Principles to practice

by Ron Boothby

DND applies capability engineering to its acquisition process

THE DEPARTMENT OF National Defence (DND) is currently at about the halfway point on the 4-year, $8.5 million CapDEM (Collaborative Capability Definition, Engineering and Management) technology demonstration project that is investigating how to apply the concept of capability engineering (CE) to the department's planning and acquisition processes. Large capital procurement programs for the Canadian Forces (CF) typically follow long-established, serial procedures through four phases: identification of requirements, analysis of options, definition and implementation. This waterfall cycle of activities provides the basis for the Canadian approach to management and planning, the Defence Management System (DMS) – a process reported to take about 15 years for major projects.

DND's policy shift to strategic capability-based from traditional threat-based planning is a relatively recent change, approved just five years ago. A capability-based planning team now exists within DND and CapDEM's mandate is to define, demonstrate and validate CE for DND and the CF. The project manager, Jack Pagotto, describes capability in the present context as, "the combination of people, process and tools required to accomplish a set of predefined tasks according to a pre-defined set of scenarios that represent the envisioned capability." He says that although the waterfall process will continue for procurement projects, the application of CE will compress some of the elements and help shorten the 15-year project cycle at the 'front end' of the DMS.

A team of DND and industry engineers, analysts and military operators work at several of DND's research facilities.[1] In order to apply CE, CapDEM is developing a 'Canadianized' process based on the best practices of well-established procedures and tools from the field of system engineering. A draft version of this process has been released and much interest in applying CE has already been shown internally for both current and planned DND projects. Pagotto says, "The goal of capability engineering is to support decision processes that would allow a capability manager to generate and maintain an optimal blend of quality and quantity of the capability elements, as required, to perform the tasks assigned according to some performance metric. To do this he has to manage the capability as a system-of-systems since no one system can deliver all three of these elements on its own."

One acknowledged issue is capability metrics. Pagotto says the identification and assessment of capability gaps is presently made by knowledgeable subject matter experts and is admittedly subjective. Although metrics are still to be developed, and it is assumed that CE will lend rigour to how selection decisions are made, the possibility remains that a strategically driven conclusion could supersede even the most thorough CE-based solution for acquisitions.

Work to date has not involved defence industry in terms of gauging response to adopting the CE concept or consideration of associated impacts to acquisition methods. An industry liaison panel and a series of workshops are planned for next year to engage the defence industry with the business architecture and roll out the CE process required to support the transformation. Pagotto says the most noticeable change for industry will be the fundamental change in thinking from system to capability requirements, and that the collective business model must understand and address the gap concerning customer expectations versus requirements. This adjustment may invoke solutions that bridge across multiple systems.

Implementation of CE may also require partnerships or realignment within industry in order to address capability gaps and achieve the collective 'system-of-systems' solution. One concern with any process change is disruption to the status quo. Pagotto admits that additional management overhead due to labour cost associated with implementing CE is a big issue, as well as the cycle time related to the iterative nature of the process. An assessment of disruption to the planning and acquisition process due to implementation of CE is a key element of CapDEM.

According to Pagotto, there is a strong pull for CE institutionalization and CapDEM is ahead of its plan in terms of acceptance. He said, "For a military capability, the process vector can include, for example, things like doctrine and training while tools would include weapon systems and/or office computers. Too often we look at acquiring capabilities around a platform-centric paradigm (i.e., the tools) that does not pay enough attention to the other elements of the capability. Using this viewpoint, we see CE as providing future departmental capability composed of people in the form of an integrated CE team; process, specifically a CE process; as well as analytical tools."

In terms of project status, things are a little behind in terms of hands-on application, but Pagotto believes the forthcoming demonstration phase will address that problem. The first evidence of CE implementation will be an already identified project in the C4ISR[2] domain that is planned for summer of 2006. And looking ahead, other opportunities for related demonstration projects have been identified such as the interface between CE and the fundamental concept development and experimentation domain.

[1] Defence Research and Development Canada (DRDC) Ottawa, Toronto and Valcartier.

[2] C4ISR – Command, Control, Communications, Computer, Intelligence, Surveillance and Reconnaissance

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