

Capability Engineering Process (CEP) Foundations – Version 2

CapDEM TD

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Abstract

The Capability Engineering Process (CEP) supports decision-making regarding strategic investments required to address a capability gap. This process is elaborated within the Collaborative Capability Definition Engineering and Management (CapDEM) project. This report provides answers to fundamental questions regarding CEP goals, scope, inputs, outputs and conception principles. These CEP Foundations were obtained through several workshops involving CapDEM members and personnel of the Director General Strategic Planning (DGSP). One (1) main goal and six (6) secondary goals are used to position the CEP within the Capability-Based Planning (CBP) activities. Major stakeholders are identified and a preliminary list of inputs and outputs is proposed. Finally, sixteen (16) conception principles are stated in order to guide the development of CEP.

Résumé

Le processus d'ingénierie des capacités (PIC) supporte la prise de décision concernant les investissements stratégiques requis pour répondre à une lacune en matière de capacité. Ce processus est élaboré dans la cadre du projet de définition, d'ingénierie et de gestion collaboratives de capacités (DIGCap). Ce rapport fournit des réponses aux questions fondamentales concernant le PIC, soient: ses buts, sa portée, ses intrants/extrants ainsi que ses principes de conception. Ces réponses furent obtenues suite à plusieurs ateliers de travail impliquant des membres du projet DIGCap et du personnel du Directeur Général de la Planification Stratégique (DGPS). Un (1) but principal ainsi que six (6) buts secondaires servent à positionner le PIC comme un processus interne aux activités de planification axée sur les capacités (PAC).. Les principales parties intéressées sont également identifiées et une liste des principaux intrants et extrants est proposée. Finalement, seize (16) principes de conception sont énoncés dans le but de guider le développement du PIC.

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Executive summary

The Collaborative Capability Definition Engineering and Management (CapDEM) project is investigating Capability Engineering (CE) in order to support the Capability-based Planning (CBP) decision-making process. The current approach does not meet the rapid evolution of business requirements and technology. It does not support adequately the new capability-based approach promoted by DND/CF and the associated increasing complexity of Systems of Systems. To that end, a Capability Engineering Process (CEP) is proposed. The development of the CEP is a major and complex endeavour that cannot be achieved without ensuring close collaboration and endorsement of various stakeholders with different requirements and interests. The CEP Team strategy is to address this issue first, by defining the various fundamental characteristics that will guide the development of the CEP, and then validating them before proceeding with elaboration of the process. These fundamental characteristics succinctly described hereafter concern goals, scope, stakeholders, inputs, outputs, and conception principles.

Goals Pursued

The institutionalization of the CEP aims at achieving one main goal and six secondary goals as summarized in the adjacent side bar.

The main goal emphasizes the need to support decision-making regarding strategic capability investments carried out by the Joint Capability Requirements Board (JCRB) and the Joint Capability Assessment Team (JCAT).

All secondary goals either support this main goal, or aim at enabling the transformation of DND/CF's strategic capability planning and acquisition processes.

Scope

The CEP is part of the CBP activities. Triggered and control by CBP decision-making, the CEP interacts with PRICIE components involved in a solution. The CEP is an approach for analysing, defining and developing the engineering solutions used to address a capability gap. The CEP starts from a given capability gap and ends with the definition of a set of Investment (divestment) Options. These options aimed at providing the DND/CF Decision-Makers with a set of candidate solutions and

MAIN GOAL

Enable JCRB/JCAT to make better-informed Decisions regarding Strategic Capability Investments

SECONDARY GOALS

1. Reduce the Risk associated to JCRB/JCAT Decision-making
2. Enable Evolutionary Acquisition
3. Reduce the time spent on the Identification, Option Analysis and Definition Phases of the DMS Acquisition Process
4. Link Capability-Based Planning (CBP) and System Acquisition
5. Facilitate Strategic Agility in Capability-Based Planning (CBP)
6. Improve Communication and Collaboration with Stakeholders

recommendation to address the gap. The application of the CEP, called a CEP instance involves continual interaction and feedback with various other processes and stakeholders.

Stakeholders

CEP interacts with a number of stakeholders having different interests and roles: Decision-Makers, Solution Implementers, Capability Designers, Capability Users and Capability Enablers. Decision-Makers are the primary clients; they are triggering the CEP and have a vested interest in CEP results to make better-informed decisions. Solution Implementers are also clients using results; they have to implement parts of a solution described in the CEP products. Capability Designers (architects, engineers, analysts, etc.) are applying the process; they are interested in the method used to deliver the products. Capability Users are also directly involved; they are closely collaborating with the Capability Designers through the process. Capability Enablers are responsible for resources required to the Capability; they support Capability Designers and Capability Users work. In addition to this functional partitioning of stakeholders, there is an organizational partitioning that takes place. Most stakeholders are DND/CF but industry, other Government of Canada organizations (e.g. Treasury Board) and academia can also be involved in the different roles.

Inputs/Outputs

The main CEP Inputs and Outputs involve the key CEP stakeholders. These stakeholders either provide inputs, or produce or use outputs. The main input, the CEP Mandate, is provided by Decision-Makers. Other inputs include various guides and references such as strategic documents, departmental standards, policies and doctrine. The main CEP outputs, the Investment Options, supported by requirements and architecture descriptions, are worked out by Capability Designers collaborating with Capability Users and supported by Capability Enablers. These main CEP outputs are then used by Decision-Makers and Solution Implementers. Other outputs, such as Management documents and Requests for Information, facilitate the CEP effort.

Conception Principles

The basic building blocks of the CEP will be its principles, or shared set of basic truths, beliefs, values and assumptions about why and how the new process will be implemented within DND/CF.

The CEP principles are classified according to categories that reflect their high-level intent in the support of stated goals. The adjacent side bar shows the sixteen (16) principle statements grouped under the categories to which they belong.

Orientation principles align the CEP on sound theoretical basis issued from generally accepted practices in the areas of engineering, modeling and acquisition.

Communication principles normalize the vocabulary and information to be exchanged between the CEP and its internal and external environments.

Collaboration principles facilitate active and timely participation of all stakeholders involved in the engineering of a capability.

Adaptation principles provide the flexibility to ensure CEP responsiveness and perennity in a context of constant change.

Governance principles provide guidance to institutionalize the CEP including its continued assessment and evolution over time.

Orientation Principles

1. Capability Thinking
2. Architectures Models
3. Evolutionary Acquisition
4. Deliverable-Centricity
5. M&S Exploitation

Communication Principles

6. Normalized Formats
7. Common Terminology

Collaboration Principles

8. Collaborative Engineering
9. Information Sharing

Adaptation Principles

10. Agility
11. Tailorability
12. Tool Independence

Governance Principles

13. Enforced Roles & Responsibilities
14. Workflow Guidance
15. Continuous Improvement
16. Transformation Enabler

Sommaire

Le projet de définition, d'ingénierie et de gestion collaboratives de capacités (DIGCap) investit l'ingénierie des capacités (IC) pour supporter le processus de prise de décision de la Planification axée sur les capacités (PAC). L'approche courante ne rencontre plus l'évolution rapide des besoins d'affaires et la technologie. Elle ne supporte pas adéquatement la nouvelle approche orientée-capacités mise d'avant par le ministère de la Défense nationale et les Forces canadiennes (MDN/FC) ni la complexité croissante des systèmes de systèmes (SdS) qui lui est associée. À cette fin, un processus d'ingénierie des capacités (PIC) est proposé. Le développement du PIC est une entreprise majeure et complexe qui ne peut être accomplie sans l'étroite collaboration et l'endossement de nombreux acteurs ayant des besoins et intérêts variés. La stratégie retenue par l'équipe PIC pour résoudre cet enjeu consiste, dans un premier temps, à définir les caractéristiques fondamentales qui guideront le développement du PIC, puis de les faire valider avant de procéder à l'élaboration du processus. Ces caractéristiques fondamentales, décrites succinctement ci-après, concernent les buts, la portée, les parties intéressées, les intrants et extrants, ainsi que les principes de conception.

Buts poursuivis

L'institutionnalisation du PIC vise l'atteinte d'un but principal et de six buts secondaires tel qu'identifiés dans l'encart adjacent.

Le but principal met l'emphase sur la nécessité de supporter le processus de prise de décision concernant les investissements stratégiques en matière de capacité par le Comité des besoins des capacités interarmées (CBCI) et par l'équipe d'évaluation des capacités interarmées (EECI). Tous les buts secondaires pour leur part, supportent le but principal ou visent à rendre possible la transformation des processus de planification et d'acquisition des capacités pour les Forces canadiennes.

Portée

Une des premières choses à faire lors de la conception d'un processus, est de déterminer ses frontières. En

BUT PRINCIPAL

Permettre au CBCI et au EECI de prendre des décisions mieux éclairées concernant les investissements stratégiques en matière de capacités

BUTS SECONDAIRES

1. Réduire le risque associé à la prise de décision de CBCI et EECI
2. Permettre l'acquisition évolutive
3. Réduire le temps passé sur les phases d'Identification, Analyse d'Options et Définition du processus d'acquisition SGD
4. Faire le lien entre la planification axée sur les capacités (PAC) et l'acquisition des systèmes
5. Supporter l'agilité stratégique au niveau de la planification axée sur les capacités (PAC)
6. Améliorer la communication et la collaboration entre les différentes parties prenantes

utilisant les buts énoncés comme point de départ, l'équipe du PIC propose de positionner le PIC comme un processus interne aux activités de Planification axée sur les capacités (PAC), interagissant avec le processus de décision et les composantes du PRICIE impliquées dans la solution. Le PIC est un processus permettant d'analyser, de définir et de concevoir des solutions d'ingénierie utilisées pour résoudre un écart de capacité. Le PIC débute avec un écart de capacité et se termine avec la formulation d'un ensemble d'options d'investissement qui fourniront aux décideurs de MDN/FC un ensemble de solutions candidates et des recommandations en vue de résoudre l'écart de capacité. Au cours de ce processus, le PIC maintiendra une interaction soutenue ainsi qu'une rétroaction avec les différents processus et parties intéressées concernés.

Parties intéressées

Le PIC interagit avec un certain nombre de parties intéressées ayant divers intérêts et rôles : décideurs, implanteurs de solutions, concepteurs de capacités, utilisateurs de capacités et facilitateurs de capacités. Les décideurs sont les principaux clients; ils déclenchent le PIC et possèdent des intérêts particuliers en regard des résultats du PIC afin de prendre des décisions mieux éclairées. Les implanteurs de solutions sont aussi des clients utilisateurs de résultats; ils doivent implanter des parties de la solution décrite dans les produits du PIC. Les concepteurs de capacités (architectes, ingénieurs, analystes, etc.) appliquent le processus; il sont intéressés par la méthode utilisée pour livrer les produits du PIC. Les utilisateurs de capacités sont aussi directement impliqués; ils collaborent étroitement avec les concepteurs de capacités durant le déroulement du processus. Les facilitateurs de capacités sont responsables pour les ressources requises par la capacité; ils supportent le travail des concepteurs de capacités et des utilisateurs de capacités. En plus de ce découpage fonctionnel des parties intéressées, il existe également un découpage organisationnel. La plupart des parties intéressées appartiennent au Ministère de la défense ou aux Forces canadiennes, mais l'industrie, d'autres organisations gouvernementales canadiennes (ex : Conseil du trésor) et académiques peuvent également être impliquées dans les différents rôles.

Intrants/Extrants

Les principaux intrants et extrants concernent les principales parties impliquées. Ces parties sont soit fournisseurs d'intrants, produisent des extrants, ou sont des utilisateurs de ces extrants. Le principal intrant, le mandat, est fourni par les décideurs. D'autres intrants comprennent les différents guides et références tel que des documents stratégiques, les normes départementales, les politiques ou la doctrine. Les principaux extrants du PIC, les options d'investissement, supportées par la description des besoins et les architectures, sont développés par les concepteurs de capacités en collaboration avec les utilisateurs de capacités et supportés par les facilitateurs de solution. D'autres extrants, tel que les documents de gestion et des demandes d'information facilitent l'effort du PIC.

Principes de conception

Les éléments de base pour la construction du PIC sont ses principes, ou groupe de vérités partagées, croyances, valeurs et prémisses à propos du pourquoi et du comment le nouveau processus sera implanté au MDN/FC.

Les principes du PIC sont catégorisés selon leur intention première au regard du support des buts énoncés. L'encart adjacent montre ces seize (16) énoncés de principes regroupés selon leurs catégories respectives.

Les principes d'**orientation** alignent le PIC sur des bases théoriques solides émanant de pratiques généralement reconnues dans les domaines de l'ingénierie, de la modélisation et de l'acquisition.

Les principes de **communication** normalisent le vocabulaire et l'information devant être échangée entre le PIC et ses environnements interne et externe.

Les principes de **collaboration** facilitent la participation active et à temps de tous les parties intéressées impliquées dans l'ingénierie d'une capacité.

Les principes d'**adaptation** fournissent la flexibilité nécessaire à assurer sa réactivité et sa pérennité dans un contexte de changement constant.

Les principes de **gouverne** visent à instituer le PIC incluant son évaluation et son amélioration continue dans le temps.

Principes d'orientation

1. La « pensée capacités »
2. Architectures et modèles
3. Acquisition évolutive
4. Accent sur les biens livrables
5. Exploitation des technologies 'M&S'

Principes de communication

6. Formats normalisés
7. Terminologie commune

Principes de collaboration

8. Ingénierie collaborative
9. Partage de l'information

Principes d'adaptation

10. Agilité
11. Versatilité
12. Indépendant des outils

Principes de gouverne

13. Application des rôles et responsabilités
14. Guidage automatisé du processus
15. Amélioration continue
16. Transformationnel

List of changes

The following table presents the list of changes applied to the document since its original publication.

Date	Version	Description
17-Aug-2005	V1	Secondary Goals #1 relative to "tolerance to risk" has been reformulated
		Secondary Goal #3 relative to "reduction of acquisition time" has been reformulated
		The Principle relative to "Compliance to legal framework" has been removed due to its obvious nature
		Regarding CEP Output, the CEP does not deliver a capability through increments as stated in the original document; the CEP delivers a set of Transformation Options. Each option identifies projects and solutions to address a capability deficiency.
		Regarding CEP Scope, the CEP is not responsible to ensure the integration and interoperability of all systems required to fulfill a capability. However, it is assumed that a specific organizational entity will have this responsibility.
		Regarding CEP Scope, a CEP instance does not end when all systems required to correct the identified deficiencies or gaps have reached the required level or state. A CEP instance ends with the delivery of the Transformation Options document and its acceptance by the JCRB/PMB.
		Regarding CEP Scope, the CEP does not control and monitor the execution of the various materiel acquisition projects and non-materiel solutions in relation to a capability deficiency.
2-Feb-2006	2.0	Version 2 of the Foundations reflects the results from the validation of CEP V1 with various stakeholders including those from the workshops conducted in January and May 2005 with DGSP stakeholders.
		The expression "Capability Acquisition" was replaced by "Capability Generation".
		The Main Goal has been reformulated to replace PMB by JCAT.
		Secondary Goal #1 relative to "Tolerance to Risk" has been reformulated.
		Other Secondary Goals definitions have been slightly changed for clarification.
		The expression "Capability Deficiency" has been replaced by "Capability Gap".
		Graphics and descriptive texts have been updated to reflect new CEP Positioning.
		The CEP Stakeholders Figure has been removed.
		The Transformation Roadmap has been replaced by "Investment Options" in the graphic and textual description of CEP Outputs.
		The "Principles vs. Goals" matrix has been updated to reflect the removal of the principle relative to "Compliance to Legal Framework".

Table of contents

Abstract.....	ii
Executive summary.....	iii
Sommaire	vi
List of changes	ix
Table of contents.....	x
List of figures	xii
1. Introduction.....	1
1.1 Document Objective	1
1.2 Context.....	1
1.3 Overview.....	1
2. Process Goals.....	3
2.1 Main Goal	4
2.1.1 Improve the Joint Capability Requirements Board (JCRB) and Joint Capability Assessment Team (JCAT) Decision-Making.....	4
2.2 Secondary Goals	4
2.2.1 Reduce Risk	5
2.2.2 Enable Evolutionary Acquisition.....	5
2.2.3 Reduce Time	7
2.2.4 Link CBP to Acquisition.....	7
2.2.5 Facilitate Strategic Agility	8
2.2.6 Improve Communication and Collaboration.....	9
3. Process Scope.....	10
3.1 CEP: A Process within Capability-based Planning.....	10
3.2 Stakeholders.....	12
3.3 Inputs and Outputs	14
3.3.1 Inputs	14

3.3.2	Outputs.....	15
4.	Process Conception Principles.....	18
4.1	Categories.....	20
4.2	Orientation Principles.....	20
4.2.1	Capability Thinking.....	20
4.2.2	Architectures & Models.....	21
4.2.3	Evolutionary Acquisition.....	21
4.2.4	Deliverable-Centricity.....	22
4.2.5	M&S Exploitation.....	22
4.3	Communication Principles.....	23
4.3.1	Normalized Formats.....	23
4.3.2	Common Terminology.....	23
4.4	Collaboration Principles.....	24
4.4.1	Collaborative Engineering.....	24
4.4.2	Information Sharing.....	24
4.5	Adaptation Principles.....	25
4.5.1	Agility.....	25
4.5.2	Tailorability.....	25
4.5.3	Tool-Independence.....	26
4.6	Governance Principles.....	26
4.6.1	Enforced Roles & Responsibilities.....	26
4.6.2	Workflow Guidance.....	27
4.6.3	Continuous Improvement.....	27
4.6.4	Transformation Enabler.....	28
4.7	Summary of Strategic Implications.....	28
4.8	Relevance of Principles to Stated Goals.....	30
5.	Conclusion – The Way Ahead.....	32
6.	References.....	33
	List of Acronyms.....	34

List of figures

Figure 1: CEP Primary and Secondary Goals – Overview	3
Figure 2: Acquisition Approaches – Current and Proposed [7]	6
Figure 3: Focus of the goal on the first 3 phases of the DMS Acquisition cycle.....	7
Figure 4: CBP-Acquisition Relationship – Current and Proposed [8]	8
Figure 5: CEP Synoptic View	11
Figure 6: An example of Investment Option.....	12
Figure 7 CEP Inputs	14
Figure 8 CEP Outputs	16
Figure 9 Overview of CEP Conception Principles and associated Categories	19

List of tables

Table 1: Strategic Impacts.....	28
Table 2: Principles to Goals Relationships Matrix.....	30

1. Introduction

1.1 Document Objective

This document describes fundamental characteristics guiding the development of the Capability Engineering Process (CEP) to be considered by DND/CF in the near-term, to support Capability-based Planning (CBP) and the associate decision-making process.

1.2 Context

The DND/CF is in the early stages of fundamental changes in their strategic planning and management approach. These changes are driven by new world realities and by the imperatives of the Revolution in Military Affairs (RMA), which is affecting Canadian Forces as the ones of all allied nations. The impact of this new reality in the military world is the shift from threat-based to capability-based force structure planning, which better supports this new environment. To support the new capability-based approach, DND/CF have started to introduce in the last four-five (4-5) years a number of initiatives. These initiatives will bring new tools, frameworks and processes aiming to help DND/CF senior managers in their planning and management activities. In the context of the Collaborative Capability Definition, Engineering and Management Technological Demonstrator (CapDEM TD) project, the Capability-based Planning and Capability Generation are areas where the current processes and decision-making are being examined to better understand the situation and propose a CEP. The new CEP should promote and enforce a top-down capability-based decision-making as opposed to the current bottom-up approach that still collates the various requirements of the three Environmental Chiefs of Staff and retains a focus on specific equipment “platforms” rather than on capabilities. However, it is important to consider that problems, most of the time, pop up bottom-up. Therefore, even if the decisions regarding how to address problems should be taken with a top-down and capability-based approach, reporting of those problems will remain bottom-up.

1.3 Overview

Version 2 of the Foundations reflects the results from the validation of CEP V1 with various stakeholders including those from the workshops conducted in January and May 2005 with DGSP (Director General Strategic Planning) stakeholders. These workshops aimed to answer many of the following fundamental questions addressed in the next sections:

- What are the goals (objectives) of the CEP?
- What is the scope of the CEP? Where does it stand in relation to and how does it interact with the overall Planning and Capability Generation processes?
- What major deliverables must be produced?

- What major inputs will be required to produce those deliverables?
- What basic principles should be adopted to guide the development of the CEP?

2. Process Goals

The goals presented in this section were either derived from the CEP Team's understanding of the overall CapDEM objectives and/or from the major problems reported in the analysis of the current situation that was first first delivered on March 24, 2004 [1]. Goals have been adjusted to reflect comments issued from CEP validation workshops.

Figure 1 provides a synoptic view of retained goals.

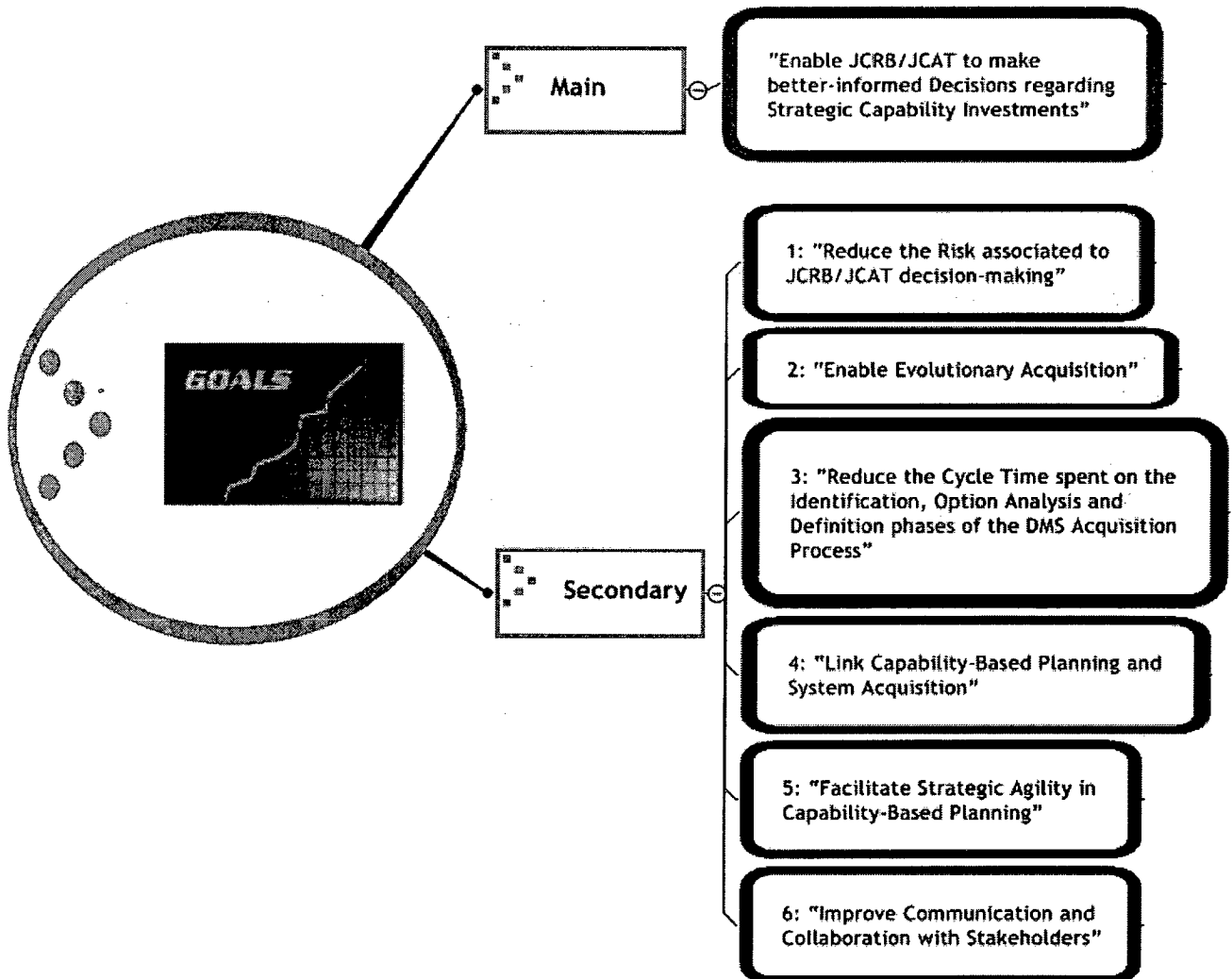


Figure 1: CEP Primary and Secondary Goals – Overview

2.1 Main Goal

2.1.1 Improve the Joint Capability Requirements Board (JCRB) and Joint Capability Assessment Team (JCAT) Decision-Making

The main goal of the CEP is as follows:

“Enable JCRB/JCAT to make better-informed Decisions regarding Strategic Capability Investments”

This goal emphasizes the need to support the decision-making process regarding capability requirements and related investment approvals. As pointed out by Pagotto and Walker in their paper on Capability Engineering [2], “the absence of a common view of the ‘as-is’ and ‘to-be’ problem space for capability areas, places defence acquisition decision-makers and processes at risk of being disconnected and potentially working at cross-purposes”. In support to this primary goal, the members of the Advisory Committee on Administrative Efficiency have stated in their report to the Minister of National Defence (MND) that the “transformation of Defence’s management structures and decision-making processes is an essential pre-requisite for transforming Canadian Forces (CF) structure and military capabilities, and for moving the Department to higher levels of administrative efficiency [4]”. The CEP will contribute to this goal by:

- Providing quality information (i.e. accurate, relevant, timely, usable, complete and precise);
- Supporting a holistic capability-centric definition process;
- Developing reusable architecture descriptions to express current, potential and preferred capability investment options; and
- Enforcing a common methodology to define and report on reliable and consistent capability metrics.

2.2 Secondary Goals

The following goal statements result from the consensual interpretation of the current and desired situations with regard to Capability Management and Capability Generation within DND/CF. Goals are listed in a sequence that does not necessarily reflect their order of importance or priority.

2.2.1 Reduce Risk

A secondary goal has been defined to address the cultural aversion of DND/CF decision-makers to risk:

“Reduce the Risk associated to JCRB/JCAT Decision-making”

The Advisory Committee on Administrative Efficiency has identified low risk tolerance as a contributing factor to the workload issue within National Defence Headquarters (NDHQ). More precisely, the Committee reported that “low tolerance to risk is exemplified by a ‘one size fits all’ approach in the capital expenditure approval process, and the organization’s tendency to manage by committee. Unfortunately, low risk tolerance runs counter to transformation and can inhibit innovation, suppress creativity and initiative, and elevate decisions to levels above which they should be made”. The CEP should contribute to reduce the risk by acting on the factors responsible for this structural deficiency, such as [4]:

- Undifferentiated approach to risk management;
- “Bottom-up” driven and environment-specific decision-making process that lacks strategic perspective;
- Persistent “Bottom-up” definition of requirements;
- Climate of internal competition for limited resources;
- Ongoing crisis in managing shortfalls; and
- Inadequate or missing supporting tools.

The CEP incremental, iterative and risk-driven approach will certainly contribute to reduce the risk associated to the decision-making process, first, by involving the decision-makers in various steps along the process itself and second, by proposing whenever appropriate incremental implementation plans in its Investment Options to progressively correct the capability gap over time

2.2.2 Enable Evolutionary Acquisition

This goal aims at supporting the transformation of the DND/CF acquisition process towards a more responsive model that is akin with the Strategic Agility imperative:

“Enable Evolutionary Acquisition”

It is widely accepted by Defence stakeholders that the current acquisition processes (in Canada and allied countries) are in dire need of reform to address their lack of agility [2].

Evolutionary Acquisition (EA) is emerging as the preferred acquisition approach within the military community mainly due to its ability to cope with change and address increasing levels of complexity (e.g. Systems of Systems). Figure 2, compares the acquisition approach (Single Step) in use today within CF and the evolutionary approach that better fits the highly dynamic and complex nature of the current Defence Environment.

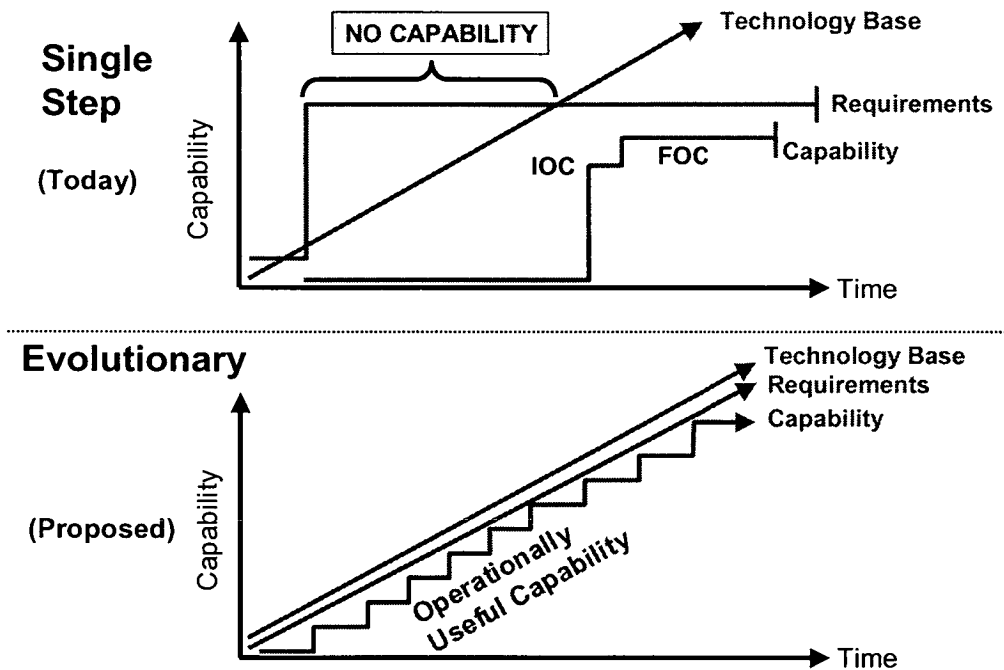


Figure 2: Acquisition Approaches – Current and Proposed [7]

According to a DND/CF source [3], Evolutionary Acquisition should be considered for all DND/CF projects that are complex and involve significant developments such as:

- Software-intensive systems;
- Systems using rapidly changing technology such as computer-based systems which require subsequent upgrading at substantial cost;
- Systems where humans with different experience and competencies are an integral part of the resulting environment where they may detect shortcomings and request modifications or system enhancements;
- Unprecedented systems where the users have difficulty identifying requirements due to a lack of past experience or knowledge with similar systems; and
- Operational needs which dictate that a limited capability (i.e. Initial Operational Capability - IOC) is required early.

CEP will support EA by proposing whenever appropriate incremental implementation plans in its Investment Options to progressively correct the capability gap over time.

2.2.3 Reduce Time

A secondary goal has been defined to address the need for the CEP to contribute to the reduction of the time spent in the first phases of the Acquisition cycle. It is stated as follows:

“Reduce the Cycle Time spent on the Identification, Option Analysis and Definition Phases of the DMS Acquisition Process”

This goal is in line with the objective of the acquisition reform to shorten the Acquisition cycle by at least thirty percent (30%). As already indicated in the description and assessment of the current DND Capability decision-making process [1], the highest reduction potential lays in the first phases of the DMS acquisition process, which means the preparation and approval of the Synopsis Sheet – Identification section (SS(ID)), Synopsis Sheet – Preliminary Project Approval section (SS(PPA)), Synopsis Sheet – Effective Project Approval section (SS(EPA)), and all supporting documents. As shown in Figure 3, the steps that precede the Implementation phase represent on an average, more than ninety-three (93) months for major and large acquisition projects.

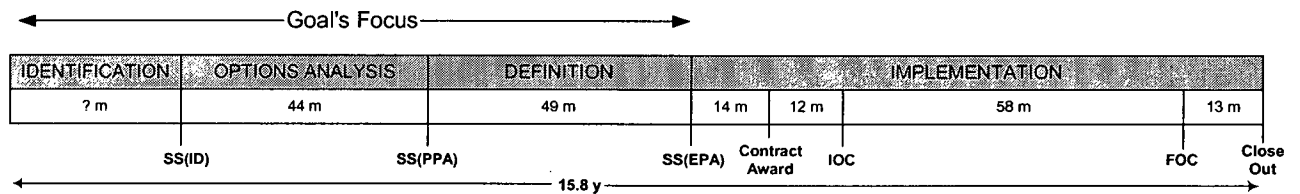


Figure 3: Focus of the goal on the first 3 phases of the DMS Acquisition cycle

The CEP will help to reduce the time spent on these phases by providing to projects reusable and relevant architecture products developed during execution of a CEP instance.

2.2.4 Link CBP to Acquisition

The following goal addresses the need to systematize the capability development process:

“Link Capability-Based Planning and System Acquisition”

The intent of this goal is to implement a systematic link between the conceptualization of a capability and the detailed definition and design of the component systems that enable that capability. Moreover it aims at implementing a collaborative engineering process and environment where trade-off analysis can be conducted across a portfolio of capabilities and

systems. Figure 4 depicts the current and desired situations regarding this CBP-Acquisition relationship.

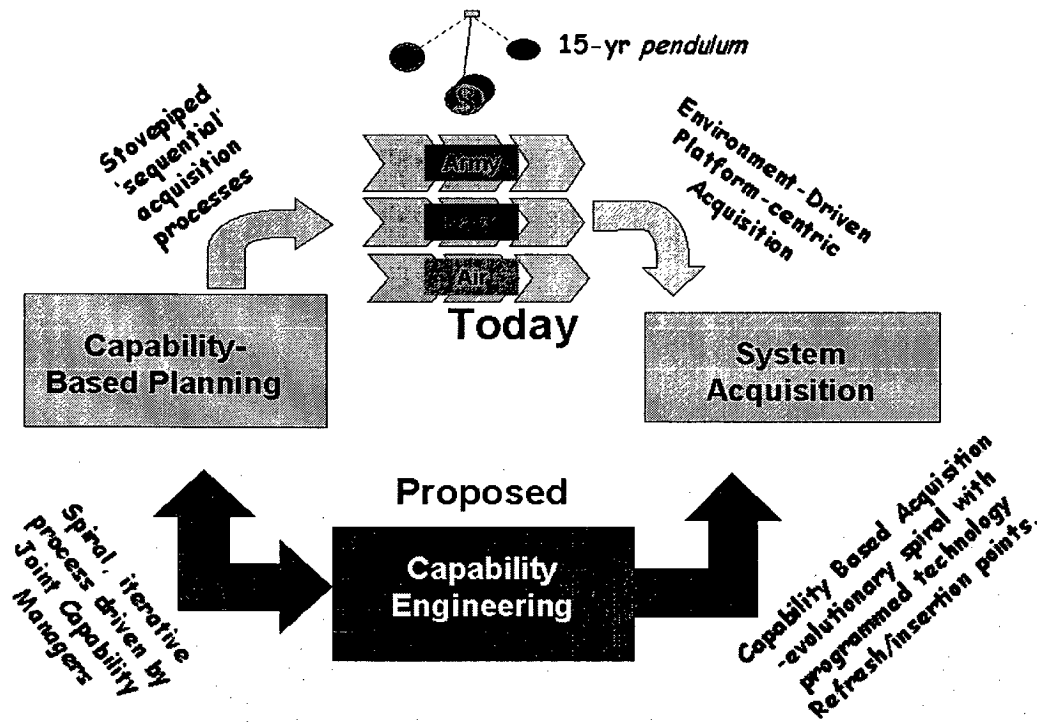


Figure 4: CBP-Acquisition Relationship – Current and Proposed [8]

The proposed CEP aims to improve the capability generation process through engineering by linking the CBP objectives to the system-centric acquisition projects.

2.2.5 Facilitate Strategic Agility

The next goal aims at providing the ability to support a reduced timescale for Defence Strategic Planning:

“Facilitate Strategic Agility in Capability-Based Planning”

“Strategic Agility can be defined as the ability to anticipate and plan to deal with future events, trends, problems and opportunities for the accomplishment of the vision. Being strategically agile enables organizations to transform their strategy depending on the changes in their environment” [3]. “A process with increased agility would be able to redirect priorities in the capability evolution plan on a much shorter time frame than is possible today. The CEP needs to quickly respond to a rapidly changing environment that may require more frequent adjustments to strategic objectives than has traditionally been seen” [2].

By using an incremental/iterative approach, the CEP will certainly facilitate Strategic Agility by giving the opportunity to introduce changes or to adjust to the situation as needed.

2.2.6 Improve Communication and Collaboration

The last secondary goal concerns relationships with stakeholders:

“Improve Communication and Collaboration with Stakeholders”

The success of the CEP depends to a great extent on the active collaboration of various actors. All organizational units within DND that are involved in the definition and refinement of requirements, and/or in the definition of an optimal solution to any given capability gap must participate. The collaboration of other Canadian Government organizations (e.g. Treasury Board, Public Works) that are involved in the approval and procurement processes is also very important. The success also depends on the timely contribution of Industry, Academia and other Government Research organizations for the innovative application of new technology and fundamental research to improve DND/CF capabilities. The CEP should contribute to this goal by implementing a collaborative engineering process and environment that will provide the necessary distributed communications infrastructure, formal workflow procedures, roles and responsibilities, and shareable knowledge base.

3. Process Scope

The purpose of this section is to:

- Identify the CEP boundaries;
- Identify the relationships with other processes such as Capability-Based Planning and the processes managing the projects within each of the PRICIE components;
- Identify where the CEP stands within the whole planning and capability generation processes i.e. when it starts and when it finishes;
- Identify the CEP inputs and outputs; and
- Gain agreement from all stakeholders regarding the scope.

Clarifying the CEP scope and limitations helps to establish realistic expectations of the many stakeholders. It also provides a reference against which the process activities will be defined, the roles and responsibilities will be determined and the deliverables will be identified.

- Section 3.1 presents a synoptic view of the CEP. To summarize, the CEP is a process for analysing, defining and developing the engineering solutions used to address a capability gap. The CEP starts with a prioritized capability gap and ends with the definition of a set of Investment (divestment) Options aimed at providing the DND/CF Decision-Makers with a set of candidate solutions and recommendation to address the gap. During this process, the CEP will have continual interaction and feedback with various processes and stakeholders.
- Section 3.2 introduces the main stakeholders who may eventually be involved in the CEP. These stakeholders represent DND/CF capability managers and decision-makers but also the defence R&D community, Concept Development and Experimentation (CD&E), Industry, Academia, Treasury Board Secretariat, etc. All of these stakeholders are potential CEP information providers and/or consumers.
- Section 3.3 identifies the CEP inputs and outputs.

3.1 CEP: A Process within Capability-based Planning

Figure 5 shows that CEP is a process fitting within the CBP activities. It is used to support the DND/CF decision-making process regarding investments in terms of Personnel, Research & development, Infrastructure & organization, Concept, Doctrine & Training, Information management, and Equipment, supplies & services to address a capability gap.

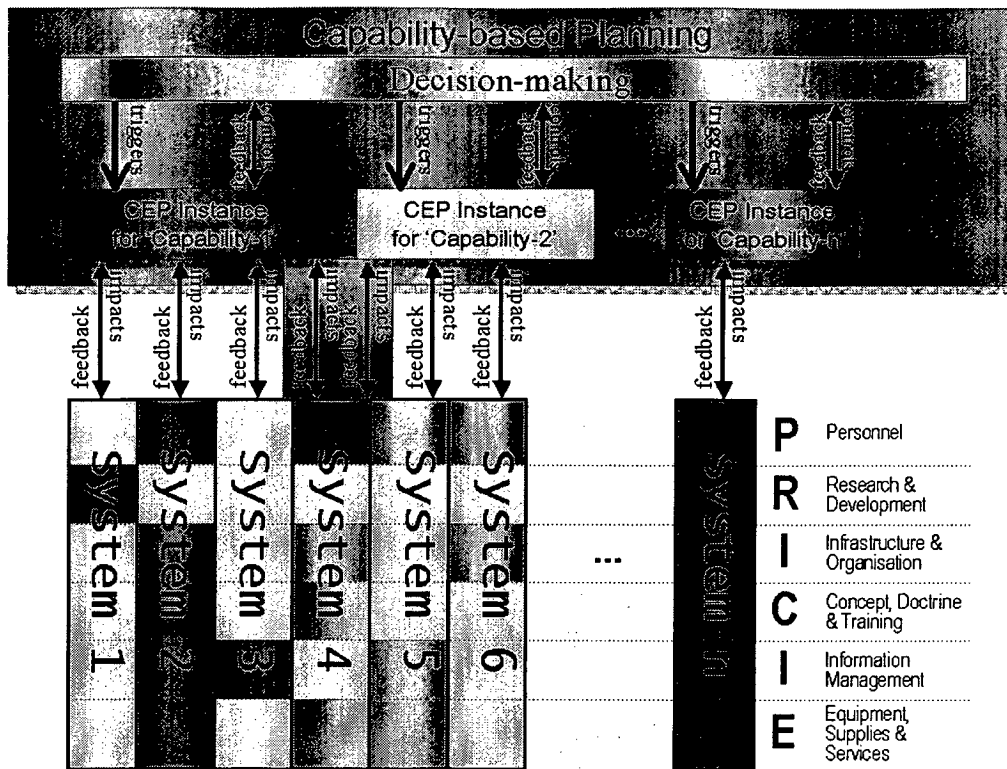


Figure 5: CEP Synoptic View

The above diagram shows the following points:

- **Single Capability:** CEP is about a single capability while CBP is about a set of capabilities;
- **Triggering Event:** CBP triggers a CEP instance through a decision at the JCRB/JCAT level;
- **Concurrency:** Multiple CEP instances can execute in parallel;
- **PRICIE Solutions:** A solution may involve any combination of the PRICIE components i.e. not limited to Acquisition-based projects;
- **System:** A System is a grouping of personnel, materiel, facilities (real property, installations and utilities), and procedures that contribute to a given capability on one or several PRICIE components;
- **Multiple Systems:** Multiple systems (a system of systems) can be involved in one capability;
- **System Sharing:** A system can be involved in one or more capabilities;
- **System Feedback:** The CEP gets feedback and project status information from various materiel acquisition projects including non-materiel solutions;
- **CBP Feedback:** The CEP communicates to the CBP the potential capability investment options including a recommendation; and

- **CBP Control:** CBP controls the CEP through appropriate decision gates.

CEP Output: the Investment Options

The Investment Options are the result of the execution of CEP management and engineering processes used to analyse, develop and recommend an integrated operational and system of systems architecture with regard to the capability gap being addressed. Figure 6 is a graphical representation and an example of an option defined by the CEP.

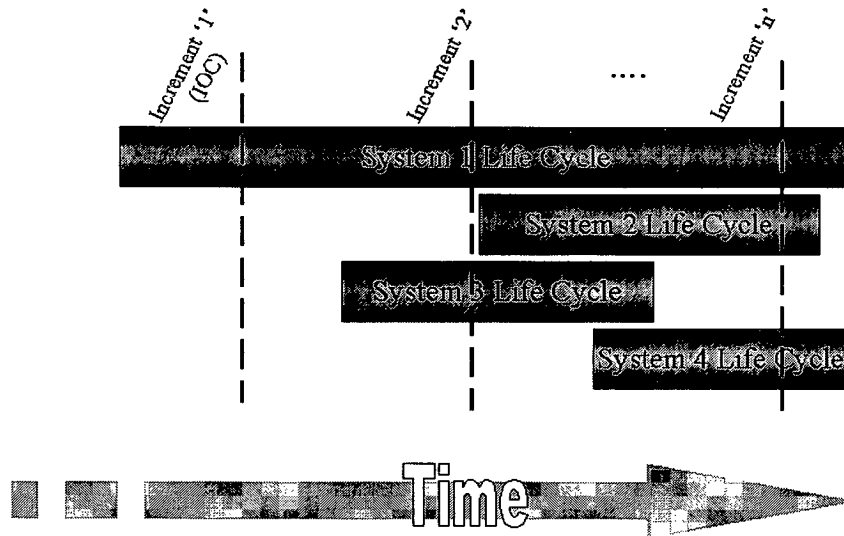


Figure 6: An example of Investment Option

The key elements of Figure 6 are:

- **Incremental Delivery:** The CEP may provide incremental implementation plans in its Investment Options to progressively correct the capability gap over time. The number of increments from one option to another may vary (a single increment is also possible if multiple releases are not required to adequately address the gap);
- **System Life-cycles:** Multiple systems (a SoS) can be involved in one capability, each being at different stages of their respective life-cycles; and

3.2 Stakeholders

During its execution, the CEP interacts with a number of stakeholders who have different interests or a roles. Stakeholders include DND/CF authorities who may trigger the CEP, mandate the CEP, support the CEP, make or influence decisions, monitor the CEP, and provide information. Stakeholders also include external entities, such as industry, academia and allies, that may collaborate in the CEP execution by providing external advice, studies, proofs of concepts, technological demonstrators, and prototypes. The collaboration of other

Canadian Government organizations (e.g. Treasury Board, Public Works) that are involved in the approval and procurement processes is also important. One CEP principle is to institute a collaborative engineering environment (CEE) to share information with all those internal and external partners

Capability-Based Planning triggers the initiation of a CEP instance and provides strategic guidance during the whole duration of the CEP. A CEP instance will provide feedback to the CBP during its evolution.

The **Capability Manager** provides the mandate to start a specific CEP instance and fulfills a management and governance role.

The CEP interacts with **PRICIE stakeholders** regarding materiel and non-materiel components. CEP feeds the relevant PRICIE components by providing such products as integrated architecture models, requirements, simulation results, interface specifications, recommendations, etc. The PRICIE components will provide feedback in terms project status information to the CEP. Existing models or architecture designs may also be provided.

The **JCRB** and **JCAT** decision will be required at key points during the CEP. These decisions may deal with approving recommended or interim capability designs and the corresponding investment options being analysed.

R&D, CD&E, MA&S may support the CEP by providing expertise, concept definitions, state-of-the-art reports, specific study reports, models, experimentations, technological trends, etc. In the collaborative environment the CEP data will be made available to internal partners like the R&D community and the CD&E.

The Minister of National Defence (**MND**) will be involved in the decision-making process regarding strategic and major crown initiatives.

The Treasury Board Secretariat (**TBS**) and Public Works and Government Services Canada (**PWGSC**) provide policies and guidelines that may have an impact on the CEP activities and nature of deliverables. Their role with respect to the CEP will be determined during the subsequent steps of the CEP development.

The Vice Chief of the Defence Staff (**VCDS**) is the owner of the CEP. It provides relevant strategic information to each CEP instance (ex. Strategic Capability Investment Plan, force planning scenarios, defence strategies and white papers).

As stated above **Academia, Allies** and **Industry** may collaborate with the CEP by proposing solutions, providing external advice, studies, proofs of concepts, technological demonstrators, prototypes, etc. In the collaborative environment the CEP data will be made available to authorized external partners.

Other stakeholders may collaborate with the CEP (for example, for non-materiel solutions, relevant organization(s) will interact with the CEP). They will be identified as needed as the CEP develops and evolves.

3.3 Inputs and Outputs

This section presents two diagrams, one illustrating the CEP Inputs and the other illustrating the CEP Outputs¹. This information complements the discussion on Stakeholders in Section 3.2 and provides additional information on relationships between them.

3.3.1 Inputs

Figure 7 identifies the CEP inputs. The list is not exhaustive but is representative of what is believed to be the most important inputs of the CEP that were identified during the workshops.

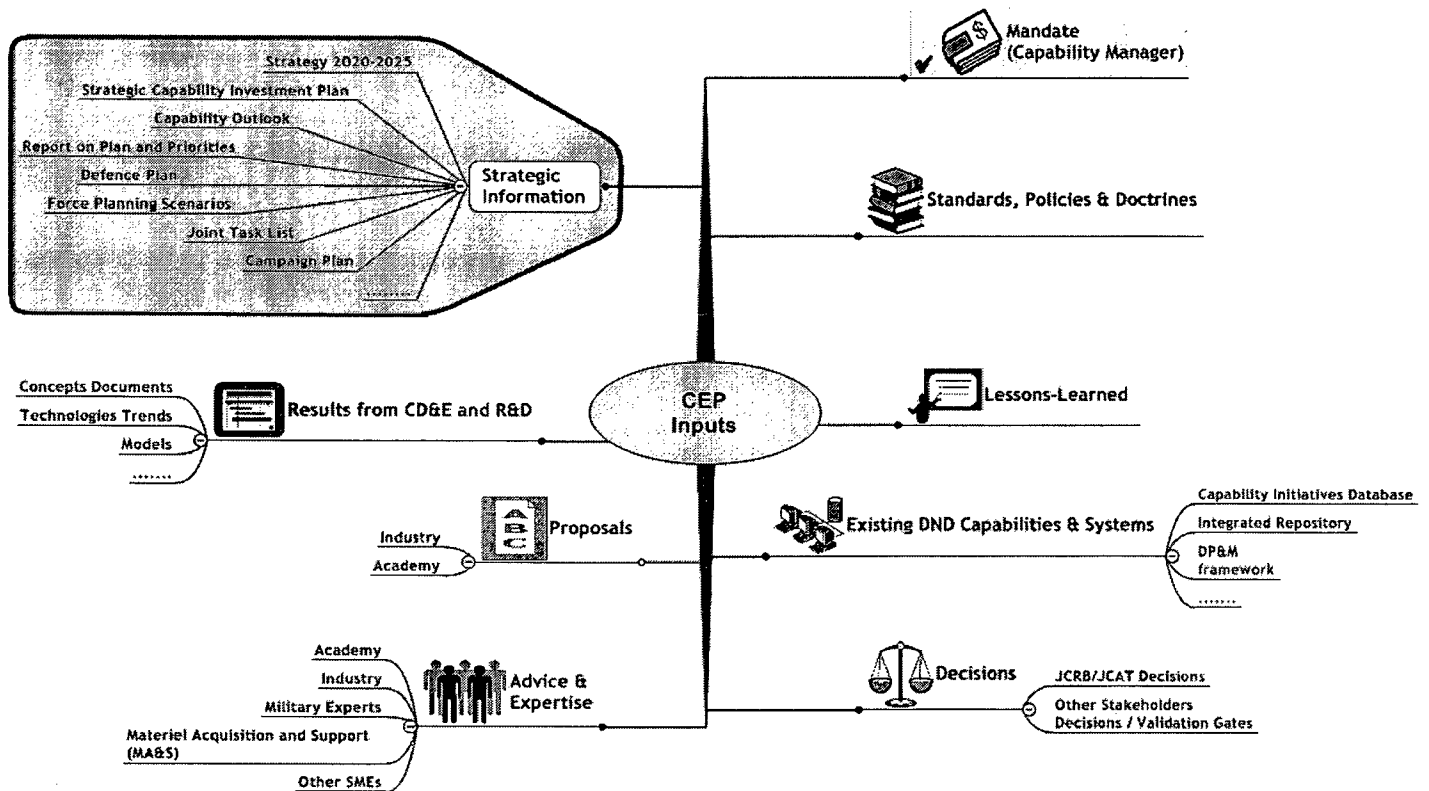


Figure 7 CEP Inputs

➤ CEP Instance Mandate

The CEP will start with a clear mandate from the capability manager. The mandate should describe at a minimum the gap in capability that is to be filled and identify the relative constraints (funding, resources, timeframe, etc.).

¹ The reader should note that the CEP Inputs and Outputs identified here are those applying to a CEP instance during its execution and not to the development of the CEP itself.

➤ *Strategic Information*

Various documents and models prepared at the capability-based planning level should be used as a basis for the CEP. In particular, the Campaign Plan provides the context and a baseline source of information for the development of a capability.

➤ *Standards, Policies and Doctrines*

Military doctrine and existing policies imposed by DND/CF or other external stakeholders and regulating bodies (e.g. TBS) should guide the process. Conversely, potential solutions may recommend changes to policies and doctrine to meet capability needs.

Without necessarily complying to them, some standards will provide useful information for a CEP instance. (e.g. ISO/IEC 15288-System Life Cycle Processes).

➤ *Lessons-learned*

Lessons-learned should be captured during a CEP instance execution and made available to other subsequent CEP iterations and even to other CEP instances.

➤ *Existing DND/CF Capabilities, Systems and Models*

Existing capabilities, systems, databases, including architecture models and frameworks are potential inputs to a CEP instance. Examples include the Capability Initiative Database, the Common Repository (to be defined for the Collaborative Environment), and the Defence Management System (DMS).

➤ *Decisions*

Decisions are required at different levels during a CEP execution. The key decision points (e.g. approval of recommended option(s)) involve the participation of the JCRB and JCAT. Other stakeholders may potentially be involved in the decision process (e.g. decisions to be taken at various validation gates during the process).

➤ *Other inputs: Proposals, Advices, Expertises, ... etc*

The CEP can leverage the expertise of DND/CF organizations (R&D; CD&E; MA&S) and external partners to identify enhancements to an existing capability or to propose solutions to develop a new capability. Solicited or non-solicited proposals coming from academia or industry are also potential inputs to the CEP.

3.3.2 Outputs

Figure 8 identifies the CEP Outputs. As with inputs, the list is not exhaustive and may change as the CEP is further developed.

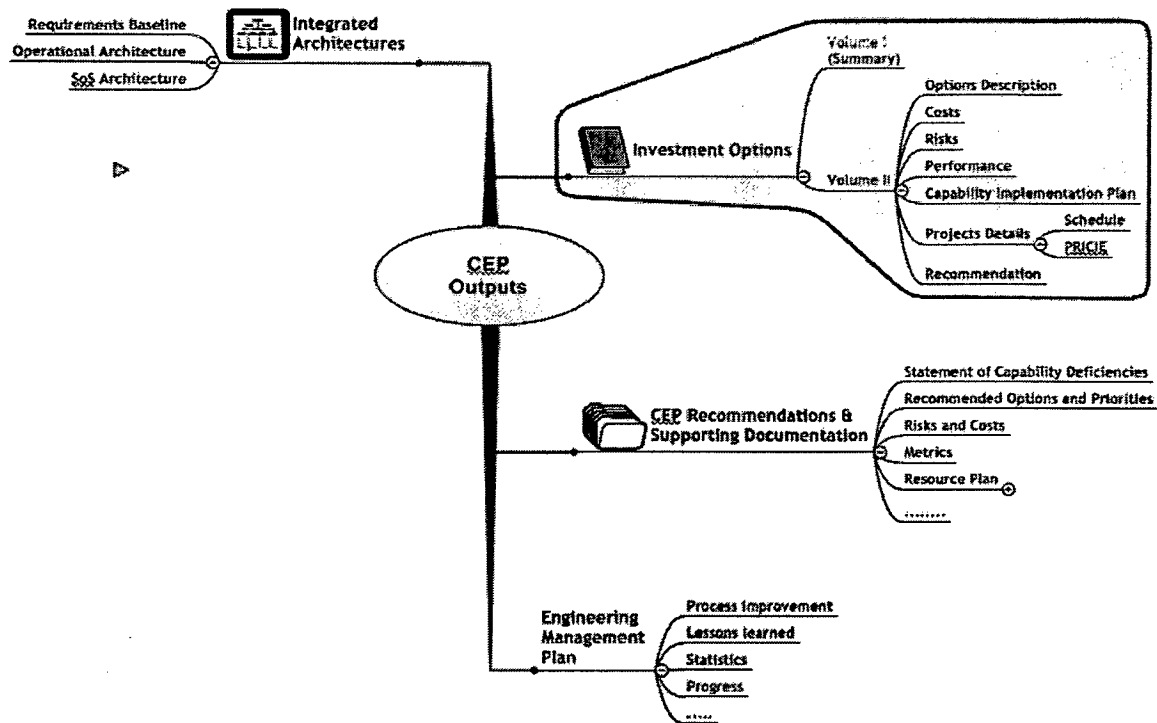


Figure 8 CEP Outputs

➤ **Integrated Architectures**

Important CEP outputs are the *Integrated Architectures* (As-Is and To-Be) depicting such information as requirements, engineering models and interface specifications of the capability gap being addressed. The capability solution most of the time corresponds to many interdependent systems that evolve individually. At the CEP level, these systems are to be considered as a whole.

➤ **CEP Supporting Documentation**

The CEP will provide to JCRB/JCAT and other stakeholders if needed various documents in order to help their decision-making processes. The information may include the results (e.g. simulations) and metrics issued from the option analysis, the associated risk and cost elements and other meaningful diagrams and models aiming to help the decision-making.

➤ **CEP Engineering Management Plan**

The Engineering Management Plan is produced as a CEP instance is initiated and it evolves as the CEP instance evolves. The report contains CEP Instance management information (ex. resources, CEP instance status, risk identification and management, configuration management, etc.). Lessons-learned from a CEP instance may also be recorded and used to improve the process itself.

➤ *Investment Options*

The Investment Options documents the results of the analysis of all options being considered for the resolution of the capability gap being addressed, including a recommendation. The Investment Options is presented in two (2) volumes. Volume I is addressed to decision-makers, it is a summary of the detailed options described in Volume II. Volume II as well as the supporting documentation is made available to decision-makers as needed. Volume II which provides the detail of the projects (estimated costs and schedules) managed across all of the PRICIE components should be reused at the projects level i.e those relative to the recommended option.

4. Process Conception Principles

Process conception principles are the “descriptive, nonquantitative companion to process objectives (goals) and constitute a vision of process operation in a future state” [5]. The basic building blocks of the CEP will be its principles, or shared set of basic truths, beliefs, values and assumptions about why and how the new process will be implemented within DND/CF. Since these guiding principles will be used to drive process conception decisions, special effort has been made to make sure they are comprehensive and intelligible to CEP stakeholders.

Each principle is described with four (4) components:

- a **Name** to be used as a quick reference (i.e. in Figure 9 below);
- a formal **Statement** beginning with the expression “The CEP shall”;
- an **Intent** expressed as an open list of basic reasons justifying its adoption; and
- **Implications** expressed as an open list of impacts stemming from its adoption.

Figure 9 on the next page provides an overview of retained principles together with the categories to which they belong.

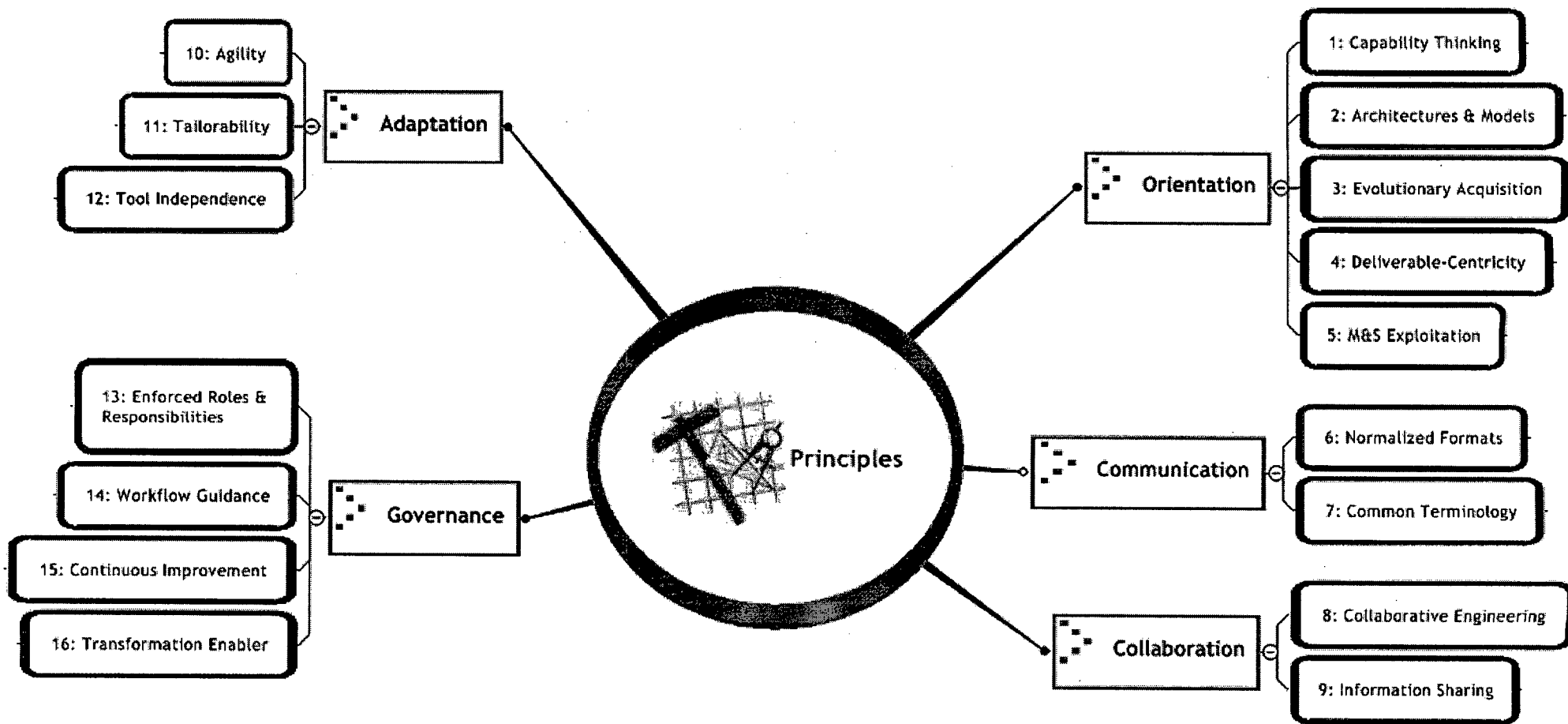


Figure 9 Overview of CEP Conception Principles and associated Categories

4.1 Categories

In order to facilitate comprehension, the CEP core team has chosen to classify the retained principles according to categories that reflect their high-level intent in support of the stated goals:

- **Orientation** principles align the CEP on sound theoretical basis issued from generally accepted practices in the areas of engineering, modeling and acquisition;
- **Communication** principles aim at normalizing the vocabulary and information that will be exchanged between the CEP and its internal and external environments;
- **Collaboration** principles reflect CEP intent to facilitate active and timely participation of all internal and external stakeholders who are involved in the engineering of a capability;
- **Adaptation** principles provide the CEP with the flexibility that is required to ensure its responsiveness and perennity in a context of constant change;
- **Governance** principles provide guidance regarding the institutionalization of the CEP, including its continuous assessment and evolution over time.

4.2 Orientation Principles

4.2.1 Capability Thinking

Statement 1:

“The CEP shall apply Capability Thinking”

Intent:

- To manage Emergent Requirements and Capabilities.

Implications:

- Will require sophisticated Configuration and Portfolio Management to address multi-project dependencies;
- Will require multi-project Requirements and Capabilities Allocation and Traceability;

- Will require consideration of other Capabilities and their component Systems; and
- Will require the application of PRICIE-Based Analysis.

4.2.2 Architectures & Models

Statement 2:

“The CEP shall be Architecture-Based and Model-Driven”

Intent:

- To capitalize on innovation from across government and Industry by better articulating the capability problem space [2].

Implications:

- Will require models to be kept for reuse; and
- Will require to mandate the use of a common Architecture Framework;

4.2.3 Evolutionary Acquisition

Statement 3:

“The CEP shall enable an Evolutionary Acquisition Approach”

Intent:

- To introduce innovation (new technologies and capabilities) throughout the acquisition cycle.

Implications:

- Will require adoption of an iterative/incremental development approach at a capability and individual project level [3];
- Capability increments should be synchronized with capability planning cycles and account for changes they may introduce;
- The determination of what content to define for each increment shall be based on risk; and

- The definition content of any given increment may consider a subset of materiel and PRICIE Components that differ from those of other increments.

4.2.4 Deliverable-Centricity

Statement 4:

“The CEP shall be Deliverable-Centric rather than Activity-Centric”

Intent:

- To “Not reinvent the wheel”, a lot of process standards already exists;
- To allow more freedom in working methods; and
- To minimize effort for CEP development and maintenance.

Implications:

- Will require a clear description of expected deliverable content; and
- May require approval of methods (proprietary or public) to be used to produce the deliverables.

4.2.5 M&S Exploitation

Statement 5:

“The CEP shall efficiently exploit M&S Technologies”

Intent:

- To reduce development Risk and Cost.

Implications:

- Will require adjustments to current engineering practices; and
- Will require focus on integration and interoperability.

4.3 Communication Principles

4.3.1 Normalized Formats

Statement 6:

“The CEP shall use Normalized Formats for Inputs and Outputs”

Intent:

- To facilitate interpretation of results; and
- To reduce delays and/or effort by preventing translation workload.

Implications:

- The CEP may need to impose new exchange standards (e.g. templates for inputs, deliverables and metrics); and
- Inputs and Deliverables may need to be adjusted to react to formats/standards imposed by external organisations such as Treasury Board or Industrial consortium.

4.3.2 Common Terminology

Statement 7:

“The CEP shall establish a Common Terminology”

Intent:

- To facilitate common understanding between stakeholders.

Implications:

- May require adopting externally generated terminology; and
- May impact current procedures.

4.4 Collaboration Principles

4.4.1 Collaborative Engineering

Statement 8:

“The CEP shall institute Collaborative Engineering”

Intent:

- To prevent isolation and development of “stovepipe” systems; and
- To promote efficient collaboration at all levels between all stakeholders.

Implications:

- May require compliance with engineering and open technology standards to ensure interoperability;
- Collaboration with partners may require technology integration;
- Will require the CEP to be workflow-driven and based on established roles and responsibilities; and
- Will require the formal establishment and application of the IPT concept.

4.4.2 Information Sharing

Statement 9:

“The CEP shall institute an Information Management Strategy”

Intent:

- To allow access and sharing of data managed by External and Internal Partners’ as required with respect of proper authorization; and
- To allow authorized partners, Internal and External, to access and share CEP data as required.

Implications:

- Will require a common knowledge base (Repository) containing reusable architecture components;
- Will require secure network interconnections; and
- Will require mutual agreements with external partners.

4.5 Adaptation Principles

4.5.1 Agility

Statement 10:

“The CEP shall provide Efficient and Agile means to respond to Change”

Intent:

- To account for Operations Feedback and Lessons Learned;
- To adapt to Geopolitical Context Evolution; and
- To leverage Technology Opportunities originating from Industry, Academia and other Government research organizations.

Implications:

- Will require risk-based depth of analysis at business and technology levels.

4.5.2 Tailorability

Statement 11:

“The CEP shall be Tailorable”

I

Intent:

- To adapt to the variety of capability to be addressed.

Implications:

- Will require flexible main and alternate process flows;
- The deliverable level of detail (business, technical) should be based on risks (schedule, quality, cost); and
- Deliverables templates will have to include directives for usage adapted to the context.

4.5.3 Tool-Independence

Statement 12:

“The CEP shall not mandate any specific Toolset”

I
Intent:

- To satisfy the variety of tool functionalities needed by user; and
- To prevent technology lock-in with tools currently in use.

Implications:

- A policy should limit tool variety to minimize training and support; and
- Selected tools will have to be flexible enough to support specific DND/CF-defined data exchange formats

4.6 Governance Principles

4.6.1 Enforced Roles & Responsibilities

Statement 13:

“The CEP shall define and enforce Roles & Responsibilities”

Intent:

- To ensure accountability.

Implications:

- May require formalization and adjustments to current roles & responsibilities regarding engineering and approval processes.

4.6.2 Workflow Guidance

Statement 14:

“The CEP shall provide Workflow Guidance”

Intent:

- To bring rigour and repeatability to the process (i.e. institutionalization).

Implications:

- May require formalization and adjustments to current engineering and approval procedures; and
- May require the acquisition and integration of a workflow engine into the collaborative engineering environment.

4.6.3 Continuous Improvement

Statement 15:

“The CEP shall devise and implement Continuous Improvement Mechanisms”

Intent:

- To ensure process perennity; and
- To ensure continuous improvement of process performance.

Implications:

- Will require that assessment mechanisms and measures be defined and applied.

4.6.4 Transformation Enabler

Statement 16:

“The CEP shall be Transformational”

Intent:

- To enable the shift from a service-driven platform-centric defence acquisition process to a capability-managed approach [2]; and
- To support the strategic re-orientation process currently ongoing within DND/CF in response to anticipated or tangible change to Canada’s security environment [6].

Implications:

- Requires strong and sustained leadership (departmental and political);
- Requires a sound change management strategy;
- May require adjustments to existing policies; and
- Requires that appropriate mechanisms be present to allow responsiveness to cyclical and non-cyclical changes issued from CBP.

4.7 Summary of Strategic Implications

The implications listed in the preceding sections are in no way exhaustive and will continue to be enriched throughout the CEP development process. Moreover, some of these implications are perceived as having a strategic impact requiring high Management attention. These implications are summarized in Table 1 below:

Table 1: Strategic Impacts

<p>Principle 3: “The CEP shall enable an Evolutionary Acquisition Approach”</p>
<ul style="list-style-type: none">• Requires adoption of an iterative/incremental development approach at a capability and individual project level.
<p><i>Principle 6: “The CEP shall use Normalized Formats for Inputs and Outputs”</i></p>

<ul style="list-style-type: none"> • The CEP may need to impose new exchange standards (e.g. templates for inputs, deliverables and metrics).
<p>Principle 9: “The CEP shall institute an Information Management Strategy”</p>
<ul style="list-style-type: none"> • Will require mutual agreements with external partners
<p>Principle 12: “The CEP shall not mandate any specific Toolset”</p>
<ul style="list-style-type: none"> • A policy should limit tool variety to minimize training and support
<p>Principle 13: “The CEP shall define and enforce Roles & Responsibilities”</p>
<ul style="list-style-type: none"> • May need formalization and adjustments to current roles & responsibilities regarding engineering and approval processes
<p>Principle 14: “The CEP shall provide Workflow Guidance”</p>
<ul style="list-style-type: none"> • May require formalization and adjustments to current engineering and approval procedures
<p><i>Principle 16: “The CEP shall be Transformational”</i></p>
<ul style="list-style-type: none"> • Requires a sound change management strategy
<ul style="list-style-type: none"> • May require adjustments to existing policies
<ul style="list-style-type: none"> • Requires that appropriate mechanisms be present to allow responsiveness to cyclical and non-cyclical changes issued from CBP

4.8 Relevance of Principles to Stated Goals

Table 2 shows how the CEP Conception principles directly or indirectly support the secondary goals introduced in Section 2 of this report. Secondary goals implicitly support the main goal. As it can be seen, all goals are correctly addressed, and conversely, all principles are relevant.

Table 2: Principles to Goals Relationships Matrix

PRINCIPLES \ GOALS	REDUCE CYCLE TIME	LINK CBP TO ACQUISITION	FACILITATE STRATEGIC AGILITY	ENABLE EVOLUTIONARY ACQUISITION	REDUCE RISK	IMPROVE COMMUNICATION AND COLLABORATION
ORIENTATION						
CAPABILITY THINKING		√				
ARCHITECTURES AND MODELS					√	√
EVOLUTIONARY ACQUISITION	√		√	√	√	
DELIVERABLE-CENTRICITY	√		√		√	√
M&S EXPLOITATION	√				√	
COMMUNICATION						
NORMALIZED FORMATS	√				√	√
COMMON TERMINOLOGY	√				√	√

PRINCIPLES \ GOALS	REDUCE CYCLE TIME	LINK CBP TO ACQUISITION	FACILITATE STRATEGIC AGILITY	ENABLE EVOLUTIONARY ACQUISITION	REDUCE RISK	IMPROVE COMMUNICATION AND COLLABORATION
COLLABORATION						
COLLABORATIVE ENGINEERING		√			√	√
INFORMATION SHARING	√	√	√		√	√
ADAPTATION						
AGILITY	√		√	√	√	
TAILORABILITY	√		√			
TOOL-INDEPENDENCE			√	√		√
GOVERNANCE						
ENFORCED ROLES & RESPONSIBILITIES	√	√	√	√	√	√
WORKFLOW GUIDANCE	√	√	√	√	√	√
CONTINUOUS IMPROVEMENT	√					
TRANSFORMATION ENABLER	√	√	√	√		

5. Conclusion – The Way Ahead

The foundations contained in this document reflect the results as gathered through interviews and workshops with various DND stakeholders regarding their perspectives on CEP scope, key terms and assumptions.

Many questions set in the original Foundations document (V1.0), have now been answered. The key elements resulting from these discussions are:

- **CEP Positioning** - the CEP is now positioned within CBP and not as a process sitting outside, between CBP and Acquisition processes;
- **JCAT role** - JCAT becomes an actor, participating in the decision-making process and performing the role of Capability Manager;
- **CEP Input.** A Capability Gap becomes a trigger for a CEP instance. It replaces the original Capability Deficiency as stated in the first foundations document;
- **CEP Output.** The CEP does not deliver a capability through increments as stated in the original document, the CEP delivers a set of Investment Options. Each option identifies PRICIE projects to address a capability gap; and
- **CEP Scope.** A CEP instance ends with the delivery of the Investment Options document and its acceptance by the JCRB/JCAT. Therefore, the CEP does not control and monitor the execution of the various materiel acquisition projects and non-materiel solutions in relation to a specific option.

CEP Foundations is a living document that evolves as the CEP is validated and challenged through workshops and experimentation. It is believed that following the release of CEP V2, feedback will undoubtedly trigger changes to underlying foundations and a revised version of the document will be produced to guide the development of the next version of the CEP.

6. References

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List of Acronyms

CADM	Core Architecture Data Model (DoD Standard for DoDAF)
CapDEM	<u>C</u> ollaborative <u>C</u> apability <u>D</u> efinition, <u>E</u> ngineering and <u>M</u> anagement
CBP	Capability-Based Planning
CD&E	Concept Development & Experimentation
CE	Capability Engineering
CEE	Collaborative Engineering Environment
CEP	Capability Engineering Process
CF	Canadian Forces
CGP	Comité de gestion de programme (PMB French equivalent)
CBCI	Comité des besoins des capacités interarmées (JCRB French equivalent)
DIGCap	Définition, Ingénierie et Gestion collaboratives des Capacités (CapDEM French equivalent)
DMS	Defence Management System (Project Approval Guide)
DND	Department of National Defence
DoDAF	US Department of Defense's Architecture Framework
EA	Evolutionary Acquisition
EECI	Équipe Évaluation des Capacités Interarmées
FC	Forces canadiennes
FOC	Final Operational Capability
IC	Ingénierie des capacités
IEC	International Electrotechnical Commission
IOC	Initial Operational Capability
IPT	Integrated Project Team

ISO	International Organization for Standardization
JCAT	Joint Capability Assessment Team
JCRB	Joint Capability Requirements Board
M&S	Modeling & Simulation
MA&S	Materiel Acquisition & Support
MDN	Ministère de la Défense nationale
MND	Minister of National Defence
NDHQ	National Defence Headquarters
PAC	Planification axée sur les capacités (CBP French equivalent)
PIC	Processus d'ingénierie des capacités (CEP French equivalent)
PRICIE	<u>P</u> ersonnel, R&D/Ops <u>R</u> esearch, <u>I</u> nfrastructure & <u>O</u> rganization, <u>C</u> oncepts, <u>D</u> octrine & <u>C</u> ollective Training, <u>I</u> T Infrastructure, <u>E</u> quipment, <u>S</u> upplies and <u>S</u> ervices
PWGSC	Public Works and Government Services Canada
R&D	Research & Development
RMA	Revolution in Military Affairs
RFI	Request for Information
RFP	Request for Proposals
SBA	Simulation-Based Acquisition
SCIP	Strategic Capability Investment Plan
SdS	Système(s) de systèmes
SGD	Système de gestion de la défense (DMS French equivalent)
SOR	Statement of Operational Requirements
SoS	System(s) of Systems
SS(EPA)	Synopsis Sheet – Effective Project Approval Section/Milestone

SS(ID)	Synopsis Sheet – Project Identification Section/Milestone
SS(PPA)	Synopsis Sheet – Preliminary Project Approval Section/Milestone
TBS	Treasury Board Secretariat
TD	Technology Demonstration
VCDS	Vice Chief of Defence Staff

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