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COMMAND SUPPORT PROJECT PERFORMANCE FACTORS

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ABSTRACT

The Canadian Army has made significant advances within the evolution of its Command Support Programme during the past 15 years. However, it is readily recognized that this evolution has not been without challenge and shortcoming. This paper seeks to examine two notable Command Support case studies with a view to identifying meaningful theoretically identified and emergent performance factors in terms of the holistic Command Support Capability. Two theoretical models are applied to the case studies: one focused on Project performance and one focused on Information Systems success. Analysis supported by extensive interview and documentary evidence enabled key findings regarding leadership shortfalls, shortcomings within the non-materiel component of the Capability, implications of non-Capital Project status, failure to learn as well as holistic investment by the Army chain of command. Finally, the analysis yields instructive deductions in terms of the potential adaptation and application of theoretical models to supplement and enhance extant Command Support Capability Delivery methodology.

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> *During the execution of operations, a commander must, through his command support system, monitor and maintain the continuity of operations to prevent the enemy from seizing the initiative and executing a faster decision-action cycle.*
>
> -B-GL-300-003/FP-001, *Command in Land Operations*, 2-22

CHAPTER 1 - INTRODUCTION

Background

Until the mid-1980s, commanders within the Canadian Army's primary means of communication were via Combat Net Radio (CNR), basic telephony and physical delivery of hard copy orders and traces. Radio and telephone messages were manually transcribed into radio log books. Hard copy orders and traces were delivered by runners in jeeps and on motorcycles. The massive Information Technology (IT) and Information Systems (IS) advances of the 1980s and 1990s and concepts such as Network Centric Warfare (NCW) and Network-Centric Operations (NCO) drove many Allied armies to advance their use of IT capabilities in order to distribute information more rapidly and broadly in order to enable enhanced decision making at all levels.[1] These evolutions signaled to the Canadian Army that the opportunity existed to greatly enhance its exploitation of technology to enable its commanders in achievement of their respective aims through the provision of digital decision-support, planning and operational tools. Many of the Army's aspirations and vision in this regard were articulated in *Land Operations 2021: Adaptive Dispersed Operations.*

[1] Pierre Forgues, Command in a Network-Centric War, *Canadian Military Journal*, Volume 2, Number 2 (Summer 2001): 23-24.

Context

Following the recognition of the potential of and opportunities presented by IT, Canada's Army began taking receipt of a series of new capabilities in the late-1990s. These capabilities included but were not limited to: Iris Operational Capability 1 (Iris OPCAP 1, CNR), Iris OPCAP 3 (microwave Line-of-Sight (LOS)), Situational Awareness System (SAS), Athene Tactical System (ATS), Land Force Command and Control Information System (LFC2IS). The collective and holistic integration of these and various other materiel, process, training and personnel components was the beginning of what has since become known as Command Support (CS) within the Canadian Army. CS is defined as follows:

> … the integrated system of resources necessary to enable command. This definition encompasses the idea that all resources (human and technological), when integrated as a system, that are involved in the control function and that lend toward the production of data, information and knowledge upon which a commander reaches a level of understanding and battlefield visualization, are considered Command Support.[2]

This holistic system became known as the Land Command Support System (LCSS). While the level of integration and cohesion levels have increased over the course of time within the realm of CS, it remains a useful term for the purposes of this paper in defining the capability which will be examined.

Having been part of a number of CS fielding and integration activities from 1999 to the present, I have a sincere motivation to understand the manner in

[2] Department of National Defence, B-GL-300-003/FP-001, *Command in Land Operations* (Kingston, Ontario: Army Publishing Office, 2007), 1-12.

which the respective Projects were managed, were delivered and performed upon implementation. This motivation is driven not only by the desire to understand what occurred in the past, but more importantly to positively influence future evolutions.

Further to the preceding paragraphs, a deliberate approach will be taken in terms of the exploration of the performance factors which affected the outcomes of CS Projects. The following research questions will be explored:

Why do commercial IT projects experience shortcomings?

Why have specific Army CS projects experienced shortcomings (repeatedly)?

What are the shortcomings of Management (the Army chain of command)?

What are the shortcomings of IT Professionals (ADM (Mat))?

What are the interactional shortcomings between Management and IT Professionals regarding IT projects in industry and those in the Army?

Why do these shortcomings persist despite the significant fiscal/business impacts?

What are the similarities and disparities between the shortcomings of IT projects in industry and those in the Army?

Are there identified solutions to any/all of these shortcomings? If so, why are they not effective implemented? If not, why not?

The methodology by which these questions will be prosecuted will be outlined in a subsequent paragraph.

Thesis and Methodology

This paper will demonstrate that there exist persistent shortcomings in theoretically-identified performance factors within Army Command Support Capability components which produce consistent deficiencies in Command Support Capabilities. The demonstration of this hypothesis will be achieved via a deliberate examination of the performance factors believed to influence CSC components and their associated outcomes. Initially, two theoretical models will be presented and defined in Chapter 2. Thereafter, two case studies (Command Support Pilot Project Trial 3 (CSPP T3) and BattleView (BV)) will be examined in Chapter 3 and Chapter 4 respectively using both of the previously presented theoretical models. Subsequently, the outcomes of the two case studies will be cross-compared in Chapter 5 with a view to deducing common and unique findings and deductions as well as identifying findings which emerged from the case studies but were outside of the specific realms of the two respective theoretical models. The correlation of the relationship between Management and IT Professionals and its influence on performance factors will also be examined. Finally, conclusions will be drawn in Chapter 6 from the overall examination. The examination of the performance factors will not be limited to the actual applications delivered, but rather be extended to the holistic CSC deliverable.

As described in the previous paragraph, a case study methodology will be used within this research paper. The theoretical case study model to be used for this paper will be based on the theories of well-known American case

study writer and researcher Dr. Robert Yin which are encapsulated in the most recent edition of his book: *Case Study Research Designs and Methods*.[3] At its core a case study is by definition a study of a case or cases. Case study methodology is used frequently in contemporary research and is instructive for the purposes of this paper due to the multi-instance and temporal nature of the research subject and questions.

As prescribed by Yin, this case study will seek to answer the questions of what happened as well as why and how it happened in terms of the specific CS Projects.[4] For the purposes of this paper, the cases or "unit[s] of analysis" will be defined as CSPP T3 and BV respectively.[5] By virtue of having two cases, this case study is by definition multi-case. The multi-case status of this case study occurred by design based on the known ability of multi-case case studies to "strengthen findings" by adding depth, tapestry, diversity and a temporal nature to the case study.[6] Further, the multi-case case study offers the important opportunity for cross-case analysis.[7]

In addition to the case study approach which will be taken regarding the two cases, two IT industry-based theoretical models will be applied to the CSPP T3 and BV cases. Each of the two theoretical models possesses a set of

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[3] Robert Yin, *Case Study Research Designs and Methods Fourth Edition* (Thousand Oaks, California: SAGE Publications, 2009).
[4] Robert Yin, "Case Study Methods," in *Complementary Methods in Education Research*, ed. Judith L. Green, Gregory Camilli and Patricia B. Elmore (Mahwah, New Jersey: Lawrence Erlbaum Associates, 2006), 2.
[5] Ibid., 3.
[6] Ibid., 5.
[7] Ibid., 14.

performance factors believed to influence the outcomes of CSCs. These performance factors will be investigated as part of the examination of the respective cases. The outcome of the application of the two models against the two case studies will further enable a determination of whether or not the case studies "build, extend or challenge" the theoretical models.[8] The application of two unique theoretical models adds additional depth in that the two models will focus on different aspects of CSCs: one on performance of the Projects delivering the IT artifacts and one on the success of the IT artifact proper.

In parallel to the case study methodology and application of the two industry-based IT project theoretical models, a complimenting Grounded Theory (GT) methodology will also be applied to the case studies within this research paper. Since its inception in 1967 by Dr. Barney Glaser and Dr. Anselm Strauss in their book *The Discovery of Grounded Theory: Strategies for Qualitative Research*, GT has underwent a series of iterative developments to arrive at its current state. GT is, by definition, a theory which is "grounded in data."[9] Glaser has stated that, "…the goal of grounded theory is to generate a conceptual theory that accounts for a pattern of behaviour which is relevant … for those involved." In essence, GT suggests that researchers can seek out data (or indicators) which can be categorized into concepts which, if supported by further and prolonged analysis can be developed into theories (or "conceptual frameworks").[10] By

[8] Ibid., 6.
[9] Barney G. Glaser with the assistance of Judith Holton, "Remodeling Grounded Theory," *Historical Social Research*, Supplement 19, Issue 32 (2007): 48.
[10] Ibid., 64.

seeking out these concepts and theories, performance factors above and beyond those identified within the two theoretical models may be identified in terms of CSCs.

As Glaser purports that theory is generated, it is key that the researcher have "no preconceived theory" when applying GT.[11] Although this restraint appears to be at odds with the application of the industry-based IT project theoretical models, the two approaches can in fact co-exist within the same case study.[12] The application of the two IT project theoretical models will seek to identify CSC performance factors as it relates to extant theoretical models, while the application of the GT methodology will seek to identify emergent CSC performance factors outside of the extant theoretical models.

This distance between the industry-based IT project theoretical models and GT methodology is further enabled by GT's desire to seek out qualitative data, specifically through its support of semi-structured interviews.[13] This enabled the interviews for this research project to be sufficiently structured so as to enable the collection of information regarding the performance factors associated with the two industry-based IT project theoretical models while still offering interviewees a significant degree of freedom to offer other evidence regarding potential emergent concepts and theories regarding other performance factors relating to CS Projects. As with the two industry-based IT project theoretical models, GT

[11] Ibid., 51.
[12] Ibid., 58.
[13] Ibid., 56-57.

methodology will underpin the overall case study in that it will seek to identify emergent performance factors, deductions and conclusions in terms of both cases.

As suggested by Yin, this diverse and multi-layered approach will reinforce his concept that "different research methods serve complimentary functions."[14] This approach serves to minimize the potential criticisms associated with single-case case studies lacking theoretical models.[15] Further, the application of the two industry-based IT theoretical models and GT methodology will add depth to the tapestry of the overall case study in that it serves to compliment the original case study approach with secondary theoretical frameworks and informs the search for theoretical, documentary and interviewee evidence.[16] The industry-based IT theoretical models will seek answers to more rigid questions with a top-down approach while the complimentary GT methodology will seek to exploit emerging data, concepts and theories derived from evidence collected in the course of the case studies.

The two primary sources of evidence for the case studies were documentary and human subject semi-structured interviews in order to reinforce Yin's principle of the value of multiple sources of data and evidence.[17] Documentary evidence included various directives, orders, After Action Reviews (AARs), assessments, Operational Research (OR) reports, Technical Assistance

[14] Robert Yin, "Case Study Methods," in *Complementary Methods in Education Research*, 2.
[15] Ibid., 9.
[16] Ibid., 3.
[17] Ibid., 10.

Visit (TAV) reports, DND websites, documentary interview submissions and emails along with other documentary pieces. Interview evidence was solicited from a plethora of sources. The availability of a wide range of evidence from various sources enabled the "triangulation" and determination of "convergence" of data in order to validate performance factors from theoretical models and suggest emergent concepts and theories above and beyond the extant theoretical models.[18]

Interviews were conducted with a wide range of personnel within the Army and ADM (Mat) from various rank levels, trades, occupations and backgrounds from both military and civilian domains across breadths of both cases in order to ensure sufficient sample size and divert of interviewees. Fortunately, no significant problems were encountered in gaining interview participation with key stakeholders in both cases. These two facts enable the facilitation of Yin's suggestion that a high level of participation across a wide cross-section of participants from various cases increases note only the validity and credibility of the evidence but also that of the case study as a whole.[19] Participation and broad cross-sections also serve to enhance the researcher's ability to resolve conflicting evidence within the respective cases.[20]

The questions comprising the human subject interviews for the CSPP T3 and BV case studies are based on the theoretical models and can be found at

[18] Ibid., 9.
[19] Ibid., 8.
[20] Ibid., 3.

Appendix 1 and Appendix 2 respectively. Each interview was recorded and included the taking of detailed notes by the researcher. Each recording and detailed set of notes were reviewed vigorously with a view to determining its impact on the respective performance factors, its potential relation to emerging concepts and theories and its correlation to the other interviews in these two regards. The evidence derived from documentation and interviews will be used to form a tapestry which can be exploited to derive potential correlations between the case study outcomes regarding specific performance factors suggested by the theoretical models as well as emergent concepts and theories outside the models.

Definitions

Prior to proceeding with the establishment of the two theoretical models and conduct of the two case studies, it is imperative to identify a set of concepts, processes, definitions and terminologies which are germane to the topic of CS and Projects within a DND, Army and ADM (Mat) context. It is also necessary to identify parallels between theoretical and military terminology such that the correlations may be identified and conclusions drawn. Acknowledging that there are differences between the two (theory and military) based on Government of Canada process and imperatives which do not apply to industry, IT Projects will be considered to be synonymous with CS Projects for the purposes of this paper.

While a number of theoretical models exist regarding IT projects, most characterize IT projects as being comprised of three main components: individuals

and organizations who originate and carry out the work of the project, the procedures which are used to direct the people's work and efforts and the final deliver of the IT artifact. American software engineer Dwayne Phillips coined these three components as the three Ps: People, Process and Product.[21] He suggests that "the key to increasing the chances of success on software projects is to maintain the proper relationships among people, process, and product."[22] Phillips defines People as those who, "… gather requirements, interview users (people), design software, and write software."[23] For the purposes of this paper, People will be considered in two distinct groups: those within the Army and those within ADM (Mat). The Army directs the overall activities, gathers and defines its CSC requirements and transfers this information and direction to ADM (Mat). ADM (Mat) designs and delivers the CS artifact to the Army. Phillips defines Process as simply, "how we go from the beginning to the end of a project."[24] The two selected models, which will be presented in Chapter 2, address many aspects of Process. Subsequent paragraphs will outline the basic process by which Projects are conceived and executed within DND. In terms of Product, Phillips describes it as, "the result of a project."[25] The Product could be considered as the IT artifact proper or some variation thereof. For the purposes of this paper, the Product should be considered as the actual CS system, application or artifact. The Product does not include the associated enablers such as procedures, doctrine, training and associated infrastructure. Of note, Phillips identifies training as a

[21] Dwayne Phillips, "People, Process, and Product," *American Programmer*, January 1995, http://dwaynephillips.net/CutterPapers/ppp/ppp.htm, last accessed 06 February 2013.
[22] Ibid.
[23] Ibid.
[24] Ibid.
[25] Ibid.

function which spans the People and Process components and one which has a positive outcome on the overall capability delivered by the IT project.[26]

The manner in which DND Capital Projects are conceived and managed is defined by the Vice Chief of the Defence Staff (VCDS) within Treasury Board (TB) regulations. As depicted in Figure 1.1, DND envisions a six-phase capability delivery: "Conceive (its long-term strategy), Design (future force capability options), Build (affordable long- and short-term resource allocation plans), Manage (in-year resource utilization), Validate (the processes and their interrelationships); and Report (to government).[27]

Figure 1.1 – DND Six-Phase Capability Delivery Model

Source: Department of National Defence, "Defence Planning & Management Framework," last accessed 13 February 2013, http://vcds.mil.ca/sites/page-eng.asp?page=4160.

The Army is responsible for defining the visions and its associated requirements for either enhanced or new capabilities. Within the Army, "Chief of Staff Land Strategy (COS Land Strat) has oversight for Army capability

[26] Ibid.
[27] Department of National Defence, "Defence Planning & Management Framework," last accessed 13 February 2013, http://vcds.mil.ca/sites/page-eng.asp?page=4160.

development on behalf of the Commander of the Canadian Army (Comd CA)."[28] Once approved, the Project Approval Directive (PAD) is issued by the VCDS authorizing the Army to proceed with the Project in question.[29] The following explanation is provided regarding the PAD:

> PAD is direction to all staff involved in the development of investment projects but recognizes that flexibility in support of management policy for tailored oversight and tailored project management needs to exist in order to best achieve investment objectives. The underlying premise of the project approval process is that project teams will be able to demonstrate with evidence that if approved, their project will achieve departmental and Government objectives in accordance with the approved performance baseline.

Of note is the expectation to achieve objectives within a performance baseline.

Once requirements have been identified for an Army CS Project and approved via PAD, the process of coordinating the delivery commences involving the Army and ADM (Mat). At the Executive level, the Deputy Commander of the Canadian Army (DCCA) and Chief of Staff (Materiel) (COS (Mat)) oversee their respective Level 1 (L1) Programmes. Within the Army, the approved requirements are transferred by COS Land Strat to the Director of Land Requirements (DLR) who will assign a Project Director (PD) within DLR 4. The assigned PD will oversee the efforts of ADM (Mat) to ensure that the Army's requirements are met in the delivery of the Project. Concurrently, and within ADM (Mat), a Director General Land Equipment Project Management (DGLEPM) tasks Director Land Command Support Project Management

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[28] Department of National Defence, "Army Capability Development Process," last accessed 13 February 2013, http://lfdts-dlcd.kingston.mil.ca/Capability%20Development%20Process/Forms/AllItems.aspx.
[29] Department of National Defence, "Project Approval Directive (PAD)," last accessed 13 February 2013, http://vcds.mil.ca/sites/page-eng.asp?page=11611.

(DLCSPM) to assign a Project Manager (PM) to the Project who will be responsible for the delivery of the product. In the two case studies to be studied in this paper, the PM is considered as the lead IT Professional. The product will be considered as the CS artifact. Figure 1.2 depicts the Army/ADM (Mat) Referential Organizational Diagram which provides a schematic defining the relative lines of coordination in the delivery of CS Projects.

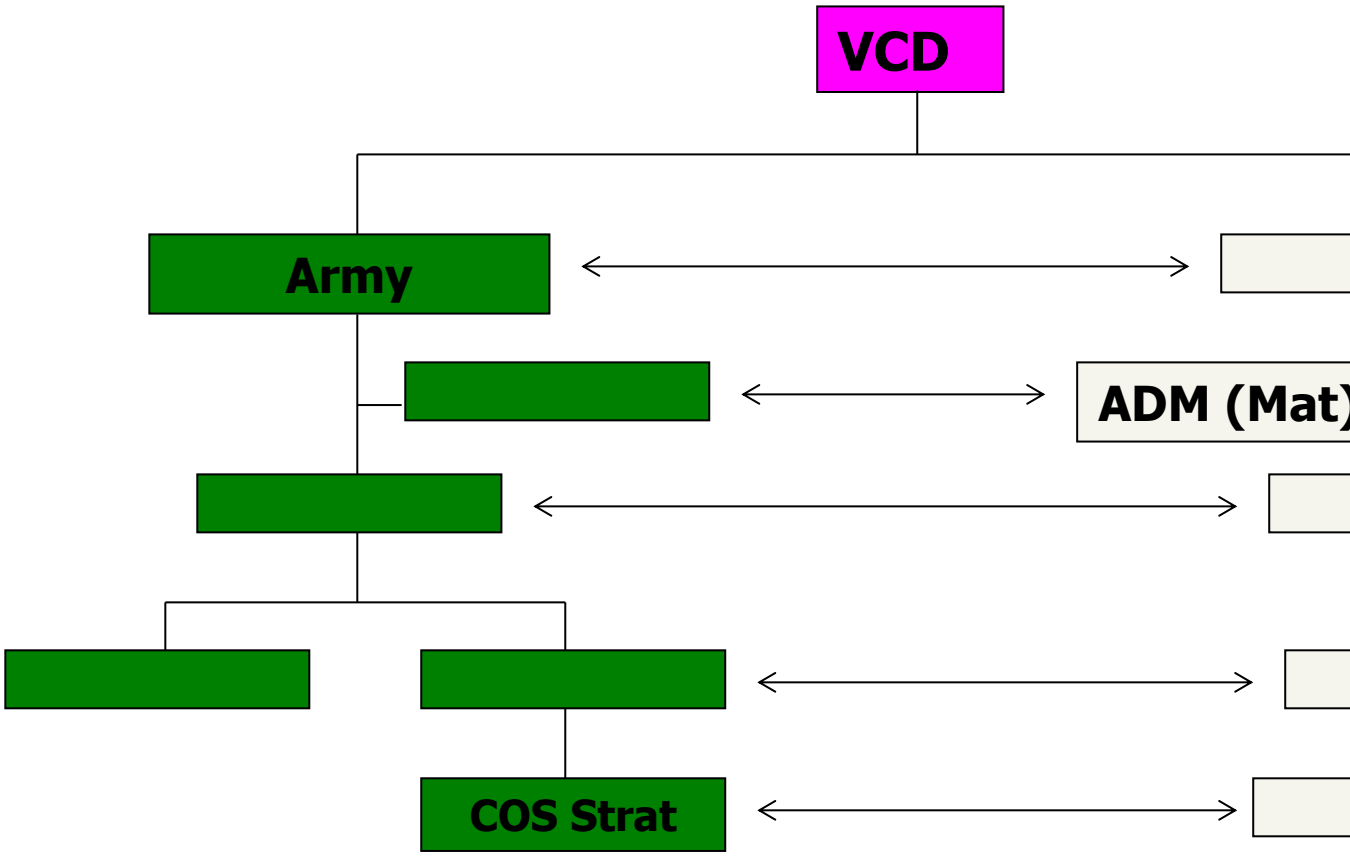

Figure 1.2 - Army/Assistant Deputy Minister (Material) Referential Organizational Diagram for Command Support Projects

As described earlier, CS is defined as "the integrated system of resources necessary to enable command."[30] Figure 1.3 depicts the Command Support Capability (CSC) Conceptual Model which provides a schematic defining the component parts of a CSC.

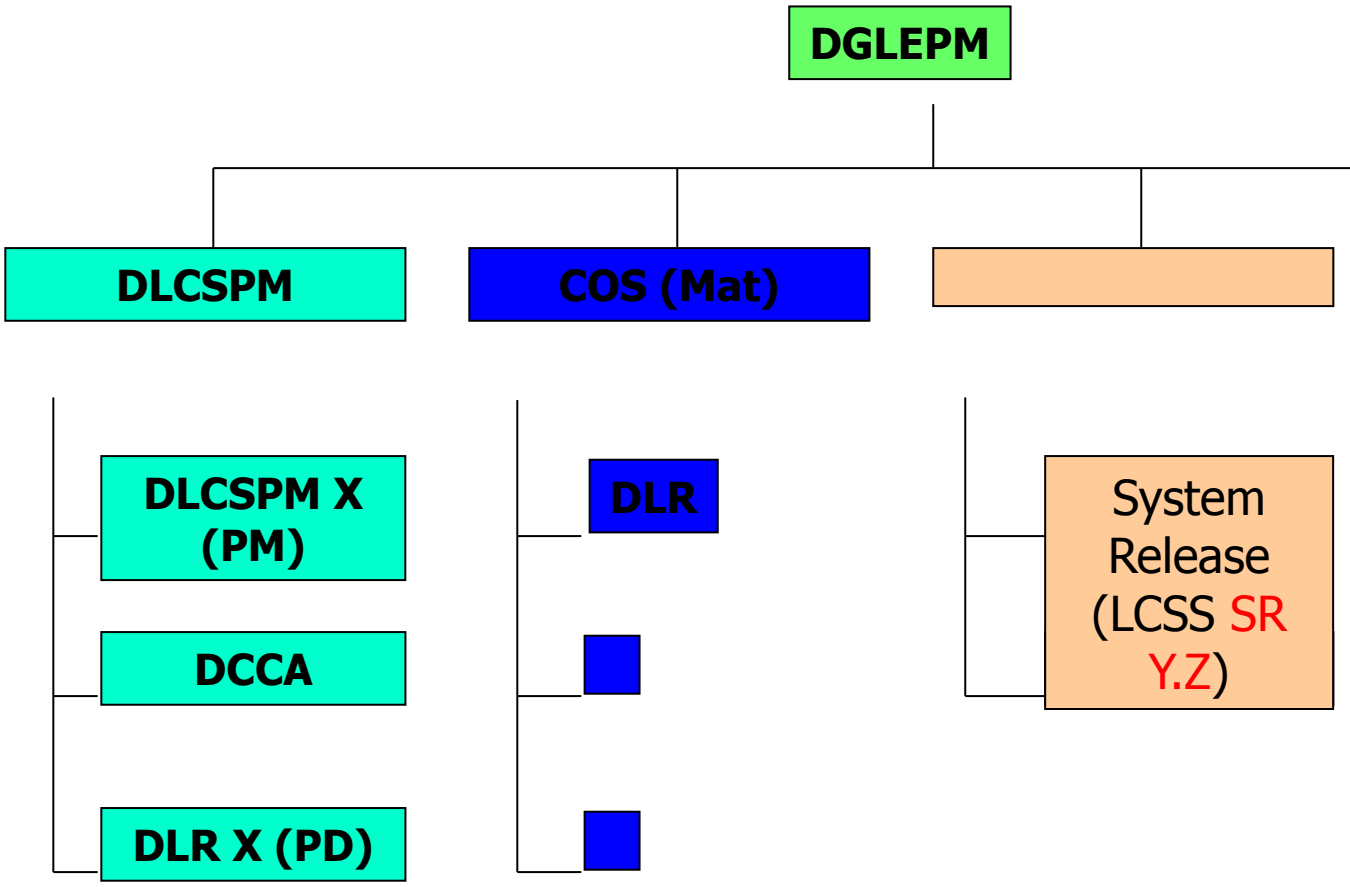

Figure 1.3 - Command Support Capability Conceptual Model

Source: DLR 4-9, email to Major Jeremy Small, 12 February 2013

[30] Department of National Defence. B-GL-300-003/FP-001, *Command in Land Operations*. Kingston, ON: Army Publishing Office, 2007, 1-12.

The System Release is the artifact (software, firmware, middleware and/or hardware) components which comprise the CSC. The Communications System (Comms Sys) comprises the Tactical Communications (TacComms) means which interconnect the disparate instances of the System. This includes CNR, LoS microwave, satellite, terrestrial and other voice and data communication links. The Information System (Info Sys or IS) consists of the Tactical Command and Control Information Systems (TacC2IS) which are the actual CS and supporting applications which enable "understanding and battlefield visualization." [31]

The Doctrine & Tactics, Techniques and Procedures (TTPs) Release consists of the formal procedures which define how the CSC is to be employed by Commanders & Staffs (C&S), Information Managers (IM) and System Managers (SM) at all levels. The Training Release consists of the Individual Training (IT) and Collective Training (CT) packages. The Training Infrastructure consists of those physical assets and resource required to deliver CS training. Of note is the interdependence of the delivery of training on all of the CSC components. It must be stated at this juncture that ADM (Mat)'s responsibility lies exclusively with the delivery of the SR as the IT artifact(s). While it is supported and enabled by ADM (Mat), the delivery of the TTP & Doctrine Release, Training Release and Training Infrastructure is the exclusive responsibility of the Army.

[31] Department of National Defence, B-GL-300-003/FP-001, *Command in Land Operations* (Kingston, Ontario: Army Publishing Office, 2007), 1-12.

Based on the requirements within the TTP & Doctrine Release, Training Release and Training Infrastructure components, best practice within the Army is considered to be to provide the SR to Land Force Doctrine and Training Systems (LFDTS) prior to the field force. This enables LFDTS to fulfill its responsibilities in terms of IT and CT delivery to the Army. It is noteworthy that the original version of this conceptual model came into existence in the mid-2000s when a far greater level of integration had occurred between the previously disparate CSC and SR components. Prior to that timeframe, when a far lesser degree of integration existed, neither the Army (Management) nor ADM (Mat) (IT Professionals) treated the extant CS system as an integrated and holistic system-of-systems.[32]

Limitations

Prior to proceeding with the introduction of the theoretical models and examination of the case studies, it is necessary to identify and acknowledge several of the key limitations of the research and conclusions which will be drawn. These limitations include both the nature of evidence which will and will not be considered as part of the examination.

[32] Director DLCSPM, 2009-2012, *Command Support Project Performance Factors* Research Project Interview, interviewed by telephone by Major Jeremy Small, 31 January 2013.

In terms of the evidence collected in the form of documentation and interviews, there exists the possibility of bias and other inaccuracies caused by personal perception, personal interest or ignorance regarding certain aspects of portions of the two case studies. This is particularly the case in scenarios where the outcomes of a given event have not been totally positive and where the perception of attribution of blame exists. There also exists the possibility that interviewees "may [echo] the same institutional 'mantra' developed over time for speaking with outsiders" as suggested by Yin.[33] These possibilities are true not only of the authors of the respective documents and various interviewees, but also on my part as an individual who has been intimately involved in a significant number of CS activities.

The amount of time which has passed between the actual events and the present may play a factor in terms of the accuracy of some of the information presented by interviewees. CSPP T3 took place nearly over eight years ago in 2004, and many of the interviewees last formal contract with BattleView was over three years ago. This gap in time presents the opportunity for their respective opinions of what took place to become vague or be influenced by subsequent events, experiences and/or the opinions of others with whom they have interacted. For this reason, a measured approach was taken in terms of correlation of evidence presented by respective interviewees with that of other interviewees.

[33] Robert Yin, "Case Study Methods," in *Complementary Methods in Education Research*, 10.

It must also be acknowledged that the models which are based on the delivery of commercial IT projects are not necessarily wholly synonymous or congruent with DND-based CS Projects and systems. While DND may attempt to follow certain industry best-practices in the execution of such Projects, commercial IT projects do not face many of the Government of Canada bureaucratic and procedural constraints which are imposed on CS Projects. However, it will be demonstrated in the presentation of the two models in Chapter 2 that the performance factors from said models can be directly correlated to inherent performance factors which influence the outcomes of CS Projects.

Finally, and as it relates to a performance factor of primary importance in industry, it must be noted that funding will not be considered within this paper. That is not to say that funding is not a critical considering in the execution of CSCs, but rather to say that it will not be a critical performance factor in the proceeding analysis of the two case studies. No interviewees or documentary evidence suggested that either case study was significantly influenced by a lack of funding. As such, the focus will remain on the theoretically-defined and emergent performance factors within the two case studies associated with the overall outcomes and value added of the CSCs.

CHAPTER 2 – THEORICAL MODELS OF IT PROJECT AND INFORMATION SYSTEM PERFORMANCE

Introduction

In the course of the research for this paper, it became apparent that there are a plethora of theoretical models of IT Project performance and IT success from which to choose. The majority of these models focused on factors such as performance, risk, commitment, user acceptance and resistance, while others focus on more specific factors such as goal setting, financial aspects, culture, role of management, learning and commitment. However, and for the purposes of this paper, it was necessary to choose models whose shared focus was the relationship between performance factors and overall project success and effectiveness. This necessity was derived from the research questions posed, which were focused on performance factors which influenced overall outcomes of the CSC. It was also necessary to chose two models which were both viable and unique in terms of their contributing performance factors as well as their focus on outcomes. The two chosen theoretical models were selected specifically based on these criteria and their ability to be applied against the CSPP T3 and BV case studies. The following paragraphs describe in detail the two selected models.

Model #1 - Integrated Performance Model of Information Systems Projects

The first of the two theoretical models is known as the Integrated Performance Model of Information Systems Projects. For the purposes of this paper, it will be known as the "Integrated Performance Model." It was proposed in 2002 by University of Kuwait information systems researcher Professor Adel M. Aladwani.

In terms of the model's development, Aladwani draws on a number of other theories in the development of the Integrated Performance Model. Amoungst others within the research and academic community, Massachusetts Institute of Technology professor Dr. Thomas Kuhn articulated the concept that theories and research should be of an integrated nature and draw on extant theories.[34] Based on this approach, Aladwani's literature study yielded three key fields of influencing literature: organizational teams research, project management research and IT research.[35]

These three key fields of literature highlighted specific performance factors which Aladwani would later consolidated into the Integrated Performance Model. In terms of organizational teams research, it offered characteristics including the level of competency of staff, process and the team's ability to

[34] T.S. Kuhn, *The Structure of Scientific Revolution Second Edition*, (Chicago, Illinois: University of Chicago Press,1970).
[35] Adel Aladwani, "An Integrated Performance Model of Information Systems Projects," *Journal of Management Information Systems*, Volume 19, Number 1 (Summer 2002): 189.

collectively solve problems as performance factors influencing outcomes.[36] Within IT research, there existed theories that the use of technology could assist in the execution and coordination of IT projects.[37] Based on the literature review, Aladwani found that the field of project management yielded a common theme of the requirement for "goal clarity."[38] Aladwani also concluded that management advocacy and project team size were factors which spanned the three literature fields[39]. Finally, Aladwani found that IT project performance was typically measured in terms of task, psychological and organizational outcomes.[40]

Based on his literature study and desire to develop an integrated model, Aladwani posits that there exist six performance factors which contribute to a three-component IS project performance measure as depicted graphically in Figure 2.1. The six performance factors are Technology Characteristics, Project Characteristics, Task Characteristics, People Characteristics, Organizational Characteristics and Processes Characteristics while the components of IS project performance are Task Outcomes, Psychological Outcomes and Organizational Outcomes.[41]

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[36] M.A. Campion, G.J. Medsker and A.C. Higgs, "Relations Between Work Group Characteristics and Effectiveness: Implications for Designing Effective Work Groups," *Personnel Psychology*, Volume 46, Number 4 (1993).
[37] P.S. Goodman, E. Ravlin and M. Schminke, "Understanding Groups in Organizations," in B. Staw and L.L. Cummings, *Research in Organizational Behaviour.* (Greenwich, Connecticut: JAI Press, 1987).
[38] Adel Aladwani, "An Integrated Performance Model of Information Systems Projects": 189.
[39] Ibid., 190.
[40] Ibid., 190.
[41] Ibid.,185.

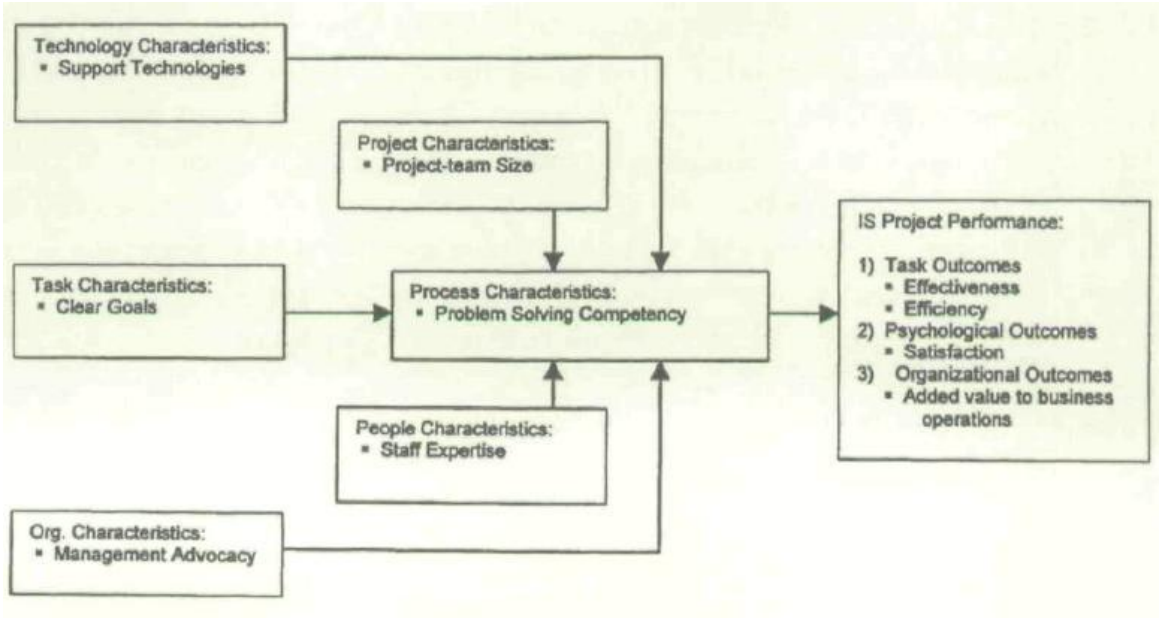

Figure 2.1 – Integrated Performance Model of Information Systems Projects

Source: Adel Aladwani, "An Integrated Performance Model of Information Systems Projects," *Journal of Management Information Systems,* Volume 19, Number 1 (Summer 2002): 191.

Aladwani argues that within each of the six respective performance factors (Characteristics), there exist:

> …certain project design attributes (such as, use of Support Technology, Project Team Size, Clear Goals, Expertise of Staff and Management Advocacy) are necessary inputs for accomplishing favourable process outcomes (such as Problem Solving Competency), which in turn represent necessary conditions to secure the ultimate desired Task, Psychological and Organizational Outcomes.[42]

Of note, Aladwani also suggests that Technology Characteristics, Project Characteristics, Task Characteristics, People Characteristics and, Organizational Characteristics all contribute directly to Process Characteristics outcomes which contribute directly to and determines IS Project Performance outcomes. These

[42] Ibid., 191.

performance factors/Characteristics and specific design attributes are specifically applicable to the two case studies to be considered as part of this paper. The paragraphs which follow will describe the Integrated Performance Model in detail including its contributing performance factors.

Technology Characteristics are defined in terms of the Support Technologies which are used to enable the project. American IT business researchers have suggested that Support Technologies could be used to influence production, coordination and organizational functional dimensions.[43] Aladwani proposes that, in terms of project performance, the use of Support Technologies will influence "problem solving competency… [as well as] task, psychological, and organizational outcomes of IS projects."[44] From an ADM (Mat) engineering perspective, these technologies could include the various technologies available to assist with the development and integration of CSCs. From an Army perspective, these technologies could include DND corporate Project technologies such as Project websites and applications, industry-based requirements management systems such as the Dynamic Object-Oriented Requirements System (DOORS), various commercial IS project management applications and more rudimental applications such as Microsoft applications (including Microsoft Project).

[43] J. Cooprider and J. Henderson, "Dimensions of IS Planning and Design Aids: A Functional Model of CASE Technology," *Journal of Management Information Systems*. Volume 7, Issue 3 (Winter 1990): 67.
[44] Adel Aladwani, "An Integrated Performance Model of Information Systems Projects": 192.

Based on his previous research, Aladwani indicates that Project Characteristics are influenced by Project Team Size.[45] While traditional thinking would dictate that a larger team would produce a more positive result, more recent research suggests that a team which is too large can lead to lack of performance in some individuals and thus an outcome which is lower than anticipated relative to the Project Team Size.[46] The Integrated Performance Model suggest that Project Team Size will influence "problem solving competency… [as well as] task, psychological, and organizational outcomes of IS projects."[47] For the purposes of the two case studies, the Project Team Size will consider the size and nature of the teams within the Army (including user engagement) and the size of the teams within ADM (Mat) (including contractors) as research has indicated that such participation directly influences various aspects of IT Project performance and IS success.[48]

The Integrated Performance Model also indicates that Clear Goals are a defining component of Task Characteristics. Project implementation research has indicated that the establishment and maintenance of such Goals are critical to enable positive outcomes.[49] As part of the model, Aladwani indicates that:

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[45] Adel Aladwani, "Formal Participation and Performance of the System Development Group: The Role of Group Heterogeneity and Group-Based Rewards,", *DATABASE for Advances in Information Systems*, Volume 31, Issue 4 (2000).
[46] B. Latané, K. Williams and S. Harkins, "Many Hands Make Light the Work: The Causes and Consequences of Social Loading," *Journal of Personality & Social Psychology*, Volume 37, Issue 6 (1979): 822.
[47] Adel Aladwani, "An Integrated Performance Model of Information Systems Projects": 192.
[48] M. Markus and J.-Y. Mao, "Participation in Development and Implementation - Updating An Old, Tired Concept for Today's IS Contexts," *Journal of the Association for Information Systems*, Volume 5, Number 11 (2004): 515.
[49] J. Pinto. and D.Slevin, "Critical Factors in Successful Project Implementation," *IEEE Transactions on Engineering Management*, Volume EM-34, Number 1 (1987): 22.

> …goal clarity can improve the ability of project members to understand the problem solving situation and develop a common understanding of the problem, to effectively communicate this understanding to other project members, and to develop a unified approach or strategy for solving the problem.[50]

This position is reinforced by other IT project-related research which suggests that, "the assignment of challenging, specific goals influences performance."[51] Software project management research also purports that Clear Goals influence not only effective resource allocations but also ultimate user satisfaction with the IS.[52] Aladwani's model posits that Clear Goals will influence "problem solving competency…[as well as] task, psychological, and organizational outcomes of IS projects."[53] The specific goals of the two case studies to be considered in this paper will be defined in Chapter 3 and Chapter 4 respectively such that they can be examined in relation to this model.

Within People Characteristics, Aladwani identifies the Expertise of Staff as a key performance factor in IS projects. Research suggests that a project team which has faced a similar problem previously, enjoys a distinctly high probability of success than a project team which lacks such experience with a specific problem.[54] Specifically, Aladwani indicates that "past research suggests that experience and knowledge and the resultant familiarity with the problem faced

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[50] Adel Aladwani, "An Integrated Performance Model of Information Systems Projects": 192.
[51] T. Abdel-Hamid, K. Sengupta and C. Swett, C. (1999), "The Impact of Goals on Software Project Management: An Experimental Investigation," *Management Information Systems Quarterly*, Volume 23, Number 4 (1999), 531-555.
[52] T. Abdel-Hamid, K. Sengupta and C. Swett, C. (1999), "The Impact of Goals on Software Project Management: An Experimental Investigation," 543.
[53] Adel Aladwani, "An Integrated Performance Model of Information Systems Projects": 193.
[54] M.Prietula, and H.Simon, "The Experts in Your Midst." *Harvard Business Review*, Volume 67, Issue 1 (1989): 121.

can be an important determinant of IS project outcomes."[55] Inversely, a group of staff lacking experience with a specific problem would be expected to produce a less positive project outcome. Other research supports the concept that participation by empowered managers and end-users will enhance overall IS success.[56] The Integrated Performance model indicates that Expertise of Staff will influence "problem solving competency…[as well as] task, psychological, and organizational outcomes of IS projects."[57] In terms of this paper, the Expertise of Staff will be examined regarding those individuals at ADM (Mat) as well as within the Army (chain of command and those involved in user participation and engagement).

As a part of Organizational Characteristics, the Integrated Performance Model defines Management Advocacy as "the willingness of management to provide the required resources and authority for project success."[58] Specifically, Aladwani draws on research which suggests the support of management tends to increase overall IS project success as well as having a positive impact on user satisfaction with the IS.[59] In terms of resource allocations, these could include people, money, time, material, information and other useful resources required in the execution of the project. The Integrated Performance Model anticipates that Management Advocacy will influence "problem solving competency…[as well

[55] Adel Aladwani, "An Integrated Performance Model of Information Systems Projects": 193.
[56] M. Markus and J.-Y. Mao, "Participation in Development and Implementation - Updating An Old, Tired Concept for Today's IS Contexts": 517.
[57] Adel Aladwani, "An Integrated Performance Model of Information Systems Projects": 193.
[58] Ibid., 193.
[59] M. Igbaria, N. Zinatelli and A. Cavaye, "Analysis of Information Technology Success in Small Firms in New Zealand," *International Journal of InformationManagement*, Volume 18, Number 2 (1998): 103.

as] task, psychological, and organizational outcomes of IS projects."[60] For the purposes of this paper, the provision of information and direction will also be considered as a resource which is directly related to Management Advocacy.

Problem Solving Competency is the key design attribute which contributes to the Process Characteristic performance factor. Aladwani describes it as the collaborative approach needed to define requirements and coordinate efforts within a project, as well as the specific technical problems which must be overcome by the engineering community. Striving for continual improvement in terms of the "solution process" is also a characteristic of Problem Solving.[61] From a temporal perspective:

> …the sooner the project conceptualizes a preliminary feasible solution for the problem, the more likely that the project mobilizes all the effort to perfecting the solution.[62]

This belief is reinforced by other research which suggests projects with high levels of diverse participation will enhance the team's ability to solve problems and ultimately lead to a more effective outcome.[63] In terms of the Integrated Performance model, Aladwani indicates that Problem Solving Competence will influence "task, psychological, and organizational outcomes of IS projects."[64] Within this paper, the problem for each case study will be defined as part of their respective Chapters.

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[60] Adel Aladwani, "An Integrated Performance Model of Information Systems Projects": 193.
[61] R. Cerveny**,** E. Garrity and G. Sanders, "A Problem-Sovling Perspective on Systems Development," *Journal of Management Information Systems*. Volume 6, Issue 4 (Spring 1990): 118.
[62] Ibid., 194.
[63] M. Markus and J.-Y. Mao, "Participation in Development and Implementation - Updating An Old, Tired Concept for Today's IS Contexts": 517.
[64] Adel Aladwani, "An Integrated Performance Model of Information Systems Projects": 193.

The IS Project Performance within Integrated Performance Model is comprised of three outcome components: Task Outcomes, Psychological Outcomes and Organizational Outcomes. Task Outcomes consist of the Effectiveness and Efficiency of the Project, Psychological Outcomes are focused on the overall level of Satisfaction of the Project, while Organizational Outcomes relate specifically to the holistic valued added to the business operations.[65] As noted earlier, the respective performance factor Characteristics and their accompanying design attributes all contribute directly to these Outcomes.

Overall, the Integrated Performance Model offers a comprehensive and holistic model which can effectively be applied to both of the case studies being examined as part of this paper. Its performance factor Characteristics and IS Project Performance Outcomes are easily adaptable to the specifics of the DND environment and the available research material on the case studies. The Integrated Performance Model will be applied to the CSPP T3 and BV case studies in Chapter 3 and Chapter 4 respectively.

Model #2 – Updated DeLone and McLean Model of Information Systems Success

The second theoretical model which will be used for this paper is the Updated DeLone and McLean Model of Information Systems Success. For the purposes of this paper, this model will be known as the "Updated D&M Model." The original model, upon which the Updated model is based, was developed and proposed by American IS

[65] Ibid., 191.

researchers and professors William H. DeLone and Ephraim R. McLean in 1992 and is included in its graphical depiction at Figure 2.2.[66] The version of the model to be considered as part of this paper, as indicated by the model's title, is an updated version which was presented in 2003.

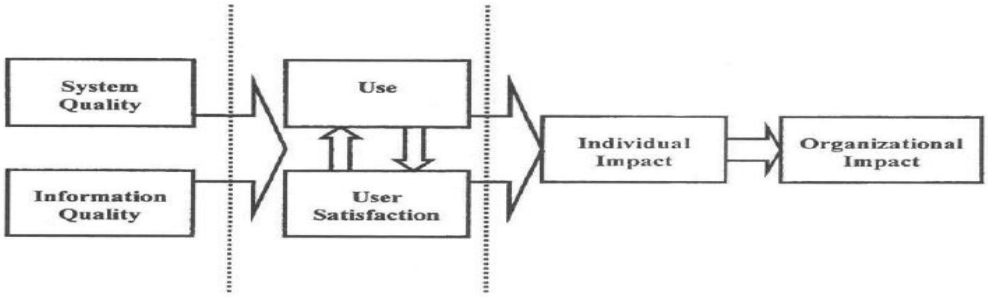

Figure 2.2 – DeLone & McLean Information Systems Success Model

Source: W. DeLone and E. McLean, "Information Systems Success: The Quest for the Dependent Variable," *Information Systems Research*, Volume 3, Number 1 (1992): 87.

Both models contain a Quality component which contributes to the effectiveness of the IS. The Quality component of the original model consisted of both System Quality and Information Quality.[67] Since the original model, research suggested that Service Quality was becoming an increasingly important factor in IS success, and that it had a causal relationship with User Satisfaction (which was also part of the original model).[68] For this reason, and based on other DeLone and McLean's research in the ten-year interim period in terms of the evolution of IS and their underpinning elements, the

[66] W. DeLone and E. McLean, "Information Systems Success: The Quest for the Dependent Variable," *Information Systems Research*, Volume 3, Number 1 (1992).
[67] W. DeLone and E. McLean, "The DeLone and McLean Model of Information Systems Success: A Ten-Year Update," *Journal of Management Information Systems*, Volume 19, Number 4 (Spring 2003): 12.
[68] W.J. Kettinger and C.C. Lee, "Perceived Service Quality and User Satisfaction with the Information Services Function," *Decision Sciences*, Volume 25, Number 5 (1995).

decision was made to include Service Quality within the overall Quality component of model.[69]

As part of the review of the original model it was clear that User Satisfaction must remain as part of the IS success model. However, the Use factor was challenged by a number of researchers including Australian IS researcher Dr. Peter Seddon who argued that Use does not necessarily lead to positive outcomes.[70] For this reason, DeLone and McLean chose to adapt this factor to include Intention to Use parallel with Use to capture both the behavioural and attitudinal aspects of using the IS.[71]

Following a detailed significant literature study, including feedback on their original model from the previously referenced Seddon article, DeLone and McLean chose to adapt Individual Impacts and Organizational Impacts into a consolidated Net Benefits factor. This is based on research suggesting the individual impacts were closely related to "work group impacts, interorganizational and industry impacts, consumer impacts and societal impacts"[72] This approach would be in line with the previously discussed concept proposed by Kuhn suggesting the integration of extant theories and concepts.[73]

As with the Integrated Performance Model, the Updated D&M Model maintains its focus on a set of performance factors which directly contribute to the overall outcomes

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[69] W. DeLone and E. McLean, "The DeLone and McLean Model of Information Systems Success": 18.
[70] P.B. Seddon, "A Respecification and Extension of the DeLone and McLean Model of IS Success," *Information Systems Research*, Volume 8, Number 3 (1997).
[71] W. DeLone and E. McLean, "The DeLone and McLean Model of Information Systems Success": 23.
[72] Ibid., 19.
[73] T.S. Kuhn, *The Structure of Scientific Revolution Second Edition*.

(or "Net Benefits" as stated by the Updated D&M Model) of the IS.[74] DeLone and McLean suggest that the three components of Quality (Information Quality, System Quality and Service Quality) all contribute to both Intention to Use/Use as well as User Satisfaction. The distinction between Intention to Use and Use is noteworthy in that "'intention to use' is an attitude, whereas 'use' is a behaviour."[75] Intent to Use/Use and User Satisfaction are interrelated. Within the Updated D&M Model, Intention to Use/Use and User Satisfaction subsequently influence the overall Net Benefits of the IS in question. Of note, there exists a feedback loop from Net Benefits to both Intention to Use/Use and User Satisfaction indicating that the overall performance of the IS will influence users attitudes and behaviours relative to the IS. [76] The Updated D&M Model is depicted graphically in Figure 2.3. These performance factors are specifically applicable to the two case studies to be considered as part of this paper. The paragraphs which follow will describe the Updated D&M Model in detail including its contributing performance factors.

[74] W. DeLone and E. McLean, "The DeLone and McLean Model of Information Systems Success": 24.
[75] Ibid., 23.
[76] Ibid., 23.

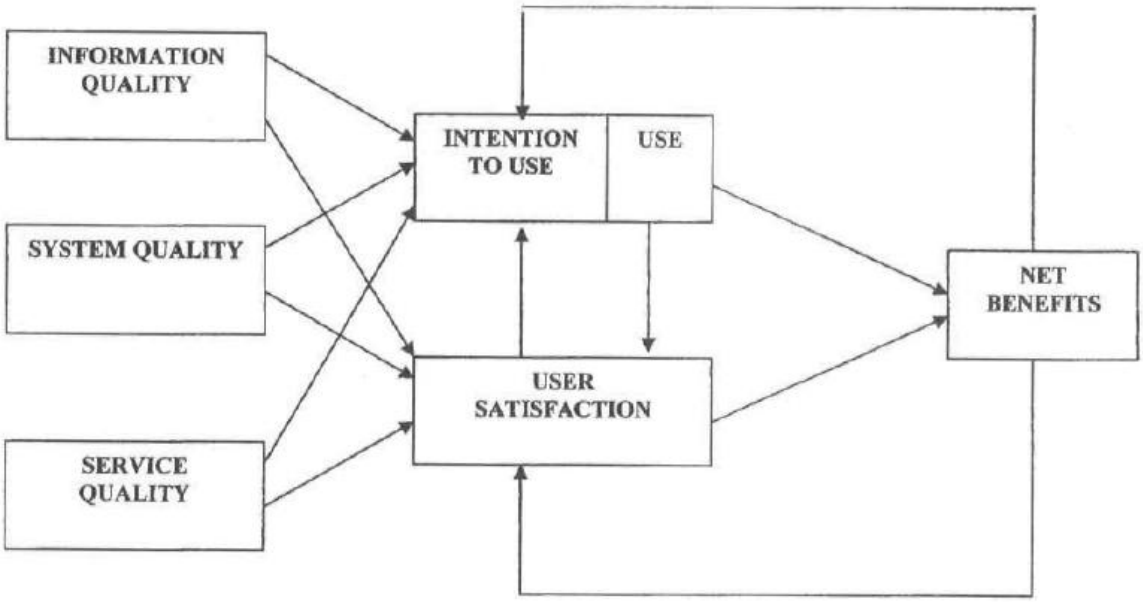

Figure 2.3 – Updated D&M Model of Information Systems Success Model

Source: W. H. DeLone and E.R. McLean, "The DeLone and McLean Model of Information Systems Success: A Ten-Year Update," *Journal of Management Information Systems*, Volume 19, Number 4 (Spring 2003): 24.

The Information Quality performance factor is defined as measuring semantic success. The Updated D&M Model draws on previous research in defining semantic success as the "level is the success of the information in conveying the intended meaning."[77] This performance factor could be "measured in terms of accuracy, timeliness, completeness, relevance, and consistency" of the information provided by the IS.[78] In terms of the Updated D&M Model, it indicates that Information Quality will influence Intention to Use/Use and User Satisfaction. Regarding the two case studies to be considered as part of this paper,

[77] C. Shannon and W. Weaver, *The Mathematical Theory of Communications* (Urbana, Illinois: University of Illinois, 1949).
[78] W. DeLone and E. McLean, "The DeLone and McLean Model of Information Systems Success": 15.

and within the overall realm of CSC, Information Quality is a vital characteristic in that it directly contributes to the creation of the knowledge which influences the Commander's ability to make decisions which effectively and successfully influence operational outcomes.

In the Updated D&M Model, the System Quality performance factor is meant to measure technical success. Technical success is defined as "the accuracy and efficiency of the communication system that produces information."[79] It can be measured "in terms of ease-of-use, functionality, reliability, flexibility, data quality, portability, integration, and importance."[80] Research on participation in the development of IS has also suggested that both meaningful user engagement and effective articulation of requirements positively influences Service Quality.[81] The Updated D&M Model also anticipates that System Quality will directly affect Intention to Use/Use and User Satisfaction based on Seddon's research.[82] As this paper is meant to consider the holistic CSCs within the two case studies, the sub-components of System Quality are useful in terms of both the Commander and his Staff as it relates to the interaction with the CS System.

Service Quality is a performance factor which was added to the original D&M Model as part of the Update, and one which acknowledges the evolution in

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[79] Ibid., 10.
[80] Ibid., 13.
[81] M. Markus and J.-Y. Mao, "Participation in Development and Implementation - Updating An Old, Tired Concept for Today's IS Contexts": 518-519.
[82] P. Seddon and M.-Y. Kiew, "A Partial Test and Development of the DeLone and McLean Model of IS Success," in *Proceedings of the International Conference on Information Systems*, ed. J. DeGross, S. Huff and M. Munro (Atlanta, Georgia: Association for Information Systems, 1994).

understanding of the requirement to deliver support to users of the IS.[83] Service Quality is comprised of the following components: "Tangibles (IS has up-to-date hardware and software), Reliability (IS is dependable), Responsiveness (IS employees give prompt service to users), Assurance (IS employees have the knowledge to do their job well), and Empathy (IS has users' best interests at heart)."[84] Service Quality is expected to influence both Intention to Use/Use and User Satisfaction. Considering the evolution within the CSC over the past 20 years, the Service Quality performance factor is relevant if not essential to the examination of both the CSPP T3 and BV case studies.

Intention to Use/Use are similar and yet unique within the Updated D&M Model and are underpinned by the Technology Acceptance Model (TAM) as proposed by American IS researcher Fred Davis in 1989.[85] As mentioned earlier, "'Intention to Use' is an attitude, whereas 'Use' is a behaviour."[86] In terms of quantification of the behaviour, Use can be "measured by frequency of use, time of use, number of accesses, usage pattern, and dependency."[87] The attitude of Intention to Use is more difficult to define and measure, and is largely a qualitative description. It does, however, relate directly to the user's plan regarding future "Use" of the IS. Intention to Use is expected to directly influence both Use and Net Benefits within the Updated D&M Model. These interrelated

[83] W.J. Kettinger and C.C. Lee, "Perceived Service Quality and User Satisfaction with the Information Services Function."
[84] W. DeLone and E. McLean, "The DeLone and McLean Model of Information Systems Success": 18.
[85] F. Davis, "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," *Management Information Systems Quarterly*, Volume 13, Number 3 (1989).
[86] W. DeLone and E. McLean, "The DeLone and McLean Model of Information Systems Success": 23.
[87] Ibid., 13.

pairing as a performance factor is of use in the analysis of the two case studies in that both the attitudes and behaviours of users of the CSC are expected to have a significant role in terms of its overall outcomes.

The Updated D&M Model describe User Satisfaction in terms of the level of "effect of the information on the receiver" in terms of how the information has met the requirements of a given user.[88] User Satisfaction and its correlation to System Quality and Net Benefits are again supported by the research of Seddon and Kettinger.[89,90] DeLone and McLean describe the relationship between Use and User Satisfaction as "closely interrelated" and go on to characterize the interrelation as follows:

> …"use" must precede "user satisfaction" in a process sense, but positive experience with "use" will lead to great "user satisfaction" in a causal sense. Similarly, increased "user satisfaction" will lead to increased "intention to use," and thus [increased] "'use". [91]

Other research has determined that participatory design has a direct relationship in terms of User Satisfaction with a given IS.[92] In terms of its value, they indicate that User Satisfaction "remains an important means of measuring our customers' opinions of [the] …system and should cover the entire user experience cycle."[93] According to the Updated D&M Model, User Satisfaction is expected to directly influence both Intention to Use and Net Benefits. User Satisfaction is of critical

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[88] Ibid., 10.
[89] P. Seddon and M.-Y. Kiew, "A Partial Test and Development of the DeLone and McLean Model of IS Success."
[90] W.J. Kettinger and C.C. Lee, "Perceived Service Quality and User Satisfaction with the Information Services Function."
[91] W. DeLone and E. McLean, "The DeLone and McLean Model of Information Systems Success": 23.
[92] M. Markus and J.-Y. Mao, "Participation in Development and Implementation - Updating An Old, Tired Concept for Today's IS Contexts": 524.
[93] W. DeLone and E. McLean, "The DeLone and McLean Model of Information Systems Success": 23.

importance within the study of CS Project in that the effects of information on the receiver (either Staff or Commander) have significant overall effects in the prosecution of operations.

Based on an extensive literature review, DeLone and McLean decided combine the sum of the positive and negative impacts of both the Individual Impacts and Organizational Impacts into a consolidated Net Benfits.[94] This adjustment to the original model is again in line with the research and recommendations of Seddon.[95] It is noteworthy that DeLone and McLean indicate that "the 'impacts' of IS have evolved beyond the immediate user" and have "group impacts, and societal impacts."[96]

As with User Satisfaction, Net Benefits is characterized in terms of the level of "effect of the information on the receiver" in terms of how the information has met the requirements of a given user.[97] It can be "measured in terms of decision-making performance, job effectiveness, and quality of work."[98] Similar to a number of the other performance factors within the Updated D&M Model, Net Benefits is anticipated to be directly influenced by participation during the development and implementation processes.[99] As previously described, the feedback loop which exists from Net Benefits to Intention to Use/Use and Net

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[94] Ibid., 19.
[95] P.B. Seddon, "A Respecification and Extension of the DeLone and McLean Model of IS Success."
[96] W. DeLone and E. McLean, "The DeLone and McLean Model of Information Systems Success": 19.
[97] Ibid., 10.
[98] Ibid., 15.
[99] M. Markus and J.-Y. Mao, "Participation in Development and Implementation - Updating An Old, Tired Concept for Today's IS Contexts": 524.

Benefits to User Satisfaction is expected to directly influence the two aforementioned performance factors respectively. The evolution of the Updated D&M Model beyond the individual user to the collective organization is particularly significant in the study of CS Projects based on the highly interconnected and interdependence of the CSC in terms of its ability to enable Commanders through various interrelated Staffs and processes.

Rating Metrics

In order to effectively determine and articulate the respective performance factors (for each respective model), it is imperative to establish pre-determined rating metrics. This is also necessary to conduct the cross-case comparison in Chapter 5. Following consideration of the evidence for respective performance factor, each will be assigned a rating in terms of its own outcome and/or how it influenced either its correlated performance factors of the overall Outcomes or Net Benefits. The same approach will be taken for emergent performance factors. The rating metrics range from VERY NEGATIVE, NEGATIVE, NEUTRAL/NIL, POSITIVE to VERY POSITIVE and are displayed graphically at Figure 2.4.

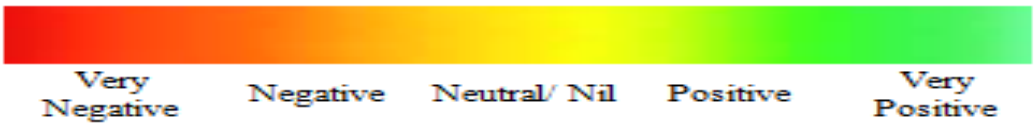

Figure 2.4 - Command Support Performance Factor Rating Metrics

Conclusion

The preceding paragraphs have described in detail both the Integrated Performance Model and the Updated D&M Model. Their respective component performance factors and relationships to overall IT project and IS outcomes have been established with a view to enabling their application to the case studies of CSPP T3 and BV which will occur in Chapter 3 and Chapter 4 respectively. Further, relevant correlations between the theoretical models and the two case studies have been highlighted to demonstrate the suitability and viability of both of the models in terms of examining the performance factors which potentially impacted the overall outcomes. The application of the two theoretical models will enable the development of a rich tapestry which will highlight the various influences that the respective performance factors had on the outcomes of the respective CSCs.

CHAPTER 3 – CSPP TRIAL 3 CASE STUDY

Introduction

Having now defined the two theoretical models, it is now possible to conduct the CSPP T3 case study. Prior to proceeding, the nature of CSPP T3 and the context within which it took place will be described to add richness and depth to the discussion. Certain limitations of the analysis of the CSPP T3 will also be identified. The nature of the research conducted for the CSPP T3 case study will be briefly described prior to proceeding with the application of the theoretical models. Following the respective examinations, conclusions will be drawn in terms of how the proposed performance factors influenced the overall outcome of CSPP T3.

CSPP T3 Context and Definitions

In terms of context, there are three factors which are distinct. From a strictly CS perspective, the significant challenges associated with the fielding of Iris OPCAP 1 (CNR) was fresh in the minds of many of the Army's commanders. This factor may have affected the perceptions and attitudes of some individuals in their approach to CSPP T3. The second significant contextual factor surrounded the fact that CSPP T3 was the first significant, holistic and collective exposure of the Canadian Army field force to an automated CSC outside the laboratory environment during which a significant load would be placed on the System. The return of the Canadian Army to Afghanistan in the Summer

of 2003 was the third significant factor affecting the Army during the timeframe leading up to CSPP T3.

CSPP T3 was part of a larger set of Trials nested within the CSPP. The objective of the CSPP was "to determine the optimal Command Support Capability required across the Army by 2004."[100] CSPP T1's purpose was to validate the Signal and SM components of the CSC while CSPP T2's purpose was to validate the Intelligence component of the CSC. CSPP T3 had the objective of validating CS at the BG/unit level. The effects of the cancellation of CSPP T1 and CSPP T2 on the outcome of CSPP T3 will be discussed later in this paper. CSPP T4, which never occurred, was meant to validate CS at the Brigade Group level. It is also noteworthy, in terms of how CSPP T3 was viewed by the Army and ADM (Mat) respectively, that CSPP was not an official DND Project but rather an Army-initiated activity funded using in-year Operating & Maintenance (O&M) funds assigned from the Army Strategic Operating and Resource Directive (SORD).

The Army's CSPP T3 Directive provided extensive background and direction regarding the activity itself. The primary objective of CSPP T3 was to "Validate command support at the [Battle Group] BG/unit level."[101] Its secondary objectives and deliverables included, but were not limited to: validate BG Headquarters (HQ) and Intelligence structures, validate BG Operations, Intelligence and technical/system management processes, determine procedures for the maintenance of automated Situational Awareness (SA) and the Common Operating Picture (COP) as well as

[100] Department of National Defence, Army Strategic Operating and Resource Directive (SORD), 2002.
[101] Department of National Defence, 3350-1 (DLCI) Command Support Pilot Project (CSPP) Trial 3 Directive – Battle Group Command Support Trial, 14 September 2004, 4.

enabling the continued refinement of the CS System training requirements.[102] CSPP T3 saw the 1st Battalion, The Royal Canadian Regiment (1 RCR) as the Trial Unit within the context of a 2 Canadian Mechanized Brigade Group (2 CMBG) simulated deployment.

It is now necessary to define the technical configuration of the CSC for CSPP T3. The TacC2IS in use during CSPP T3 was known as the Land Force Command and Control Information System version 1 (LFC2IS v1). LFC2IS v1 was composed of the Athene Tactical System (ATS) and the Operational Environment Planning and Reference Application (OPERA) from the Land Force Command System (LFCS) Project as the two primary CS applications used between the static 2 CMBG and unit HQs. 2 CMBG and unit HQs were interconnected via Iris OPCAP 3 (microwave LOS) TacComms links. The Situational Awareness System (SAS) was the primary TacC2IS CS application used between mobile vehicle-based platforms at the 2 CMBG, unit and sub-unit levels and was interconnected via Iris OPCAP 1 (CNR) TacComms links. It is noteworthy that the CSC was not fully or universally considered and managed as a holistic system-of-systems (SoS) at the time of CSPP T3.

Research

The research for the CSPP T3 consisted of both interview and documentary evidence. Comprehensive interviews were conducted with a total of 19 personnel with intimate knowledge of certain aspects of CSPP T3; 15 of which were employed within the

[102] Department of National Defence, 3350-1 (DLCI) Command Support Pilot Project (CSPP) Trial 3 Directive, 4.

Army and four of which were employed within ADM (Mat) at the time of the Trial. In terms of the Army, these interviews included: former Army CSPP Trial Officer and staff, Army Operational Research (OR) Teams, former Army G6s, former Army G6 staff, former Directors of the Army Digitization Officer at Kingston (Dir ADOK), former DLR 4 staff, former Comd 2 CMBG, former 2 CMBG G3 staff, former CO 1 RCR, former CO 2 CMBG HQ & Sig Sqn, former sub-unit commanders from 2 CMBG HQ & Sig Sqn and former Sig O 1 RCR. From an ADM (Mat) perspective, interviews were conducted with former Directors DLCSPM, former PMs as well as former engineering staffs. Documentary evidence reviewed in the course of the research included various Army and subordinated formation CSPP T3 and related directives and After Action Reviews (AARs), the CSPP T3 Operational Research and Analysis Report as well as email submissions from a number of interviewees. It is assessed that the research conducted for the CSPP T3 case study was sufficient to meet the demands of the theoretical models.

Limitations

There are several limitations which must be considered in the examination of CSPP T3. Most significantly, the length of time between the completion of CSPP T3 and the interviews was approximately eight years. This presents the opportunity not only for memories to falter, but also for individuals to construct their respective perception of what occurred. It has also led to a situation where a number of the key members of the chain of command at the higher levels within the Army had retired and were unavailable to interview. This same lapse in time has contributed to a difficulty in sourcing written documentation. Depending on how respective unit and HQ Central Registries (CRs) apply

the duration of file storage requirements in accordance with the Defence Subject Classification and Disposition System (DSCDS), many of the files have been removed and/or destroyed, making it exceptionally challenging to source them. Finally, and not to preempt the analysis, it must be acknowledged that due to the Army and ADM (Mat)'s inability to deliver a stable and reliable CSC from a technical perspective, it was not possible to proceed with the remainder of the CSPP T3 objective set which was more focused on the C&S and IM perspectives.

Application of Integrated Performance Model

The examination of CSPP T3 using the Integrated Performance Model will now occur using the performance factors as defined in Chapter 2. This will enable overall conclusions to be drawn in terms of the applicability of the performance factors in determining outcomes of CSPP T3. The following performance factors will be reviewed in sequence: Support Technologies, Project Team Size, Clear Goals, Staff Expertise, Management Advocacy and Problem Solving Competency.

The first of six performance factors to be examined is the use of Support Technologies. Based on the review of the documentary and interview evidence, there is no evidence to suggest that any specific IT project Support Technologies were used in its overall management, nor was there any evidence presented in terms of a Support Technology in use for the overall SoS integration or management. While the lack of the presence of Support Technologies does not condemn CSPP T3 to success or failure, it does in fact rob it of an opportunity for exploitation of a factor which the Integrated

Performance Model suggests would have contributed to its success. Due to the fact that CSPP T3 was not a Capital Project, none of the DND-level Support Technologies and associated accountabilities were observed. Support Technologies are deemed to have had NEUTRAL/NIL influence on the Problem Solving Competency or success of CSPP T3, but their absence may have contributed to its shortcomings.

In terms of Project Team Size, this performance factor can be viewed in different ways in terms of CSPP T3 regarding the Army and ADM (Mat). From the Army perspective, all interviewees believed that its commitment of personnel to the Trial proper was sufficient. However, one consistent comment which arose from interviewees was the perceived lack of properly trained and experienced C&S and IM users despite the massive commitment by 2 CMBG. From an ADM (Mat) perspective, the consistent comment regarding its personnel commitment prior to CSPP T3 was that the SoS approach was not fully developed in the 2004 timeframe – a factor is believed to have contributed to the negative outcomes of CSPP T3. One less-reported suggestion regarding ADM (Mat)'s support by a number of highly-involved interviewees suggests that its Subject Matter Experts (SMEs) were not made available in the direct support of CSPP T3 due to their engagement in activities supporting the next iteration of their respective portions of the CS System.[103,104,105,106,107] It was further suggested by multiple interviewees that the

[103] Former Army G6, 2004-2006, *Command Support Project Performance Factors* Research Project Interview, interviewed by telephone by Major Jeremy Small, 20 February 2013.
[104] Former CSPP Trial Officer, *Command Support Project Performance Factors* Research Project Interview, interviewed by telephone by Major Jeremy Small, 06 February 2013.
[105] Former CSPP Technical Officer, *Command Support Project Performance Factors* Research Project Interview, interviewed by telephone by Major Jeremy Small, 21 February 2013.
[106] Former OC D 2 CMBG HQ & Sig Sqn, 2004-2006, *Command Support Project Performance Factors* Research Project Interview, interviewed by telephone by Major Jeremy Small, 05 February 2013.

knowledge of SMEs was very narrow and that SMEs were frequently unable to coordinate with each other due to stove-piped knowledge of the overall SoS, a suggestion which is congruent with the previous comments regarding a low level of SoS integration. Based on this analysis, it is believed that a lack of allocation of personnel in terms of ADM (Mat) regarding SoS integration and direct support to the activity proper contributed to a VERY NEGATIVE outcome in terms of Problem Solving Competency and ultimately of CSPP T3 itself.

The Army's CSPP T3 Directive articulated its Clear Goals for CSPP T3. However, and from a CS Programme level, there remained an ambiguity which a senior Army G6 staff officer characterized as having "no coherent view of what Command Support was supposed to do."[108] The most consistent message from interviewees in terms of Clear Goals was that the Army's Afghanistan Force Generation (FG) requirements played a predominant role in the Army's fierce desire to acquire and deploy a digitized CSC as well as its scheduling of CSPP T3. A number of interviewees, including the former Comd 2 CMBG and former DLCSPM went so far as to say that the Army chain of command was not willing to entertain suggestions that the CS System was not ready for such a trial or that its soldiers were not sufficiently prepared to deploy, operate and maintain such a System, despite warnings to those effects from ADM (Mat) and within the Army. The CSPP Trial Officer suggested that there was "zero appetite for delays."[109]

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[107] Former Sig O 1 RCR, 2004-2007, *Command Support Project Performance Factors* Research Project Interview, interviewed by telephone by Major Jeremy Small, 31 January 2013.
[108] Former Army G6 Staff Officer, 2001-2005, *Command Support Project Performance Factors* Research Project Interview, interviewed by telephone by Major Jeremy Small, 14 February 2013.
[109] Former CSPP Trial Officer, 06 February 2013.

Regarding ADM (Mat)'s goals, interviewees generally perceived that it participated in order to support the Army, but that its goals were more aligned with objectives such as achieved Final Operating Capability (FOC) for several of the component Projects which comprised LFC2ISv1 and considering the next iterations of CS applications. This notion is supported by the perceived lack of direct support provided by ADM (Mat). It was also suggested by a significant number of interviewees that ADM (Mat)'s priorities may have seen support to the Army's deployment to Afghanistan and the development of the next generation CSC as higher priority than CSPP T3.

One further key aspect which must be considered in terms of how the Army established and maintained its Clear Goals is its ability to adjust to a developing situation. It is instructive to examine the key assumptions which underpinned the success of the overall activity which were articulated in the Army's CSPP T3 Directive. These included, but were not limited to: the successful execution of the CR 1 (LFC2ISv1) Field Validation Exercise (FVE), the provision of a stable version of LFC2ISv1 with which to train to 2 CMBG and the provision of system management (SM) training to 2 CMBG.[110]

In terms of the FVE, its Report highlighted 2 CMBG's inability to deliver the required functionality within the SoS without significant intervention from the contracted Original Equipment Manufacturer (OEM), the limited ability of the SoS to deliver the required functionality as well as numerous training and experiential shortfalls.[111]

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[110] Department of National Defence, 3350-1 (DLCI) Command Support Pilot Project (CSPP) Trial 3 Directive, 5.
[111] Department of National Defence, 3350-1 (G6) Command Support Capability Release 1 Field Validation Exercise – Phase 1 Report, 28 October 2004.

Regarding the provision of the stable LFC2ISv1 to 2 CMBG in sufficient time to prepare, the version of the SoS to be used for CSPP T3 was delivered mere days before the commencement of the activity. A former troop commander stated that ADM (Mat) had, "thrown kit over the fence" at the last minute prior to the Trial.[112] As for SM training, this was never formally provided to 2 CMBG. While it conducted significant Off-The-Shelf (OTS) training, the extent to which training on the LFC2ISv1 applications and SoS perspectives was limited to specific exposures with the OEM during FVE and several exposures to ADM (Mat) staff from DLCSPM.

Software project management research suggests that such complex activities require, "a continuous process of identifying goals, reconciling and making decision with respect to conflicts goals, and managing with respect to several simultaneous goals."[113] In hindsight, the CSPP Trial Officer characterized his lack of recognition and decision-making in this regard as akin to "sailing the Titanic into Dieppe…even if you made it to the lifeboats, you were still in the kill zone" and identified the CSPP Project office's lack of effective risk management was its "biggest failing" as it relates to these assumptions.[114]

Based on the Integrated Performance Model's definition of Clear Goals, the manner in which goals were *initially* established and communicated likely did not contribute to the poor overall outcomes in Problem Solving Competency and of CSPP T3. However, the inability of the chain of command to adjust its Goals on the basis of an

[112] Former OC D 2 CMBG HQ & Sig Sqn, 2004-2006, 05 February 2013.
[113] T. Abdel-Hamid, K. Sengupta and C. Swett, C. (1999), "The Impact of Goals on Software Project Management: An Experimental Investigation," 535.
[114] Former CSPP Trial Officer, 06 February 2013.

assessment of the situation at hand and the lack of symmetry between the Army and ADM (Mat)'s Goals likely did contribute to the shortcomings in Problem Solving Competency and as part of CSPP T3 as a whole. From this perspective, the Clear Goals are assessed as having had a VERY NEGATIVE impact on Problem Solving Competency in that they were established but never adjusted to fit the situation and likely contributed to the overall shortcomings of CSPP T3.

The next factor to be examined is Expertise of Staff. As noted earlier, and as a pretext for this discussion, it must be noted that CSPP T3 was the first major exposure of the Canadian Army to a digitized CSC and was the first delivery by ADM (Mat) of a SoS CSC. It is also significant that the Army had bypassed CSPP T1, an activity which would have validated the Signal and SM components of the CSC prior to proceeding to CSPP T3. For these reasons, it is a given that both the Army and ADM (Mat) are largely inexperienced at the outset of the activity.

In terms of the Army specifically, interviewees reinforced the previous finding that its users lacked the C&S, IM and SM training and experience to effectively establish, maintain and operate the CSC. This status was likely predicated on the lack of comprehensive TTP & Doctrine Release, Training Release and Training Infrastructure Release with which to operate the CSC. From an SM perspective, this is not surprising considering the outcomes of the CR 1 FVE and the exceptionally late delivery of the version of LFC2ISv1 provided to 2 CMBG only days before the activity commenced. A former OC D 2 CMBG HQ & Sig Sqn (who was responsible for the delivery of the TacC2IS portion of the CSC) summarized the situation by remarking that "we couldn't

have been less prepared" while an Army G6 staff officer responsible for the CS portfolio characterized the Army's knowledge of the systems as "low to non-existent."[115,116] A senior DLCSPM Project Manager stated that the Army had "no hands-on knowledge" of the CSC.[117] While several interviewees suggested there was a perception within ADM (Mat) following the Trial that the technical failures were due to a lack of *application* of training within the Army, no interviewees suggested that this was *in fact* the cause of the inability to establish and maintain a stable and reliable CSC during CSPP T3. Acknowledging that CSPP T3 never reached a point from which this perception could be verified, the Army C&S and IM condition was comparable. These C&S, IM and SM perceptions were corroborated by the CSPP T3 Operational Research and Analysis Technical Report.[118]

As described earlier, some level of expertise did exist within ADM (Mat) in terms of specific CS applications and other respective aspects of the SoS. However, most ADM (Mat) staff who were interviewed acknowledged that little Expertise of Staff existed in terms of the holistic SoS and its integration. Further, it was consistently suggested that few of the ADM (Mat) and/or OEM staff had significant experience or expertise outside of the lab environment. Commanding Officer (CO) 1 RCR lamented that some ADM (Mat) staff had "never seen the system in a vehicle."[119] Further exacerbating this lack of

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[115] Former OC D 2 CMBG HQ & Sig Sqn, 2004-2006, 05 February 2013.
[116] Former Army G6 Staff Officer, 14 February 2013.
[117] Former DLCSPM Project Manager, *Command Support Project Performance Factors* Research Project Interview, interviewed by telephone by Major Jeremy Small, 07 February 2013.
[118] Department of National Defence, "Command Support Pilot Project Trial 3 Observations, Data Collection and Analysis," Defence Research & Development Canada Centre for Operational Research and Analysis Technical Report 2005-20, June 2005, 36-40.
[119] Former CO 1 RCR, 2003-2005, *Command Support Project Performance Factors* Research Project Interview, interviewed by telephone by Major Jeremy Small, 28 January 2013.

Expertise of Staff on its part was the lack of a meaningful presence of ADM (Mat)'s and its OEM's SME staffs. The combination of these three factors would explain some of the technical issues which were never overcame and which lied at the intersection of various applications and components of LFC2ISv1.

Overall, the lack of Expertise of Staff within both the Army and ADM (Mat) likely contributed to the significant challenges which were encountered in terms of Problem Solving Competency, most significantly within the SM realm. However, and although it could not be validated as part of CSPP T3 proper, it is inferred that similar challenges would have been experienced within the C&S and IM realms. This VERY NEGATIVE outcome affirms the proposed relationship with Expertise of Staff with Problem Solving Competency and overall IS Project Performance within the Integrated Performance Model.

In terms of Management Advocacy, its responsibility lies with the Army as the owner of CSPP T3. In terms of resource allocations, all interviewees believed that the Army succeeded in its efforts to allocate the appropriate level of personnel and equipment. However, the resource which many interviewees suggested was improperly allocated was time itself. Constraints induced by the Army's deployment to Afghanistan and other factors led to the decision to bypass CSPP T1 and CSPP T2 and to conduct CSPP T3 despite the erosion of its underpinning assumptions. While a number of interviewees suggested that subordinate commanders and staffs were hesitant to recommend to the Chief of the Land Staff (CLS) that the Trial be postponed, one interviewee suggested that the CLS "…ordered the Trial to happen despite the push back

from ADM (Mat) that it wasn`t ready."[120] Several other interviewees suggested that the senior Army leadership displayed an "enough is enough" attitude in terms of the CSC and insisted that CSPP Trial 3 proceed.[121,122] While it is unclear exactly what recommendations were provided to the CLS, it is clear that the direction remained to proceed with the Trial. From an ADM (Mat) perspective, it is likely that internal and OEM SM SME staffs were not provided to CSPP T3 due to the allocation of these resources to future development efforts which were considered higher priority activities. Overall, it is assessed that both the Army and ADM (Mat)`s approach to Management Advocacy created more difficult and complex Problem Characteristics and thus had a VERY NEGATIVE effect on overall Problem Solving Competency.

The assessment of the five performance factors within the Integrated Performance Model support the model's suggestion that they will contribute to an organization's Problem Solving Competence, which in turn influence the overall IS Project Performance. There were two critical instances where the Army failed to solve key Problems. The first was taking decisive action based on the lack of adherence to the pre-conditions/assumptions underpinning CSPP T3. The second was related to the resolution of the complex technical problem in terms of delivery a stable and reliable CSC. The CSC was never established and maintained which leaves two conclusions: (1) the CSC as delivered by ADM (Mat) was not capable of being established and maintained or (2) ADM (Mat) did

[120] Former Dir ADOK, 2004-2007, email to Major Jeremy Small, 14 February 2013.
[121] Former CSPP Trial Officer, 06 February 2013.
[122] Former Dir ADOK, 2004-2007, *Command Support Project Performance Factors* Research Project Interview, interviewed by telephone by Major Jeremy Small, 05 April 2013.

not allocate the resources required to enable the establishment and maintenance of the CSC. In either conclusion, we are left with the deduction that the technical configuration and SoS employed for CSPP T3 presented a problem for which the Army and ADM (Mat) did not possess the Problem Solving Competency to resolve. The CSPP Trial Officer articulated this conclusion as follows:

> ...if all the engineering effort had been brought to Petawawa and it still failed, they [ADM(Mat)] had no way to come back and say "it's training" or "it's not set up right"...that they would have to acknowledge that ... it [the CSC] wouldn't work.

These shortfall in Problem Solving Competency had a fundamental impact on the IS Project Performance and has a VERY NEGATIVE influence on Outcomes. Further, it is clear that Problem Solving Competency has influenced IS Project Performance.

In terms of Task Outcomes, CSPP T3 was not able to achieve its objectives based at least in part on an inability to establish and maintain a stable and reliable CSC. Comd 2 CMBG would characterize the level of success in stating that, "it didn't get anywhere" while CO 1 RCR bluntly articulated that CSPP T3, "failed before it started."[123,124] Considering the overall result and considerable resource investment, the Task Outcome was neither effective nor efficient and thus VERY NEGATIVE.

[123] Former Comd 2 CMBG, 2004-2006, *Command Support Project Performance Factors* Research Project Interview, interviewed by telephone by Major Jeremy Small, 28 January 2013.
[124] Former CO 1 RCR, 2003-2005, 28 January 2013.

The Psychological Outcomes associated with CSPP T3 were VERY NEGATIVE within the C&S, IM and SM communities. Nearly all interviewees believed that the extant negative perceptions within the Army chain of command towards for digitized CSCs and the CS applications which comprised LFC2ISv1were reinforced if not intensified by the poor outcomes of CSPP T3, a perception which was supported by the CSPP T3 Operational Research and Analysis Report.[125] While interviewees generally perceived the Army chain of command to be less enthusiastic about the current iteration of the digitized CSC, they also largely indicated that the chain of command continued to believe in the value of such a capability in future iterations. CSPP T3 also had a negative impact on the SM community, particularly within 2 CMBG. While many soldiers within the Army maintained a keen interest in the evolution of the CSC, interviewees believed that the morale and engagement of many soldiers towards a digitized CSC was at least temporarily diminished as a result of CSPP T3.

CSPP T3 added little (if any) value to the Army's holistic or business operations. The CSC was clearly not suitable for fielding to the Army nor employment on operations in Afghanistan. It was aptly stated by the CSPP Trial Officer when he articulated that the CSC was, "not yet up to the task."[126] Most interviewees felt that CSPP T3 forced the Army to reconsider its future approach to the development, fielding and integration of CSCs which predicated a series of

[125] Department of National Defence, "Command Support Pilot Project Trial 3 Observations, Data Collection and Analysis," Defence Research & Development Canada Centre for Operational Research and Analysis Technical Report 2005-20, June 2005, 36-40.
[126] Former CSPP Trial Officer, 06 February 2013.

smaller, lower-risk activities to incrementally introduce capabilities into the Army. The former CO 1 RCR characterized CSPP T3's results as a "forcing function" in this regard.[127] Such a suggestion is congruent with ADM (Mat)'s "build a little, test a little" approach.[128] From an ADM (Mat) perspective, most interviewees suggested that the Organizational Outcomes were minimal in that it was already working on the newer version of the CSC at the time of CSPP T3. Organizational Outcomes are therefore assigned a rating of VERY NEGATIVE.

Summatively, the CSPP T3 case study has reinforced Aladwani's Integrated Performance Model. The five primary performance factors (with the possible exception of Support Technologies) have influenced Problem Solving Competency and thus IS Project Performance. While there remain certain ambiguities and inconsistencies within the evidence and perceptions provided by interviewees, the overall results of the activity were so dramatic that it leaves negligible doubt in terms of the overall relationship between the performance factors and the overall IS Project Performance.

Application of Updated D&M Model

Based on the definition found at Chapter 2, the examination of the CSPP T3 case study using the Updated D&M Model will now occur. The analysis will occur by using the Updated D&M Model performance factors of Information Quality, System Quality,

[127] Former CO 1 RCR, 2004-2006, 28 January 2013.
[128] Director DLCSPM, 2009-2013, 31 January 2013.

Service Quality, Intent to Use/Use and User Satisfaction in an attempt to determine their model is able to predict the overall outcomes or Net Benefits of the IS.

The Information Quality performance factor of the Updated D&M Model is difficult to assess in terms of CSPP T3 due to the inability to proceed with the C&S and IM portion of the activity based on the inability to establish and maintain a stable and reliable. For this reason, it is difficult to assess the "intended meaning" or the "accuracy, timeliness, completeness, relevance, and consistency" of the information conveyed by the CSC. However, interviewees reported that users anticipated low Information Quality based on exposures during the C&S and IM training. For these reasons, and similar to the Support Technology performance factor with the Integrated Performance Model, the absence of a definitive influence from the Information Quality performance factor will not be wholly determinate in terms of the Intention to Use/Use, User Satisfaction and ultimately Net Benefits. It did, however, rob the Updated D&M Model of the opportunity to have it as a positively influencing performance factor. Based on this assessment, Information Quality is assessed as having had a NEUTRAL/NIL influence on Intention to Use/Use and User Satisfaction.

The assessment of System Quality is somewhat similar to the assessment of Information Quality and can be divided into two components: TacComms and TacC2IS. As the vast majority of interviewees indicated, there were significant challenges in establishing and maintaining a stable and reliable Iris OPCAP 3 bearer network and the underlying framework of the TacC2IS applications which precluded the C&S and IM portions of CSPP T3. Thus, the low performance of the LFC2IS CS applications

anticipated by users applies equally to the System Quality performance factor in terms of "ease-of-use, functionality, reliability, flexibility, data quality, portability, integration, and importance." However, and as suggested by a number of ADM (Mat) interviewees, this anticipated level of performance was somewhat influenced by unrealistic expectations, limited training/skillfade and limited experience of the given C&S and IM users. System Quality is assessed as having VERY NEGATIVELY influenced Intention to Use/Use and User Satisfaction.

The delivery of Service Quality was problematic due to the low level of System Quality. In an initial exposure such as CSPP T3, a high demand for Service and Service Quality is to be expected based on the lack of comprehensive Doctrine & TTP Release and Training Release. These anticipated challenges were exacerbated by the last minute delivery of the TacC2IS component of the System just days prior to the Trial which was characterized by one participant as ADM (Mat), "throwing kit at us."[129] As discussed in the Expertise of Staff performance factor of the Integrated Performance Model, the failure of 2 CMBG along with ADM (Mat) and OEM SM SMEs to deliver a stable and reliable CSC is indicative of an inability to deliver the requisite level of Service Quality. Based on this assessment, low Service Quality is assessed to have VERY NEGATIVELY affected both Intention to Use/Use and User Satisfaction.

Intention to Use/Use are important in terms of the introduction of new CSCs within the Army. Prior to proceeding with an assessment of this factor, it is noteworthy that all three of the previously assessed performance factors influencing Intention to

[129] Former OC D 2 CMBG HQ & Sig Sqn, 2004-2006, 05 February 2013.

Use/Use have been deemed to have negatively influenced Intention to Use/Use. As mentioned in the description of Updated D&M Model and due to its nature as an attitude, Intention to Use is difficult to effectively and qualitatively assess within a military environment. In the context of CSPP T3, Intention to Use likely had a positive influence on Use due the compelling direction of the chain of command. However, due to the inability to establish and maintain a stable and reliable CSC, Use of the system was not possible. There were no interviewees who suggested that 2 CMBG had prematurely ceased efforts to successfully achieve the outcomes of the Trial. To the contrary, a number of interviewees indicated that 2 CMBG went to great lengths to attempt to achieve a stable and reliable CSC in the absence of a reasonable probability of success in doing so. Overall, and in the absence of the influence from the interdependent User Satisfaction and Net Benefits performance factors on Use which will be discussed in subsequent paragraphs, Intention to Use/Use is deemed to have had a VERY NEGATIVE impact on User Satisfaction and Net Benefits.

Based on the preceding analysis, the level of User Satisfaction with the given CSC at CSPP T3 is deemed to have been VERY LOW. Due to the preemptive problems at the SM level, the user was unable to experience what the capability may have been able to deliver within the C&S and IM realms. Interviewees perceived that User Satisfaction may have been negatively influenced by residual negative attitudes of many users from the Iris OPCAP 1 (CNR) fielding experience coupled with negative SM outcomes and negative perceptions of the CS applications based on C&S and IM training of CSPP T3.

Such an outcome is predicted in resistance to IT implementation research which states that:

> …an individual's experience with success and failure at tasks involving similar technologies evoke casual attributions. In turn, these attributions influence the individual's expectations regarding future performance outcomes, which then drive his or her affective and behavioural reactions toward the technology and its use.[130]

One experienced Army Signal Officer stated that the outcome of CSPP Trial 3 was "underwhelming" in 2004 that TCCCS had been in 1999-2000.[131] In terms of the logical model, and as "'use' must precede 'user satisfaction'," it is not possible for Use to positively influence User Satisfaction in the CSPP T3 scenario due to the lack of Use outside of the training environment.[132] As a follow-on and second-order effect, User Satisfaction is precluded from providing any positive influence towards Intention to Use and Use by the same logic. User Satisfaction is deemed to have VERY NEGATIVELY influenced Net Benefits.

Net Benefits, as influenced by Intention to Use/Use and User Satisfaction, are assessed as low based on the preceding assessment of respective performance factors. Little (if any) positive benefit was realized out of CSPP T3. The negative impacts of CSPP T3 were significant, and far outweighed the positive impacts in terms of the sum of Individual Impacts and Organizational Impacts. Based on the Updated D&M Model, the negative overall Net Benefits assessment had a VERY

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[130] L. Lapointe and S. Rivard, "A Model of Resistance to Information Technology Implementation," *Management Information Systems Quarterly*, Volume 29, Number 3 (2005): 461-491.
[131] Former CO 2 CMBG HQ & Sig Sqn, 2009-2010, *Command Support Project Performance Factors* Research Project Interview, interviewed by telephone by Major Jeremy Small, 30 January 2013.
[132] W. DeLone and E. McLean, "The DeLone and McLean Model of Information Systems Success": 23.

NEGATIVE influence on both Intention to Use and User Satisfaction based on the respective feedback loops.

The VERY NEGATIVE Individual Impacts and Organizational Impacts have been addressed as part of the Psychological Outcomes and Organizational Outcomes discussion within the Integrated Performance Model analysis of the CSPP T3 case study. The two most significant and detrimental Outcomes identified by interviewees at in terms of the Individual and Collective level are the further degradation of the confidence in the holistic CSC SoS and the withdrawal of the Army chain of command from engagement in the CSC development. A former Dir ADOK characterized the disengagement as the Army "recoiling in horror" following CSPP T3.[133] This further loss of confidence and withdrawal influenced future decisions and approaches regarding the evolution of the CSC. Specifically, it influenced the manner in which the Army chain of command approached the second case study within the paper (evolution of BV). It was also suggested by a number of interviewees that the Army's loss of interest in CSC was due to its engagement in Afghanistan. Considering the shortfalls of CSPP T3 in late-2004 and the nearly coincidental announcement in early-2005 of Canada's formation/Brigade-level deployment to Kandahar in early-2006 it is likely that the Army prioritization of effort negatively impacted resource allocation to the development of the CSC.

[133] Former Dir ADOK, 2007-2011, *Command Support Project Performance Factors* Research Project Interview, interviewed by telephone by Major Jeremy Small, 25 February 2013.

In summary, the examination of CSPP T3 using the Updated D&M Model has served to validate its underpinning expectations regarding the influence of its component performance factors on overall and holistic Net Benefits. While several of the performance factors were difficult to fully assess due to the technical shortfalls associated with the Trial conduct and lack of C&S and IM exposures, there existed significant evidence to assess those factors using interviewee perceptions based on training experiences (during which the Information Quality, System Quality and Service Quality were likely artificially high due to the laboratory environment). There is negligible doubt in terms of the inability of the CSC in use at CSPP T3 to deliver the requisite Net Benefits in terms of enabling the "decision-making performance, job effectiveness, and quality of work."[134]

Emergent Findings

While outside of the two theoretical models, there were two notably positive and one notably negative deduction which emerged from CSPP T3. All three emergent outcomes relate to higher-order CSC concepts.

The first positive Outcome was the recognition that the CSC lacked a holistic and empowered leader responsible for all aspects of its development and implementation. Such a leader would be referred to, in industry, as a Champion. Leading business strategy organization Six Sigma defines Champions as "leaders

[134] W. DeLone and E. McLean, "The DeLone and McLean Model of Information Systems Success": 15.

and senior managers who ensure that resources are available for training and projects, and who are involved in project [milestone] reviews."[135] A leading logistics management organization expands upon the Sig Sigma definition and suggests that a Champion "uses their authority to overcome organizational barriers."[136] In the absence of a cohesive and consistent DND and/or CF definition, a Champion will be defined as a credible executive-level leader who is appointed and empowered with authority and ownership to enable the allocation of resources and coordination across organization boundaries to ensure successful Capability outcomes.

The Champion of CSC must be a Commander in the Army sense of the term due to the inherent need for command authority within the Army to make decisions regarding the CSCs conception, design, vision and overall integration into the holistic Army capability. In a typical DND project, such a Champion exists on the basis of the source of the Capital Funding from the Army (DCCA as Army Programme Manager or his/her delegate). In the case of CSPP T3 and LFC2ISv1, no such holistic Champion existed. A Champion would have also served to have enabled with pivotal Problem Solving Competency aspect within the Integrated Performance Model. A former Army G6 staff officer overseeing the Army's CS portfolio later stated that the fact that "the [CS] Programme went

[135] Six Sigma, "Six Sigma Dictionary", last accessed 09 April 2013, http://www.isixsigma.com/dictionary/champion/.
[136] About.com Logistics, "Six Sigma Terminology," last accessed 09 April 2013, http://logistics.about.com/od/operationalsupplychain/a/6_Sigma_Terms.htm.

down the rails without a Champion was a huge flaw."[137] Overall, the absence of a CS Champion had a VERY NEGATIVE influence on overall Outcomes and Net Benefits.

While it could be argued that Commander Land Force Central Area (Comd LFCA) was the Champion of the CSC based on his appointment as Champion of the Command operational function within the Army at the time of CSPP T3, it is likely unreasonable to expect the Comd of an LFA to conduct the role of Champion as defined above while concurrently commanding a Superior Formation within the Army. Furthermore, the practice of assigning LFA Comds as Champions of operational functions was abandoned by the Army shortly following CSPP T3 based on ineffectiveness.

The second positive Outcome was the recognition of the necessity to treat CSCs as holistic SOSs. Based on the challenges experienced from an SM perspective and the training experience from a C&S and IM perspective, nearly all interviewees acknowledged that the perception existed that the CSC was of a level of complexity and interconnectivity that obliged the Army and ADM (Mat) to take a deliberate SoS approach. DLCSPM lamented following CSPP T3 that the CS community "didn't realize how big the seams" were in the SoS.[138] It is also noteworthy that interviewees suggested that this recognition was of the need to incorporate the Doctrine & TTP Release, Training Release and Training

[137] Former Army G6 Staff Officer, 14 February 2013.
[138] Former DLCSPM, 2004-2006, *Command Support Project Performance Factors* Research Project Interview, interviewed by telephone by Major Jeremy Small, 07 February 2013.

Infrastructure Release components of the CSC Conceptual Model as previously depicted at Figure 1.2. The absence of the recognition of the imperative of an SoS and holistic approach is deemed to have VERY NEGATIVELY influenced Outcomes and Net Benefits. The second recognition of the SoS nature of the CSC served to predicate the recognition of the necessity for a CSC Champion.

The startlingly NEGATIVE outcome related to what the Army learned from CSPP T3. Two interviewees used characterized this as, "lessons observed but not learned" while a number of others articulated analogous negative observations using variations of very similar language.[139,140] Despite the trauma associated with CSPP T3 and the valuable insights it provided in terms of the evolution of the CSC, most interviews perceived that both the Army and ADM (Mat) failed to capitalize on the opportunity to make significant changes in terms of their respective approaches.

From an Army perspective, this related most prominently to an anticipated continued lack of meaningful participation and engagement of the chain of command and user communities. This is a foreboding as software project risk management research predicts that a lack of management and user participation will have a detrimental outcome on IT-based projects.[141]

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[139] Former Director DLCSPM 2006-2009, *Command Support Project Performance Factors* Research Project Interview, interviewed by telephone by Major Jeremy Small, 26 February 2013.
[140] Former Sig O 1 RCR, 2004-2007,31 January 2013.
[141] H. Barki S. Rivard and J. Talbot, J., "An Integrative Contingency Model of Software Project Risk Management," *Journal of Management Information Systems*, Volume 17, Number 4 (2001): 57.

From an ADM (Mat) perspective, perceptions related to its intention to continue development and prosecution of CS Projects in the same manner as those which had produced the results of CSPP T3. Both of these perceptions are enabled by a continued lack of a CSC Champion.

Conclusion

Summatively, the application of the two theoretical models against the CSPP T3 case study has yielded validation of both theoretical models and has provided a series of performance factors which can be directly linked to CS Project performance outcomes. While there are many lessons to be learned from the examination of the case studies which are based on failures or lacks of success, the two key positive deductions which emerged remain the recognition of the requirement for a CSC Champion and necessity to manage the CSC as a holistic SoS including the requirement to incorporate the non-materiel components of the CSC Conceptual Model (TTP & Doctrine Release, Training Release and Training Infrastructure Release) into the holistic approach. The negative emergent outcome relating to what was learned from CSPP T3 must be examined against the subsequent BV case study to determine if the same challenges persisted over the course of time.

In terms of the comprehensiveness of the examination of the two case studies, one shortfall regarding the CSPP T3 case study lies in the requirement to infer from the training environment (vice deducing directly from the Trial

environment) regarding the influence of some user-centric performance factors such as Staff Expertise, Task Outcomes, Psychological Outcomes and Organizational Outcomes in the Integrated Performance Model and Information Quality, System Quality, Use, User Satisfaction and Net Benefits in the Updated D&M Model. Notwithstanding this shortfall, a rich tapestry has been developed in terms of the identification of CS Project performance factors which will be consolidated with those identified in the BV case study in Chapter 4 as part of the case study cross-comparison in Chapter 5.

Finally, and in response to the gap identified regarding C&S and IM user-centric performance factors, the subsequent case study of the evolution of BV in Chapter 4 will provide an opportunity for far greater assessment regarding the user-centric performance factors proposed in the Integrated Performance Model and the Updated D&M Model in that users experienced far more numerous, controlled and managed exposures to the CS application itself from which interviewee feedback was solicited and received.

CHAPTER 4 – BV CASE STUDY

Introduction

The evolution of the BV application provides a second viable and unique case study for examination using the two theoretical models. As a component of the CSC, BV is narrower than the SoS artifact which was the subject of examination in the CSPP T3 case study and is more closely aligned to what might be a considered as a classic IS project to deliver a single IT artifact. It also addresses the gap in the CSPP T3 case study in that it derives specific assessments regarding the influence of C&S and IM user-centric performance factors on CS projects. While the CSPP T3 case study provided an opportunity to examine a CSC at a fixed point in time, the BV case study considers how performance factors have influenced a CS project over the course of time (from approximately 2005 to 2013). In order to effectively understand the BV case study, it is necessary to understand the context in which its evolution took place, the key limitations within which it occurred as well as the nature of the supporting research. By taking these factors into account, richness will be added to the application of the two models. Following the respective examinations, conclusions will be drawn in terms of how the proposed performance factors influenced the overall outcome of the BV evolution.

BV Context and Definition

Following CSPP T3 and due to various factors, ADM (Mat) recognized that ATS and OPERA no longer met the Army's C&S and IM requirements at the BG/unit level and above, nor did they meet Canada's commitment to the NATO Multilateral Interoperability Programme (MIP) in terms of data formats and protocols. As such, ADM (Mat) made the decision in 2005 to life-cycle the primary CS applications of LFC2ISv1 (delivered by the LFCS Project) and transform its thinking towards the SoS approach. This decision is important in that it led to a significant financial commitment of O&M funding to what was known as the Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) Project which had the mandate of integrating all of the disparate stove-piped CSC components (including Sensors which are beyond the scope of this paper) into a cohesive and holistic LCSS. While OPERA was absorbed by a series of other CS applications, the BV application was essentially a one-for-one replacement application for ATS.

The context of BV as a life-cycle activity is significant. The majority of ADM (Mat) interviewees cite this designation as a positive in that it frees BV from the constraints of a Capital Project such as the rigid nature of the process, the long duration between definition of requirements and delivery of the IT artifact and the rapidly developing technologies which could be exploited to enhance the quality of the product. The three most recent Director DLCSPMs all indicated this status as having a positive influence from a procurement, engineering and evolutionary perspective, but conceded that it likely had a negative influence in terms of the level of engagement by the

Army.[142,143,144] One former Director DLCSPM went so far as to say that such a status is critical in the delivery of IT-based Projects in that it relieves DLCSPM of the "tyranny" of Capital Projects.[145] It does, however, introduce risk in that the PM ISTAR funding was derived directly from ADM (IM)'s allocation and did not experience Army oversight. Similarly, the evolution of BV was not subjected to the typical rigour and accountability framework of a Capital Project, the Champion function which would typically be provided from within the Army, nor did it receive personnel allocations to support PD functionality. A DLCSPM BV engineer described these factors as leading to a situation in which "nobody was accountable."[146]

In terms of positive and progressive developments within the Army's overall approach and sentiment towards CSC, the Army chain of command had incrementally recognized the importance of the non-material component of the CSC by the 2005/2006 timeframe in its institution of ATS on AOC at the CLFCSC in 2006. This action served to ensure that all Army Captains would receive a meaningful exposure to the digitized CS application as part of their formal training. While it would be several years before BV would be instituted as the digital CS application at CLFCSC, the initial institutionalization of ATS and the exposure of the bulk of Canada's Army officers to various CS applications as part of operations in Afghanistan were suggested by nearly all interviewees as having an incrementally positive impact on attitudes towards the potential value of such applications.

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[142] Former DLCSPM, 2004-2006, 07 February 2013.
[143] Former Director DLCSPM 2006-2009, 26 February 2013.
[144] DLCSPM 2009-2012, 31 January 2013.
[145] Former DLCSPM, 2004-2006, 07 February 2013.
[146] Former BV Engineer, 2008-2011, *Command Support Project Performance Factors* Research Project Interview, interviewed by telephone by Major Jeremy Small, 30 January 2013.

The purpose of the BV application was not universally understood or articulated by interviewees. Responses ranged from a full battle management tool, full battle planning/Operational Planning Process (OPP) tool, Common Operating Picture (COP) tool, Situational Awareness (SA), Positional Awareness (PA) to a host of other capabilities which could potentially be delivered by a digitized CS tool. The former DCCA characterized the Army as having "wild expectations" of BV's capabilities.[147] It is also imperative to consider a factor raised by a former Director DLCSPM in that ADM (Mat) was "trying to automate a processes which were not well-documented within the Army." These factors will be instructive in that they will indirectly affect the assessment of the respective performance factors. For clarity, BV is defined by the PM as an application meant to enable the visualization of geospatial information such as the COP (which includes SA and PA), and limited/rudimentary planning capabilities.[148] That is to say that while BV was meant to enable battle management functions, it was not meant to enable battle planning functions such as the OPP.

The final factor in terms of the context of the BV evolution relates to Canada's deployment to Afghanistan and its effects on the Army. Following the initial announcement of Canada's move of a unit-sized engagement in Kabul to a Brigade/formation-sized deployment to Kandahar in early-2005 seized the Army's priorities. The bulk of interviews suggested that this FG activity consumed the Army at a time when BV development was occurring concurrently.

[147] Former DCCA, 2009-2012, 05 February 2013.
[148] BattleView Project Manager, 2004-2013, 27 February 2013.

Research

BV case study research consisted of both interview and documentary evidence. Comprehensive interviews were conducted with a total of 31 personnel with intimate knowledge of specific aspects of BV, 23 of which were employed within the Army and eight of which were employed within ADM (Mat). In terms of the Army, these interviews included: a former DCCA, the leaders of the Army's C2 Technical Assistance Visit (C2 TAV) to Afghanistan, members of the Army BV Action Team (BVAT), former Army G6s, former Army G6 staff, former Dir ADOK, former DLR 4 staff, former and current CMBG G3 staff as well as former and current COs of CMBG HQ & Sig Sqn. From a non-Army perspective, interviews were conducted with former and current Directors DLCSPM, former and current DLCSPM PMs, former and current DLCSPM PM/engineering staffs, members of DLCSPM's BV User Engagement Team (UET), BV OEM contractors and engineers, OEM-contracted Field Support Representatives (FSRs) as well as the Manager of the Joint Battle Lab from the Canadian Forces Warfare Centre. Documentary evidence reviewed in the course of the research included various Army and subordinated formation BV and related documents such as the Army C2 TAV to Afghanistan report, BV Action Team reports and presentations, 1 Canadian Division's (1 Can Div) Joint Exercise (JE) AARs as well as email submissions from a number of interviewees. It is assessed that the research conducted for the BV case study was sufficient to meet the demands of the theoretical models.

Limitations

There are four key limitations which must be considered in the examination of the evolution of BV case study. As described earlier, BV's lack of status as a Capital Project must be considered as the potential exists for both positive and negative implications of such a status. The second limitation relates to perceptions and expectations which are clearly asymmetric based on the ambiguous understanding of the purpose of BV reported by interviewees. The third limitation lies in BVs' status as a component of a larger SoS. This leads to the possibility of outside factors influencing the assessment of respective BV performance factors. The final limitation of note is the lack of written documentation available from within the Army. This limits the case study's ability to examine the nature of the Army's direction to ADM (Mat) in terms of the evolution of BV.

Application of Integrated Performance Model

Having outlined the context and associated limitations, the application of the Integrated Performance Model against the BV case study can now commence. As outlined in Chapter 2, the Integrated Performance Model envisions the five performance factors of Support Technologies, Project Team Size, Clear Goals, Staff Expertise and Management Advocacy all influencing holistic Problem Solving Competencies which ultimately influence IS Project Performance. At the completion of the examination, conclusions will be drawn in terms of the overall applicability of the respective performance factors in influencing the overall outcomes of the BV evolution.

In terms of the use of Support Technologies, there is evidence to suggest that this performance factor was exploited to influence the Project's Problem Solving Capacity. PM Staff from DLCSPM reported using various Support Technologies such as DOORS, IBM ClearQuest and Microsoft Project amoung other applications to manage BV requirements, System Problem Reports (SPRs), scheduling and tasks respectively within the context of the BV evolutionary cycles.[149] The majority of ADM (Mat) interviewees also suggest that these Support Technologies were used to improve overall coordination with other elements of the CSC SoS from an engineering perspective. However, and as will be discussed later in this case study, the lack of articulation of clear requirements and ongoing user engagement during development throughout the BV evolution served to dampen the positive effects of the use of Support Technologies. That is to say that the quality of the requirements and feedback provided by the Army to ADM (Mat) had a direct relationship on the influence of Support Technologies. Further, and as a life-cycle and not a Capital Project activity, the DND-level Support Technologies and accompanying management framework were absent from BV's development. For these reasons, the use of Support Technologies is deemed to have had a POSITIVE influence on Problem Solving Competency as well as overall IS Project Performance to the degree to which the quality of the information provided by the Army allowed. It is also deemed to have been a missed opportunity in terms of the freedom of action enabled by BV's non-Project status. Overall, Support Technology is rated as POSITIVE.

[149] Former BV Engineer, 2008-2011, 30 January 2013.

It is necessary to discuss the Project Team Size performance factor as a product of two aspects of the case study. It must be addresses as a function as well as a function of organization. That is to say that it will be examined over the course of BV's evolution in terms of both the Army's and ADM (Mat)'s perspectives with a view to making a consolidated assessment.

From an ADM (Mat) perspective, all interviewees report that sufficient personnel (or funding to contract additional personnel) were allocated to the BV activity throughout the course of its evolution. These personnel included military, Public Service and contracted personnel along with those personnel working for the OEM. The quality and expertise of these personnel will be discussed in the assessment of the Expertise of Staff performance factor.

Interview evidence suggested that the Army experienced shortcomings in the Project Team Size performance factor in two key areas. The first was in the domain of the Army HQ in terms of Championship. In this case, Championship would include a dearth of PDship and its affiliated identification and articulation of requirements and ongoing developmental user engagement which led one highly experienced CS staff officer to state that, "DLR was disengaged for about a decade."[150] The second domain related to the non-materiel component of the CSC.

[150] Former Army G6 Staff Officer, 2001-2005, 14 February 2013.

As was observed in the CSPP T3 case study, BV continued the trend of lacking a Champion during its evolution which had the anticipated negative effects of a lack of ownership, resourcing and coordination. In terms of requirements, the former DCCA characterized their articulation to ADM (Mat) as "non-existent" and by a former Director DLCSPM as "abysmal."[151,152] This factor intensified the gap between BV functionalities and C&S and IM user expectations. The former DCCA also acknowledged the lack of meaningful, credible and consistent user participation in the early stages of BV evolution.[153] One DLCSPM Engineer articulated ADM (Mat)'s frustrations in that they "stopped asking [for user engagement] because people told [them] to screw off."[154] The lack of PDship was predicated by the lack of dedicated personnel accompanying a Capital Project as well as the demands on DLR 4 induced by the deployment to Afghanistan, noting that PDship has since been more effectively established in approximately 2009.

The second area in which the Army experienced shortfalls was that of its delivery of the non-materiel component of the CSC. Interviewees from both ADM (Mat) and the Army indicated that the Army was largely unable to produce its Doctrine & TTP Release, Training Release and Training Infrastructure deliverable as it relates to the BV evolution. While IT research has found that, "few organizations have the infrastructure, education, training or management discipline" to do so, this delivery remains imperative for the ultimate success of the CSC.[155] This non-materiel component challenge was further aggravated by the lack of a Champion and a limited residual capacity within LFDTS due

151 Former DCCA, 2009-2012, 05 February 2013.
152 Former Director DLCSPM 2006-2009, 26 February 2013.
153 Former DCCA, 2009-2012, 05 February 2013.
154 Former BV Engineer, 2007-2009, 05 February 2013.
155 J. McManus and T. Wood-Harper, "Understanding the Sources of Information System Project Failure." *Management Services*. Volume 51, Issue 3 (Autumn 2007): 39.

Signal trades training production and other FG priorities in support of the Afghan mission. A former Army G35 staff officer affirmed this conclusion when he indicated that the Army "has never had a comprehensive approach to [CS] fielding."[156]

In contrast to the largely negative findings in the early portion of BV's evolution, it is noteworthy that both Army and ADM (Mat) interviewees recognized shifts in Army's engagement in the 2010 timeframe. This is true both from the PD and Army chain of command. A number of Army and ADM (Mat) interviewees correlated these investments by the Army in Project Team Size to positive outcomes in Problem Solving Competency and overall IT Project Performance. The non-materiel component of the CSC remains a realm within which little progress was recognized by interviewees.

Based on the preceding assessment, Project Team Size is assessed to have progressed from having a VERY NEGATIVE influence to now having a NEGATIVE influence on Problem Solving Competency and overall IS Project Performance. This is true in a negative sense in the early stages and an incremental positive sense in more recent stages of the BV evolution. Despite the fact that ADM (Mat) had adequate staff to deliver the IT artifact, the Army's failure to effectively resource its portion of the Project Team Size performance factor led to a net NEGATIVE effect. Further, the potential second-order effects of these shortcomings will be explored in the examination of the Clear Goals, Expertise of Staff and Problem Solving Performance Factors.

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[156] Former Army G35 Staff Officer, 2009-2011, *Command Support Project Performance Factors* Research Project Interview, interviewed by telephone by Major Jeremy Small, 15 February 2013.

In terms of Clear Goals, interviewees provided a nearly universal view that the absence of bona fide operational requirements for BV inhibited a common understanding of the purpose and deliverables of BV. This absence and the associated lack of performance metrics are also causal in terms of the disparity between Army and ADM (Mat) perceptions of the success of BV. This situation is again reflective of the lack of Championship and BV's lack of Capital Project status.

While most ADM (Mat) interviewees affirmed that the ATS requirements were the genesis of the requirements used for the life-cycle activity which spawned BV, they also conceded that these ATS requirements derived in the late-1990s were flawed and were not sufficiently comprehensive to deliver an effective CS application in the mid-2000s. However, the vast majority of interviewees could provide no evidence that the Army provided any meaningful input into BV requirements in the early stages of its evolution. When the Army did occasionally provide feedback regarding BV, it was often inconsistent and lacked legitimacy and credibility based on its content and the source from which it was received. This scenario led one DLCSPM engineer to characterize BV requirements as "all over the map."[157] The qualitative assessment of these individuals will be addressed as part of the discussion of the Expertise of Staff performance factor. The Army and ADM (Mat) later established a series of initiatives in the 2010-2012 timeframe to incrementally establish and consolidate Clear Goals. These activities will be discussed as part of the Management Advocacy performance factor

[157] Former BV Engineer, 2008-2011, 30 January 2013.

Based on the preceding analysis, Clear Goals are deemed to have improved from VERY NEGATIVELY to NEGATIVELY influencing Problem Solving Competency and the overall outcomes of the BV activity. This stems from a low level of Army Championship and engagement in the activity from the outset which precipitated a poor definition of requirements and inadequate feedback during the development process. The former DCCA submitted that "the [C&S and IM] user is to blame in the end…he didn't articulate what he wanted."[158] From the most fundamental of levels, ADM (Mat) and the Army lacked a common vision of the Clear Goal of BV. These two factors combined to create a scenario where "nobody knew how to define the success [of BV]."[159] As with Project Team Size, this performance factor has seen a minor level of relief since 2010 and the initiation of the FSRs, Army C2 TAV, BVAT and UET which will be discussed in the assessment of the Problem Solving Competency performance factor.

In terms of the Expertise of Staff performance factor, it must be considered in terms of specific ADM (Mat) and Army components within the overall BV evolution.

Most interviewees from ADM (Mat) and the Army were confident in the level of engineering Expertise of Staff as it related to BV. The counterbalance to this confidence was aptly articulated by a former DCCA when he stated that BV was, "created by those who will never use it" in that they did not possess the knowledge to enable them to interpolate the Army's requirements.[160] The assertion of several interviewees that such requirements were being addressed by the Army G6 and/or DLR 4 staffs are indicative of

[158] Former DCCA, 2009-2012, 05 February 2013.
[159] Former Army G6 Staff Officer, 14 February 2013.
[160] Former DCCA, 2009-2012, 05 February 2013.

a continued lack of appointment of an LCSS Champion. While another DLCSPM engineer conceded that while "Signalers are not [C&S and IM] users," ADM (Mat) was forced to "assume what users wanted."[161]

While it is true that only commanders within the Army (as the future C&S and IM users of the system) are capable of fully articulating the requirements of BV, one former Director DLCSPM suggested that the Army's approach to LCSS and its components as lacking the "sophisticated view" to effectively, collectively and collaboratively address the complex SoS requirements.[162] Another Director DLCSPM went so far as to state that "…the Army doesn't know what they want until they see it…[but] are very good at saying what they don't like."[163] Low levels of training, skill retention, understanding, unrealistic expectations and lack of continuity of personnel within the Army likely also contributed to a low level of Expertise of Staff. Ultimately, the Army failed to articulate its vision and requirements for the CSC.

Overall, Expertise of Staff is assessed to have had a VERY NEGATIVE influence on Problem Solving Competence and overall IS Project Performance. During the bulk of the evolution, this correlation has been a negative. More recently, and specifically since 2010, investments in the Army C2 TAV to Afghanistan, BVAT and UET have served to create an increase in the level of Expertise of Staff which has in turn had a positive influence on Problem Solving Competence and overall IS Project Performance. The non-

[161] Former BV Engineer, 2007-2009, 05 February 2013.
[162] Former Director DLCSPM 2006-2009, 26 February 2013.
[163] Director DLCSPM 2009-2012, 31 January 2013.

materiel domain remains an area into which interviewees did not identify as having experienced a meaningful level of investment to date.

Clearly, and based on previous consideration of the BV case study, the activity has not enjoyed a high level of Management Advocacy throughout its evolution. This situation was recognized as particularly lacking until the 2010 timeframe. Since 2010 a number of activities have started to demonstrate a stronger level of Management Advocacy in the BV evolution.

While the vast majority of interviewees perceived that the Army believed in the importance and value of a digitized CS application, the Army's behaviours and actions are not indicative of such a belief. This is most evident in the lack of allocation of resources to the BV activity in the form of personnel (including a Champion), information (requirements) and time (engagement). Further, and in addition to the emergent lack of learning finding from the CSPP T3 case study, the BV Project Manager colourfully expressed his dissatisfaction within the Army's Management Advocacy in that there was, "nobody kicking ass and taking names."[164] As a counter-balance to this assertion, it must be noted that the Army leadership was decisively engaged in the Afghan mission from BV's inception until the 2011 timeframe.

One of the most striking perspectives on Management Advocacy came from both a former Dir ADOK and DLCSPM PM who both suggested that the Army has failed to recognize and take ownership of LCSS (and by extension BV) as a ***Command*** Support

[164]BattleView Project Manager, 2004-2013, 27 February 2013.

System which by definition must be holistically Championed ***by commanders***.[165,166] Similarly, the BV PM suggested that the failure lied in an inability to effectively manage capabilities which were not unique to a single trade or Corps (in the way that a tank or artillery piece would be Championed by the Armoured or Artillery Corps respectively).[167] For a multi-disciplinary system such as LCSS or a CS application such as BV, the affiliation in terms of who Champions the capability is far less clear. This perception was reinforced by a recent DCCA who, when asked to identify the Champion of BV, stated that "[the Army] G6 was/is the OPI."[168] To be clear, the Signal community plays a significant role in terms of the SM aspects of LCSS and BV. However, the Army G6, as a Signal Colonel-level Staff Principal within the Army HQ, is not empowered with the authority or resources to meaningfully Champion the LCSS or BV.

It is ill-conceived to argue that Management Advocacy was not required by the Army due to the fact that BV was not a Capital Project. Such a status does not negate the Army's obligations in terms of the continued management and evolution of its capabilities. However, it must also be noted that had BV in fact been a Capital Project, it would almost certainly have experienced a higher level of oversight and accountability. This case study is an instance where the Army failed to capitalize on a tremendous opportunity to influence the evolution of its primary CS application without the scrutiny and rigidity of a Capital Project.

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[165] Former Dir ADOK, 2007-2011, 25 February 2013.
[166] Former Director DLCSPM, 2006-2009, 26 February 2013.
[167] BattleView Project Manager 2004-2013, 27 February 2013.
[168] Former DCCA 2009-2012, email to Major Jeremy Small, 04 March 2013.

As the combat mission in Afghanistan neared its completion in 2010, the Army demonstrated more Management Advocacy. Two key initiatives originated from the DCCA. The first was the Army C2 TAV to Afghanistan which examined the use of digitized CS tools.[169] It found that, while it offered potential value, "BattleView is, presently, of extremely limited value."[170] Based on this finding and ongoing negative feedback, the DCCA established the BVAT in 2011. While the BVAT did allocate a meager collection of resources to the BV activity to address the priority shortfalls, this direction failed to assign ownership outside of the Signal community by appointing the Army G6 as lead. A similar, yet unique initiative by ADM (Mat) known as the UET was established in 2011. Its purpose was to gain credible command engagement and feedback regarding BV as well as to provide education and expectation management from and for commanders and users of BV.[171] While not an Army initiative, it was embraced by the Army chain of command and at times fed into the activities of the BVAT. Unfortunately, and with the notable exception of AOC and then BV use on AOC at CLFCSC, no interviewees reported a significant shift in the resource allocation within the Army in terms of the non-materiel aspects of the CSC.

Summatively, it is affirmed that BV experienced a very low level of Management Advocacy which is anticipated to have a VERY NEGATIVE influence on Problem Solving Competency. As a counter-balance, the Army C2 TAV reported that, "there is no

[169] Department of National Defence, 3350-1 (G35 Cont'l Plans) Joint Task Force Afghanistan Command and Control Technical Assistance Visit Instruction, 28 July 2010.
[170] Department of National Defence, Joint Task Force Afghanistan Command and Control Technical Assistance Visit Backbrief to DCCA, 29 November 2010.
[171] BattleView Project Manager, 2004-2013, 27 February 2013.

reason to believe that, with focused operator input, the problems most commonly identified cannot be overcome."[172]

The discussions of the performance factors within the Integrated Performance Model all contribute to the Problem Solving Competency performance factor. It is apparent based on the evidence already presented that a low level of collaboration has existed between the Army chain of command and ADM (Mat) in terms of setting the conditions for the delivery of a successful BV application. From a Championship perspective, most interviewees perceived that BV was seen by the Army chain of command as a technical or Signal issue, vice as one to be owned by the chain of command. This perspective of the Army chain of command was counterproductive in terms of its Problem Solving Competency. Further, the absence of requirements and effective metrics to measure effectiveness made the achievement of Clear Goals an elusive if not impossible task. While initiatives such as the establishment of FSRs, C2 TAV to Afghanistan, BVAT and UET do demonstrate an incremental increase in resourcing, Problem Solving Competency is deemed to have improved from having a VERY NEGATIVE to NEGATIVE impact on overall IS Project Performance.

In order to assess overall IS Project Performance, the components of Task, Psychological and Organizational Outcomes must be examined. This examination will be based on the previous assessments of the six contributing performance factors.

[172] Department of National Defence. 3350-1 (G35 Cont'l Plans) DRAFT Joint Task Force Afghanistan Command and Control Technical Assistance Visit, November 2010 (UNSIGNED), H-3/4.

From a Task Outcome perspective, BV was neither Effective not Efficient in that the majority of interviewees stated that the Army chain of command is not satisfied with the BV application as an IT artifact. As stated by the Army C2 TAV leader, "…the lack of use and utility of certain core applications [including BV] mitigates against the optimal use of [Tac]C2IS both in planning and operations."[173] The absence of measureable criteria and common expectations against which to assess BV continues to be highly problematic in this regard. The fact that ADM (Mat) has expended tens of millions of dollars and seven years of personnel and time effort to a CS application with which the Army continues to be dissatisfied is indicative of a lack of Efficiency. While more recent initiatives have served to address some shortfalls, Task Outcome is deemed to have improved from inducing a VERY NEGATIVE to NEGATIVE influence.

As indicated in the previous paragraphs, the overall Psychological Outcomes continue to be NEGATIVE. Satisfaction with BV continues to be less than adequate considering the level of resources which have been expended from a DND perspective. When asked to articulate the Army's perceptions in this regard, the former DCCA stated that, "the albatross called BV [is] hated to this day…by all."[174] Although this is potentially an extreme view which is not representative of all, of even the majority, of C&S and IM users, it is in fact the view which was held by the former Army Programme Manager and DCCA. While some shortfalls within BV have been identified and addressed through the BVAT and UET, there is still a marked level of discontent in terms

[173] Department of National Defence. 3350-1 (G35 Cont'l Plans) DRAFT JTF-Afg C2, G-4/4.
[174] Former DCCA, 2009-2012, 05 February 2013.

of the gap between the expectations of BV and its current level of performance which leads to negative perceptions of the application.

In terms of Organizational Outcomes, this component relates specifically to the holistic value which BV has added to the Army. In this regard, few interviewees suggested that BV has added a meaningful level of value to the Army which leads to a rating of NEGATIVE. However, a number of Army interviewees indicated that they perceived incremental advances had been achieved in the value which BV had added to their respective organizations. The majority of Army interviewees continued to suggest terms such as "frustrating", "tired" and "clunky" to characterize the Army's sentiments towards BV. Holistically, the Army staff officer who led the C2 TAV to Afghanistan on behalf of the DCCA later described BV as akin to "opening up your Christmas present and your bike's got one wheel."[175] In terms of positive developments, the BVAT and UET have provided incremental successes upon which further advances could be built.

The collective effect of the assessments of the three components of IS Project Performance leads to an overall NEGATIVE assessment of IS Project Performance. This is based on the delivery of an IT artifact that does not meet the perceived requirements of its users and does not add a meaningful level of value to the organization as a whole. It must be noted that the responsibility for this shortcomings lies primarily with the Army based on its failure to invest the appropriate level of effort and resources into the BV activity throughout its evolution and development. As aptly articulated by the one reflective officer, the Army:

[175] Former Army G35 Staff Officer, 2009-2011, 15 February 2013.

> …can't lay blame at the feet of those [engineers] who designed the system. It doesn't matter if nobody asked us [C&S and IM users] …we never inserted ourselves into the process.[176]

Summatively, the application of the Integrated Performance Model against the BV case study has yielded an affirming result of the theoretical model. All five other performance factors have proven to be applicable and predictive of the Problem Solving Competency and subsequently overall IS Project Performance. While it must be acknowledged that there existed a lack of unanimity amoungst interviewees regarding certain aspects of the various performance factors, the level of consistency of perception regarding the core elements of the respective performance factors was noteworthy and convincing in terms of the overall assessment and credibility.

Application of Updated D&M Model

The BV case study analysis will now continue with the application of the Updated D&M Model. Referring back to Chapter 2, the Updated D&M Model exploits a set of performance factors which ultimately influence Net Benefits. The three Quality factors are suggested to influence both Intent to Use/Use and User Satisfaction which both directly influence Net Benefits. Following a discussion of respective performance factors, conclusions will be drawn in terms of their respective influences on the relationships defined by the model.

[176] Former Army G35 Staff Officer, 2009-2011, 15 February 2013.

In order to determine the Information Quality provided by BV, it is necessary to first acknowledge requirements, level of understanding and expectations of C&S and IM user. Based on the application of the Integrated Performance Model to the BV case study, it is clear that BV lacked proper requirements, common expectations and user engagement during its evolution. These factors have led to a significant shortfall in terms of C&S and IM users' perception of Information Quality regarding accuracy, timeliness, speed, completeness, relevance, display and overall "intended meaning."[177] These shortcomings were noted by the Army C2 TAV to Afghanistan which stated that BV had a, "slow refresh/update rate which has an adverse effect on usability, particularly during operations execution/battle tracking."[178] Information Quality was also NEGATIVELY influenced by System Quality which will be addressed in the subsequent paragraph. One notable positive attribute from an Information Quality perspective of BV which was indicated by ADM (Mat) and several Army interviewees was BV's MIP compliance which enables it to automatically display Battle Management data received electronically from other MIP-compliant nations with whom Canada shares a TacComms link. Based on this assessment, Information Quality is assessed to have had a VERY NEGATIVE impact on Intent to Use/Use as well as User Satisfaction. The poor assessment in the Information Quality performance factor is noteworthy in that the display of geospatial information is at the core of BV's purpose.

[177] W. DeLone and E. McLean, "The DeLone and McLean Model of Information Systems Success": 10.
[178] Department of National Defence. 3350-1 (G35 Cont'l Plans) DRAFT JTF-Afg C2 TAV, G-4/4.

System Quality is closely linked to Information Quality and can be measured "… in terms of ease-of-use, functionality, reliability, flexibility, data quality, portability, integration, and importance."[179] As described under the Information Quality performance factor, most C&S and IM users had a negative perception in the majority of these areas characterizing BV as "complex", "clunky" and "non-intuitive." The C2 TAV articulated this NEGATIVE area when it stated that that BV, "takes too long to enter the icons/boundaries/drawing conventions," has poor "map manipulation functionality," and that, "the look of BV detracts from familiarity/intuition."[180] A number of more technically-aware interviewees sighted BV's ODB-architecture as being problematic to System Quality (and by extension Information Quality) due to its inherent dependence on high bandwidth communications links, frequent ODB replication and lack of availability in mobile platforms.[181,182,183] Two positive aspects of System Quality which interviewees identified were BV's overall integration with the remainder of the LCSS and its MIP compliance. Acknowledging the Army's ownership of the shortfalls which likely contributed to a number of its components, System Quality is deemed to have VERY NEGATIVE influenced Intent to Use/Use and User Satisfaction.

[179] W. DeLone and E. McLean, "The DeLone and McLean Model of Information Systems Success": 13.
[180] Department of National Defence. 3350-1 (G35 Cont'l Plans) DRAFT JTF-Afg C2 TAV, H-2/4.
[181] DLCSPM Project Manager, 1999-2013, 07 February 2013.
[182] Director Canadian Forces Experimentation Centre, 2001-2013, *Command Support Project Performance Factors* Research Project Interview, interviewed by telephone by Major Jeremy Small, 28 February
[183] G3 CMBG, 2011-2013, *Command Support Project Performance Factors* Research Project Interview, interviewed by telephone by Major Jeremy Small, 11 February 2013.

The Service Quality performance factor addresses the requirement to deliver support to the users of the CSC. A number of interviewees suggested that the ad hoc and asymmetric delivery of the SR to Army formations contributed to challenges in Service Quality in that the artifact often arrived via mail with minimal documentation, installation instructions or rudimentary procedures. This fact coupled with a meager non-materiel component served to further aggravate a pre-existing gap in knowledge and ability by those providing the Service. As described earlier, the implementation of knowledgeable OEM-provided FSRs post-CSPP T3 served to enhance Service Quality. Based on this analysis, Service Quality is assessed as having had a NEGATIVE overall impact on Intent to Use/Use and User Satisfaction.

The next performance factor will be discussed using its component parts: Intent to Use and Use. Most interviewees reported the Intent to Use varied over the course of time and based on individual commanders. Many interviewees suggested that previous negative experiences with Iris OPCAP 1 (CNR), CSPP T3 and initial BV exposures influenced the attitude in terms of Intent to Use. Other interviewees suggested that a lack of comprehensive direction and follow-through from the Army in terms of Intent to Use and Use served to create an asymmetric environment where subordinate commanders had the latitude to Use or not Use BV; an effect could have been mitigated by the presence of a Champion. In a number of instances, interviewees reporting individual commanders expressing an Intent to Use but then discontinuing Use base on perceived BV shortfalls in the realms of Information Quality, System Quality, Service Quality or other negative

conditions relating to the specific use case.[184,185,186] Such responses are in line with research on user resistance which suggests users will cease use when they perceive use as producing negative outcomes or its costs outweigh its benefits.[187,188]

While the Army C2 TAV reported the BV was, "hardly used" in Afghanistan in 2010, two instances where Intent to Use has matched Use for an enduring period is at the CLFCSC and at 1 Canadian Division Headquarters (1 Can Div HQ).[189] CLFCSC has consistently employed either ATS or BV on the AOC since 2005. 1 Can Div HQ has demonstrated an enduring to IT, CT and the employment of BV (including during Joint Exercise 13 (JE13)) following its stand-up in 2010. Of note in terms of the 1 Can Div HQ exposure to BV and LCSS in general, Director DLCSPM suggested that these CSC components have the potential to become the Joint CS tools of choice.[190] If such a decision were made, careful consideration would need to be taken to avoid a number of the pitfalls identified within this paper in terms of the development, integration and evolution of such a Joint CS system into 1 Can Div HQ and the CF as a whole.

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[184] Former CO 2 CMBG HQ & Sig Sqn, 2010-2012, *Command Support Project Performance Factors* Research Project Interview, interviewed by telephone by Major Jeremy Small, 04 February 2013.
[185] CO 1 CMBG HQ & Sig Sqn, 2011-2013, *Command Support Project Performance Factors* Research Project Interview, interviewed by telephone by Major Jeremy Small, 19 February 2013.
[186] G3 2 CMBG, 2011-2013, email to Major Jeremy Small, 05 March 2013.
[187] S. Rivard and L. Lapointe, "Information Technology Implementers' Responses to User Resistance: Nature and Effects," *Management Information Systems Quarterly*, Volume 36, Number 3 (2012): 899.
[188] M. Markus, "Power, Politics, and MIS Implementation." *Communications of the Association for Computing Machinery*, Volume 26, Number 6 (1983): 430.
[189] Department of National Defence. 3350-1 (G35 Cont'l Plans) DRAFT JTF-Afg C2 TAV, B-1/8.
[190] Director DLCSPM 2009-2012, 31 January 2013.

Further, and as described in detail under the Management Advocacy performance factor of the Integrated Performance Model, the Army C2 TAV to Afghanistan, BVAT and UET all served to set the conditions for an improved level of Intent to Use/Use. Finally, ADM (Mat) and Army interviewees also perceived that incremental improvements in investment and the non-materiel component served to enhance Intent to Use/Use. For these reasons, Intent to Use/Use is assessed to have influenced both User Satisfaction and Net Benefits in both NEGATIVE and POSITIVE senses over the course of BV's evolution. This assessment affirms the anticipated relationship and influence of Intent to Use/Use in accordance with the Updated D&M Model. Intention to Use/Use is deemed to have NEGATIVELY impacted User Satisfaction and Net Benefits.

As previously described, a high level of User Satisfaction has not existed. One DLCSPM Engineer when so far as to interpolate that the Army had "given up" on BV.[191] During the earlier portion of its evolution, lack of User Satisfaction can be attributed to low levels of Quality (Information, System and Service) as corroborated by both ADM (Mat) and Army. That is to say that the "effect of the information on the receiver" was not deemed to have met his requirements.[192] Low levels of training and unrealistic expectation likely influenced this perception and make it difficult to qualify based on the absence of agreed upon requirements and metrics. Initiatives by CLFCSC, 1 Can Div HQ coupled with the outcomes of the Army C2 TAV, BVAT and UET have all had incremental positive effects on

[191] Former BV Engineer, 2008-2011, 30 January 2013.
[192] W. DeLone and E. McLean, "The DeLone and McLean Model of Information Systems Success": 10.

User Satisfaction based on the perception of improvements in the level of Battle Management, COP and PA provided by BV. This affirms the model which suggests that Use must precede User Satisfaction from a process perspective, that User Satisfaction will influence Use from a causal perspective and both Intent to Use/Use and User Satisfaction influence Net Benefits.[193] However, and despite the incremental improvements, User Satisfaction is deemed to have had a NEGATIVE influence on Intention to Use and Net Benefits.

As with IS project performance in the Integrated Performance Model, Net Benefits is the most important aspect of the Updated D&M Model in terms of "decision-making performance, job effectiveness, and quality of work."[194] While initiatives described in the earlier performance factors of this model have highlighted a limited level of value in terms of Individual and Organizational Impacts, significant positive Impacts in terms of BV have yet to be realized. As stated by the Army C2 TAV to Afghanistan, BV:

> …has fallen short in its ability to deliver certain promised capabilities, most notably a functional planning and operating tool which makes use of near-real-time source information."[195]

A former DLR 4 stated that "the Army did not exercise strong enough managerial control over the Programme" to deliver on its expectations.[196] It is instructive to note, however, that a number of ADM (Mat) and Army interviewees highlighted the incremental progress as a clear demonstration of the potential value which BV

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[193] W. DeLone and E. McLean, "The DeLone and McLean Model of Information Systems Success": 23.
[194] W. DeLone and E. McLean, "The DeLone and McLean Model of Information Systems Success": 15.
[195] Department of National Defence. 3350-1 (G35 Cont'l Plans) DRAFT JTF-Afg C2 TAV, 3.
[196] Former DLR 4, 2007-2009, *Command Support Project Performance Factors* Research Project Interview, interviewed by telephone by Major Jeremy Small, 04 February 2013

could add to Army commanders and staffs. However, BV has not had significantly negative Impacts within the Army due to the limited resource investment and relatively small scale of engagements. That is to say that the Army has not made a significant resource commitment in BV, but has also failed to realize a meaningful level of positive Individual or Collective Impact from the CS application to date.

Based on this assessment, Net Benefits is deemed to be low. Further, and based on the lack of perceived Individual and Collective Impact, Net Benefits is believed to have NEGATIVELY influenced Intent to Use as well as User Satisfaction as prescribed by the feedback loop of the Updated D&M Model.

Summatively, application of the Updated D&M Model against the BV case study has affirmed the relationship of the performance factors to Net Benefits as proposed by DeLone and McLean. Due to the temporal approach taken to the examination of the case study, this is true in both negative and positive senses for various performance factors over the course of the evolution. While there did exist a level of contention in terms of perceptions of interviewees regarding some aspects of given performance factors, much of which is related to ADM (Mat)'s perception of the Army's level of training and expectations, little doubt existed in terms of the holistic Net Benefits which BV has added within the Army to date.

Emergent Findings

As with the CSPP T3 case study, the BV case study yielded deductions outside of the two theoretical models. Three of these findings were affirmations of those made in the CSPP T3 case study, while one was specific to the BV case study.

In terms of affirmations, the BV case study affirmed the findings related to the lack of Championship within a CS Project as well as the direct influence of the non-materiel component. Despite nearly eight years having passed, there was no evidence of a meaningful increase in Championship or the non-materiel component of the CSC. Both of these factors were absent from the BV evolution and continued to lead to VERY NEGATIVE outcomes in terms of overall Outcomes and Net Benefits.

The deduction which was unique to the BV case study relates to the impact of non-Project status. The BV case study demonstrated that such a status must be carefully and deliberately managed to optimize results. While it can offer ADM (Mat) significant flexibility in terms of engineering, procurement and evolution of an IT-based Project, these benefits are tempered with the risks associated with lack of proper oversight, accountability and engagement (including requirements) from the Army. Overall, the lack of Project status is deemed to have NEGATIVELY influenced Outcomes and Net Benefits.

The final affirmation is that of the lack of learning following CSPP T3. While it will be discussed further in Chapter 5 as part of the Cross-Comparison, it is clear that the same shortfalls have persisted from one case study to the next. One DLCSPM engineer stated that despite all of the challenges that the CSC has endured over the past years, he believed that both the Army and ADM (Mat), "would probably do the same thing" in subsequent CS endeavours.[197] Accordingly, and considering the very clear lessons which were seized from CSPP T3, failure to learn is deemed to have had a VERY NEGATIVE impact on the BV evolution.

Conclusion

Both the Integrated Performance Model and the Updated D&M Model have been validated through their respective application to the BV case study. Further, each model has yielded a set of performance factors which are deemed to have influenced overall outcomes. These performance factors are believed to be directly indicative of the anticipated outcomes of CS projects. The more user-centric nature of BV has also enabled the closing of the gap observed in the application of the two theoretical models against CSPP T3.

In terms of common findings, the lack of underpinning requirements and common expectations were found to have negatively influenced various performance factors and overall outcomes within both theoretical models. As was

[197] Former BV Engineer, 2008-2011, 30 January 2013.

found for the CSPP T3 case study, a lack of meaningful Doctrine & TTP Release, Training Release and Training Infrastructure was again found to be causal in both performance factor and overall outcomes within both models. Finally, the absence of a Champion and application of previous lessons continued to present an adverse influence on overall success within the BV case study.

As positive developments, investment at CLFCSC and 1 Can Div HQ as well as the FSRs, C2 TAV, BVAT and UET served to enhanced the assessment of the Intent to Use/Use and User Satisfaction performance factors over the course of time. There was a level of recognition within the Army chain of command that these resource allocations yielded value both in terms of the progression and perception of BV.

Based on the overall consistency of information obtained as part of the examination of both case studies, it is believed that a sufficiently reach tapestry was developed to effectively evaluate both models and their respective performance factors. This fact, coupled with the results of the CSPP T3 case study will enable us to cross-compare the findings of the two case studies in Chapter 5. This will enable the realization of further conclusions regarding the respective performance factors as it pertains to the two case studies and more generically, to CSCs as a whole.

CHAPTER 5 – CROSS-COMPARISON OF CASE STUDIES

Introduction

Having completed the analysis of the two case studies using the theoretical models as well as the GT approach, it is now instructive to conduct a cross-comparison of the analysis and deductions. This discussion will be composed of two components. Initially, the findings of the two case studies using the theoretical models will be discussed in terms of common and unique findings. Subsequently, a comparison of the two theoretical models will take place in terms of their overall utility in terms of application to CS projects.

Comparison of Results of Case Studies

In terms of the findings of the two case studies, there were noteworthy relationships within the findings. Some of these findings demonstrated commonalities while others were unique to specific case studies. Considering the sequential nature of the two case studies and the temporal nature of the BV evolution, it is instructive to consider the ratings of the performance factors as a function of time in that both the Army and ADM (Mat) had ample time and opportunity to improve their respective performance within the performance factors. Table 5.1 summarizes the ratings of the performance factors of the two theoretical models as well as the emergent performance factors across the two case studies.

Model	Performance Factor	CSPP T3	BV
Integrated Performance Model	Support Technology	NEUTRAL/NIL	POSTIIVE
	Project Team Size	VERY NEGATIVE	NEGATIVE
	Clear Goals	VERY NEGATIVE	NEGATIVE
	Expertise of Staff	VERY NEGATIVE	VERY NEGATIVE
	Management Advocacy	VERY NEGATIVE	VERY NEGATIVE
	Problem Solving Competency	VERY NEGATIVE	NEGATIVE
	Task Outcomes	VERY NEGATIVE	NEGATIVE
	Psychological Outcomes	VERY NEGATIVE	NEGATIVE
	Organizational Outcomes	VERY NEGATIVE	NEGATIVE
Updated D&M Model	Information Quality	NEUTRAL/NIL	VERY NEGATIVE
	System Quality	VERY NEGATIVE	VERY NEGATIVE
	Service Quality	VERY NEGATIVE	NEGATIVE
	Intention to Use/Use	VERY NEGATIVE	NEGATIVE
	User Satisfaction	VERY NEGATIVE	NEGATIVE
	Individual Impacts	VERY NEGATIVE	NEGATIVE
	Organizational Impacts	VERY NEGATIVE	NEGATIVE
Grounded Theory/ Emergent	Championship	VERY NEGATIVE	VERY NEGATIVE
	Non-Material Component	VERY NEGATIVE	VERY NEGATIVE
	Non-Project Status	NEGATIVE	NEGATIVE
	Learning	NEGATIVE	VERY NEGATIVE
	SoS Approach	VERY NEGATIVE	POSITIVE

Table 5.1 – Summation of Ratings of Theoretical and Emergent Performance Factors

Despite being nuanced within the scope of the case studies, there existed five striking and emergent findings which were common to both case studies, along with one unique result for each the CSPP T3 and BV case study respectively. A number of the emergent performance factors will be linked to the theoretical model performance factors in the subsequent paragraphs. An analysis will also be provided from a temporal perspective to determine changes over the course of time. It is worth restating that no interviewees suggested that a lack of funding contributing in any way to the shortfalls in either CSPP T3 or BV.

For the purposes of this paper, a Champion was defined as a credible individual who is appointed and empowered with the authority to enable the allocation of resources and coordination across organization boundaries to ensure successful Capability outcomes. As an emergent performance factor, the lack of Champion is apparent across both case studies and VERY NEGATIVELY influenced Clear Goals, Management Advocacy and Problem Solving Competencies of the Integrated Performance Model and in the examination of the Information Quality, System Quality and User Satisfaction performance factors of the Updated D&M Model. This influence was a direct result of a failure to invest the time, effort and proper personnel into the articulation of C&S and IM user requirements as well as meaningful and pervasive user engagement in the development process. Had a Champion existed, the critical shortfalls in Army chain of command engagement, requirements definition, cross-L1 coordination and the non-materiel component could have been addressed.

As a second emergent performance factor, failures in establishing and maintaining the non-materiel component of the CSC are pervasively linked to VERY NEGATIVE influence on the overall value provided by CSCs. The shortfalls were evident in the Integrated Performance Model in terms of the Project Team Size, Staff Expertise and Problem Solving performance factors and within the Service Quality, Intent to Use/Use and User Satisfaction performance factors of the Updated D&M Model. Failures in the non-materiel component of the CSC persist in having negative effects on the level of C&S, IM and SM user experience and satisfaction and overall cultural acceptance within the Army. It is

unreasonable to expect that the overall results of CS projects and CSCs to have fundamentally different results in the absence of changes to meaningful Championship and significant investment in the non-material components of the CSC. Unfortunately, the Army may have failed to capitalize on previously available funds as DND moves into a period of fiscal restraint.

While offering ADM (Mat) some level of flexibility in terms of engineering and procurement, the lack of DND Project status has had NEGATIVE impacts on CSPP T3 and BV in that it alleviated the Army's obligations in terms of Championship, meaningful engagement, oversight and accountability. This status was at least partially responsible for the adverse assessment of all of the performance factors of the Integrated Performance Model as well as the Information Quality and System Quality of the Updated D&M Model. While user requirements and engagement has improved as a result of the C2 TAV, BVAT and UET, it is problematic from a Championship perspective that overall ownership of the CSC continues to be seen to lie with the Army G6, DLR 4 and ADM (Mat). The ongoing approach of treating the evolution of BV and the overall integration of the holistic SoS using O&M funding also introduces future risks considering ongoing fiscal challenges within the GoC and specifically within DND.

As suggested as an emergent performance factor as part of the CSPP T3 case study, failure to learn persisted into the BV case study. Not only did it continue to have VERY NEGATIVE influence on Outcomes and Net Benefits, it

also NEGATIVELY influenced other theoretical and emergent performance factors which could have been capitalized upon to deliver significantly improved Outcomes and Net Benefits. Again, this failure to learn is correlated to a lack of Championship.

The impact of the SoS approach was the lone positive emergent performance factor common to the two case studies. While it was lacking in the CSPP T3 timeframe, it demonstrated significant improvement over time and specific to the BV evolution. While interviewees were not wholly satisfied with many aspects of BV, its integration with the remainder of the CSC was frequently cited as a highly positive characteristic.

The one noteworthy finding as part of the CSPP T3 case study was the absence of a meaningful risk assessment methodology in the timeframe leading up to the activity. Research on software project risk management suggests that:

> …failure to understand, identify, and manage risk is often cited as a major cause of IS project problems such as cost and schedule overruns, unmet user requirements, and the production of systems that do not provide business value.[198]

In retrospect, most interviewees were unable to provide reasons why such a methodology did not exist and why a decision was not made to reassess, delay or cancel CSPP T3 based on the lack of validity of several of its key underpinning assumptions. Several interviewees from the Army suggested that in the post-CSPP

[198] L. Wallace, M. Keil and A. Rai, "How Software Project Risk Affects Project Performance : An Investigation of the Dimensions of Risk and an Exploratory Model," *Decision Sciences*, Volume 35, Number 2 (2004): 290.

T3 environment, the Army became adverse to large-scale CSC events. This explanation, if valid, would explain future iterations of CSC events and the incremental approach to BV evolution.

The BV case study's noteworthy unique deduction relates to lack of comprehensive requirements and the subsequent inherent difficulties in establishing and applying metrics of performance measurement. The majority of interviewees believed that there were no formal requirements provided by the Army to ADM (Mat) for BV, and that there existed no system of metrics by which to measure the performance of BV. The lack of consensus amoungst interviewees on the level of success of BV is indicative of the validity of this assessment.

From a temporal perspective, there are several noteworthy VERY NEGATIVE findings which emerge from the cross-comparison despite a number of incremental improvements in some performance factor ratings. The persistent VERY NEGATIVE influence of the lack of Championship, lack of meaningful delivery of the non-material component and failure to learn have already been discussed as part of the cross-comparison. As previously discussed, there was a notable increase in POSITIVE influence within the CSC based on enhanced SoS integration over the course of time. The final temporally based deduction will be described in the following paragraph.

The persistent belief of the potential value of a digitized CSC as universally indicated by all interviewees from both case studies was noteworthy.

While incremental improvements in terms of investment and meaningful engagement have served to demonstrate behaviour to support this attitude within the Army chain of command, this is not definitive. For the Army to optimize the potential value of IS Project Performance and Net Benefits as defined in the two respective models, it must pervasively and tangibly invest in the CSC, most specifically in terms of Championship and the non-materiel component. While not yet fully delivered/executed, there are a series of activities which suggest such investment.

The first of four known investments to this effect are the Army G3's inclusion of the CSC version on the Army Managed Readiness Plan (MRP) which is indicative of a recognition by the chain of command that CS must be deliberately considered in the Army's FG planning.[199] The second development is the anticipated inclusion of a digitized CS capability (vehicle-borne version of BV known as Tactical Battle Management System (TBMS)) in the Army Tactical Operations Course (ATOC) which is the precursor to the AOC which is indicative of a recognition of not only the need to invest in the non-materiel component, but to do so at increasingly early points in the careers of Army personnel.[200] Third is the ongoing activation of the Command Support Training and Integration Centres (CSTICs) at key Army installations will serve to further enhance the level of User Satisfaction and address some of the shortfalls within the non-materiel

[199] Department of National Defence, "Army Managed Readiness Plan," last accessed 04 March 2013, http://acims.mil.ca/ops/ArmyG63Ops/MRP.
[200] Former Dir ADOK, 2007-2011, 25 February 2013.

component.[201] Finally, the Army has recently run its pilot serials of is Information Management Officer (IMO) course.[202] Even with these investments at hand, a key Army CS staff officer aptly stated that the Army "has not, to date, made the commitment of resources to address the Programme requirements."[203]

Comparison of Theoretical Models

The two theoretical models are unique by definition: The Integrated Performance Model of Information Systems Projects and The DeLone and McLean Model of Information Systems Success. The former examines the performance of IS projects and the latter addresses IS success. While related, the two models are distinct in terms of what they address and how they address it. As Aladwani states, "it is important to understand that IS project performance is a different construct from IS effectiveness."[204]

The Integrated Performance Model is oriented towards the performance of the IS project whose primary focus is the delivery of the IS artifact. Its contributing performance factors are unique to the planning and execution of the IS project proper, and not to that of the success of the IS. Its ability to anticipate the IS project performance of both the CSPP T3 and BV are indicative of its predictive potential within the CS realm. Based on this assessment, the Integrated

[201] Former Dir ADOK, 2007-2011, 25 February 2013.
[202] Ibid.
[203] DLR 4, 2011-2013, *Command Support Project Performance Factors* Research Project Interview, interviewed by telephone by Major Jeremy Small, 25 February 2013.
[204] Adel. Aladwani, "An Integrated Performance Model of Information Systems Projects": 187.

Performance Model could potentially be adapted into a specific model with which to plan and assess the performance of CS projects, specifically in terms of the delivery of the SR component of the CS Conceptual model.

The Updated D&M Model is focused on success of the IS proper as experienced by its users. This model also displayed the ability to predict the IS outcome of both the CSPP T3 and BV case study. It is noteworthy that the performance factors within the Updated D&M Model are all C&S and IM user-oriented and contribute to the overall outcomes of the CS project. Of note, the contributing performance factors of the Updated D&M Model are applied following the delivery of the IT artifact. For these reasons, and similar to the finding for the Integrated Performance Model, the Updated D&M Model could potentially be adapted in a CS-specific model used in the assessment of CS projects. Such an adapted CS-specific model could also potentially address the gap in performance measurement metrics which were found to exist within the BV case study.

Based on the preceding paragraphs, it is apparent that the application of the Integrated Performance Model would precede the application of the Updated D&M Model in terms of the process to deliver a CSC with all its supporting components. Recalling the DND six-phase capability delivery model previously depicted at Figure 1.1, the Integrated Performance Model would loosely correspond to the Design and Build phase in terms of delivery of the IT artifact or SR, while the Updated D&M Model would loosely correspond to the Manage and

Validate phase in terms of assessing the IT artifact or SR. Such a corresponding or paralleling relationship is graphically depicted at Figure 5.1.

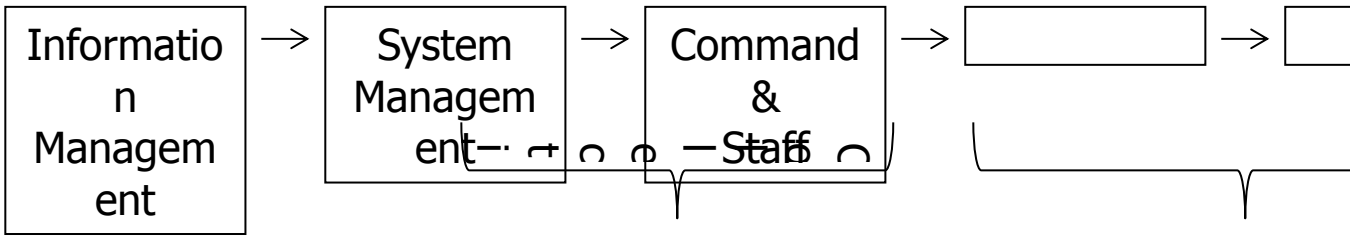

Figure 5.1 – Potential Adapted DND Six-Phase Command Support Capability Delivery Model

Source: Department of National Defence, "Defence Planning & Management Framework," last accessed 13 February 2013, http://vcds.mil.ca/sites/page-eng.asp?page=4160.

The Manage and Validate phases would also need to include elements to address the non-material components of the CSC. Further, CS-specific models would need to be adapted or developed to meet and supplement the demands of all six phases of the DND capability delivery model.

Clearly, such an approach would require a definitive CSC Champion due to its wide-ranging implications within the Army, ADM (Mat), ADM (IM) and beyond. While such a recommendation is beyond the scope of this paper, its discussion is illustrative of the specific and unique nature of the two theoretical models, their temporal relationship and the potential to adapt specific theoretical models to enhance the manner in which the Army delivers its CSC.

Conclusion

Summatively, the cross-comparison of the findings of the two case studies and of the two theoretical models has yielded useful deductions in terms of the overall research questions and aim of this paper. These deductions fall out of both the common and unique deductions of the case studies derived from the theoretical and emergent performance factors, as well as from the comparison of the two theoretical models.

Three of the five persistent and most significant emergent commonalities of the two case studies are instructive in terms of identifying enduring shortcomings in CS projects which remain largely unaddressed. All of these shortfalls must be addressed if an effective CSC is to be realized. The final commonality in terms of the persistent believe of the potential value of a digitized CSC is reason for optimism as are the incremental steps which the Army has taken to address a number of the outstanding shortfalls.

In terms of unique deductions from the cross-comparison of the two case studies, it is instructive to consider the potential implications of lack of comprehensive requirements, lack of risk management and lack of DND Project status in a combined scenario. While funding has not been identified as a shortcoming to date, the anticipated fiscal environment of the coming years could significantly alter the course of this necessary resource for CSC development, maintenance and evolution. Combining a fiscally restrained environment with an ill-defined requirements set and a lack of an

effective risk management framework could serve to eradicate the incremental level of momentum which recent investments in the CSC has initiated.

The analysis of the cross-comparison of the two theoretical models has highlighted their succession and respective focuses on IS project performance and IS success respectively. When the two models are compared against the DND Capability Delivery six-phase model, it is clear that these two models could be adapted as components of a CSC-specific capability delivery model. Such an adaptation has demonstrated the potential to address ongoing shortfalls in terms of performance metrics within both the IS project performance and IS success aspects of the CSC within the Army and ADM (Mat) as well as the potential for further adaptation of other theoretical models to the larger DND Capability Delivery Model.

At this time, and having completed the two case studies and a cross-comparison, we can proceed to the conclusions provided by the previous analysis. The previous application of the theoretical models will also allow for an assessment in terms of responses to the research questions which will serve to yield a series of overall and holistic assessment of the success of CS projects as demonstrated by the two selected theoretical models.

CHAPTER 6 - CONCLUSIONS

This paper set out to determine if there existed performance factors which could be applied to CSCs and be predictive in their outcomes. With a view to doing so, and following a sustained literature review, Aladwani's Integrated Performance Model and DeLone and McLean's Updated D&M Model were selected for application against the CSPP T3 and BV case studies using both case study and Grounded Theory methodologies. The outcomes of the case studies were then cross-compared in order to deduce both common and unique outcomes in terms of the two theoretical models as well as from an emergent perspective. This approach yielded a series of rich findings and deductions which are instructive in terms of our analysis of the subject.

From a theoretical perspective, both the Integrated Performance Model and Updated D&M Model were found to be predictive in terms of both Project Performance and IS outcomes respectively. Further, the respective performance factors within the two models were also found to be relevant predictive in terms of an affirmation of the theoretical models themselves and towards the specific CSCs within the two case studies. From a Grounded Theory perspective, there were a number of deductions which emerged to add depth to the tapestry created by the two theoretical models. The five key deductions and conclusions of this paper will be addressed in the following paragraphs.

The most striking conclusion of this paper is the lack of a CSC Champion despite repeated shortfalls within the domains of resource allocation, training and cross-organizational coordination. This pervasive shortcoming had an enduring influence on both Project and IS outcomes throughout both case studies and is indicative of the actual value placed on the CSC by the Army chain of command. The lack of Championship has had a broad influence on CSCs and is an opportunity upon which the Army chain of command has failed to capitalize. While it is outside the scope of this paper to recommend who the CSC Champion should be, the two most apparent options are the DCCA and Comd LFDTS (in his role as the Army Training Authority (ATA)). Both individuals possess the rank and access to resources required to fundamentally Champion the Capability in terms of the Army Programme and non-materiel components specifically. It has also been shown that the non-Project status of many CSC components is potentially an aggravating factor in the lack of appointment of a Champion.

Both of the CSC case studies within this paper were not formal DND Projects. While this status offers certain flexibilities from an engineering and procurement perspective, it also relieves the activity of accountability for delivery and fiscal oversight by the Army which would typically accompany a Project. It also significantly complicates other aspects of the activity such as allocation of personnel and the delivery of the non-materiel component of the CSC. The Army chain of command's lack of engagement has led to a scenario where the Army G6, DLR 4 and ADM (Mat) are unfairly left to interpolate the Army's requirements and must operate without meaningful performance measurement and

risk management criteria. This lack of clarity has in turn led to a significant inefficiency in terms of resource expenditure versus value. That is not to say that all CSCs must be delivered via formal DND Projects. To the contrary, a measured and deliberate approach should be taken in such decisions. However, if CSCs are to be pursued via non-Project activities, the Army and ADM (Mat) must consider and articulate which aspects of Project process and architecture must be observed in order to ensure that deliverables meet the requirements in terms of value and accountability. Finally, the use of O&M funds for the evolution of the CSC has served ADM (Mat) well in recently years. However, the new fiscal environment within the GoC and DND may preclude this fiscal approach in the future. For this reason, the continued non-Project status of many components of the CSC may become problematic if not prohibitive.

As identified within the discussion of the lack of Champion and lack of Project status, the non-materiel component of the CSCs has persistently negatively influence both Project and IS outcomes. Significant investment is required to meaningfully enable the Doctrine & TTP Release, Training Release and Training Infrastructure components within the C&S, IM and SM domains both from an IT and CT perspective. Having failed to capitalize on available funding prior to the 2010/2011 timeframe, the Army will now be forced to attempt to develop and deliver the non-materiel component during a time of vastly increased fiscal instability and scrutiny which will become increasingly difficult and time-consuming. Failure to address the shortfalls within the non-materiel

component will lead to a further degradation in the perceived value of the CSC within the C&S and IM communities.

The fourth key deduction of this paper is the gap between the chain of command's attitudes and behaviour towards CSCs. While the chain of command persistently indicates its belief in the value of such a Capability, its behaviour does not reinforce such a belief in terms of direction, guidance, resource investment or engagement. This conclusion is in line with the often suggested "lesson observed but not learned" mantra reported throughout both case studies. As with the shortfalls associated with non-Project status and the non-materiel component, the gap between attitudes and behaviour can only be addressed through leadership, the Army chain of command and a CSC Champion.

The final significant deduction relates to the potential to adapt theoretical models to supplement the DND six-phase capability delivery model in order to enhance the manner in which CS Projects are delivered. While the Integrated Performance Model could be adapted to supplement the Design and Build phases and the Updated D&M Model could be adapted to supplement the Manage and Validate phases, further research would be required to identify theoretical models which could positively supplement the Conceive and Report phases as well as to add richness to the adaption of all phases. In this way, various industrial and academic research could be exploited to enhance our ability to deliver CSCs.

In terms of the research questions identified in Chapter 1, these have been largely addressed throughout the body of the paper. The two theoretical models discovered in the literature review and the two employed in the case studies identified a number of performance factors influencing IT project and IS outcomes within the industrial domain. The application of the two theoretical models demonstrated the relevance of the theoretical models and respective performance factors to CSCs and in predicting their respective outcomes. The examination of the case studies also highlighted a number of critical shortcomings on the part of Management (the Army chain of command) which have persistently led to disappointing outcomes, but did not highlight significant shortfalls on the part of the IT Professionals (ADM (Mat)). A persistent lack of meaningful Army chain of command engagement and the lack of a CSC Champion were the most significant shortfalls in terms of interorganizational relationships which influence CSC outcomes based on the two case studies. As anticipated in Chapter 1 and Chapter 2, one significant difference between industrial IT projects and IS and Army CSCs was the focus on the financial aspects of their respective delivery. While the continued shortcomings of CSCs are vexing, they cannot be completely unanticipated due to the consistent approach of the Army chain of command.

Summatively, this paper has proven that there exist persistent shortcomings in theoretically-identified performance factors within Army Command Support Capability components which produce consistent deficiencies in Command Support Capabilities. This finding was definitive based on the clearly defined theoretical models and performance factors. The emergent

performance factors identified from the Grounded Theory approach were also strongly correlated with both Project and IS outcomes.

While the examination within this paper was limited to the performance factors of only two theoretical models using two CS case studies, the outcome remains indicative of the predictive power of theoretical models applied to CS activities. Accordingly, further research within this domain is recommended to include additional theoretical models and more numerous CS Project case studies to add depth and richness to the available research.

Finally, this paper has made clear that CSCs are in constant evolution and require persistent investment by the Army chain of command. They evolve as a function of the changing requirements of the Canadian Army, agreements with our Allies and with technology itself. The preceding discussions have demonstrated that the shortcomings in CSCs were not linked to a lack of funding of technological problems, but rather primarily to leadership and management. For these reasons, the Army chain of command and its CSC Champion must seek perpetual participation, engagement and evolution of the processes by which they deliver CSCs and by which they measure their respective performance to ensure continued value for money as well as operational value for our commanders. If the Army chain of command truly *believes* in the Capability, it must demonstrate concrete *investment* through its *actions* to realize this potential value. As one of

the Army's most experienced CS staff officers aptly stated: "vision without resources is hallucination."[205]

[205] Army G6 Staff Officer, 2010-2011, email to Major Jeremy Small, 01 May 2013.

Appendix 1 – Command Support Pilot Project Trial 3 Interview Questions

Ser	Question
1	Briefly describe your role in CSPP T3.
2	Would you consider your role as Management or IT Professional?
3	What did the Army learning from TCCCS/Iris fielding?
4	What was the purpose of T3?
5	Was CSPP T3 a capital project as defined by the Government of Canada? If not, what was it? What (if any) were the implications of such a definition/situation?
6	Which Level 1s (L1s) were involved in CSPP T3?
7	Which L1 initiated the conduct of CSPP T3?
8	Was the conduct of CSPP T3 welcome by all involved L1s?
9	How would you describe the Army's willingness and readiness to conduct CSPP T3? (support, general, technical, training, doctrine, TTPs, etc)
10	How would you describe ADM (Mat)'s willingness and readiness to conduct T3? (support, general, technical, training, doctrine, TTPs, etc)
11	Were the Army and ADM (Mat) pressured in terms of time regarding T3?
12	What were the Army's key objectives of CSPP Trial 3?
13	What were ADM (Mat)'s key objectives of T3?
14	Did the Army effectively articulate its requirements for support to CSPP T3 to ADM (Mat)? If so, what were they?
15	What were the technical pre-conditions for T3? Were these met? If so, how?
16	What was the Army's technical level of confidence prior to T3?
17	Was ADM (Mat) adequately prepared to provide engineering and technical support to T3?
18	How would you describe the relationship between the Army and ADM (Mat) in the preparation phase of CSPP T3? (communication, coordination, synchronization, etc)?
19	How would you describe the periodic coordination meetings between the Army and ADM (Mat) conducted to confirm that T3 was on schedule, meeting milestones goals and anticipated to meet future requirements to achieve success?
20	Did the Army allocate sufficient resources (information, personnel, funding, time, etc) to meet its T3 requirements?
21	Did ADM (Mat) allocate sufficient resources (information, personnel, funding, time, etc) to meet its T3 requirements?
22	Did that Army change its expectations for T3 over the course of time? If so, how was this communicated, managed and affected?
23	Were effective performance measurement milestones in place? If so describe milestones and contingent actions.
24	Were proper QA means in place? If so describe means and contingent actions.

25	Was a user-acceptance trial conducted for the Command Support System prior to T3? If so, what was confirmed from an IT perspective? User perspective? What were the qualitative and quantitative findings?
26	How was risk managed for T3? Were there off-ramps? Branch plans? Mitigation strategies?
27	Did ADM (Mat) adequately support the requirements for support as articulated by the Army?
28	How would you describe the level of success in the achievement of the Army's key objectives of CSPP T3?
29	How would you describe the level of success in the achievement of ADM (Mat)'s key objectives of CSPP T3?
30	Why did CSPP T3 occur as it did?
31	Did the Army and ADM(Mat) anticipate that T3 would achieve its aim?
32	Were/are there organizational factors (champion, longtime owner, empire building, status, power, slack money and resources) which influence T3?
33	Were there psychological factors (attachment, emotion, responsibility, ownership, leadership) and/or social factors (rivalry, norms))which influenced the conduct of T3?
34	How would you describe the level of satisfaction amoungst users with the effectiveness/success of ATS as a battle mgmt./planning application? Why?
35	How would you describe the overall results, impacts and implications of CSPP T3 for the overall Army Command Support capability and community?
36	What do you believe the Army learned from CSPP T3?
37	Post-T3, did the Army believe that ATS (or an electronic, networked CS/BM/BP software application) was a promising and necessary capability?
38	Were there people within the Army and ADM (Mat) who thought "the Army would just turn it on and use it"?
39	What is a Land Command Support System (LCSS)?
40	What do you believe ADM (Mat) learned from CSPP T3?
41	Do you have any specific information in terms of documentary evidence which may be of use in the study of the challenges experienced in CSPP T3?
42	Do you have any specific information in terms of other individuals who may be able to provide useful information in the study of the challenges experienced in CSPP T3?
43	Do you have any further information which may be of use in the study of the challenges experienced in CSPP Trial 3?

Appendix 2 – BattleView Project Interview Questions

Ser	Question
1	Briefly describe your role in BattleView (BV).
2	Would you consider your role as Management or IT Professional?
3	What did the Army learn from CSPP Trial 3?
4	What did the Army learn from TCCCS/Iris fielding?
5	What is the definition of Battleview?
6	What is the purpose of BV?
7	What is a Land Command Support System (LCSS)?
8	Was BV a capital project as defined by the Government of Canada? If a capital project, what were its milestone objectives? -If not, what was it?
9	What (if any) were the implications of such a definition/situation?
10	Which L1 initiated the BV activity?
11	Which Level 1s (L1s) were involved in the BV activity?
12	When was BV initiated?
13	Did the Army effectively articulate its requirements for BV?
14	Where and how did the Army clearly articulate its BV requirements to ADM (Mat)?
15	Were periodic coordination meetings conducted to confirm that BV were on schedule, meeting milestones goals and anticipated to meet future requirements to achieve success?
16	Were effective performance measurement milestones in place? If so describe milestones and contingent actions.
17	Were proper QA means in place? If so describe means and contingent actions.
18	How was risk managed for T3/BV? Were there off-ramps? Branch plans? Mitigation strategies?
19	What have been the major events/engagements between ADM (Mat) and the Army as it pertains to the development and evolution of BV? (temporal by event/iteration)
20	Did the Army provide supplemental direction/feedback to ADM (Mat) based on said engagements?
21	Were users satisfied with the effectiveness/success of BV as a battle mgmt/planning application? Why or why not?
22	How would you describe the relationship between the Army and ADM (Mat) in terms of BV during its development and evolution?
23	Did the Army allocate sufficient resources (information, personnel, funding, time, etc) to meet its BV requirements?
24	Was ADM (Mat) allocated sufficient resources (information, personnel, funding, time, etc) to meet the BV requirements of the Army?
25	Did that Army change its expectations for T3/BV over the course of time? If so, how was this communicated, managed and affected?
26	Did ADM (Mat) adequately support the delivery of the Army's

	requirements for BV? (temporal by event/iteration)
27	Did you feel that your work on Battleview was what was required by the Army? Did you feel that the work ADM (Mat) was conducting was IAW the requirements of the Army?
28	How would you describe the level of success in the achievement of the Army's key objectives in terms of BV?
29	When and why was the BattleView Action Team established? What were its Terms of Reference/key objectives?
30	Describe the objectives and effectiveness of the BV Rapid Development Cycles (RDCs) conducted with 1 Can Div?
31	Why has BV development and evolution occurred as it has?
32	To what degree is BV in operations in the Army today? -Has BV been used in operations (JTF-Afg or elsewhere)? If so, where? If not, why not?
33	What is the perception within the Army in terms of BV today? User pull?
34	How much money has been expended on BV?
35	How would you describe the overall results, impacts and implications of BV development and evolution for the overall Army Command Support capability and community?
36	Were there psychological factors (attachment, emotion, responsibility, ownership, leadership) and/or social factors (rivalry, norms))which influenced the conduct of T3/BV?
37	Were/are there organizational factors (champion, longtime owner, empire building, status, power, slack money and resources) which influence T3/BV?
38	What do you believe the Army learned from the development and evolution of BV?
39	What is, in your opinion, the Army's general perception of BV?
40	What do you believe ADM (Mat) learned from the development and evolution of BV?
41	What is, in your opinion, ADM (Mat)'s general perception of BV?
42	Were there people within the Army and ADM (Mat) who thought "the Army would just turn it on and use it"?
43	Did/does the Army believe that BV (or an electronic, networked CS/BM/BP software application) is a promising and necessary capability?
44	Do you have any specific information in terms of other individuals who may be able to provide useful information in the study of the challenges experienced in the development and evolution of BV?
45	Do you have any specific information in terms of documentary evidence which may be of use in the study of the challenges experienced in the development and evolution of BV?
46	Do you have any further information which may be of use in the study of the challenges experienced in BV?

BIBLIOGRAPHY

Abdel-Hamid, T., Sengupta, K. and Swett, C. "The Impact of Goals on Software Project Management: An Experimental Investigation." *Management Information Systems Quarterly*, Volume 23, Number 4 (1999), 531-555.

About.com Logistics. "Six Sigma Terminology." Last accessed 09 April 2013. http://logistics.about.com/od/operationalsupplychain/a/6_Sigma_Terms.htm.

Addison, Tom. "Controlling Software Project Risks – An Empirical Study of Methods Used by Experienced Project Managers." *Proceedings of SAICSIT* (2002), 128-140.

Aladwani, Adel, "An Integrated Performance Model of Information Systems Projects." *Journal of Management Information Systems*, Volume 19, Number 1 (Summer 2002): 185-210.

Aladwani, Adel. "Formal Participation and Performance of the System Development Group: The Role of Group Heterogeneity and Group-Based Rewards." *DATABASE for Advances in Information Systems*, Volume 31, Issue 4 (2000): 25-40.

Bannerman, P.L. "Toward An Integrated Framework of Software Project Threats." Conference Paper, The Institution of Engineering and Technology (2008), 139-148.

Barki, H., Rivard, S., and Talbot, J. "An Integrative Contingency Model of Software Project Risk Management." *Journal of Management Information Systems*, Volume 17, Number 4 (2001): 37-69.

Campion, M.A., Medsker, G.J., and Higgs, A.C. "Relations Between Work Group Characteristics and Effectiveness: Implications for Designing Effective Work Groups." *Personnel Psychology*, Volume 46, Number 4 (1993), 823-850.

Canada. Department of National Defence. B-GL-300-001/FP-001, *Land Operations*. Kingston, Ontario: Army Publishing Office, 2008.

Canada. Department of National Defence. B-GL-300-003/FP-001, *Command in Land Operations*. Kingston, Ontario: Army Publishing Office, 2007.

Canada. Department of National Defence. CANFORGEN 034/13 CMP 016/13, Appointment of Defence Champion for Women. 28 February 2013.

Canada. Department of National Defence. "Army Capability Development Process." Last accessed 13 February 2013. http://lfdts-dlcd.kingston.mil.ca/Capability%20Development%20Process/Forms/AllItems.aspx.

Canada. Department of National Defence. "Army Managed Readiness Plan." Last accessed 04 March 2013. http://acims.mil.ca/ops/ArmyG63Ops/MRP.

Canada. Department of National Defence. Army Strategic Operating and Resource Directive (SORD). 2002.

Canada. Department of National Defence. 3350-1 (G6) Command Support Capability Release 1 Field Validation Exercise – Phase 1 Report. 28 October 2004.

Canada. Department of National Defence. 3350-1 (DLCI) Command Support Pilot Project (CSPP) Trial 3 Directive – Battle Group Command Support Trial. 14 September 2004.

Canada. Department of National Defence. "Command Support Pilot Project Trial 3 Observations, Data Collection and Analysis." Defence Research & Development Canada Centre for Operational Research and Analysis Technical Report 2005-20. June 2005.

Canada. Department of National Defence. "Defence Planning & Management Framework." Last accessed 13 February 2013. http://vcds.mil.ca/sites/page-eng.asp?page=4160.

Canada. Department of National Defence. "Defence Subject Classification and Disposition System." Last accessed 09 April 2013. http://img-apps.ottawa-hull.mil.ca/DSCDS/.

Canada. Department of National Defence. Instruction – Command Support Capability Release 1 Field Validation Exercise 4 October – 5 November 2004. 25 August 2004.

Canada. Department of National Defence. 3350-1 (G35 Cont'l Plans) Joint Task Force Afghanistan Command and Control Technical Assistance Visit Instruction, 28 July 2010.

Canada. Department of National Defence. 3350-1 (G35 Cont'l Plans) DRAFT Joint Task Force Afghanistan Command and Control Technical Assistance Visit, November 2010 (UNSIGNED).

Canada. Department of National Defence. Joint Task Force Afghanistan Command and Control Technical Assistance Visit Backbrief to DCCA, 28 November 2010.

Canada. Department of National Defence. *Land Operations 2021: Adaptive Dispersed Operations*. Kingston, Ontario: Army Publishing Office, 2007.

Canada. Department of National Defence. "Project Approval Directive (PAD)." Last accessed 13 February 2013. http://vcds.mil.ca/sites/page-eng.asp?page=11611.

Cerveny**,** R., Garrity, E. and Sanders, G. "A Problem-Sovling Perspective on Systems Development." *Journal of Management Information Systems*. Volume 6, Issue 4 (Spring 1990): 103-122.

Cooprider J. and Henderson, J. "Dimensions of IS Planning and Design Aids: A Functional Model of CASE Technology," *Journal of Management Information Systems*. Volume 7, Issue 3 (Winter 1990): 67-87.

Davis, F. "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology." *Management Information Systems Quarterly*, Volume 13, Number 3 (1989).

DeLone, W. and McLean, E. "Information Systems Success: The Quest for the Dependent Variable." *Information Systems Research*, Volume 3, Number 1(1992): 60-95.

DeLone, W. and McLean, E. "The DeLone and McLean Model of Information Systems Success: A Ten-Year Update." *Journal of Management Information Systems*, Volume 19, Number 4, (Spring 2003): 9-30.

Desai, M. and Chulkov, D. "Escalation Of Commitment In MIS Projects: A Meta-Analysis." *International Journal of Project Management*. Volume 13, Number 2 (2009): 29-38.

Forgues, Pierre. Command in a Network-Centric War. *Canadian Military Journal*. Volume 2, Number 2 (Summer 2001): 23-24.

Glaser, Barney G. "Conceptualization: On Theory and Theorizing Using Grounded Theory." *International Journal of Qualitative Methods*. Volume 1, Issue 2 ((Spring 2002): 1-31.

Glaser, Barney G. with the assistance of Judith Holton. "Remodeling Grounded Theory." *Historical Social Research*, Supplement 19, Issue 32 (2007): 47-68.

Glaser, Barney G. and Strauss, A.L. *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Hawthorne, New York: Aldine de Gruyter, 1967.

Goodman, P.S., Ravlin, E. and Schminke, M. "Understanding Groups in Organizations." In B. Staw and L.L. Cummings, *Research in Organizational Behavior*. Greenwich, Connecticut: JAI Press, 1987, 121-173.

Igbaria, M., Zinatelli, N. and Cavaye, A. "Analysis of Information Technology Success in Small Firms in New Zealand." *International Journal of Information Management*, Volume 18, Number 2 (1998): 103-119.

Irani, Z., Sharif, A. and Love, P. "Transforming Failure into Success Through Organisational Learning: An Analysis of a Manufacturing Information System." *European Journal of Information Systems*, Volume 10, Number 1 (March 2001): 55-66.

Jun, L., Qiuzhen, W. and Qingguo, M. "The Effects of Project Uncertainty and Risk Management on IS Development Project Performance: A Vendor Perspective." *International Journal of Project Management*. Volume 29, Issue 7 (October 2011): 923-933.

Kappelman, L., McKeeman, R. and Lixuan Z. "Early Warning Signs of IT Project Failure: The Dominant Dozen." *The EDP Audit, Control & Security Newsletter*. Volume 35 Issue 1 (January 2007): 1-10.

Keil, M. (1995). "Pulling the Plug: Software Project Management and the Problem of Project Escalation." *Management Information Systems Quarterly*, Volume 19, Number 4 (1995): 421-447.

Keil, M., Mann, J., and Rai, A. "Why Software Projects Escalate: An Empirical Analysis and Test of Four Theoretical Models." *Management Information Systems Quarterly*, Volume 24, Number 4 (2000): 631-664.

Keil, M., Tan, B., Wei, K., Saarinen, T., Tuunainen, V., and Wassenaar, A. "A Cross-Cultural Study on Escalation of Commitment Behavior in Software Projects." *Management Information Systems Quarterly*, Volume 24, Number 2 (2000): 299-325.

Kenneth, J. and Kozar, S. "Management's Role In Information System Development Failures: A Case Study." *Management Information Systems Quarterly*, Volume 2, Issue 2 (June 1978): 7-16.

Kettinger, W. and Lee, C. "Perceived Service Quality and User Satisfaction with the Information Services Function." *Decision Sciences*. Volume 25, Number 5 (1995): 737-765.

Kim, H-W. and Kankanhalli, A. "Investigating User Resistance to Information System Implementation: A Status Quo Bias Perspective." *Management Information Systems Quarterly*, Volume 33, Number 3 (September 2009): 567-582.

Korzaan, M. "The Influence Of Commitment To Project Objectives In Information Technology Projects." *Review of Business Information Systems*, Volume 13, Number 4 (Fourth Quarter 2009): 89-98.

Kuhn, T.S. *The Structure of Scientific Revolution Second Edition*. Chicago, Illinois: University of Chicago Press, 1970.

Lapointe, L. and Rivard, S. "A Model of Resistance to Information Technology Implementation." *Management Information Systems Quarterly*, Volume 29, Number 3 (2005): 461-491.

Latané, B. Williams, K. and Harkins, S. "Many Hands Make Light the Work: The Causes and Consequences of Social Loading." *Journal of Personality & Social Psychology*, Volume 37, Issue 6 (1979): 822-832.

Limayem, M. and Hirt, S. (2003) "Force of Habit and Information Systems Usage: Theory and Initial Validation. *Journal of the Association for Information Systems* Volume 4 (2003): 65-97.

Markus, M. "Power, Politics, and MIS Implementation." *Communications of the Association for Computing Machinery*, Volume 26, Number 6 (1983): 430-444.

Markus, M. and Mao, J-Y. "Participation in Development and Implementation - Updating An Old, Tired Concept for Today's IS Contexts." *Journal of the Association for Information Systems*, Volume 5, Number 11 (2004).

Markus, M. and Robey, D. "Information Technology and Organizational Change – Causal Structure in Theory and Research." *Management Science*. Volume 34, Number 5 (1988): 583-598.

Mathiassen, L., Saarinen, T., Tuunanen, T. and Rossi, M. "A Contingency Model for Requirements Development." *Journal of the Association for Information Systems*, Volume 8, Issue 11 (November 2007): 569-597.

McManus, J. and Wood-Harper, T. "Understanding the Sources of Information System Project Failure." *Management Services*. Volume 51, Issue 3 (Autumn 2007): 38-43.

Phillips, Dwayne. "People, Process, and Product." *American Programmer*, January 1995. Last accessed 06 February 2013. http://dwaynephillips.net/CutterPapers/ppp/ppp.htm.

Pinto**,** J. and Slevin, D. "Critical Factors in Successful Project Implementation." *IEEE Transactions on Engineering Management*, Volume EM-34, Number 1 (1987): 22-27.

Prietula, M. and Simon, H. "The Experts in Your Midst." *Harvard Business Review*, Volume 67, Issue 1 (1989): 120-124.

Rivard, S. and Lapointe, L. "Information Technology Implementers' Responses to User Resistance: Nature and Effects." *Management Information Systems Quarterly*, Volume 36, Number 3 (2012): 897-920.

Seddon, P. and Kiew, M.-Y. "A Partial Test and Development of the DeLone and McLean Model of IS Success." In *Proceedings of the International Conference on Information Systems*, edited by J. DeGross, S. Huff and M. Munro. Atlanta, Georgia: Association for Information Systems, 1994.

Seddon, P.B. "A Respecification and Extension of the DeLone and McLean Model of IS Success." *Information Systems Research*. Volume 8, Number 3 (1997): 240-253.

Shannon, C. and Weaver, W. *The Mathematical Theory of Communications*. Urbana, Illinois: University of Illinois, 1949.

Six Sigma. "Six Sigma Dictionary." Last accessed 09 April 2013. http://www.isixsigma.com/dictionary/champion/.

Wallace, L., Keil, M. and Rai, A. "How Software Project Risk Affects Project Performance : An Investigation of the Dimensions of Risk and an Exploratory Model." *Decision Sciences*, Volume 35, Number 2 (2004): 289-321.

Wixom, B. and Todd, P. "A Theoretical Integration of User Satisfaction and Technology Acceptance." *Information Systems Research*. Volume 16, Number 1 (2005): 85-102.

Yin, Robert. "Case Study Methods." In *Complementary Methods in Education Research*, edited by Judith L. Green, Gregory Camilli and Patricia B. Elmore, 111-122. Mahwah, New Jersey: Lawrence Erlbaum Associates, 2006.

Yin, Robert. *Case Study Research Designs and Methods Fourth Edition*, Thousand Oaks, California: SAGE Publications, 2009.