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A REVIEW OF PROJECT DEVELOPMENT FOR THE CFHIS PROJECT

"Lessons Learned during the creation of the CFHIS Enterprise Architecture Plan and RFP"

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ENTERPRISE ARCHITECTURE PLANNING

The majority of leading health care organizations, world wide, are introducing advanced Information and Communications Technologies (ICT). However, many of these organizations are often faced with significant problems including delayed delivery, project costs that exceed budgets, and more importantly, profound disappointment since the systems delivered do not meet requirement expectations. There is a high risk that critical system requirements will not be met, especially if system requirements are not developed and defined within a context of realizing the important linkages that exist between system requirements and business processes. Many vendors are energetically proposing Commercial off the Shelf (COTS) solutions. Experience illustrates that there is a high risk that COTS products will offer sub-optimal solutions or the COTS solution will exceed system requirements at a higher than expected cost.

Enterprise Architecture Planning has been defined as "the process of defining architectures for the use of information in support of the business and the plan for implementing those architectures.¹" The Canadian Forces recognized the importance of Enterprise Architecture Planning as a pre-requisite to the implementation of any enterprise-wide ICT capability. As a result, the success that the Canadian Forces Health Information System (CFHIS) Project has experienced to date has largely been due to the creation of a comprehensive Enterprise Architecture Plan (EAP). The creation of the EAP represented the development phase of the CFHIS and it assisted with: validating the Project; supporting requirements definition and management; identifying risk; and identify priorities for implementation. As a consequence of creating an EAP, many of the risks associated with large ICT projects were then mitigated through the creation of a sound CFHIS implementation plan.

Enterprise Architecture Planning encompasses and goes beyond determining the needs of proposed users of the system, or Requirements definition.² An EAP will analyze requirements and propose a complete architectural view of the enterprise and establish priorities for implementation based on a number of criteria. The process of creating an EAP for a health information management capability is intimidating, but can be better understood by referring to John Zachman's Framework³. In Zachman's framework, the "customer" is responsible for defining data, function, and network requirements to satisfy the objectives and scope of the business and for developing a related model of the business. From this point forward, the "implementer" or system designers and builders start their work. The EAP is an essential step that precedes the implementation of applications or associated hardware. An explanation of the use and importance of the Zachman framework is also described within the Government of Ontario's "Enterprise Information and Information Technology Architecture".³

The CFHIS EAP process was a multi-disciplinary, consultative process in which the CF and contracted consultants worked as a team to create the EAP that would be the blueprint for the future CFHIS. The implementation of the CFHIS will lead the Canadian Forces Health Services (CFHS) towards a sophisticated, networked health information system that will incorporate advanced ICT in order to create a comprehensive Electronic Health Record (EHR) for every CF member.

BACKGROUND

Virtually every Canadian health care organization underwent significant change and upheaval in the 1990s. The CFHS was no exception and while it was also challenged with many changes, there remained a requirement to provide support to operational missions abroad while simultaneously reorganizing the manner in which health care was being provided to the CF. Many complicated health services delivery issues and problems concerning the management of health information emerged during increased operational activity and "rightsizing", most notably during and after the Gulf War and operations in the Balkans. Several studies and reports identified the requirement for the CF to exploit advanced ICT and develop an EHR.

Business Cases supporting EHRs may be difficult to build based on a purely financial cost/benefit basis. However, the most important driver toward EHRs continues to be the manual record itself.⁴ The Minister's Advisory Council on Health Infostructure has determined that "Patient based health records are fundamental to provincial and territorial health info structures. The Council believes that with particular care, electronic health records can actually enhance privacy protection, improve patient care, enable telehealth, empower citizens through greater control of their own health records and serve as the foundation for ever-improving information and evidence based health system".⁵ Others have stated that: "the EHR is key to improving life for various patient types as it may be used to rapidly extract meaningful data from available patient information and use it to improve not only individual patients' care and status, but the care and status of large numbers of patients at once".⁶

In spite of the compelling arguments, until very recently, the cost of implementing an EHR may have been prohibitively high. However, the high costs and the risk of implementing the CFHIS that existed less than a decade ago have significantly reduced by the: creation of the CF Integrated Information Environment (IIE); expansion of the Defence Wide Area Network (DWAN); and, implementation of an enterprise wide security capability based on Government Public Key Infrastructure. In addition, the significant growth of the HIS commercial market and the creation of industry wide standards such as HL7 and DICOM, have decreased development and

integration effort, and increased the number of potential COTS solutions.

In December 1998, recognizing the potential benefits of a HIS on patient care, the CFHS developed a cornerstone Information Management (HSIM) Strategic Plan. The HSIM Strategic Plan set the agenda while other CF policy documents and guidance established the parameters for future development of the CFHS. The HSIM Strategic Plan represents the collective efforts of the HSIM Council. The Plan evolved as a result of analysis of information from HS Branch Council discussions, considerable input from supported organizations, and DND plans, policies and directives. One of the priorities established by the IM Council, within the HSIM Strategic Plan, was the creation of an EAP for the CFHS.

FRAMEWORK FOR THE DEVELOPMENT OF THE EAP METHODOLOGY & PLANNING

In February 1999, a Contractor was awarded the contract to assist the CFHS with the creation of the CFHS EAP. A "Team" approach, within which the Contractor and the CF both participated, was utilized in the creation of the EAP. Prior to commencing work, a detailed project work plan was created in MS Project and contractor support was dedicated to specific tasks. The Contractor and the CF identified those tasks that would require CF input and CF resources were identified and then also incorporated into the EAP workplan.

In general, the work breakdown structure was broken down into four main parts to develop the following:

- Business Model;
- Baseline Architecture;
- Target Architecture; and
- the Roadmap for Implementation.

The Business Case, a critical supporting document, served to validate the requirement, analyze and recommend options, and propose a preferred implementation plan. A number of documents were required to support the requirement through the scrutiny of the DND comprehensive Capital Project Approval Process and the Departmental Validation Framework which is outlined below.

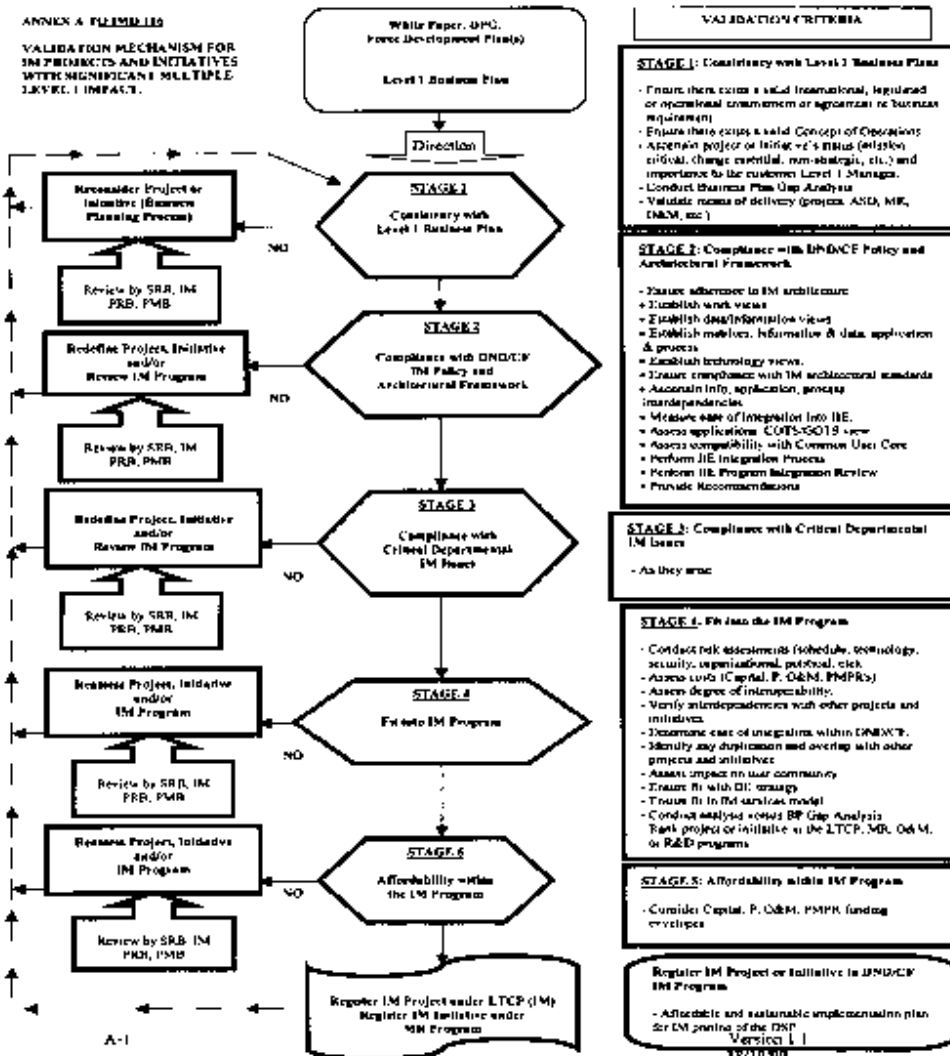
REQUIREMENTS MANAGEMENT

The EAP Contractor was made aware that the EAP would support submissions for approval and funding, as well as being the "blueprint" for the CFHS. With such a significant undertaking, the need for a robust requirements management framework and automated tool to support requirements management was deemed to be essential. As work progressed, the EAP Team was able to define many CFHS requirements, particularly in the Patient Care and Support Business Area. However, a number of requirements in

the Administrative and Planning and Support Business Areas could not be defined and were identified as areas for future development within the CFHS Project that would then be "managed" as work progressed. Each requirement is identified and linked to particular business processes. There is an ability to track requirements, assess the impact on business processes should a requirement not be met, and there is an ability to share the visibility of the requirements matrix with all Project team members.

DEVELOPMENT OF THE EAP USER INVOLVEMENT

Direct participation in the development of the EAP by those personnel who would eventually implement and maintain the system was considered to be essential. Moreover, since personnel from the CFHS were actively involved in creating the EAP there would be a sound understanding of user requirements from across the CFHS. This approach ensured that the implementation of a CFHS would be in concert the CFHS IM Strategy. CFHS personnel across the country, and from the Army, Navy and Air Force, were involved in the interview and focus group activities. Consequently, the Project was able to identify the business processes that were in place across the CF.



COMMUNICATE

As work on the CFHIS EAP progressed, a Communications Plan was implemented. The objective of this plan was to ensure that as much of the user community as possible, and CF as a whole, was aware of the initiative, and to simultaneously secure both “buy in” and understanding. Presentations were made at various conferences including the OPMED Conference in Quebec City in early November 1999. Numerous presentations were made to Federal Government agencies and internal Department stakeholders. Information was eventually made available through the CFHS and ADM (IM) web-sites, the CF Newsletter, and the Maple Leaf.

DOCUMENT

During interviews and focus groups, the CF worked closely with the Contractor. Following interviews or focus groups, the Project prepared records of discussion and entered the records of discussion into the requirement database. Following each session, the Project extracted requirements information and this information was then entered into the requirements management database. As a result, a comprehensive record of meetings and information requirements was maintained.

Creation and documentation of a Business Case was critical to obtaining Project approval. The EAP “Roadmap for Implementation” and risk assessment enabled the creation of the Business Case which could then be used to prepare the required approval documentation.

OBTAIN CRITICAL SUPPORT

Despite efforts to optimize concurrent activity, a considerable amount of time was spent in the staffing process prior to obtaining Departmental approval for the Project. This step was essential since support and understanding from both procurement authorities and from across the Department was critical. The importance of using an EAP to validate an IM requirement is readily apparent given the complexity of the Department’s validation framework.

Obtaining support for the CFHIS, particularly in the early stages, proved to be invaluable since delays in obtaining Project approval at later stages were minimized. The Project advanced relatively quickly through The Department and the Government of Canada Treasury Board being eventually granted full expenditure authority and approval to proceed to through the contracting process.

Obtaining critical support and understanding for an enterprise wide capability should not be underestimated both in terms of effort and impact. Our experience illustrates that resources should be allocated to marketing on a continuous basis throughout the life of a Project.

UTILIZE OUTSIDE EXPERTISE

Although the methodology and EAP outputs were known, there was a lack of experience within DND, and in CFHS in particular, to create an EAP for a HIS. Creation of the EAP with the assistance of an outside contractor provided an opportunity to utilize specialized consulting services that would examine the CFHS and its business practices. A considerable amount of CF engineering expertise was incorporated in to the EAP Team by engaging components of the CF’s IM Group into the Project. This activity served to secure support for the approach in addition to providing expert engineering advice. During the EAP process, it became very clear that a considerable adjustment or re-engineering of CFHS business practices, and utilization of the CF DWAN, would be necessary to support the effective delivery of care to the CF. These adjustments were incorporated into the desired target architecture and the implementation plan.

PREPARATION OF THE CFHIS RFP

The overall objective of the EAP was to create a blueprint for a CFHIS. This blueprint could then be used to create the RFP that would eventually be distributed to industry. As the EAP was being created, the CF, independent of the contractor involved in assisting with the creation of the EAP, was concurrently engaged in producing a draft RFP that included a SOW and Requirements Specification. Sensitizing industry to the requirement was previously achieved through the distribution of a letter of interest in the spring of 1999. Following a bidders’ conference, during which the CFHIS was presented, the draft RFP was distributed to industry for comment in March 2000. Feedback from industry to this draft proved to be extremely important and resulted in some adjustments to the requirements specification and procurement approach that appeared in the final RFP. Bidders were advised that their response to the final RFP would utilize “DOORS” software using the abridged “bidders’ view” of the database and that “DOORS” software would be used by the Department to assist in the evaluation process.

The preparation and maintenance of the requirements database leading up to release of the final RFP proved to be a significant undertaking. All project documentation was placed into the database including the EAP, the Statement of Work, Qualification and Evaluation Criteria, and the weighting of criteria. The RFP was released, in electronic format, in July 2000 and the RFP closed 28 September 2000. After an evaluation period, A “short-list” of compliant bidders was determined and negotiations are continuing with the remaining compliant bidders. Contract award is expected before Summer 2002. Throughout the process, questions received from potential bidders during the solicitation phase and DND answers were recorded in DOORS.

On receipt of Proposals in electronic format, each proposal was evaluated by 14 Evaluation Teams that were tasked to evaluate various components of each Proposal. All evaluation results and scores were entered into the database that would then serve as a complete record of decisions made and scores awarded for each proposal. The establishment of all requirements, project documentation, evaluation criteria and bidder responses in one database facilitated management of the bid and evaluation process.

LESSONS LEARNED

A number of lessons were learned during creation of the EAP. The following points summarize the “best practices” that an organization should consider when undertaking an EAP Project as complex as the CFHIS EAP.

1. The creation of a Work Plan and conducting regular meetings with contracted support is essential to measure progress and budget, and to plan future work.
2. The format of documents, such as the Business Case and EAP, should be determined and agreed upon before work begins. All documents should be self-sufficient, with adequate explanation, so that they can stand on their own as reference documents. Document version control is extremely important and must be managed accordingly.
3. Contractor support should be offered locally since communications and meeting can be difficult to coordinate if some of the principal consultants are located in other distant locations.
4. Project Management methodology to be used by the contractor should be stated clearly in the SOW. Nothing should be taken for granted, regardless of what the

contractor's project management track record might be. The requirement to manage the EAP process should include the management of personnel and budgets, and the ability to project costs as work is completed. Regular financial reports are essential.

5. Responsibility must be placed on the contractor to ensure that in the event that key individuals leave, suitable candidates will step in immediately. The identification of alternate resources should be specified.
6. Communication of Project development activities is essential.
7. Direct participation and ownership of an EAP, including requirements definition, by the sponsor organization is essential. This will require the introduction of new skills and personnel.
8. The early identification of other organizations that may eventually be involved in Project implementation is critical. Early participation of future implementation partners ensures understanding of the requirements and facilitates the planning of a future implementation approach. Continuous dialogue with supporting organizations is essential.
9. Slippage is a major problem on any IT project or initiative. A sound approach to project management, ongoing communication with the contractor and senior contractor personnel, and prompt reaction to problems or delays will significantly mitigate project slippage.
10. Contractors that have several ongoing projects will have limited availability. Priority for contractor support should be established with clear expectations for performance being established during work planning.
11. Input from industry is extremely important. The distribution of a letter of interest which outlines general intent, the distribution of a draft RFP, and sensitizing industry to the release of a future contract increases the probability that industry will be prepared to respond appropriately to a future RFP. Moreover, comment will be solicited that will validate requirements and implementation approach.
12. The CFHIS requirements management application was relatively easy to use; however, time should be dedicated for training and to the maintenance of applications and associated databases.
13. Specific personnel requirements concerning training, holidays or personal problems can often overwhelm any project activity. Time must be dedicated in the Project Plan to manage personnel.
14. The creation and acceptance of a Strategic Plan is an important pre-requisite to Project Development.
15. Project Documents will be presented in several drafts prior to acceptance of the final deliverable. A final document deliverable may require significant refinement and time should be dedicated to document preparation and approval.
16. Detailed specifications of the qualifications and experience of the senior and junior consultants in the RFP/SOW is critical. Reference checks should be completed
17. Documents, work plans, invoices, time sheets and meeting

dates must be controlled. This will require a dedicated effort that should not be under-estimated. Despite the increased use of electronic devices, there was always a need for clerical support. Related tasks include: document preparation, mail, filing, and the keeping of records and accounts.

18. Current reference material is critical to creating an EAP. All reference material should be established within a document repository.
19. The requirement for the contractor to possess literary ability in preparing reports should not be overlooked. It may be necessary to acquire specialised assistance in preparation of final reports so that they are presented clearly.
20. An automated requirements management application is essential in a large complex project. An automated requirements tool may be used to translate requirements into system functional and technical specifications and, in the future, align change management with requirements.
21. Management of the bid-evaluation process following release of an RFP is essential. An automated application, linked to the requirements management application can be an effective approach to managing the RFP process.

CONCLUSION

In conclusion, the creation of an EAP prior to implementing any health ICT capability is essential. The EAP will provide the information required to issue an RFP and assist in proposal evaluation. The creation of an EAP and issuing an RFP for a complex health IM capability such as the CFHIS is not a trivial undertaking and the lessons learned have been summarized in this article. Health Care organizations should recognize the need for a robust requirements management framework, user involvement, communication throughout the process, documentation, obtaining and maintaining critical support as well as the need for obtaining outside expertise when undertaking the EAP process.

Footnotes:

- 1 Steven H. Spewak, Enterprise Architecture Planning - Developing a Blueprint for Data, Applications, and Technology, John Wiley and Sons, New York, 1992
- 2 Fertuck Len, System analysis and Design with Modern Methods, Business and Education Technologies, W.C. Brown Communications Inc., Dubuque, 1995. P.5
- 2 IBM Systems Journal, Vol. 26, No 3, 1987
- 3 Government of Ontario, Enterprise Information and Information Technology Architecture, Panel Session With ITAC Ontario Public Sector Business Sub-Committee dated October 1, 1999
- 4 Murphy Gretchen F et al, Electronic Health Records-Changing the Vision, Chapter 1, page 5. W.B. Saunders Company, Philadelphia 1999.
- 5 Advisory Council on Health Infrastructure, Paths to Better Health - Final Report, Health Canada Publications, Ottawa, 1999. Page 9.
- 6 Haglund Mark, "Managing disease by managing IT", Health Management Technology, June 1998.

