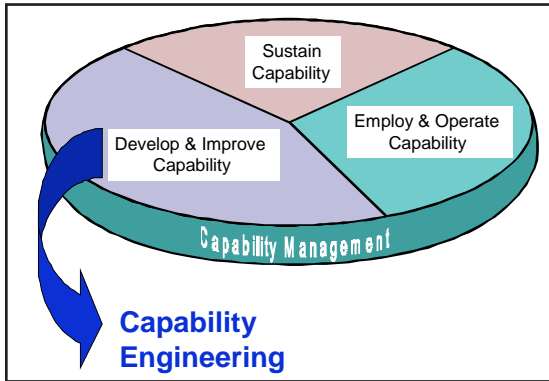


CapDEM TD

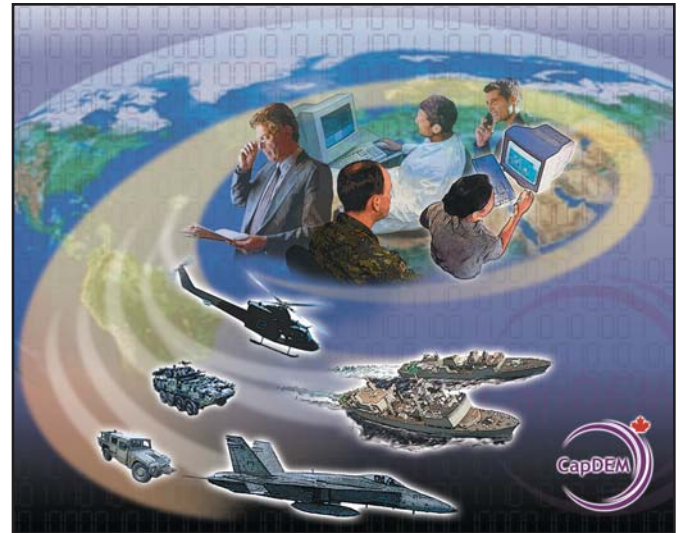
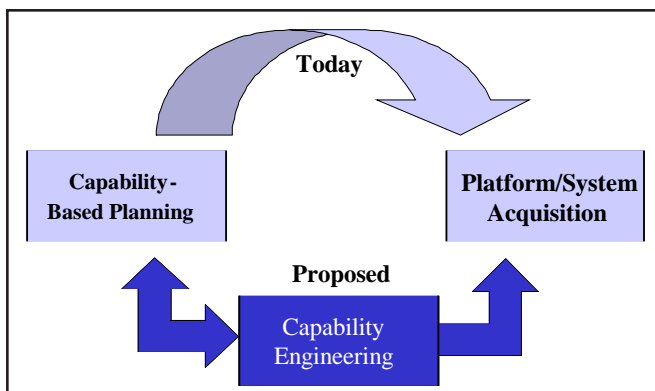
Collaborative Capability Definition, Engineering and Management Technology Demonstrator

Background

The Department of National Defense (DND) is currently implementing Capability-Based Planning as a core tool in the overall business process. Once a capability is defined it must then be managed. Capability Management considers a number of sub-domains. In the context of this TD, Capability Engineering will only focus on the development domain.



There is no systematic link between the conceptualization of a capability and the detailed definition of the component systems, nor is there an analytical process or environment where trade-off analysis can be conducted across systems to evaluate their overall impact on each other or on the overall capability. In order to systematize this capability development process the rigor of the systems engineering process is required. The current process 'leaps' from capability planning to component system acquisition, while the introduction of capability engineering would provide rigor and structure to what must become an integrated process.



Aim

CapDEM is investigating Capability Engineering (CE) in order to improve an acquisition process that (15+ years) does not meet the rapid evolution of business requirements and technology and is not adapted for the increasing complexity of system of systems.

Here are some of the problems frequently observed today with acquisition of defense systems [1]:

- Underestimation of complexity (rigor);
- Failure to develop and manage the proper set of requirements;
- Too much reliance on few experienced people;
- Non-repeatability of the process; and
- Absence of tools supporting the entire process (only tools supporting specific areas).

[1] Symposium INCOSE 2003 - Tutorial Applied System Engineering 101: Essentials of Productive System Engineering Processes

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Objectives

The CapDEM objectives are to:

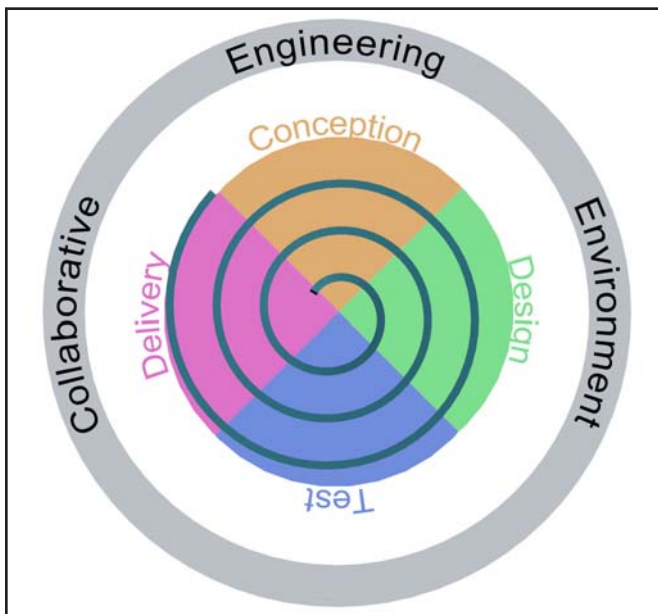
1. Define and demonstrate Capability Engineering and a Canadian Collaborative Engineering process.
2. Establish a Collaborative Engineering Environment (CEE), with an Integrated Synthetic Environment (ISE).
3. Evaluate the process, CEE, and ISE in Canadian DND projects (three case studies).
4. Provide guidance to DND on the introduction and exploitation of CE within DND, including guidance on the business process and organizational changes that would be required.

The entire project will involve a spiral development cycle, with a rolling wave project management approach, whereby the full process and tool set will be defined up front, with iterative evaluation through multiple case studies. The process and tools will then be refined to integrate the case study results.

Toward a Definition

A capability is a combination of plans, people and equipment that allow the forces to act in a specific way in a specific situation to achieve mission objectives. Engineering is the application of a systematic, disciplined, quantifiable approach to structures, machines, products, systems, or processes [1]. System Engineering is an interdisciplinary collaborative approach to derive, evolve and verify the life cycle balanced system solution to meet customer expectations and public acceptability [2]. The process is the means by which people, procedures, methods, equipment and tools are integrated to produce a desired result [3].

Based on those definitions, we can define a Capability Engineering Process (CEP) as a set of ordered activities using a collaborative, systematic, disciplined and quantifiable approach involving people and technologies to produce a desired capability.



Toward a Process

Although Capability Engineering is a new concept under investigation, some key requirements are being considered:

- A first phase will define the capability problem e.g. its deficiencies in relation to objectives as defined in the capability-based planning process. The process then would look at the current situation (as is architecture), forecast capability gaps, identify success metrics, and apply organization priorities.
- A spiral approach involves architecture, design, construction, verification, implementation (e.g. training and transition) phases and trade-off studies in each cycle. In each cycle, each of these elements is addressed at a different level of details to mitigate risk and ensure achievability of the whole solution.
- A collaborative approach operates concurrently from different perspectives that involves participants with different concerns: management (cost/benefits), development, maintenance, operations, human, and environmental factors.
- A precise specification and simulation of deliverables, with examples, allows users of the process to focus their work.
- A fairly simple and flexible process to understand, thereby facilitating its implementation and control.
- A Collaborative Engineering Environment will support the Capability Engineering Process. The CEE is an environment built with a set of tools to facilitate data/information exchange and collaboration among engineers, scientists, users and managers at multiple distributed geographic-locations for the purpose of defining, develop and evaluate a capability.

1. IEEE Std 610.12, 1990
2. IEEE 1220, 1994
3. IDEAL: User Guide for Software Process Improvement, 1996

For more information

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