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Applying Project Management Best Business Practices to an Operational Deployment like Camp Julien

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How does a "project" from a commercial or industrial perspective, compare to a Canadian Forces (CF) Operation? More specifically how does the establishment of a task force encampment compare to a commercial project. Although there are a number of sources for information on Project Management (PM), the main reference this paper will utilize is the Project Management Institute's (PMI) Program Management Body of Knowledge (PMBOK).[1] PMI was founded in 1969 and "is the worlds de facto standard for project management knowledge and practices in today's global marketplace."[2] The PMBOK has been accepted as an international standard and is the basis for personal accreditation from the PMI. Various environments, or disciplines, use PM though they all have slight differences or variations in their application of the principles. The PMBOK provides "generally accepted project management knowledge and practice"[3] to standardize the lexicon and application of principles in PM.

From a PM perspective a project is differentiated from day to day operations by the fact that it is both unique and temporary in nature. The PMBOK defines a project as:

> A temporary endeavor undertaken to create a unique product or service. Temporary means that every project has a definite beginning and a definite end. Unique means that the product or service is different in some distinguishing way from all other products or services.[4]

These two characteristics of temporary and unique are normally associated with CF operations as well. Some operations have developed into protracted timelines, but several recent examples have been both temporary and most certainly unique. Operation Eclipse into Eritrea from November 2000 to June 2001, Operation Constable into Haiti from July 1997 to November 1997, Operation Toucan into East Timor from October 1999 to April 2001and the ongoing Operation Athena into Afghanistan which started August 2003 are examples of operations that are unique and temporary.[5]

The paper will focus on the recent Operation Athena deployment into Afghanistan and the establishment of Camp Julien (CJ). The Deputy Chief of Defence Staff (DCDS) is head of operations for the CF. The DCDS staff plan, coordinate and provide overwatch on military deployments. Once the political decision was made, in February 2003, to send a Brigade size task force into Afghanistan the DCDS staff went into "high gear" to prepare for the deployment.

After initial planning it was decided that Major General (MGen) Leslie would command the task force being sent into theatre. His initial tasks were to prepare/train the task force to an operationally ready state for the mission. To allow the task force commander to focus on the operational aspects of the mission, it was decided that a Theatre Activation Team (TAT), commanded by Colonel (Col) Pouliot, would establish a camp for the task force. Having the TAT take care of all aspects of accommodating,

feeding etc., for the task force alleviated the task force commander from those duties.[6]

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[5] Department of National Defence, "Operations," available from http://www.forces.gc.ca/site/operations/past_ops_e.asp; Internet; accessed 26 May 2004.

[6] The TAT commander and the task force commander had different reporting relationships. DCDS staff wanted to keep the task force organization separate from the TAT because of their different responsibilities. The rationale for this will be more fully explained later in the paper, but it essentially separated the project manager (TAT commander) from his client (task force commander) which would be considered a problem in the PM world.

Information was garnered from several key members of the TAT that established CJ for the Canadian task force.[7] CJ was a camp constructed outside the city of Kabul, Afghanistan. It was designed to accommodate the Canadian task force who participated in Operation Athena. The basic composition of the task force was: the task force HQ, the brigade HQ and the brigade soldiers. When the first rotation was complete in August 2003 there were approximately 1600 personnel in the camp.

Construction of CJ was a project in the truest sense of the word (by PMBOK standards). Firstly it was unique and designed to be temporary. As well, there was a timeline, a budget, and there were many stakeholders and customers or users. These criteria will be explored in greater detail throughout the paper. In the construction of CJ few of the accepted PM tools were used[8] and that is one of the primary reasons this example was chosen.

Because the temporary and unique supposition exists for both, there are likely many similarities between the CJ construction and the PM processes. Further, based on the author's knowledge of the PMBOK generally accepted principles and discussions with the key TAT staff about the CJ construction, there appear to be many areas where there is commonality between the two methodologies.

The establishment of Camp Julien was a successful endeavour. The office area, messing, accommodations etc., were all satisfactory for the bed-down of the task force. The main customer, MGen Leslie, as task force commander, was happy that Camp Julien met the task force requirements. A review of the source documents shows control mechanisms for the

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[7] Various discussions and email between Colonel Pouliot, (Theatre Activation Team Commander) Maj Smith (CJ Engineer) and Maj Pilon (J5 Coord CFJOG) during January 2004. These individuals were critical to the "CJ project" and were available for consultation. This opportunity provided much more information than was available on the other Operations.

[8] Discussions with the CJ Engineer, Maj Smith, January 2004.

development/establishment of CJ were in place. However, a study of the methods used for those control mechanisms indicates there is much that the PM process could offer to improve those mechanisms in a project such as Camp Julien. As a minimum, PM tools and techniques offer an alternate perspective to the approach that was taken. This study will demonstrate that the use of PM tools and techniques to augment and validate the control mechanisms will improve the success of completing a project such as Camp Julien.

An examination of some basic PM information will be followed by a discussion of the many similarities between the PM processes and the CJ project. Next the paper will focus on some of the tools and techniques of the PM arena and investigate/analyze how these could have been applicable to CJ, including sections on scope management, risk management, quality management and project costing and time management methodologies.

PROJECT MANAGEMENT

Until the mid-eighties project management was not really recognized as a discipline. In fact Levine reports that the media of the day thought of it as arcane or somewhat mysterious.[9] However, project management has had significant development and acceptance over the past twenty years. Levine describes project management as a practical approach to minimizing what can go wrong on a project, and if the process does go awry it can minimize the damage. Project failures are often brought about through the misconception that "short cuts" can be taken. There is a balance in PM between the project schedule, budget and quality, the three key criteria that

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[9] Harvey Levine, *Practical Project Management: Tips, Tactics and Tools*, (New York: John Wiley & Sons, 2002), xi. Levine reports that a book he had written in April 1986, was reviewed by the New York Times and the reviewer classified project management as arcane.

must be diligently tracked at all times. Col Pouliot, as TAT commander had envisioned mission success in terms of time, budget and quality. Future TAT commanders may be less apt to realize the criticality of managing all three criteria and this is a shortcoming that must be recognized.[10] Obviously there will be occasions where short cuts can be taken but it must be realized that one or several of time, cost or quality will be affected. By truncating the process the element of risk increases significantly in both the PM and CJ systems. This risk has to be identified and mitigated to whatever degree possible in order to try and ensure a successful outcome.

As PMBOK states "Projects involve doing something that has not been done before and which is, therefore, unique,"[11] much like the operations mentioned earlier are unique. As a practical example PMBOK describes a situation where a large campus or complex of buildings are being developed. Each building could be considered an individual project because of the unique requirements to satisfy its occupants. In a similar way CJ required many different buildings, from office areas to sleeping/living accommodations, each with its own problems and requirements, to be constructed as part of the camp.

As a project manager it is critical that your senior management team provide you with a definition of project success. This is somewhat analogous to an operations end state required in the Operations Planning Process (OPP) or perhaps from an estimate.[12] Col Pouliot was given three tasks by MGen Leslie, the overall task force commander. The tasks were as follows:

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[10] Col Pouliot has a logistics background and has had PM training. A future TAT commander who is chosen from the combat arms may not have the requisite background for a project orientation to CJ type endeavours. Their focus may be more mission or operationally driven which may be more the responsibility of the task force commanders. They may not have the training required to appreciate the balance between schedule, budget and quality. This issue will be discussed later in the paper.

[11] *PMBOK* …, 5.

Accommodate the task force; Liaison – establish local contacts with both military and civilian agencies; and Conduct the preparatory work for Reception, Staging and Onward Movement of the task force. The tasks were clear enough, but what was not provided was what would be required for CJ to be considered a success, so Col Pouliot developed his own definition of success.[13] As mentioned, the PM realm, perhaps being more client oriented, would have provided a definition of success in terms of CJ. According to Kerzner, in the past it was usually considered acceptable if the project delivered the product or service and it worked. More than this is expected today.

Project success is now defined in terms of primary and secondary factors. Primary factors include delivered on time, within budget and at an acceptable quality whereas the secondary factor is acceptance by, and satisfaction of, the customer.[14] Col Pouliot had set his own concept of quality and was given a schedule and budget. With his determination the secondary factor of customer satisfaction was given the importance it deserved. As mentioned earlier the TAT commander was to focus on "administration" and the task force commander was to focus on operations, they had two separate roles or functions. The DCDS felt there was no requirement for liaison between the two commanders. However after much discussion and Col Pouliot's continued insistence, Col Pouliot was permitted to brief MGen Leslie and the key task force staff on the basic camp plan.

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[12] Department of National Defence, *Combined and Joint Staff Officer's Handbook* (Toronto: CF Command and Staff College, 2003) VI-4/12. Defines end state as "the political and/or military situation which needs to exist when an operation has been terminated on favourable terms."

[13] Col Pouliot's definition of success included elements of time, budget and quality. Time and budget, at least initial forecasts, were provided. What he developed was his own meaning of quality for the camp based on his experience, training and discussion with stakeholders.

[14] Harold Kerzner, *Applied Project Management: Best Practices on Implementation* (New York: John Wiley & Sons, 2000), 31.

Project stakeholders are another key element of PM. Stakeholders could be any of the following people: customers, management, project manager and the project team, regulatory agencies, and basically any person or group that could be positively or negatively affected by the project.[15] Although we do not normally think of CF operations as involving customers, many of the principles from the PMBOK would be relevant in the CJ situation because by the PMBOK definition MGen Leslie and the task force were "customers/clients" of the TAT.

According to the PMBOK projects are initiated and completed through processes. A project has five "process groups" that its project team would follow through to its completion: Initiating, Planning, Executing, Controlling and Closing. Figure 1 shows the relationships among the processes.

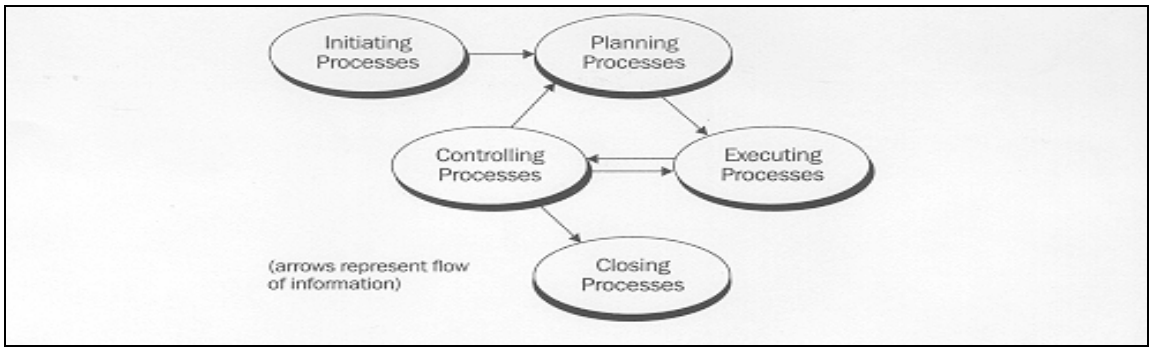


Figure. 1. The process relationships of a project.

Source: *PMBOK* …, 31.

After each phase or process group of a project there are key milestones or deliverables that represent "gates" or "phase exits." The gates are basically reviews to determine if the project continues, stops completely or returns to the last phase for more work. As reported by Martin, the initiation phase gate is an approved charter, the planning process gate is the project plan, the

[15] Michael Dobson, *Project Management: How to Manage People, Processes and Time to Achieve the Results You Need* (Avon Massachusetts: Adams Media Corporation, 2003), 106.

execution gate is the accepted final deliverable and the project terminates with a close out report.[16] Col Pouliot said the TAT staff did not have the CJ plans developed into these process group constructs. Besides giving structure to a project as mentioned, there are certain deliverables expected within each process group. This would help keep future projects like CJ on track within a management plan for the various milestones/deliverables expected. It is recommended that this type of mechanism be adopted for all future CJ type projects.

These phases or process groups when combined together form a project life cycle. The five process groups from Figure 1 are representative of all applications but different industries or organizations have developed their own variations on project life cycles. The construction industry often uses four stages in its life cycle: feasibility; planning and design; construction; and turnover and startup. Certainly the CJ example would be very similar in nature to the construction life cycle. These similarities will be further explored over the course of the paper and the best business practices used during the PM lifecycle will be discussed in a CJ context. The first two stages in the PM lifecycle, as shown in Figure 1, are the initiating and planning processes. These two processes basically authorize the project, define its objectives and develop the projects courses of action to attain the objectives.[17] This allows the PM methodology to move to the next stage project scope management.

PROJECT SCOPE MANAGEMENT

[16] These deliverables mentioned here are described later in the paper and in Martin and Tates book.
Paula Martin and Karen Tate, *Getting Started in Project Management* (New York: John Wiley & Sons, 2001), 25.

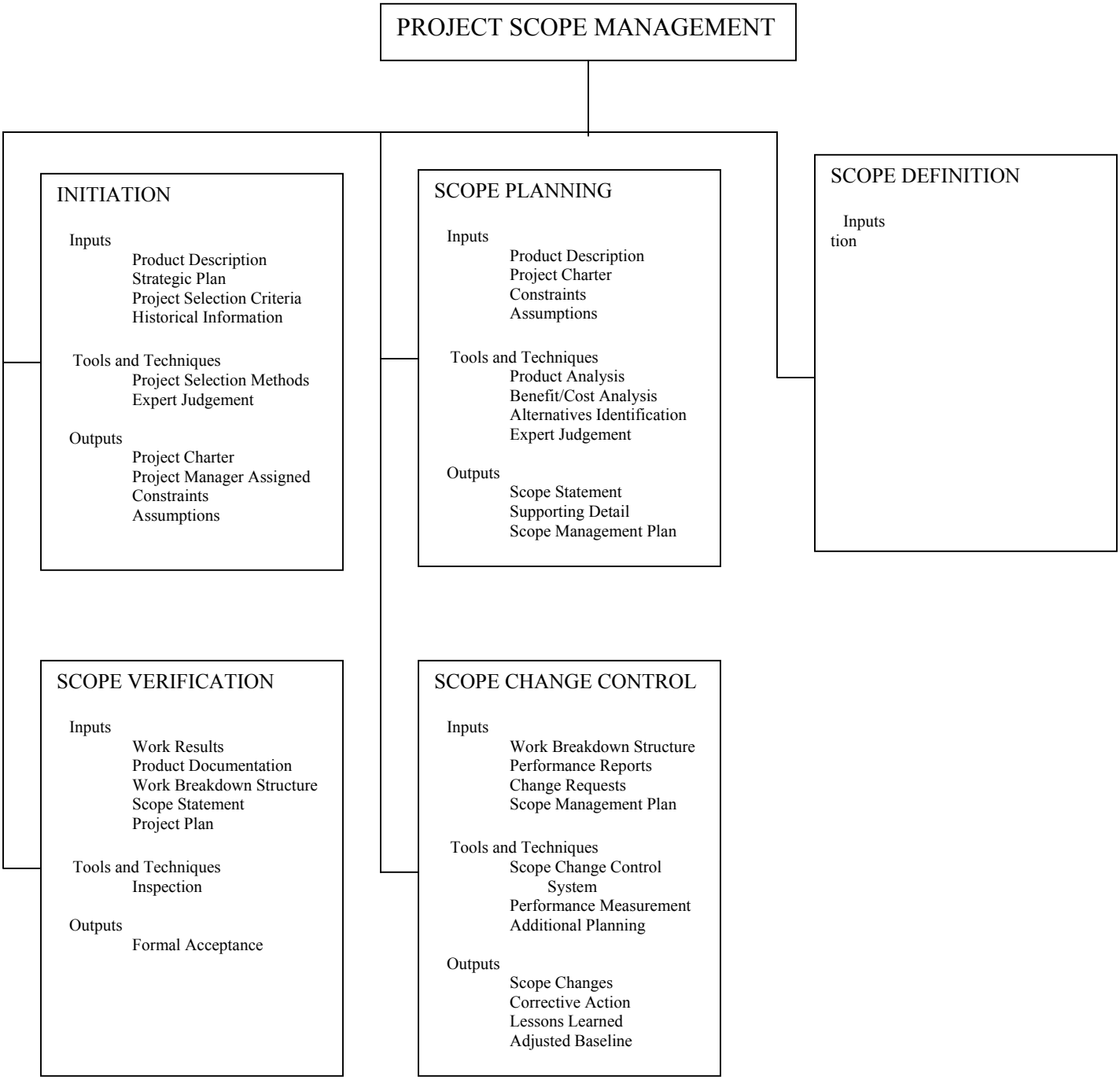
[17] *PMBOK...,* 30.

Project scope management has five components as depicted below in Figure 2. Each of these components will be discussed commencing with initiation. With each phase of the project there are certain key inputs, outputs and procedures or techniques applied to the inputs.

Initiation

The initiation phase of a project identifies everything that is required in terms of work for the project and, equally as important, what is not required.[18] There are many similarities between the initiation and scope planning portions of a project and the plan

[18] Dobson, *Project Management …,* 134.


PROJECT SCOPE MANAGEMENT
INITIATION
Inputs
Product Description
Strategic Plan
Project Selection Criteria
Historical Information
Tools and Techniques
Project Selection Methods
Expert Judgement
Outputs
Project Charter
Project Manager Assigned
Constraints
Assumptions
SCOPE PLANNING
Inputs
Product Description
Project Charter
Constraints
Assumptions
Tools and Techniques
Product Analysis
Benefit/Cost Analysis
Alternatives Identification
Expert Judgement
Outputs
Scope Statement
Supporting Detail
Scope Management Plan
SCOPE DEFINITION
Inputs
tion
SCOPE VERIFICATION
Inputs
Work Results
Product Documentation
Work Breakdown Structure
Scope Statement
Project Plan
Tools and Techniques
Inspection
Outputs
Formal Acceptance
SCOPE CHANGE CONTROL
Inputs
Work Breakdown Structure
Performance Reports
Change Requests
Scope Management Plan
Tools and Techniques
Scope Change Control
System
Performance Measurement
Additional Planning
Outputs
Scope Changes
Corrective Action
Lessons Learned
Adjusted Baseline

development for CJ. Usually a project start has been preceded by a needs analysis or feasibility study identifying some shortfall in the company or possible business opportunity. This is similar to what was required for CJ with the military estimate that was completed. With the PM scoping process there is more of a focus on the client whereas with the military analysis the focus is on achieving the mission objectives. Dobson provides an additional comparison when he defines assumptions and constraints in a way closely resembling those that would be applicable to an estimate that would be produced for a project like CJ; "…assumption is something taken as being true or certain without a factual basis. Constraint is a factor that limits the project manager's options on a project, a restriction that affects the performance of the project …."[19]

The project charter is the first key document produced during the PM process. As shown in Figure 2, the charter is the first output of project scope management within the initiation box. The charter essentially answers the traditional "five W's", who, what, where, when and why. The focus is on why the project is being undertaken, who are the interested stakeholders and how will the customer be satisfied. The PMBOK describes the charter as a document that provides the formal authorization for the project. The charter includes rationale for the project i.e. the business need and a detailed description.[20] Besides the PMBOK there are many definitions or descriptions of what a project charter should contain.[21] As the project moves into the planning stage the vision

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of the charter becomes much more practical and concrete.

Scope Planning

During planning it will be determined if in fact the objectives in the charter are achievable. The project charter is an output of initiation and an input for scope planning. The charter is more concerned with the "why" the project is undertaken and "what" it is expected to accomplish. Whereas the scope is centered on "who" is involved, "when" as in the schedule and, "how" the project will actually be completed.

McManus and Wood-Harper define their version of a charter using military style terminology, i.e. requires vision, mission statement, objectives, assumptions and constraints, etc.. They go on to describe vision as, "the project manager serves to plant the starting point ideas, and the team members, customers and other stakeholders help with and take responsibility for the ultimate direction and composition of the shared vision."[22]

Tyron and Associates define the project charter as "a formal agreement between the creators and consumers of project deliverables that establishes the purpose, boundaries, directions, limitations and participants of a project."[23] They see the charter as a keystone document and detail its contents much further and concisely. Tyron and Associates have a more comprehensive structure and consider the charter to be composed of the following nine components: project description, opportunity statement, impact statement, constraints and

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[22] McManus and Wood-Harper, *Computer Bulletin* …, 25.

[23] Charles Tyron and Associates, "So, Whats Your Charter" Internet article www.bestpractises.cahnet.gov. accessed 22 Jan 04, 2.

assumptions, project scope, project objectives, project justifications, project approach and project organization.[24] Hayes has taken each of Tyron's charter components and built upon their definitions with her own research of the literature.[25] Through the use of Haye's work and her references, an individual knowledgeable of an operation or project could develop a sound charter document. The three interpretations of the charter have been provided to demonstrate the different approaches to writing a charter, but more importantly to highlight its wide acceptance as a critical document in the projects life cycle. The charter concept is one that could be applied to CJ as an all-encompassing document to start the process.

Col Pouliot said he went into theatre with a basic terms of reference for his position as TAT commander and the three tasks given him by MGen Leslie, described earlier. If a charter style document were developed for deployment into theatre the TAT commander would have a much better guide/reference for carrying out their responsibilities. As mentioned earlier the charter would contain stakeholder information like contacts in theatre, TAT staff and responsibilities, contractor relationships and responsibilities to the TAT. As well, include the stakeholder agreement that would have the task force commander sign off on the agreed basic camp layout.

Tyron and Associates refer to boundaries, directions, limitations etc. being included in the charter. Col Pouliot indicated he had developed goals/objectives in terms of schedule, budget and quality. These three criteria should be included in the charter with a range of acceptable

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[24] Charles Tyron and Associates, *So Whats Your Charter* …, 2.

[25] Dianne Hayes, "Evaluation and Application of a Project Charter Template to Improve the Project Planning Process", *Project Management Journal* 31, Mar 2000, 15.

values. This would allow the TAT commander autonomy to act on his own accord, to make decisions within certain bounds, without having to get DCDS approval.[26]

The charter is a key document to get the project established and underway, but it is the scope statement, one of the outputs of the scope planning component, of a project that is the most critical document. Figure 2 shows the project charter as an input to scope planning which creates the scope statement. In terms of criticality the scope statement is analogous to the mission statement of an operation, its important to have the wording correct and unambiguous to ensure complete understanding as to it's intent. The customer is involved in completing the scope statement and this adds a degree of validation to the process. The end-user requirements must be determined and factored into the scope management plan, much like the "end state" expected for CJ. The scope definition plan is written with an understanding of how the project will be completed and is also where the resources for the project are first allocated. Part of the scoping process involves spending time with the user in determining what problems are being experienced and how implementing the project will help resolve those problems.

Once the customer requirements have been determined the scope statement is prepared. "The scope description is a communication tool to ensure that what you are producing is what the customer and sponsor want you to produce."[27] Although Martin and Tate use scope description rather than scope statement, they indicate that for them, the scope description basically identifies what is included in the project. It is normally prudent to also have sign-off on what is not included in the project if there is any possibility of ambiguity. Martin and Tate have developed a problem solving methodology, somewhat analogous to the development of options

[26] Being in different parts of the world with the different time zones, and often poor communications, it was not always possible to get timely decisions from the DCDS staff.

[27] Martin and Tate, *Project Management* ..., 91.

in a military estimate such as what would have been produced for CJ. It is known as DAS/IR; Define the problem, Analyze the problem, Select a solution, Implement, and Review.[28] For more detail on this methodology refer to Annex A.

Preparing a PM style scope statement would be difficult given the current military construct. As explained by Col Pouliot, DCDS direction was that he was not permitted liaison with MGen Leslie.[29] The intent of the TAT was to focus on the bed-down of the task force, allowing the task force commander to focus on training and getting the task force operationally ready for the upcoming mission. As Col Pouliot stated it was only at his insistence that he and his key staff were flown out to Wainwright to present the basic camp plan to MGen Leslie and his task force COs/RSMs during the final stages of their training. Although the DCDS is the TAT commanders' superior and the task force commander is the client, a critical aspect in developing the project scope in PM is the client's involvement. Therefore, a balance must be struck allowing the task force commanders involvement in the finalizing of the camp plans. As Col Pouliot relayed, something as simple as a basketball court could be forgotten or something as critical as a runway for the Unattended Aerial Vehicle (UAV) may have been missed. (The UAV requirement was added after the initial camp plan had been developed).

The question of actual sign off of the mission or scope statement could be driven by the relationship of the parties involved. Col Pouliot felt he had a good relationship with MGen Leslie and he did not have a signed off document for CJ. To a degree the requirement for sign off can

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[28] Martin and Tate, *Project Management …*, 239. The DAS/IR is similar to the OPP. The estimate process that was used with CJ would contain much of the information as well. The basic sections of Situation, Mission, Execution, Service Support and Command and Control are somewhat similar. The advantage of DAS/IR is it is intended for project use and has a focus on clients and quality that is not normally the case with a military approach.

[29] Rationale for this as explained by Col Pouliot was the task force commander is to focus on operations and the TAT commander is to take care of all administration regarding the task force care and feeding. As well there had

be personality driven. If the relationship between the "customer" and the person providing the service were more professional and business-like a "sign off" would be the best approach for the protection of both parties. Certainly as a rule, much like PM procedures recommend, the TAT Commander would be well advised to get sign off on the camp they are to provide.

During ProjectWorld 2003[30], the President of Business Improvement Architects (BIA) conducted a survey of attendees and a common theme given for projects in trouble was the lack of clarity or poorly defined scope. The President of BIA added that his company assists many projects in crisis, and having a clearly articulated scope was crucial to a projects success. He went further to say that following the overall corporate strategy and not trying to accomplish too much were key elements. "To bring projects back on track, the project team must go back and re-define these elements, including a clear understanding of the needs of the stakeholders. This provides a solid foundation for the project plan and a basis for future project decisions."[31] Col Pouliot's insistence on a meeting with the task force leadership alleviated many potential problems. It is certainly recommended that the DCDS incorporate this approach into the lead up of the task force's preparations for deployment.

Changes, usually in the form of an increase in the requirements or deliverables, are common practice in both projects and operations. Scope creep with projects and mission creep with operations are inevitable as was evidenced by Col Pouliot with CJ. The challenge is identifying and tracking these changes, which is the function of change control practices. As

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apparently been large over-expenditures for camp set up in the past when task force commanders were involved in the decision-making regarding what was required at the camp.

[30] ProjectWorld is an annual event for Project Management professionals held in Toronto. During April 2003 the event attracted over 3000 and the statistics from the poll was based on feedback from the participants.

[31] Sally Stanleigh, "Survey at ProjectWorld 2003," ; available from http://www.bia.ca/arti/ ;Internet; accessed 23 January 2004.

Levine suggests, the issue is often identifying the legitimate changes, and he gives examples of such situations with their appropriate response, as shown in Table 1.

Table 1: Change Control.

Situations	Appropriate response
Items that have been omitted from the original concept.	These are covered or incorporated in the scope statement but need to be added to the work breakdown structure.
A new methodology has been suggested for the project.	Again not a scope change, so adjustments are made as required.
Earlier estimates of effort are incorrect.	Adjust the schedule as the detail is developed.

Source: Levine, *Practical Project Management* …, 223,224.

Col Pouliot cited many examples of unforecast and unexpected changes he encountered during the establishment of CJ. From the camp size being too small and a new location required, to contractor issues over the provision of generators. Since he and his staff dealt with these issues in a rather ad hoc manner, the change management procedures offered by PM would have provided a much more structured and auditable means of controlling change. For example a major change to the TAT estimate was required as a result of one of the reconnaissance teams determining there were security issues to be addressed, and the subsequent assessment that four Light Armoured Vehicles (LAVs) with crew were needed as part of the camp's establishment.[32] This caused much angst and negotiations between the TAT and DCDS staff.

This was a significant enough change that proper change control procedures would definitely have been followed in the PM realm. The establishment was changed but that is not

[32] Lieutenant Colonel Stu Sharpe, Infantry, led the reconnaissance team. As Col Pouliot explained Sharpe was qualified to be a battalion commander and as well, Col Pouliot's knowledge of Sharpe allowed him to accept the recommendation and he fought with the DCDS staff to have it implemented.

sufficient. Because of possible incidents with the LAVs in theatre and to explain any post-mission questions that may arise, it is recommended that changes of this magnitude follow accepted PM change procedures for proper audit trails to be provided.[33]

It is natural and expected that as the scope is refined, estimates of time and effort will change and this is acceptable. What is not acceptable is poor performance that causes delays or overruns, and the project sponsor or customer wants to expand the scope – this would only be acceptable assuming additional resources (i.e. time and/or money) are provided. This is an area of concern for projects like CJ, where changes and mission creep are common in a rapidly changing environment, especially during the early stages of the process. This can be especially relevant because of the degree of contractor support expected for future operations.[34] This change management control or construct will be covered in more detail later and is a major concern for task force camp construction planners.

Scope Definition

As per the PMBOK diagram on Project Scope Management, Figure 2, one of the outputs from scope planning is the scope statement. The next stage in the process is scope definition with its major deliverable being the Work Breakdown Structure (WBS). The scope statement plus any constraints and assumptions are used to define the project into manageable components. The WBS is a "deliverable-oriented grouping of project components that organizes and defines the

[33] The actual change control procedures will be discussed in the subsequent pages on that topic.

[34] Col Pouliot discussed this plan during the 27 May 2004 discussions. Contractors are usually happy to make any changes to the contract though usually at exorbitant prices. This is another reason change management practices must be in place.

total scope of the project."[35] The WBS is used to decompose the project into manageable pieces and can be thought of as the project organizational chart that graphically displays all the tasks and activities.[36] As Lavold reports, using a WBS is critical to the success of any project and further; "Developing the WBS early in the project life cycle provides a method for clear definition of the project scope, and the process of WBS development helps all participants to clearly understand the project during the initial stages."[37]

The number of WBS levels to which the project is decomposed depends on a number of variables including, the complexity of the project and the preferences or common practices of the project team. Each deliverable from the scope statement is sub-divided into activities and tasks using action verbs at the lowest levels to describe how the task will be completed. Typically a WBS has four to six levels. The bottom levels need to be decomposed down to a level where elements of time, budget and resources can be assigned to them. Once the final decomposition of the WBS is completed this type of information could be used in building a troops to task matrix. Using a WBS approach for CJ would have presented another perspective on solving the problem and it would also allow for concurrent activity if different portions of the WBS were assigned to CJ sub-teams (or contractors as described below).

The WBS is a critical document for work assignments, resource and budget allocation, contract establishment etc. The different levels of the WBS provide a common language for the stakeholders and those executing the plan. The user representative and other senior stakeholders need to accept and sign-off on the WBS. If portions of the project are to be contracted out

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[35] *PMBOK* …, 209.

[36] Dobson, *Project Management* …, 144.

[37] Garry Lavold, "Developing and Using the Work Breakdown Structure" in Project Management Handbook, ed. David Cleland and William King (New York: Van Nostrand Reinhold, 1988), 322.

usually the lowest levels of the WBS are used as the common language to ensure a clear understanding as to what is to be delivered by the contract. It's at the lowest level where simple unambiguous descriptions of how a task is to be completed is meant to provide a common understanding of what needs to be done. This was definitely the situation in CJ.

Since the government plans to adopt this "contractor support" arrangement where possible in the future it would be prudent to take this approach for future contract negotiations. [38] Certainly large contracting firms would be more familiar with PM principles than military estimates, so using the WBS approach would facilitate dialogue and effective negotiations. A WBS was not produced for CJ, the plan was presented in spreadsheet format. One approach for future task force camps would be to build the WBS "bottom-up" as negotiations with contractors are conducted. These bottom-up modules could be prepared by the contractor from a standard template. For instance if messing, accommodation and ablution systems were to be provided by contract, a WBS approach used by the TAT staff would combine these systems of systems into an overall project plan or WBS[39].

Whether a top-down, bottom-up, or some combination of both approaches is taken in producing the WBS, the project team must conduct a deliberate review of the completed structure. Although some of the more future components may be incomplete on the first iteration of the WBS because of various unknown variables, it is worth assigning extra time for the team to review the initial components of the WBS to ensure correctness of the decomposure. It is a given that all parts of a project are important, however the WBS will form the basis of all future work on the project, so extra time reviewing the structure many save tenfold the time to return

[38] Discussion with Colonel Pouliot 27 May 2004 regarding his experiences as TAT commander for CJ.

and correct any of the structure elements. The necessity of conducting this style of review will be expounded upon in the quality management section.

The next stage in the process is to code or number each individual component of the WBS. The WBS is typically a hierarchical structure so the individual elements are usually best identified using a hierarchical numbering sequence. The WBS can have a rudimentary representation in a spreadsheet format such as was used by the CJ staff. However, using a spreadsheet as opposed to project software puts severe limitations on what can be presented because it is not designed for this purpose. A spreadsheet basically provides a matrix format for the presentation of its data, and is not able to graphical represent different project information. The hierarchical structure, created with project software, of the CJ elements can be seen at Appendix E.

The next step involves assigning resources to each work package, the lowest element in a particular major branch of the WBS**.** Typically this amounts to the assignment of personnel to the WBS elements, usually project team members, but it could also be contracted support. Next in the sequence is assigning time or duration to each work package. After determining a work package duration, this information is normally translated into a more practical benchmark, known as work effort. Work effort is defined as the number of workdays it would take for one person to complete the task.[40] Through the use of this work effort parameter the project manager can readily forecast personnel requirements for a particular task. An example of work effort, in terms of personnel and resources, is shown in the CJ stand-up at Appendix E.

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[39] This is over simplified to a degree but based on the authors experience it is not unreasonable for a contractor to include a WBS as part of their contract proposal. The TAT staff would have to generate some modules on their own to complete the overall project WBS

[40] Saint Mary's University, *Project Planning* …, 5-13. Basically a person works eight hours a day and forty hours a week, so a task taking twenty-four hours would be three person days.

One means of capturing essential work package information from the WBS was developed by Business Improvement Architects[41] is known as the Project Planning Tool, shown in Figure 3.

<table>
<tr><td>Project Planning Tool</td><td colspan="2">Deliverable:</td></tr>
<tr><td>Level:</td><td colspan="2" rowspan="6">Activity/Task:</td></tr>
<tr><td>WBS #:</td></tr>
<tr><td>Resource:</td></tr>
<tr><td>Cost:</td></tr>
<tr><td>Start Date:</td></tr>
<tr><td>Finish Date:</td></tr>
<tr><td>Predecessor:</td><td>Duration:</td><td>Successor:</td></tr>
</table>

Figure 3. Project Planning Tool

This project tool is a convenient method of capturing all the required information associated with each WBS element and their interdependencies among other elements.

Once the WBS decomposition has been completed the next stage in the process is to show the inter-relationships between the elements. These inter-relationships are typically depicted using a network diagram**.** "A network diagram is a graphic representation of a series of activities and events depicting the various aspects of a project and the order in which these activities and events must occur."[42] The advantages of using a network diagram are many and include the following: "establishes an exact sequence of events; … shows concurrent and consecutive task flow; … identifies all predecessors and successors …, and makes it easier to identify critical milestone project dates."[43] This information can be readily captured and presented with project

[41] Saint Mary's University, *Project Planning* …, 5-5.

[42] Ralph Kleim, *The Secrets of Successful Project Management*, (Toronto: John Wiley & Sons Inc., 1986), 35.

[43] Saint Mary's University, *Project Planning* …,5-17.

software, but not using a spreadsheet as was used by CJ staff. Project software allows the data to be entered once and the many different reports like resource usage, successor and predecessor relationships and WBS can be generated. Spreadsheets can produce some of these reports but the data must be re-entered for each view or report required.

Two common network-diagramming techniques that have been in use since the 1950s are the Critical Path Method (CPM) and the Program Evaluation and Review Technique (PERT). In fact these two methods have been so commonly used that many practitioners often refer to CPM and PERT in terms of a generic Network Diagramming technique vice their specific purpose.[44] CPM and PERT are useful diagramming techniques that aid in time and cost estimation for a project. The primary difference between PERT and CPM is that PERT "uses the distribution mean (expected value) instead of the most likely estimate used in CPM."[45] PERT use's three different times for estimating an activities completion, namely optimistic, most likely and pessimistic times whereas CPM uses only one estimate per activity. CPM is defined as "The series of tasks that must finish on time in order for the entire project to finish on schedule. Each task on the Critical Path is a critical task. The Critical Path represents the series of activities that define the total project duration."[46]

Another commonly used scheduling tool in the PM realm is a Gantt chart. A Gantt chart is similar in concept to a bar chart and is an excellent means of depicting project duration down to the work package level. Activities are typically shown down the left side of the chart with dates shown along the bottom. A network-diagram and a Gantt chart has been developed using

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[44] Gido and Clements, *Network Planning* …, 181.

[45] *PMBOK…,*75.

[46] Saint Mary's University, *Project Planning* …, 5-28. PERT has a similar definition, it differs in the approach to estimating duration, in that it uses a weighted average. CPM will be referenced through most of the paper but PERT could equally be used for most applications.

our theatre activation example through the use of Microsoft Project software, see Appendix E.[47] Again, spreadsheet software is not readily able to present Gantt chart or CPM type of information as it was not designed for that purpose.

Tools such as CPM and Gantt chart are very useful when the project schedule must be modified. When modifying the schedule, the project manager is normally faced with moving up the final delivery date. There are three basic techniques for shortening the critical path, sometimes referred to as "crashing the plan:" additional resources can be added, this refers primarily to personnel; activities on the critical path can be started concurrently vice consecutively; and by scheduling overtime for certain critical tasks.[48] The graphical representation of information in CPM and Gantt charts aid in assessing the impact of schedule changes and they also provide a quick overview of where changes can possibly be made.

Once the data has been input into one of the various PM software tools, including MS Project, the production of many different views or reports are possible. These views range from CPM and Gantt charts to budgeting and resource utilization charts. A resource utilization chart will identify if certain resources, i.e. a project team member, is working on more than one task concurrently which may be a problem or is over-tasked with too many hours in a particular work period. (In the example in Appendix E the Theatre Activation Team Engineer (TAT Engr) is over-tasked and the software program automatically highlights this.) Another powerful advantage of the use of software tools is the ability to see the result of a change in variables, to ask "what if" type questions. For example, will reducing the duration of a certain task or delaying it by a week change the critical path? Simply through the means of a few keystrokes,

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[47] Microsoft Project is a software tool produced by Microsoft Corporation for use in the PM field.

[48] Saint Mary's University, *Project Planning* …, 5-32.

significant changes to different parameters can be reviewed to improve a project timeline or budget or perhaps get it back on track.

Scope Verification and Scope Change Control

The final two sections of project scope management, as shown in Figure 2, are scope verification and scope change control. Once the WBS, network diagramming and data entry into the PM software is completed, it is best to meet with the project stakeholders, especially the sponsor and customer. This meeting is primarily to have the project information to date verified and a formal acceptance should take place.[49]

The last section of scope management to be discussed is change control. This was introduced in discussing changes to the scope statement and the CJ example of adding the four LAVs to the establishment. For a complex or relatively large project change requests are commonplace and change control is the procedure to properly document and track these proposals. "Scope change control is concerned with a) influencing the factors that create scope changes to ensure the changes are agreed upon, b) determining that a scope change has occurred, and c) managing the actual changes when and if they occur."[50] There were many changes that the TAT staff encountered that needed to be addressed. These changes were dealt with as

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[49] *PMBOK* …,61.

[50] Ibid., 62.

expeditiously as possible but the control mechanisms that PM offers were not used. Obviously, if operational requirements did not allow the time for change management procedures to be adhered to, that needs to be accepted. However, with the Auditor General and general accounting practices demanding proper audit trails be provided, a structured approach such as that offered by PM, would provide that necessary trail.

Project change request procedures need to be identified by the project team.[51] The requests are normally submitted in written form using a predetermined template. An example change request form is shown at Appendix B. Any approved change to the project scope results in an addendum to the scope. The originally approved scope is never changed only addendums are added to it, this process permits a proper audit trail to be developed and followed. Any request for scope changes must be reported to the project sponsor identifying the issue and must include the impact on cost, schedule, quality, deliverables or any stakeholders and as well a recommendation for acceptance or not.[52] This tracking of changes is an approach that could have been used with CJ. With the CJ construction there was a contract dispute with the prime contractor over the provision of generators that resulted in a months delay by the time negotiations were complete and the generators delivered. Although there is paperwork on the delay as a result of the dispute, if a change management approach were taken all impacts would have been mitigated. The schedule impact would have been dealt with, the follow-on impact with the remainder of the project would have been adjusted and most importantly the complete audit

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[51] The project team may have to draft up the change control procedures if the company or sponsor does not have a system in place.

[52] Saint Mary's University, *Project Planning* …, 6-7.

trail of events would have been available for subsequent review and possible follow-on action against the contractor.

Scope management, as is evident by Figure 2, encompasses a significant portion of a project. All elements of it could be directly applied to a project such as CJ. It is somewhat analogous to writing an estimate, or the first three phases of the OPP initiation, orientation and course of action development.[53] The scope statement would relate to a mission statement or the three tasks Col Pouliot was assigned by MGen Leslie. The constraints, assumptions, analysis and alternatives identification are common to both the PM process and a military estimate or the OPP. The WBS is similar to the intimate detail expected of the chosen course of action. As mentioned earlier, the WBS may be a useful tool in decomposing the chosen course of action and developing the troops to task matrix. A charter and scope change control document could be considered for addition to the process because of the all-encompassing approach to the charter, and the focus on the client provided by the scope statement. Scope management gets a project underway and makes solid inroads into the detailed planning, one of the project process groups as shown in Figure 1. Risk management keeps the train on the tracks and is part of the planning and controlling process groups of a project.

RISK MANAGEMENT

Risk management is all about preparing for the unknown, or unexpected event. When asked what area of PM he thought would have benefited his efforts with CJ, Col Pouliot

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suggested automated risk management tools or analysis would have made his job easier.[54] Though unexpected events, or risks, can lead to positive opportunities they are often associated with negative outcomes so project managers look to mitigate or avoid risk when possible. "Risk management is the systematic process of identifying, analyzing, and responding to project risk. It includes maximizing the probability and consequences of positive events and minimizing the probability and consequences of adverse events to project objectives."[55] There are four generally accepted stages to risk management: identification; assessment; response planning; and, monitoring and control.[56] PMBOK further divides the risk assessment or analysis into qualitative and quantitative components.

Taking a proactive approach in conducting risk management, as opposed to a reactive one, is generally accepted as the best means to successful project management.[57] Using the bed-down project for the task force in CJ as an example, assume that construction of a two hundred-man barrack block with a five-man crew outfitted with the proper equipment and power tools, in Canada had been templated at three months work. In this example scenario there have been at least the following three new variables, or risks, introduced for the barrack block project namely: forty percent of the work crews must be local Afghanistan's who are rated as carpenters but their skill level is unknown; maintenance of the power tools (blowing sand) as well as power generation to effectively use the tools is potentially a problem; and, instead of the usual practice of framing the barracks wall with wood, the J3 Engineer has been directed to trial a new

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[54]Discussion with Colonel Pouliot 27 May 2004 regarding his experiences as TAT commander for CJ.

[55] *PMBOK* …,127.

[56] Max Wideman, "Project Risk Management," in The Project Management Institute: Project Management Handbook, ed. Jeffery Pinto (San Francisco, California: Jossey-Bass Inc., 1998), 142-143.

[57]Saint Mary's University, "Assessing and Managing Project Risk," *Masters Certificate in Project Management Notes* (Halifax: Saint Mary's University Professional Development Programs, Spring 2000), 7-2

technique of constructing both the foundation and walls with poured cement (better cooling and termite problem is avoided).

With these three new variables the risk of the schedule being extended beyond the three months is a distinct possibility. The project manager can be proactive and address the issues early or the reactive approach can be taken and any problems will be dealt with as they occur. The danger of using the reactive approach is that it is commonplace for each new variable to generate a crisis situation and time becomes critical. The better approach is to address the variables or risk early, look for situations to exploit and improve the chances for success on the project. "When project risks are ignored and left to be handled reactively, the possibility of an opportunity gets overlooked. The justification for project risk management is to be proactive in mitigating the adverse effects of risk events and moving them towards opportunity.[58]

Risk identification is a crucial stage in the risk management process and it tends to be more of an art than a science. Typically the project team and key stakeholders generate a list of potential risks to the process based on a company checklist or they may draw on their own experiences. There are many such risk checklists available, one example provided at Appendix C is known as a "success criteria worksheet." [59]

Brainstorming is a common technique in identifying project risks. The WBS work packages could each be reviewed as a means of generating potential items of risk. Though not all Commanders use a brainstorming approach, Col Pouliot said he used it on a regular basis with his staff at CJ.[60] He said he encouraged all staff to participate and he drew on their expertise.

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[58] Max Wideman, *Project Risk Management* …, 140.

[59] Saint Mary's University, *Project Risk* …,73.

[60] One of the CJ brainstorming examples is provided in the quality management section.

Another source for identifying risks are any assumptions that have been made earlier in the scoping process. These assumptions (much like those identified in an estimate or the OPP) need to be regularly revisited and should be tracked as risks. Equally important with the assumptions or any an identified risk is to determine the threshold or trigger when these potential risks become actual issues, and appropriate action needs to be taken.

Once the project risks have been identified they should be categorized in the range of low to high probability risks and, as low to high impact on the project. Usually the best method of capturing this information is a project risk matrix with probability on one axis and impact on the other. Obviously, the high probability risks that have the highest impact on the project will be of greatest concern. After the risks have been identified and put in categories they can be prioritized. The project risk matrix should be used to rank the projects with the high probability, high impact being ranked first. An example Project Risk Matrix is shown at Appendix D.[61]

A decision tree is another method of graphically depicting expected value and associated risks in a project. [62] Schuler states this decision tree of events "acts as a blackboard to develop and document our understanding of the problem and facilitates team collaboration and communication. Conceptually, any decision, no matter how complex, can be analyzed with a decision tree analysis."[63] The decision tree, which is normally drawn from left to right in a chronological fashion, has a node for each decision and the number of branches is determined by the possible outcomes of each decision.

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[61] Saint Mary's University, *Project Risk* …, 73.

[62] The cause and effect diagram demonstrated in the next section on Quality Management is a similar looking diagram.

[63] Doug Schuler, Decision Analysis in Projects, (Newtown Square, Pennsylvania: Project Management Institute, Inc. 1996) 25-26.

Many of these tools are now available through computer software, certainly simulation tools are. Monte Carlo simulation is one of the most common simulation tools and is named after the games of chance in Monte Carlo, Monaco. Much like a game of chance, Monte Carlo simulation numbers are generated on a random basis. This allows a project manager to input a range of values and determine a typical distribution, or probability of the risks appearing in the project.[64] With a simulation style of computer program trials with hundreds or thousands of sample values can be easily generated. This allows the project manager to see the expected distribution or probability of the different risks that can affect the project. With this simulation information the project team has additional means of predicting and dealing with potential risks. As mentioned earlier Col Pouliot felt these risk management tools would have benefited him in his construction of CJ. Monte Carlo simulation would allow a TAT Commander or his staff to generate possible variables for any conceivable risk associated with the task force camp construction.

This section explored methods of preventing and responding to project risks. One technique of mitigating risk is to instill high quality standards in your project procedures. Quality standards and quality management help provide the ways and means of ensuring that project objectives are achieved.

QUALITY MANAGEMENT

[64] Decision Engineering, *What is Monte Carlo Simulation,* available from http://www.decisionengineering.com/monte-carlo-simulation.html; Internet; accessed 07 Mar 04.

The management of quality from a PM perspective "includes the processes required to ensure that the project will satisfy the needs for which it was undertaken."[65]

Quality management must be an integral part of the PM process from initiation to the final delivery of a quality product. Project managers must continually balance the three elements of time, cost and quality.[66] This was the approach Col Pouliot took, but not all TAT commanders would have his background experience and training to use to their advantage. Obviously it would not be acceptable to the customer if a product was delivered on time and on budget, but was at an undesirable quality.

The best definition of quality lies in the eye of the beholder, but from a construction point of view Heidenreich defines quality as "fitness for use or compliance with requirements."[67] PMBOK further divides quality or more precisely quality management into quality planning, quality control and quality assurance, with quality planning primarily centered on determining standards associated with the project and the requisite means of meeting the standards.[68] Quality Control is normally referred to as the systems built into the process such as training, inspections, keeping records and analysis.[69] Quality assurance is defined as "independent functions that monitor the quality control programs to assure organizations that desired results are obtained.

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[65] *PMBOK* …, 95.

[66] John Heidenreich, "Quality Program Management in Project Management," in *Project Management Handbook*, ed. David Cleland and William King (New York: Van Nostrand Reinhold, 1988), 515.

[67] Ibid., 514.

[68] *PMBOK* …,97.

[69] Edward McQuire, "Quality Assurance and Quality Control," in *Project Management: A Reference For Professionals*, ed. Robert Kimmons and James Loweree (New York: Marcel Dekker Inc., 1989), 531.

These assurance monitoring functions may be performed by personnel working for the prime contractor, the owner or government agencies."[70]

Using the CJ example the associated quality plan would describe all the programs that would be involved in ensuring a quality camp was constructed. It is not simply a list of the building codes or building specifications that must be complied with. The quality plan should explain or define how the construction will be undertaken to ensure the codes or specifications are met. Equally as important for the project manager to consider are the quality assurance inspections that are required by law or are deemed as best practice. For example at any construction site, even CJ, government building inspectors will check building codes, the Fire Marshall will verify fire safety systems are in place, insurance companies may want to inspect the site before providing insurance coverage, etc.

Two key architects who were influential in instituting quality management processes into the PM realm were Edward Deming and Philip Crosby. Deming developed the PDCA cycle (Plan Do Check Act). In its basic form its: Plan – what you will do to meet the requirements; DO – what it is you have planned; Check – what you are producing is what you had planned, and; Act – to adjust the plan as required. [71] See Table 2 below for details on the Deming approach.

Table 2**:** Plan-Do-Check-Act, Deming's Ideal Quality Process

[70] Edward McQuire, *Quality Assurance*…, 531.

[71] Saint Mary's University, "Project Quality Management," *Masters Certificate in Project Management Notes* (Halifax: Saint Mary's University Professional Development Programs, Spring 2000), 1-11.

PLAN **Step 1:** **Identify the Problem**	Select the problem to be analyzed. Clearly define the problem and establish a precise problem statement. Set a measurable goal for the problem solving effort. Establish a process for coordinating with and gaining approval of leadership.
DO **Step 2:** **Analyze The Problem**	Identify the processes that impact the problem and select one. List the steps in the process as it currently exists. Map the Process. Validate the map of the process. Identify potential cause of the problem. Collect and analyze data related to the problem. Verify or revise the original problem statement. Identify root causes of the problem. Collect additional data if needed to verify root causes.
DO **Step 3:** **Develop Solutions**	Establish criteria for selecting a solution. Generate potential solutions that will address the root causes of the problem. Select a solution.
DO **Step 4:** **Implement a Solution**	Implement the chosen solution on a trial or pilot basis. If the Problem Solving Process is being used in conjunction with the Continuous Improvement Process, return to Step 6 of the Continuous Improvement Process. If the Problem Solving Process is being used as a standalone, continue to Step 5.
CHECK **Step 5:** **Evaluate The Results**	Gather data on the solution. Analyze the data on the solution.
Achieved the Desired Goal?	**If YES, go to Step 6.** **If NO, go back to Step 1**
ACT **Step 6:** **Standardize The Solution (and Capitalize on New opportunities)**	Identify systemic changes and training needs for full implementation. Adopt the solution. Plan ongoing monitoring of the solution. Continue to look for incremental improvements to refine the solution. Look for another improvement opportunity.

Source: Taken from the Six Sigma website. Edward Deming, *Plan Do Check Act*; available from http://www.isixsigma.com/me/pdca/; Internet; accessed 27 Feb 04.

The PDCA cycle would be applicable to any PM process and equally to camp construction such as CJ. This would be an alternative approach to doing a military style estimate. It has a focus on quality and as discussed earlier, quality needs to be a factor considered for the welfare of the task force. By thinking in terms of the PDCA cycle this similar but differing perspective may lead to new idea's being generated for the camp construction, with more of a focus on the soldier requirements. Certainly Deming felt that a quality program had to be followed throughout the process, and this approach to validating and verifying throughout the estimate process is critical as well. Though time will always be critical during the construction of a camp such as CJ, conducting reviews and validations at each stage is critical to success.

Crosby is credited with developing the concept of "Cost of Conformance," having a quality program and following it. He also developed the "Cost of Non-Conformance," saving money on not having a quality program but paying for the cost of correcting any mistakes. The Cost of Conformance is basically defined as "the quality costs involved in doing things right" with the definition of the Cost of Non Conformance as "the quality costs involved in fixing errors."[72] Crosby showed that following a quality program cost three to five percentage of the cost of sales, compared to the cost of non-conformance that he rated in the range of twelve to twenty percent of the cost of sales.[73] With the approximate cost of CJ being $50 Million, a ten percent savings would equate to $5 Million. With that amount of money at stake it would be easy to justify the effort required to institute a quality management program. Table 3 below is a checklist Crosby developed to aid in determining the cost of conformance versus the cost of non-conformance.

The review process and other checks and balances of following a quality approach will save many times over the cost of the quality program compared to the cost of correcting past mistakes.

Table 3. Crosby's Cost of Conformance versus Non-Conformance

CONFORMANCE	NON-CONFORMANCE
Design	

[72] Saint Mary's University, *Project Quality* …, 1-12

[73] Ibid., 1-12.

Planning	Engineering Changes
Project Control	Material Review
Training	Schedule Delays
Design Review	
Design Testing	
Execution	
Process Control	Incoming Inspection
Quality Audits	Scrap and Rework
Product Testing	Cost Overrun
Test Equipment	Excess Inventory
Calibration	Expediting
Application	
Field Testing	Warranty Costs
Customer Orientation	Complaint Handling
Customer Support	Liability Judgements
	Product Recalls

Source: Saint Mary's University, *Project Quality* …, 1-13.

Another source for ideas on implementing a quality management program is the International Organization for Standardization (ISO). Most ISO standards are specific and relate to a particular discipline. ISO 9000[74] is designed to be more generic across disciplines and is written on the topic of quality management. "Quality management means what the organization does to ensure that its products or services satisfy the customer's quality requirements and comply with any regulations applicable to those products or services." [75] The ISO expects companies who are certified with them to continually strive to improve their performance. ISO 9000 is oriented towards process, that is the ISO relates to how a product is developed much more so than the product itself. The ISO, through its ISO 9000 standard, expects companies to have an effective quality management process in place to ensure the product satisfies customer

[74] International Organization for Standardization, *ISO 9000:The Basics*; available from http://www.iso.ch/iso/en/iso9000-14000/basics/general/basics_1.html; Internet; accessed 14 March 2004.

[75] ISO 9000, *The Basics* ..., 4-4.

requirements. There are many certification agencies available to register or certify that a company's quality management process is in accordance with ISO 9000.[76]

ISO 9000 certification is a good marketing tool for companies, but it does not guarantee a project the company undertakes will be successful. With CJ construction, if any of the bidding contractors were ISO 9000 certified it would be a positive indicator that they have a quality management program in place. ISO 9000 is also a good benchmark or discriminator for comparison amongst competing contractors. For future camp builds, or companies providing ongoing support to a deployed force, ISO accred

quality management validation and verification. Unless there were operational reasons not to permit a longer timetable then the additional time required for quality management program could be easily justified. Without senior management buy-in either the quality program will not be resourced properly or it will not have the authority to effectively carry out its function. Customers today expect high quality with fewer failures at a lower cost, and this can be achieved through a quality standards program.[77] It is critical that an entire organization both accepts and understands the benefits of using a quality management program in order for the quality program to be successful.

The task force commander and the task force members should have been involved in the quality of the camp from inception to completion. For CJ, the task force commander and COs were involved but it was only at the insistence of Col Pouliot. Even after a task force has occupied a camp there should be follow-up on quality conditions of everything from washing and cooking facilities to heating of the office complex. Likewise the project engineer would have a quality program to allow proper monitoring of requirements, design and construction of the various contractors in the stand-up of a camp.

When a problem develops on a project it is human nature to want to react to the situation, solve the problem and continue progressing the project. By taking a quality analysis approach a more comprehensive, permanent solution to the problem can be achieved. A brainstorming approach with the project team, and SMEs as available is often used. Possible symptoms are investigated to develop the related cause and effect. A list of possible solutions is determined and the best approach is implemented. This brainstorming generation of ideas, "thinking outside the

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[77] Harold Kerzner, *Advanced Project Management: Best Practices on Implementation*, 2d ed. (Hoboken, New Jersey: John Wiley & Sons, Inc, 2004), 10.

box," is often considered the "creative phase" of the process; followed by the more scientific "analytical phase" of selecting the root cause and solution through logical deductive reasoning. This problem description leading to probable cause and best solution is the basis of quality analysis tools.[78] As was mentioned earlier Col Pouliot used brainstorming regularly with his staff and found it an effective tool. One example he relayed that was "thinking outside the box" or more of a quality analysis approach concerned a problem he had with locals tunneling outside the camp compound. These tunnels posed a security risk and short of simply filling in the start of them or sending a soldier in to investigate (possibly encountering a booby trap) or both he gathered the staff for a brainstorming session. One of the junior engineering officers explained that civilian industry had devices able to determine if tunneling below them existed, while the device rested on the surface. This equipment was acquired and now engineering staff could monitor tunneling efforts safely from within the confines of the compound, and had a means of determining how much of a tunnel required filling in if they went below the camp. Again, not all commanders use brainstorming techniques and as a result they may miss out on solutions from their resident subject matter expertise.

An excellent way of presenting the biggest problem or challenge, with visual impact, is with a Pareto chart (similar to a bar chart). With a Pareto chart data is arranged in descending order of magnitude. This approach is one of the best ways of focusing the project group's attention on key issues. In the CJ example below, Figure 4, unskilled workers, dirty power, ISO accreditation and late delivery of supplies have a cumulative percentage, or total of one hundred percent of the cause for project delay. Another interpretation of the chart shows that if the unskilled workers and dirty power issues were resolved, it would solve eighty-three percent of

[78] Saint Mary's University, *Project Quality*…, 6-2.

the delay problems. The Pareto chart can be further developed creating a cumulative curve by adding the bars together, see the reference for this and other advanced applications.[79]

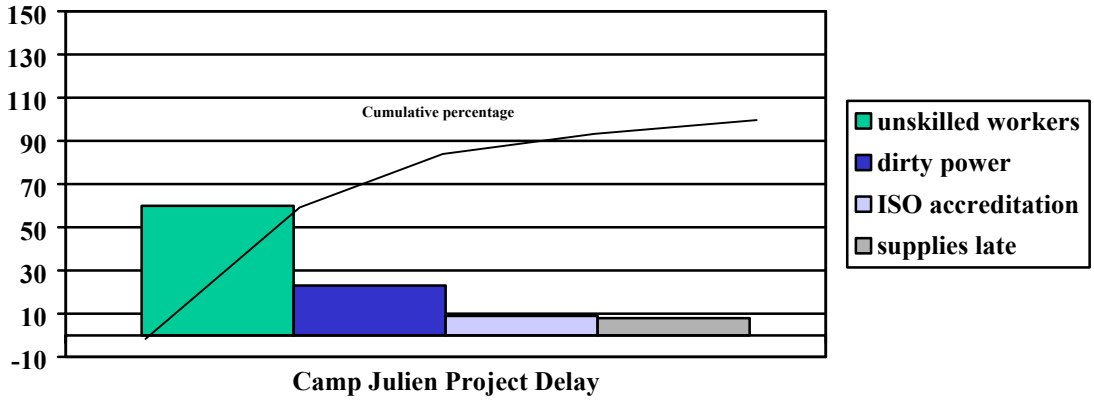
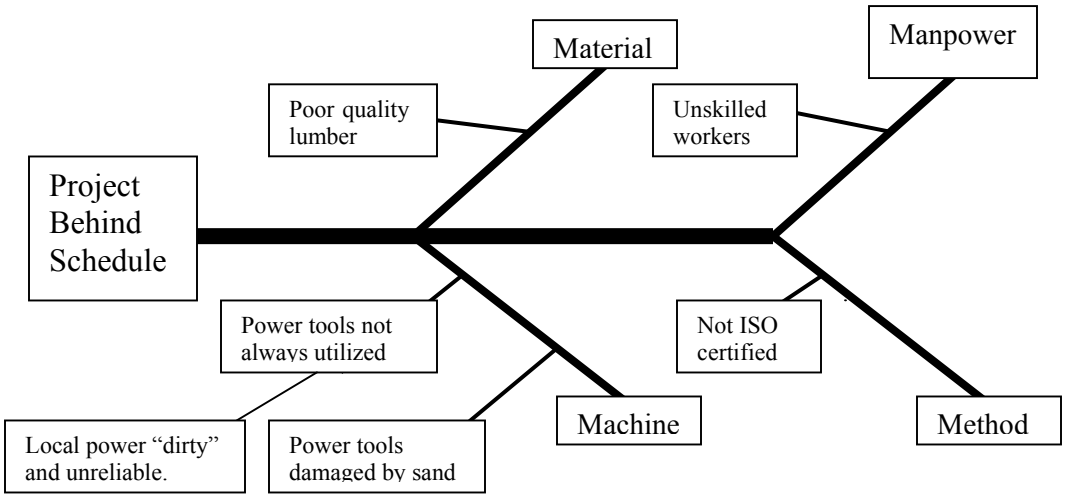


Figure 4. Pareto Chart depicting project delay at CJ

The second tool to be discussed under quality analysis is called cause and effect analysis, often depicted as a fishbone diagram like the one shown at Figure 5.



[79] Saint Mary's University, *Project Quality*…, 6-7.

Figure 5. Cause and Effect Diagram of project delays at CJ

In the fishbone diagram key themes are portrayed on the main trunk. In this hypothetical example the CJ project is behind schedule three weeks. The fishbone diagram allows the project staff to visualize the problem areas and possibly identify trends or themes causing the three-week schedule delay. "There can be several causes for a problem. A root cause is that which, when eliminated removes most other causes."[80] The four categories of Material, Manpower, Machine and Method are used on the main trunk. (These four categories are commonly used and are referred to as the 4M's.[81]) Branches are taken from the four trunks and these are sub-components of the trunks, for instance "unskilled workers" are a branch off the main trunk Manpower. Branches can be decomposed into twigs, such as the "local power dirty and unreliable." There can be as many branches and twigs as necessary to represent the problem. Branches and twigs can be color coded for easier recognition. This fishbone or cause and effect analysis is another way of brainstorming the problem. Issues are categorized in related fields, often making it easier to identify trends and solutions.[82]

Quality management is directly applicable to a project like CJ and all elements of a quality management program should be followed. As was shown throughout this section quality assurance, control and analysis will often be key determinants of assuring a project is on time, on budget and at the desired quality. Quality is one third of a projects triad of deliverables. The next section will expound on the other two, budget and schedule.

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[80] Saint Mary's University, *Project Quality* …, 6-12.

[81] Ibid., 6-13.

COST AND TIME MANAGEMENT

Cost management, in particular contract administration, can play a part in development of courses open especially support arrangements, as is the case currently in Bosnia and Afghanistan. CJ was constructed primarily by contract and the majority of ongoing support to the task force is being provided by contract as well. Certainly the construction of CJ is a project as determined by the PMBOK definition and all elements of cost and time management should be applied. Cost and time management constructs applicable to CJ will be described throughout this section.

PMBOK has assigned resource planning as a major component of cost management. "Resource planning involves determining what physical resources (people, equipment, materials) and what quantities of each should be used and when they would be needed to perform project activities. It must be closely coordinated with cost estimating."[83] Kerzner has developed a comprehensive methodology for determining resource requirements of a project. The following thirteen steps, shown in Table 4 below, are a means of determining resource requirements.

Table 4. Project Resource Requirements.

1	Provide a complete definition of the work requirements.
2	Establish a logic network with checkpoints
3	Develop the work breakdown structure (WBS).
4	Price out the WBS.
5	Review WBS costs with each functional manager.
6	Decide upon the basic course of action.
7	Establish reasonable costs for each WBS element.
8	Review the base case costs with upper-level management.
9	Negotiate with functional managers for qualified personnel.
10	Develop the linear responsibility chart.

[82] Saint Mary's University, *Project Quality* …, 6-12.
[83] *PMBOK* …, 85.

11	Detail the final detailed and CPM schedules.
12	Establish pricing cost summary report.
13	Document the results into a program plan.

Source: Harold Kerzner, "Pricing Out the Work" in *Project Management Handbook*, ed. David Cleland and William King (New York: Van Nostrand Reinhold, 1988) 395-407.

The work requirements in step one are developed as part of the scope management process, primarily through discussions with the user and/or sponsor of the project. Any associated specifications or work standards that impact on the requirements would be captured as well. Step two involves producing a logic network or arrow diagram, which will form the basis for determining the critical path of the project. At this stage the project team does their forecasting as though they have unlimited resources, they do not establish any constraints at this time. The WBS is used for step three and the process involved in decomposing the project into components was discussed in detail in an earlier section.

Step four is actually costing out the work packages of the WBS. The project manager determines the "what," "when," and "why" for the project and the functional managers use their expertise to determine the "how," "who," and "where." Steps five through nine are self explanatory, but additional details are available in the reference.[84]

The main activity in step ten is producing the linear responsibility chart that provides the mechanism for the project manager to assign project components or responsibilities to their sections. [85] For step eleven the schedule will be affected by the negotiations that have transpired in step nine when determining who would be doing what work, i.e. skilled versus unskilled

[84] Harold Kerzner, *Pricing Out the Work* …, 395-407.

[85] The linear responsibility chart is briefly explained in the text but Kerzner goes into great detail on the charts in chapter sixteen of his book *Project Management: A Systems Approach to Planning, Scheduling and Controlling* (New York: Van Nostrand Reinhold, 1984).

personnel. Skilled employees are able to complete project work more expeditiously but are more expensive and may not be readily available.

The final two steps, twelve and thirteen, involve proper documentation and appropriate reporting of project milestones and progress. The reports should include a breakdown for each work package of the WBS and costs associated with particular departments.

The key deliverable for a project manager, when completing a project, is to finish it on time, on budget and within quality expectations. As mentioned earlier Col Pouliot had the requisite training to balance the budget, schedule and quality of CJ. With a project costing approximately $50 Million dollars the TAT commander should either have some finance training or have someone on their staff that does. Bringing the project in on budget involves having control over the costs of your various resources. Peles recommendation in achieving this goal is to begin with a cost management plan (CMP) and a project cost group.[86] The CMP would essentially document Kerzner's thirteen-step resource plan and would be the all-encompassing document for resource and cost information. The CMP would detail the responsibilities of the project group and also include their relationship with other members/sections involved in the project. The CMP also provides other details such as the system used for cost reporting and management procedures.

The project cost group responsibilities would also include cash flow and/or progress analysis. They would be responsible for managing risk or contingency issues pertaining to costs and resources. "This calls for jointly identifying specific risks with the project team members,

[86] Charles Peles, "Managing Costs With Precision" in Project Management: A Reference for Professionals, ed. Robert Kimmons and James Loweree (New York: Marcel Dekker, Inc., 1989), 551-552.

and then summarizing and analyzing the results using techniques such as the Monte Carlo simulation method," described earlier.[87]

For a project such as CJ, with several millions of dollars involved, it would be prudent to establish a project cost group (perhaps just one comptroller) who would be responsible for assimilating the information in the CMP. The project manager needs a means of depicting expenditure of resources. Software such as "Microsoft Project" can be used to show trends and assist in identifying pending problems, such as the example shown at Appendix E. Another means of regularly reporting various resources and their costs is a simple spreadsheet containing planned and actual completion for several consecutive weeks. This would help identify any trends that may be developing. Kliem recommends using this type of report on a weekly basis. "The project manager can use this information to detect any cost variances that may have occurred, and to take corrective action, such as rescheduling activities or decreasing resource allocations."[88] As Kliem suggests regular reporting will allow a project manager to conduct one of his prime responsibilities, keeping a project on budget. Any trends that are identified through this regular reporting methodology allows project staff to reschedule activities or re-allocate resources.

With CJ, project staff was at a minimum, so several key individuals had several functions and/or duties to conduct. Often, with too few staff and too many responsibilities shortcuts are taken. In discussions with project staff shortcuts were taken, where it was deemed acceptable risk, with the CJ construction because of the tight schedule.[89] The project was successful as the task force was provided with the requisite infrastructure at a satisfactory condition, therefore the

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[87] Ibid., 554.

[88] Ralph Kliem, *The Secrets of Successful Project Management* (New York: John Wiley & Sons, Inc. 1986), 92.

project team deserves full credit for a job well done. However, with the amount of finances at stake and the risk involved in meeting the schedule with a quality camp, there can be false economies in taking shortcuts! As is often the case, as discussed in the quality management section, cutting back on such items as design reviews, regular reports and analysis, etc. during the preliminary portions of the project can result in much more time expended later. Even under severe time constraints, best business practice and the authors experience in managing projects has shown, early reports and reviews can save much more time later on in the project cycle as a result of corrective action that must be undertaken.[90] On a simple level, it is somewhat analogous to the carpenter's penchant of "measure twice cut once." "Setting and achieving an aggressive schedule target is perhaps the most sacred of all sacred cows in the field of project management. It is also the source of some of the most destructive behavior and phenomena in projects."[91]

All projects, by necessity, have resources assigned to them for completion of project deliverables. Often key personnel or key equipment are not assigned on a full time basis to the project so the project manager must implement a resource leveling strategy. There are many ways to accomplish resource-leveling including: scheduling over-time; extending the completion time of the project; sub-contracting or out sourcing portions of the project; or the use of slack/float time in the schedule to reduce or eliminate the resource contention.[92] The project work has been assigned once the work packages of the WBS have been allocated for completion.

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[89] Refer back to footnote 5 regarding key project officer names and information.

[90] It is the author's experience that holding design reviews, bidders conferences, site inspections etc. paid many dividends in his project work. Though time consuming during the early stages of a project, having all parties in agreement as to what had been accomplished and what remained to be completed was well worth the preliminary effort.

[91] Kenneth Cooper, "Four Failures in Project Management, in *The Project Management Institute Project Management Handbook,* ed. Jeffery Pinto (San Francisco: Jossey-Bass Publishers, 1998), 402.

[92] Saint Mary's University, "Effective Project Cost Management," *Masters Certificate in Project Management Notes* (Halifax: Saint Mary's University Professional Development Programs, Spring 2000), 2-4.

Through the use of a technique such as Kerzner's linear responsibility chart a resource histogram can be completed. The resource histogram plots key personnel or equipment on a timetable displaying the work they are expected to complete. Any conflict becomes readily apparent through the use of a resource histogram if a key resource has been assigned more than can be accomplished in the time allotted. A resource histogram is shown as part of the Microsoft Project documentation in Appendix E that is based on the CJ information.

If a particular resource has been over-tasked as demonstrated by a resource histogram the project manager must invoke one or more of the techniques mentioned earlier to level out resources and maintain the schedule and budget. Again, through the use of tools such as those available with Microsoft Project the critical path of the project is determined. Once the critical path is known slack/float time can be identified to alleviate resource-leveling problems. If the project manager can reschedule activities without affecting the critical path, many resource conflicts can be solved in this manner. One of the merits of software tools such as Microsoft Project is the ability to pose "what if" questions. By simple manipulation of the data, resource-leveling problems can often be resolved quickly on a trial and error basis (or perhaps more scientifically than trial and error depending on experience of project team members). With a paper-based approach data can be manipulated but the follow on effects are not known or automatically calculated. Automation tools are designed to register the impact on the schedule and budget and the results are practically immediate, this is one of the big advantages of using a software program. When they are resource leveling project mangers must remember that all events not on the critical path have some associated slack and although there may be extra

resources overall on the project, there remains the possibility of resource shortages during peak or load periods.[93]

For a project such as CJ a methodology such as Kerzner's thirteen steps of determining resource requirements is critical to have in place. In profit driven industry cost management is accepted, with the CF its more for accountability to the government and taxpayers that costs must be managed. Concepts like resource leveling are important for managing resources to avoid problems like the one demonstrated with CJ in Appendix E.[94] Finally, as discussed keep the user informed regardless of whether its an issue with time, money or quality.

CONCLUSION

The intent of this paper was to examine the similarities of the PM and CJ processes, and look for opportunities where control mechanisms and the best business practices of PM could be applied to CJ and future similar projects. Certainly the construction of a camp for a task force such as CJ is a project in every sense and the PM principles of the PMBOK should be considered for use on any such project in the future.

The merits of many PM tools and techniques were discussed and need to be considered for adoption for projects such as CJ. All of the PM best business practices may not necessarily be better than those employed by the CJ staff, but they offer a different perspective and a fresh approach can often generate a new solution to an old problem. As Col Pouliot reflected the PM practices add "de rigueur" to the military process. Certainly throughout the paper the similarities

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[93] Saint Mary's University, *Project Cost* …, 2-25.

[94] As can be seen from a resource usage reports in Appendix E, a situation based on fact but exaggerated shows the TAT Engr being literally over tasked and it show up in Microsoft Project hi-lited in red.

between the CJ construction and PM were evident and areas where the tools of PM could be applied to CJ were identified.

As discussed in the scope management section, the charter could be an all-encompassing document intended to initiate the CJ construction. The TAT commander should deploy to the theatre with more than a terms of reference and three tasks to complete. A completed charter document would make fulfilling their responsibilities much easier. Also with the scope statement, a focus on the client or soldiers welfare would be appropriate for the TAT commander. The WBS technique would be especially useful for negotiations with contractors, both because of its structure and because of its familiarity to civilian industry. Finally the PM change control procedures should be adopted for a project of this financial magnitude because they provide the rationale for particular decisions through their audit trail mechanisms.

With risk management there are many tools available. As Col Pouliot suggested this was one area where he felt PM practices could have been beneficial to him as a TAT commander. Project management software packages often include components like Monte Carlo simulation.

Quality management discussed Deming's PDCA process, yes it is similar to the estimate process but its focused on quality, a possible shortfall of military procedures for a CJ type of project. Crosby's estimated cost of non-conformance resulting in costs of twelve to twenty percent on a $50 Million dollar project is a good incentive to adopt quality management principles. The use of ISO certification and quality program validation may help select the best bid for contracted support for an installation such as CJ.

They were other tools and techniques detailed in the paper that are not covered in the summary that should also be considered for use in CJ type projects. Most certainly, for future projects like CJ, as a minimum automation tools such as Microsoft Project must be a critical

consideration.[95] For minimal training, money and time the information-automated tools can produce make them an essential element for management purposes. Certainly the use of spreadsheets for tracking project data is severely lacking compared to the power and potential of project software.

The use of a TAT and contracted support for establishing camps such as CJ is a new concept. They both have a lot of merit and potential but can be significantly enhanced with the control mechanisms and best practices that the PM realm has to offer.

[95] The author is not advocating Microsoft Project in particular as a software tool. The author is aware of the basic capabilities of the product though there are many other software project tools available.

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Appendix A

MT Problem-Solving Methodology*

The MartinTate ™ Problem-Solving Methodology is called DAS/IR. In the first three stages, the problem is defined, analyzed and then a solution is selected. The Implementation and Review stages are used for implementing the solution.

Stage One – Define the Problem (D). In the first stage, the team studies the problem and the environment in which the problem fits. Any existing data about the problem is studied and a problem statement is written.

Stage two – Analyze the Problem (A). In the second stage, data is collected to clarify the problem, the process in which the problem exists is mapped, and the root causes of the problem are identified. Finally a cause statement is written.

Stage Three - Select a Solution (S). In the third stage, the team brainstorms possible solutions to the problem and generates several potential solutions. Each solution is then evaluated and the optimal solution is selected. A solution description is written.

This three-stage process should be done before any project that will implement a solution to a perceived problem is initiated. The last two stages of the methodology are Implementation and Review. During implementation, the team designs and then pilots the solution. During review, performance data from the solution is compared to the original data collected about the problem, to ensure that the solution will resolv

Appendix B

CHANGE REQUEST

Project Name		**Date of request**		**Change Number**	
Project manager		**Project Sponsor**			
Description of the Request for Change					
Recommended option and impact if approved					
Option B and impact if approved					
Option C and impact if approved					
Project Impact if recommended option not approved					
Change accepted? Yes/No Why?					
Project Manager			Date Change Approved		
Sponsor			Decision Date		

*Taken from Saint Mary's University, *Project Planning and Control,* Masters Certificate in Project Management Notes (Halifax: Saint Mary's University Professional Development Programs, Spring 2000), 6.8