems like airframes[6], IT-related activities (e.g. CGI)[7], training and simulations (CAE)[8], and other specialty areas.

However, even if Canada remains the 14th exporter of defence materiel globally, its main export market is the USA[9]. Furthermore, it is home to only one player in the top 100 defence companies in the world[10]. This implies that 1) the Canadian industry is highly dependent on very few markets – mostly the United States – and that 2) it is made up of mid-market firms that hold a lot of potential, but may not yet have the scale and scope to compete head on with global tier-1 providers.

In the global arena, including Canada, the financial constraints on national procurement projects, pressure to meet market performance expectations, and the growing price tag for developing and maintaining existing and new platforms are major influences on the defence industry. These have reinforced two important trends in the industry that are causing significant shifts in the global defence industry: the use of Commercial off-the-shelf (COTS) components and products and a trend toward consolidation of the number of platforms developed to meet the technical and operational requirements of customers, namely states and their armed forces.

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[5] Canadian Association of Defence and Security Industries, *Kpmg Report: Economic Impact of Defence and Security Industry in Canada* (Ottawa, ON: CADSI, 2012).

[6] Daniel J. L. Lachance et al., "Projecting Power: Trends Shaping Canada's Air Force," ed. Department of National Defence (Trenton, ON: Aerospace Warfare Centre (Canada), 2009).

[7] CGI, "Defense Information System Agency Selects Oberon, a Cgi Federal Subsidiary, for Us$871 Million Test & Evaluation Mission Support Services Id/Iq," *Media announcements* (26 Sept 2012).

[8] "News in Brief: Training & Simulation News," *Asian Aviation Magazine* 8, no. 7 (2010).

[9] SIPRI, "Facts on International Relations and Security Trends," (2014). Specifically see SIPRI Arms Transfer Database for 2008-2012 http://www.sipri.org/googlemaps/2013_of_at_top_20_exp_map.html

[10] Ibid. Specifically see SIPRI Top 100 ranking of the largest defence companies in the world http://www.sipri.org/research/armaments/production/Top100. CAE is the only Canadian company on that list.

COTS. Using COTS components is often an efficient way to mitigate inflationary pressures (i.e. spiraling costs) in defence markets[11]. One main challenge associated with COTS is associated with the globalized nature of non-defence portions of commercial supply chains. With the advent of increased modularization, COTS components are no longer simple products. They drive an increase in the commoditization of increasingly complex products. A major implication is that many generic modules, subsystems or subcomponents are sourced from emerging markets that entail many challenges such as quality assurance (including counterfeiting), security, and limited supply chain visibility. A revealing, yet classical, example of the forces in play is the National Flat Panel Display Initiative in the mid-1990s put forth by the Clinton Administration partly to ensure the military could access leading edge equipment in a market dominated by Japanese firms[12].

Platform reduction. As militaries have grown and their roles adapted to the Cold War and post-Cold War security environments, the number of platforms used by militaries has tended to fluctuate accordingly[13]. Within the European Union, they are conditioned by member states national policies and the diversity of platforms implies a greater cost of operation as well as more complex maintenance and overhaul over their lifecycles. In the United States, there has been a trend toward a reduction in the number of platforms to better control development and lifecycle costs. This is best exemplified by the Joint Strike Fighter which, a multirole and multiservice aircraft set to replace a number of legacy aircrafts[14].

As these trends gathered momentum, especially in the post-Cold War era, the industry began a wave of consolidation in the 1990's to deal with increased uncertainty. In the USA the number of prime contractors fell[15]. In Europe, there was also consolidation, for example with a group of companies coming together as EADS[16]. The Russian industry survived, but became much smaller. Emerging economies such as China and Brazil built a national defence-related industrial base to serve their growing global ambitions.

[11] E.g. John Keller, "The Revenge of Cots in an Aging Commercial Technology Base," *Military & Aerospace Electronics* 24, no. 12 (2013).

[12] US Congress Office of Technology Assessment, *Flat Panel Displays in Perspective*, vol. OTA-ITC 631 (Washington DC: US Government Printing Office, 1995).

[13] European Parliament, "European Common Security and Defence Policy," in *Cost of Non-Europe Report*, ed. European Added Value Unit of the Directorate for Impact Assessment and European Added Value (Brussels BE: Directorate–General for Parliamentary Research Services (DG EPRS) of the Secretariat of the European Parliament,, 2013).

[14] See for example Amy Butler, "Best Laid Plans," *Aviation Week and Space Technology* 174, no. 8 (2012).

[15] The Economist, "American Monsters, European Minnows," 338, no. 7948 (1996).

[16] Pierre Sparaco, "Eads Completes Europe's Long-Awaited Restructuring," *Aviation Week & Space Technology* 153, no. 4 (2000).

Israelis and South Africans remained strong in specific niches. There is yet more pressure for consolidation[17].

These major trends suppose a need for states to develop and support a critical range of KICs in order to adapt to the new security and public finance environments. In Canada's case, the DPS puts forward that $200 billion will be spent over the next 20 years[18]. As outlined by the Jenkins report, this is an unprecedented opportunity to develop and reinforce Canada's defence-related industrial base.

Given the important development costs associated with a wide industrial base, it would be reasonable for Canada to concentrate on those KICs where it holds a competitive advantage as suggested in part by the Jenkins Report[19].

3. Capabilities and KICs

In order to identify KICs, one must first define the notion of capability. An influential school in strategic management research examines the role of capabilities and is associated with a research stream called the Resource-Based View (RBV) of the firm[20]. The RBV posits that the firm is a portfolio of resources. Capabilities are understood to be resources within that portfolio. As such, the concept of capability is generally understood as "the ability to carry out an activity"[21]. Afuah goes on to specify that a capability is the coupling of competences and endowments[22]; competences being specific "bundles of skills" according to Hamel and Prahalad[23]. Thus, capabilities play an important role at both firm level and industry level in that they bring a competitive advantage if they have a high degree of specificity.

KICs are embedded in products and services, much in the manner that intuitive design is embedded in Apple products. Therefore, identifying KICs entails identifying those capabilities – at industry-level – that set, or would set, Canada apart from its competitors.

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[17] The Economist, "A Hard Pounding, This; Europe's Defence Industry," Mar 02 2013.

[18] The Canadian Press, "Military Procurement Changes to Bring More Scrutiny, Trade Focus," *CBC*, 5 Feb 2014. See http://www.cbc.ca/news/politics/military-procurement-changes-to-bring-more-scrutiny-trade-focus-1.2524133

[19] Jenkins, *Canada First: Leveraging Defence Procurement through Key Industrial Capabilities - Report of the Special Adviser to the Minister of Public Works and Government Services*.

[20] Birger Wernerfelt, "A Resource-Based View of the Firm," *Strategic Management Journal* 5, no. 2 (1984).

[21] See Allan Afuah, *Innovation Management : Strategies, Implementation and Profits* (Oxford: Oxford University Press, 1998).

[22] Ibid., 384.

[23] Gary Hamel and C. K. Prahalad, *Competing for the Future* (Boston MA: Harvard Business School Press, 1994), 199-212.

An implication is that the pool of firms that hold a similar capability is wide enough to ensure that this capability survives within the industry should one firm fail.

Furthermore, industrial capabilities are not products *per se* as stated in the Jenkins report[24], but rather the skills that enable companies to deliver superior products and services. Thus, a key step for identifying existing KICs on which to build implies the deconstruction of the skillsets necessary to accomplish each step of the industry's value chain to enable a better focus on the high value-added activities.

Figure 1: Revisiting strategic implications of the Jenkins Defence Procurement Continuum

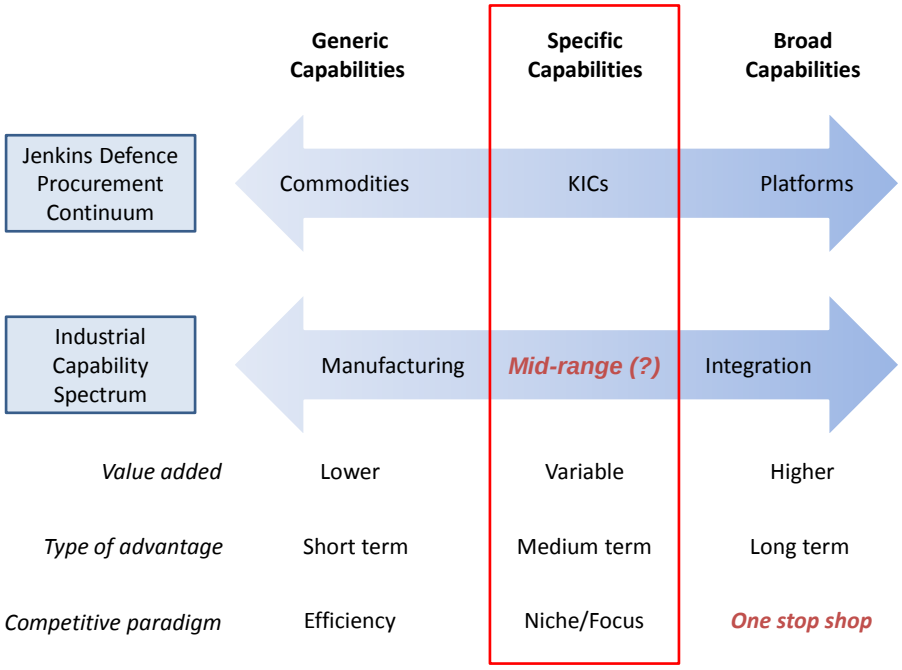

Figure 1 shows how capabilities may be segmented to understand their strategic implications. At one end of the spectrum are generic capabilities. These industrial capabilities can be assimilated to manufacturing activities that produce commodities on the Jenkins defence procurement continuum. These capabilities tend to generate lower levels of added value. Since the competitive paradigm is based on efficiency, this entails a shorter term advantage because the business model is easier to copy and barriers to entry are generally moderate. At the other end of the spectrum are broad capabilities.

[24] Jenkins, *Canada First: Leveraging Defence Procurement through Key Industrial Capabilities - Report of the Special Adviser to the Minister of Public Works and Government Services*, xv.

Their mix translates into a specific industrial capability that enables firms to master a specific expertise in integration, i.e. a unique ability to blend expertise from various fields into high-end complex platforms, products and services. This means there are high levels of value added derived from these capabilities that tend to be hard to replicate, providing firms with a longer term competitive advantage, specifically because of costs associated to managing such complexity. This explains the emergence of large "one-stop-shop" integrators. The middle of this spectrum is occupied by players with specific capabilities in between manufacturing and integration[25]. These are named KICs on the Jenkins Defence Procurement Continuum[26]. The products derived from these capabilities possess variable levels of value added as success stories are able to generate important margins but they are not the rule. This generates a medium term strategic advantage until the firm is acquired by a larger player or its products and services are copied by others. Therefore, a dominant paradigm for these firms is to occupy and defend very specific niches while focussing on high-margin activities leading them in a relentless race to innovate.

4. Selection and sustainment of KICs

In the current context, before moving into the thorny and complex issues that surround the selection and sustainment of KICs, a fundamental question that remains unaddressed by the Jenkins Report must be answered with regards to the CFDS and the DPS that supports it: what is the expected balance between national security and industrial policy in terms of identifying, selecting and sustaining KICs? In other words, is it about developing the industry itself or a set of capabilities on a national level (notwithstanding individual firms themselves, or providing the CF with reliable suppliers? The answer to this question will influence the types of KICs will matter. Should the goal be purely oriented on national security, then procuring globally best-in-class equipment and services may put some Canadian defence players at a relative disadvantage in certain industry segments. Should industrial policy weigh in too much, Canadian companies will surely benefit a lot, but national security imperatives may suffer from some suboptimal acquisitions.

[25] These capabilities may be around design or various types of highly innovative activity, but not necessarily.

[26] A more precise name could have been "Key Targeted Product Families" as capabilities should not be confused with the products or systems that embody them. See Jenkins, *Canada First: Leveraging Defence Procurement through Key Industrial Capabilities - Report of the Special Adviser to the Minister of Public Works and Government Services*. *24.*

Selection of KICs

In the absence of a clear guidance in this matter, this paper takes the view that both national security and industrial policy imperatives must be simultaneously met. Following a thorough analysis, the Jenkins report puts forth three criteria that may be useful in identifying KICs[27], but that do come with their own sets of challenges (See table 1).

First, the specific needs identified by the CF. It is of paramount importance that KICs be geared toward ensuring that CF needs are met, especially for mission-critical products and services. In that sense, it is imperative that multifaceted perspectives be used beyond CF requirements to increase the latter's coherence with increasingly dynamic changes in the global strategic environment. Thus, this criterion should be revisited so it better reflects mission-related operational and threat-based requirements for the CF.

Second, success in penetrating global markets. This makes sense since global markets are often the only ones to provide enough volume in order for firms to benefit from sufficient economies of scale. Furthermore, defence markets are increasingly global. However, such a step is a very difficult one to take because of the fragmented nature of global defence markets, often times along national line. Three elements should be considered: 1) Newer products may be severely handicapped since they do not have a sufficient track record on global markets. Therefore, a product's export potential is a much better gauge, not knowing precisely what the magnitude of its success will be. 2) It does not take into account the firm's global competitiveness nor does it consider its entire product portfolio. 3) The way revenue is generated represents an important challenge. Thus, the adaptability and/or flexibility in firms' business models need to be considered.

Third, the potential for innovative products. Innovative products are the linchpin of defence firms' strategic advantage. Unfortunately, they hold important business risks in line not only with a range of technological and organizational choices, but also with their levels of adoption by markets. One blind spot of this criterion is that it does not allow for the discrimination pf products according to their innovativeness. A finer-grained perspective would allow for better differentiation of innovative products and services when compared to similar or legacy solutions. Another issue is that it does not immediately relate capabilities (e.g. KICs) and the products they embody. A way of fixing this shortcoming would be to evaluate the degree to which that capability is extendable to other product families.

[27] Ibid., section 5.

Table 1: Selecting KICs: Jenkins Report vs. revisited criteria

Jenkins Report criteria	***Potential challenges***	***Revisited criteria***
Specific needs identified by the CF	Needs should take into account a wide view of the strategic environment and be expressly mission-focused	Mission-related Operational/ Threat-based requirements for the CF
Success in penetrating global markets	Newer products or services may be handicapped since they have no/limited track records	Export potential
	Firm and product portfolio issues should be considered	Opportunities for growth (including through mergers and acquisitions)
	This view does not take into account where/how revenue is generated	Adaptable/flexible business models
Potential for innovative products	Does not allow to discriminate according to the level of product innovativeness	Degree of differentiation
	Does not immediately relate capabilities and products	Extendability of capability

Following the determination of the three criteria for selecting KICs, the Jenkins Report analyzed the CFDS, some American views on industry capabilities on both sides of our common border, and a list of capabilities compiled by CADSI in order to determine six major KICs[28] (see table 2). However, KICs should be selected beyond their mere embodiment in products and services.

Table 2: Canada's KICs: Jenkins Report vs. revisited capabilities

Jenkins Report KICs	***Revisited capabilities***
• Arctic and Maritime Security • Protecting the Soldier • Command and Support • Cyber-Security • Training Systems • In-Service Support	• Geographic expertise • Software integration and computer security • Specialized garment making and design • Man-machine interaction Process design • Situational awareness • Experiential learning conception • Customer interaction

[28] Ibid., xiv.

The KICs identified in the Jenkins Report are not industrial capabilities *per se*, they are products and services attached to defence-related industrial capabilities. Firms delivering these occupy niches where Canadians are well positioned and hold competitive advantages with varying levels of fungibility would not necessarily be 1) sustainable over long periods of time, 2) may be replicable in a short to medium time horizon. The way to mitigate that risk is to put in place the conditions that will lead to their sustainment.

Sustaining KICs

The sustainment of KICs implies not only their appropriate selection, but also a process to allow for their evolution whether it be their growth or their disappearance. A such, a monitoring and evaluation process is necessary. This may be done using a customer-centric approach with a process that starts from military requirements and matching industrial capabilities analyzed in the context of Jenkins-like panels or working groups. They would be able to access to the appropriate data and use a variety of analytical techniques and processes that would allow for an efficient triangulation[29] toward relevant outcomes, working their ways from platforms to an in-depth look at the required value chains. A range of qualitative and quantitative aspects (financial and non-financial) may be synthesized using specialized software and techniques[30]. Ideally a KIC could be linked with white papers or industrial/defence policy in general, but it should be selected from market-based imperatives. On one hand, it may be a non-defence industrial capability that is transferable into defence applications. On the other hand, it may be a defence-related industrial capability where Canadian players have demonstrated a competitive advantage.

Once properly selected, these KICs will need to be nurtured. The best ways to sustain KICs is centered on relatively simple steps:

Focus[31]. As suggested in the Jenkins Report, a limited set of KICs should be selected and nurtured. These capabilities should be the focus of a coordinated industrial and policy effort based on the strategic advantage of Canadian firms. They can be grown at home or

[29] Terri A Scandura and Ethlyn A Williams, "Research Methodology in Management: Current Practices, Trends, and Implications for Future Research," *Academy of Management journal* 43, no. 6 (2000).

[30] A very well-known and implementable technique is CHAID, which does lead to robust outcomes in the absence of normal distributions, See John A McCarty and Manoj Hastak, "Segmentation Approaches in Data-Mining: A Comparison of Rfm, Chaid, and Logistic Regression," *Journal of business research* 60, no. 6 (2007). Another one could be the Analytic Hierarchy Process, see for example Alessio Ishizaka and Ashraf Labib, "Analytic Hierarchy Process and Expert Choice: Benefits and Limitations," *OR Insight* 22, no. 4 (2009).

[31] E.g. "[T]he number of strategically critical sectors cannot exceed five to seven. Good strategy is about choice." in Jenkins, *Canada First: Leveraging Defence Procurement through Key Industrial Capabilities - Report of the Special Adviser to the Minister of Public Works and Government Services*, 28.

be the result of acquisitions on foreign markets that may then be leveraged to benefit Canadian procurement efforts at competitive costs. An interesting case could be that of Optosecurity, a Canadian maker of checkpoint screening equipment[32]. While not a pure defence player, but rather active in the security industry, it remains a case in point of a firm that is able to leverage unique technical abilities in the narrow and highly focused airport security market. As a result, they have become a global reference player in their market. However, focussing on KICs also entails that capabilities that are considered non-key should be phased out or in the best of cases, no longer supported.

Develop viable business models. Business models are typically defined as "the architecture behind the firm's value-creation efforts [or more to the point] it's how a firm makes money"[33]. In that context, key questions are: how does one make money on a defence contract? Where do margins come from? While it is true that successful companies in the defence industry are not self-generated as underlined in the Jenkins Report, an initial contract by the Canadian government would not necessarily always be a must; it would be a sufficient but not necessary condition. A *sine qua non* condition however is that a firm possesses unique capabilities that may be useful for defence applications in Canada or abroad. Associated to these capabilities are revenue streams that need to be developed and nurtured. Many tools exist for defence firms to develop business models. Two important ones in recent years have taken hold in the industry.

A first approach is tightly monitor costs. This means extracting more value from supplier relationships. Another way of doing so is increased reliance on COTS inputs and replacement parts. To mitigate spiralling costs, firms should simultaneously consider product/service design and manufacturing processes. The auto industry – and to a different extent the civilian aerospace industry – has met this challenge either through increasing the modularity of products or through the careful design of platforms that can be easily customized into different products. While it is desirable to validate technologies locally before going abroad, it is a sufficient but not necessary condition to efficiently monitor costs associated with such technological choice.

A second approach is to promote dual uses, e.g. ruggedized versions of civilian equipment can be sold to the military and then be used in the construction industry for example as in the case of some information technology equipment. Adding features to technologies or designing them with training systems and licensing options is another technique that may be leveraged.

[32] See http://www.optosecurity.com/

[33] Yan Cimon and Diane Poulin, "Understanding Global Strategic Dynamics," in *Essentials of Logistics and Management – the Global Supply Chain*, ed. Philippe Wieser, Francis-Luc Perret, and Corinne Jaffreux (London: EPFL Press/CRC Press, 2012), 540.

An interesting case is the Canadian Disruptive Pattern (CADPAT™), a trademarked camouflage pattern – that has been exported – owned by the Department of National Defence that is applied on specialized military fabrics (e.g. soldier's clothing and equipment) by key manufacturers like Consoltex[34] thus simultaneously leveraging both the trademark and the technical expertise of these firms. For example, Consoltex leverages its expertise beyond military markets to clean room and medical environments. This demonstrates that various revenue streams may be generated from an innovative and multipronged business model.

Create and nurture a critical mass. Firms active in the defence industry should be sustainable economically. In other words, firms operations should grow to an appropriate scale for them to benefit from strategic opportunities. When Saab sold its Gripen fighter to Switzerland, it licensed its manufacturing to RUAG, a Swiss aerospace company; this enabled RUAG to benefit from new work, while Saab was able to make an important sale[35]. Together they have scale to bid for important contracts globally, including in some emerging markets[36].

Globalize Canada's defence industry. The limited size of Canada's defence markets makes it necessary for the industry to look abroad as CGI did[37]; it also means making tough choices that may rupture the current equilibrium. A variety of mechanisms may be used to that end:

- Encouraging Canadian firms to team up together and/or with global industry leaders to access world class expertise and capabilities.
- Making Canada into a true player in value added activities that are integral part of global supply chains by focusing the higher value segments of these chains with targeted services and products. This implies the establishment of efficient linkages between R&D, production, service and disposal activities. This would allow better revenue perspectives for Canadian know how and intellectual property.
- Putting conditions in place that will enable Canadian firms to buy foreign assets and redeploy expertise at home and globally.

An opportunity resides in penetrating international markets by encouraging Canadian firms to develop a "local look and feel". The USA is the foremost natural market for

[34] See http://www.consoltex.com/pages/products/techeng/militaryfab.aspx?lang=EN-CA
[35] Marc-Henri Jobin, "Le Gripen Doit Sauver Saab Mais Aussi Ruag Aviation," *Le Matin*, 14 Sept 2012. See : http://www.lematin.ch/suisse/Le-Gripen-doit-sauver-Saab-mais-aussi-Ruag-Aviation/story/22834388
[36] Francis Leithen, "Intercontinental Push," *Aviation Week & Space Technology* 175, no. 13 (2013).
[37] CGI, "Defense Information System Agency Selects Oberon, a Cgi Federal Subsidiary, for Us$871 Million Test & Evaluation Mission Support Services Id/Iq."

Canadian firms because of their North American way of doing business as they are used to "Americanising" the way they operate in these value chains.

A second opportunity is to bank on the multiplication of platforms in Europe[38]. Even though American platforms and standards tend to be a reference globally, the diversity and multiplication of platforms in Europe may represent a potential revenue stream for Canadian firms. European countries national defence and procurement policies makes for great diversity in platforms as national requirements sometimes clash with Europe's federative model. Yet European firms and governments often require an intimate knowledge of American equipment and processes where Canadian players excel.

Promote university-industry-government linkages. These linkages, as put forward in the Jenkins Report, would give Canada an independent analysis capability. Beyond that advantage, it could also be a source of innovation for the industry, allowing for targeted research on product features, business models and processes that would position Canada's industry on an innovative path.

5. Some policy gaps and fixes

There are many issues that should drive policy on order for KICs to be properly implemented. First, there should be a KIC promotion effort, for industry, government and stakeholders to be on the same page regarding this issue. Second, KICs should be adequately synchronized with Canadian defence requirements so that industry and government agencies involved in defence-related activities are able to deal more efficiently with the procurement process. Third, while there are many tools to assist Canadian companies to go abroad, in order to build a more agile industry and allow for rapid intake of world class technology and processes, Canadian firms should become more attractive for foreigners. This section concludes by identifying some key aspects that should absolutely be dealt with efficiently when it comes to KICs.

Promotion of KICs

From dual business and policy perspectives, how can KICs be promoted? In order for stakeholders to coalesce around the idea that the Canadian industry should focus on a set of KICs, as recommended in the Jenkins Report, various strategic actions may be implemented.

[38] European Parliament, "European Common Security and Defence Policy."

Promote Canadian integrators. Integrators are often able to derive higher margins from their business activities. Thus, moving up the value chain implies moving into its high value added segments. For Canadian firms to do so in a smaller amount of time than go it alone options would entail, they must continue aggressively developing a partnership culture with the best players globally. They must also be open to foreign acquisitions (i.e. to buy foreign assets, or eventually be bought under conditions of sustained Canadian activities).

Promote dual activities. The cyclicality of defence industries sometimes puts companies at risk. Risk mitigation should include developing a portfolio of activities that are either non-defence and/or non-government to provide for more financial stability.

Establish robust dialogue between major stakeholders. Major stakeholders in the Canadian defence industry would greatly benefit from improved dialogue. This would allow for better visibility of the acquisition and policy pipeline. In turn, better decisions would be made at all steps of the acquisition process and the economic benefits resulting from the acquisitions process would be better optimized. Among others, the Department of National Defence (DND), Public Works and Government Services Canada (PWGSC) and the industry should be undertaking in-depth dialogue.

Shift the procurement mindset. From a traditional product or service mindset, the procurement process should become capability-focused. Such a shift would align the procurement process to support industry- wide capabilities in line with the various needs of government agencies while ensuring high value added activities can be carried out in Canada.

Improve decision cycle and sourcing cycle times. As the global strategic environment is often in turmoil and taxpayers want the best possible return on investment for their tax dollars, improving decision and sourcing cycle times is crucial. Another added benefit is the increased agility this will provide the CF. Furthermore, on the financial side, the impact is likely to be a better managed cash cycle for industry and government.

Synchronizing KICs and Canada's defence requirements

The range of KICs managed by industry would also need to be fully synchronized with Canada's defence requirement to leverage the full extent of upcoming procurement opportunities. KICs further need to be aligned with doctrine and force employment scenarios. This means two practical steps may be taken: reduce the politics of procurement and promote better risk-sharing between government and industry.

Less politics, better policy. Defence procurement should be an independent endeavor free of political meddling. Indeed, urgency or political crises/considerations are important factors to take into account, but they should not drive the agenda to make the industry competitive. This should be achieved by a more focused scope of government intervention and by better policy design, including the establishment of a process that takes into account the industrial effects of any defence responsibility that is taken on or given up[39].

Develop risk-sharing mechanisms. Government and industry should jointly develop risk-sharing arrangements[40]. These mechanisms should cover the entirety of the procurement process – from design to delivery to service – in order for the industry not to be put at risk by important requirement changes within projects. Government and industry should work to increase supply chain visibility and decrease reaction time in crises. As the CF and its allies confront extremely fast paced operational environments, efficiency and operational considerations dictate that interoperability remain a priority, again as a risk sharing tool for industry and government.

Make Canadian firms attractive investments.

The development and sustainment of KICs beyond national procurement activities involves access to capital and markets beyond those of Canada, especially for those players where scale and scope are requisites to remain competitive. In that context, for Canadian firms need to be competitive, they need to become attractive investments. So it becomes crucial to relax takeover provisions, to leverage procurement and to look beyond North America.

Relax investment and takeover provisions. Canada can position itself as a country friendly to defence industry investments. A just equilibrium must be sought: An overtly nationalistic approach with regard to this industry may signal to allies that Canada is not "open for business", but an approach that is too open may be detrimental to Canadian companies. Canadian champions could be acquired by multinationals from friendly countries (ABCA or NATO countries) while imposing stringent guidelines to meet the Canadian military's goals and objectives. The Canada Investment Act may be amended accordingly[41].

[39] This would allow for mitigation of adverse effects from decisions like pulling out of the AWACS. See Murray Brewster, "Canadian Firms Lose Millions in Nato Cancellation; Ottawa Withdraws from Awacs in Bid to Save Money," *Ottawa Citizen*, 6 Aug 2013.
[40] These would include measure for better risk management and sharing when prototyping, especially in case of program cancellation. See Graham Warwick, "Canada Scraps Combat Vehicle, Says No Longer Needed," *Aerospace Daily & Defense Report*, 31 Dec 2013.
[41] For more details on this Act, see https://www.ic.gc.ca/eic/site/ica-lic.nsf/eng/home

Continue leveraging Canadian procurement. National procurement may be leveraged to help foster global champions. However, this needs to be done carefully by mapping industrial networks in order to optimize the support given to the higher value added segments. Moreover, it is important for this process to ensure supply chain redundancy and security by using regular supply chain audits to reveal vulnerabilities (e.g. counterfeit parts in aerospace[42]) and design audits (e.g. to mitigate unforeseen flaws like backdoors on military chips[43]).

Look beyond the North American security environment. The industry should be able to meet Canada's procurement goals in a competitive manner, but should not be focused on catering primarily to the Canadian Forces. It should provide solutions and methods in line with the global threat environment. A focus on US activities while providing expertise to select allies and emerging markets could help leverage Canada's KICs abroad.

(re)Shape procurement policy and practice. Projects could be implemented with go-no go decisions and maximum spillovers at every step. Meanwhile, a framework for rapid prototyping and deployment of Canadian innovations may be done by leveraging DRDC (Defence Research and Development Canada) and NRC (National Research Council) installations, capabilities and IP. Many NRC capabilities could be put to use in a military or defence-related environment[44]. Also, maybe Canada should look into procuring more products and services beyond its traditional tier-one foreign providers.

Key policies

To properly leverage defence procurement, a range of policies need to be developed or maintained. A single point of accountability, ensuring the security of supply and market-based IRBs are instrumental in reaching that goal.

SPA. A single point of accountability (SPA) with prime contractors is an important tool for government agencies that should be continued as it reduces direct coordination costs for the customer. Faced with increasing pressures for efficiency, government agencies do

[42] See Courtney E. Howard, "Counterfeit Component Chaos," *Military & Aerospace Electronics* 24, no. 12 (2013). And also Henry Livingston, "Compliance Programs for Counterfeit Parts Avoidance and Detection," *Contract Management* 53, no. 5 (2013).

[43] See Sergei Skorobogatov and Christopher Woods, "Breakthrough Silicon Scanning Discovers Backdoor in Military Chip," *Cryptographic Hardware and Embedded Systems–CHES 2012* (2012). See also Taylor Armerding, "China Not to Blame for Backdoor in Us Military Chip," *CSOonline*, June 4 2012. http://www.csoonline.com/article/707542/china-not-to-blame-for-backdoor-in-us-military-chip

[44] And they are showcasing their capabilities in security : http://www.nrc-cnrc.gc.ca/eng/rd/security/index.html

not necessarily have time or resources to develop in house the highly focused capabilities enabling them to efficiently negate the need for SPA. Fractioned work is hard to supervise, integrate and coordinate. While fractioning contracts may work in some settings (e.g. manufacturing, aerospace), is does not always prove efficient of practical in service-oriented industries (e.g. information technology, research and development).
SPAs allow the effective mitigation of risks[45] associated with large-scale endeavours such as coordination costs, technical risks, and some financial risks.

Security of supply. A level of independent military capacity must be retained by Canada in case of major disruptions in international markets. Procurement efforts should consider what levels can be deemed appropriate in different contracts for operationally critical domains like ammunition, IT services, telecommunications or in-service support for example.

IRBs. Industrial Regional Benefits (IRBs) should be the subject of an in-depth revision. This process should move toward a controlled transparent bidding process devoid of political influence. To ensure Canada remains competitive, IRBs should shift to a market-based model that puts the emphasis on technology and value added preoccupations instead of geographical equity. This market-based model would help extract savings and maximize the expertise, the capabilities, and the managerial abilities that are incorporated in the products and services. That would in turn help Canadian players align with best practices globally and by extension to integrate faster in global value chains. Industry should be a prime shaper of IRBs using a thorough bidding process that would enable it to better control its cost structure and especially that of its supply chains. In that sense risks derived from, and requirements for, a national industrial capacity is dependent on the product or service acquired.

6. Conclusion and implications

In conclusion, as the Jenkins Report mentions, the CFDS is an opportunity to leverage procurement efforts to build and sustain KICs in Canada's defence industry. While Canada is an important player in the global defence industry, it is only home to one of the top 100 firms globally. In order to select and nurture KICs, the Canadian industry needs to focus on specialized capabilities that will generate high value added activities in specific niches with a view to developing integrators of the future. As such, KIC selection may be done: by focussing on operational and threat-based requirements of the

[45] See "Improving Government Performance," *Government Financial Management TOPICS* 47, no. 22 (2007). See also Julian Kerr and James Hardy, "Parliamentary Report Castigates Australian Dod Project Management," *Jane's Defence Industry* 29, no. 10 (2012).

CF; by examining business models and the global potential of KICs; and by making sure innovative products/services are clearly differentiated in the global arena. Canadian KICs are centered on geographic expertise, software expertise, process design and interactional technologies to name a few.

In order to sustain such KICs, firms will need to use various strategies. One is to focus on highly specific niches. They will also need to create a critical mass to reach global markets. This means that business models and globalizing their activities will be key to success. Finally, university-industry-government linkages is a last tool for the Canadian industry to remain ahead of its competitors. This implies that a range of policies will need to be implemented to promote KICs and to allow for their synchronization with defence-related requirements. Another key will be to make Canadian firms attractive while maintaining key policies like having a SPA, ensuring the security of supply and shifting to market-based IRB determination.

A balancing act?

In order to identify, develop and nurture KICs and leverage procurement efforts to that end, it is important to find a middle ground between a proactive industrial policy and free market approaches. The industry will be facing a major challenge from the relationship between the DPS and industrial policy objectives. If the final objective national sufficiency then it should be accepted that procurement efforts will result in higher costs and a much broader base of industrial capabilities; should the goal be to build and promote a globally competitive industry, then procurement efforts should contribute in shaping select KICs where the Canadian industry is a global leader and globalize procurement efforts for other segments. This is especially important since national content and boundaries matter less and less as value chains are now increasingly global. Indeed, Canada needs to remain competitive globally. In the USA, our main defence export market, it should be communicated 1) that Canada is a trustworthy, reliable and secure ally and 2) that more integration of our defence industries enables America to efficiently meet its defence needs and fulfill its role in the global arena. These communication efforts should be directed toward industry associations, States and Counties that harbour major defence contractors, the Pentagon, Congress, and the White House. Industrial policy, national defence requirements and markets often have competing interests which makes the interaction between the DPS and industrial policy a balancing act. A second dilemma is that between the need to control various IP assets as opposed to accessing these assets. The former implies acquiring proprietary assets whereas the latter favours licensing agreement and similar vehicles. Furthermore, if defence procurement is based on a utilities business model, then market forces will not yield optimal outcomes if the market is not well designed.

References

Afuah, Allan. *Innovation Management : Strategies, Implementation and Profits*. Oxford: Oxford University Press, 1998.

Armerding, Taylor. "China Not to Blame for Backdoor in Us Military Chip." *CSOonline*, June 4 2012.

Brewster, Murray. "Canadian Firms Lose Millions in Nato Cancellation; Ottawa Withdraws from Awacs in Bid to Save Money." *Ottawa Citizen*, 6 Aug 2013, A4.

Butler, Amy. "Best Laid Plans." [In English]. *Aviation Week and Space Technology* 174, no. 8 (2012 Feb 27 2012): 31.

Canadian Association of Defence and Security Industries. *Kpmg Report: Economic Impact of Defence and Security Industry in Canada*. Ottawa, ON: CADSI, 2012.

CGI. "Defense Information System Agency Selects Oberon, a Cgi Federal Subsidiary, for Us$871 Million Test & Evaluation Mission Support Services Id/Iq." *Media announcements* (26 Sept 2012).

Cimon, Yan. "Defence Policy and the Aerospace and Defence Industry in North America: The Changing Contours of the Post-9/11 Era." In *Game Changer: The Impact of 9/11 on North American Security*, edited by Jonathan Paquin and Patrick James. Vancouver, BC: UBC University Press, Forthcoming.

Cimon, Yan, and Diane Poulin. "Understanding Global Strategic Dynamics." Chap. 20 In *Essentials of Logistics and Management – the Global Supply Chain*, edited by Philippe Wieser, Francis-Luc Perret and Corinne Jaffreux, 535-52. London: EPFL Press/CRC Press, 2012.

Department of National Defence. "Canada First Defence Strategy." Ottawa, ON: Government of Canada, 2008.

European Parliament. "European Common Security and Defence Policy." In *Cost of Non-Europe Report*, edited by European Added Value Unit of the Directorate for Impact Assessment and European Added Value, 91. Brussels BE: Directorate–General for Parliamentary Research Services (DG EPRS) of the Secretariat of the European Parliament,, 2013.

Hamel, Gary, and C. K. Prahalad. *Competing for the Future*. Boston MA: Harvard Business School Press, 1994.

Howard, Courtney E. "Counterfeit Component Chaos." *Military & Aerospace Electronics* 24, no. 12 (2013): 10-15.

"Improving Government Performance." *Government Financial Management TOPICS* 47, no. 22 (2007): 7-7.

Ishizaka, Alessio, and Ashraf Labib. "Analytic Hierarchy Process and Expert Choice: Benefits and Limitations." *OR Insight* 22, no. 4 (2009): 201-20.

Jenkins, Tom. *Canada First: Leveraging Defence Procurement through Key Industrial Capabilities - Report of the Special Adviser to the Minister of Public Works and Government Services*. Ottawa: Public Works and Government Services Canada, 2013.

Jobin, Marc-Henri. "Le Gripen Doit Sauver Saab Mais Aussi Ruag Aviation." *Le Matin*, 14 Sept 2012.

Keller, John. "The Revenge of Cots in an Aging Commercial Technology Base." *Military & Aerospace Electronics* 24, no. 12 (2013): 4-4.

Kerr, Julian, and James Hardy. "Parliamentary Report Castigates Australian Dod Project Management." [In English]. *Jane's Defence Industry* 29, no. 10 (2012 Oct 01 2012).

Lachance, Daniel J. L., Joe T. Fernandes, Tim R. Gushue, Andrew B. Godefroy, and Lisa Moulton. "Projecting Power: Trends Shaping Canada's Air Force." edited by Department of National Defence, 45. Trenton, ON: Aerospace Warfare Centre (Canada), 2009.

Leithen, Francis "Intercontinental Push." *Aviation Week & Space Technology* 175, no. 13 (2013): 52-52.

Livingston, Henry. "Compliance Programs for Counterfeit Parts Avoidance and Detection." *Contract Management* 53, no. 5 (2013): 46-55.

McCarty, John A, and Manoj Hastak. "Segmentation Approaches in Data-Mining: A Comparison of Rfm, Chaid, and Logistic Regression." *Journal of business research* 60, no. 6 (2007): 656-62.

"News in Brief: Training & Simulation News." *Asian Aviation Magazine* 8, no. 7 (2010): 15-15.

Scandura, Terri A, and Ethlyn A Williams. "Research Methodology in Management: Current Practices, Trends, and Implications for Future Research." *Academy of Management journal* 43, no. 6 (2000): 1248-64.

SIPRI. "Facts on International Relations and Security Trends." 2014.

Skorobogatov, Sergei, and Christopher Woods. "Breakthrough Silicon Scanning Discovers Backdoor in Military Chip." *Cryptographic Hardware and Embedded Systems–CHES 2012* (2012): 23.

Sparaco, Pierre. "Eads Completes Europe's Long-Awaited Restructuring." [In English]. *Aviation Week & Space Technology* 153, no. 4 (2000 Jul 24 2000): 103-09.

The Canadian Press. "Military Procurement Changes to Bring More Scrutiny, Trade Focus." *CBC*, 5 Feb 2014.

The Economist. "American Monsters, European Minnows." 338, no. 7948 (1996): 63-64.

———. "A Hard Pounding, This; Europe's Defence Industry." Mar 02 2013, 64-65.

US Congress Office of Technology Assessment. *Flat Panel Displays in Perspective*. Vol. OTA-ITC 631, Washington DC: US Government Printing Office, 1995.

Warwick, Graham. "Canada Scraps Combat Vehicle, Says No Longer Needed." *Aerospace Daily & Defense Report*, 31 Dec 2013, 3.

Wernerfelt, Birger. "A Resource-Based View of the Firm." *Strategic Management Journal* 5, no. 2 (Apr-Jun 1984): 171-80.