

RECLAMATION

Managing Water in the West

Managing for Excellence: The Status of Project Management in Reclamation

Final Draft

NOTE TO READER: The authors expect to make future changes to this document as a result of ongoing reviews.

**U.S. Department of the Interior
Bureau of Reclamation**

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Executive Summary

In 2004, the Bureau of Reclamation asked the National Academy of Sciences' (NAS) National Research Council (NRC) to review Reclamation's organization, business practices, culture, and capabilities for managing construction and infrastructure in the 21st century. As a result, the NRC published a report in early 2006, *Managing Construction and Infrastructure in the 21st Century, Bureau of Reclamation* (NAS Report). Project Management (PM) is one of the nine issue areas recommended for Reclamation action and is the subject of this report. Specifically the NRC identified three PM issues: 1) Each phase of project development has a different management process, 2) The Reclamation Manual is incomplete regarding PM and there is insufficient oversight of its implementation, and 3) PM as a discipline is not well recognized in Reclamation.

The Project Management Team was assembled to address these three issues. The work was divided into two phases. Initial efforts (Phase I) were focused on an evaluation of Reclamation's current PM practices and needs, throughout the entire project development process from inception through operations and maintenance, relative to proven project management practices. The purpose of this report is to summarize the Team's findings and present the Team's recommendations. This report is offered as the basis for implementation phase (Phase II) should it be necessary.

The Team members surveyed Reclamation's current practices by conducting interviews with a cross section of Reclamation managers and staff. Interviewees were people involved with executing the planning, design, construction and operation, and maintenance phases of projects. People in peer groups such as other agencies and private firms were also interviewed to provide a basis for comparison with their practices, problems, and successes. Reclamation's PM practices were also compared to those recommended by the Project Management Institute's (PMI) *A guide to the Project Management Body of Knowledge (PMBOK® Guide) – Third Edition*¹. Developed over the past 30 years, the PMBOK Guide is a consolidation and organization of knowledge on the project management profession.

The evaluation of PM in Reclamation also took into account Reclamation's evolving mission, which has shifted from one focused on water resource development, based almost entirely on planning, design, and construction of infrastructure, to one focused on the efficient and effective management of those water supplies and related resources. As a result, project management in Reclamation has moved from using centralized, highly-structured, prescribed processes developed by Reclamation over decades, carried out by functional managers, to using local, more flexible personal-based approaches. Also, the projects now are generally smaller and the positions accomplishing PM functions are at lower levels in the organization.

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The Team found that the range of PM experience and current practices varied widely from region to region and from office to office within some regions. Based on PMI's definition of PM, currently there are few people in Reclamation who have a full understanding of the PM profession, years of PM practice experience, or who have certifications. Even for most of those in Reclamation with PM experience, their expertise was incidental, although very useful, to their position description responsibilities. It was found that the development and use of PM practices has arisen from the staff level of the organization up.

The Team found that in the private sector there was a high correlation among the responders from the interviews in terms of philosophy, strategy, methodology, and use of the PMBOK Guide. There was an overwhelming positive response that PM must be active and proactive throughout the duration of the project and addressed on a daily basis.

In general, the Team found that in Reclamation when a project manager is assigned, a project is more successful in all aspects, from the decision making process, communication with interested parties, to meeting budget, scope and schedule constraints. However, there is significant room for improvement, particularly in the initiating, integration, and closing processes. It was found that PM as outlined by the PMBOK Guide is not a consistently well understood or well executed process across Reclamation and has not been seen as a priority by management except when projects are high profile. It was also found that Reclamation has inconsistent approaches, solutions, and policies, which can be characterized as providing flexibility, but can lead to problems in some areas such as effective and consistent communication with management and stakeholders. Through the interviews, it was suggested to the PM Team that Reclamation realize that the academic discipline of PM is no longer a "soft" science, but is now an American National Standards Institute standard. The knowledge, skills, and abilities of PM should be considered no less important than its science and engineering disciplines as they relate to the success of Reclamation's mission.

Through the needs assessment, the Team validated the three NRC findings, listed above, and recommends that Reclamation diligently implement the practice of sound PM for all work that meets the definition of a project (defined in Chapter 5 of this report). A clear mandate from management, via the Reclamation Leadership Team, is necessary to ensure successful implementation. Therefore, the Team also recommends that Phase II be completed.

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1.0 Introduction

1.1 Managing for Excellence Framework

In 2004, the Bureau of Reclamation (Reclamation) asked the National Academy of Sciences' (NAS) National Research Council (NRC) to review Reclamation's organization, business practices, culture, and capabilities for managing construction and infrastructure in the 21st century. As a result, in early 2006 the NRC published, *Managing Construction and Infrastructure in the 21st Century, Bureau of Reclamation* (NAS Report). That report recommended action in nine issue areas, project management (PM) being one of them, the subject of this report. Reclamation's *Managing for Excellence, An Action Plan for the 21st Century* (Action Plan) provided a process and time frame to Reclamation teams tasked with pursuing the NAS recommendations.

Table 1 – Action Plan and NRC Recommendation Cross Walk, displays the NAS Report findings and recommendations concerning PM and the Action Plan tasks to address the recommendations. Action items 20, 21, 22, and 23 were assigned to the Project Management Team (PM Team).

A fifth item was included in the Action Plan under the Project Management group requiring establishment and maintenance of a central repository for examples and appropriate guidance regarding procurement contracting. This action is addressed elsewhere by Team 24 – Acquisition Repository.

1.2 Phases of the Work

The PM Team is addressing action items 20-23 in two phases:

- Phase I – Evaluate Reclamation's current PM practices and needs, throughout the entire project development process from inception through operations and maintenance (O&M), relative to proven project management practices.
- Phase II – Develop implementation recommendations, if necessary, based on the Phase I results.

2.0 Purpose of the Report

The purpose of this report is to summarize the PM Team's Phase I activities and findings and present the Team's recommendations.

Table 1– Action Plan and NRC Recommendation Cross Walk

Action Item	Task Description (Action Plan)	NRC Recommendation (NAS Report)	NRC Finding (NAS Report)
20	Identify and implement a project management process for all construction projects.	Recommendation 6a. “Reclamation should establish a comprehensive and structured project management process for managing projects and stakeholder engagement from inception through completion and the beginning of O&M.”	Finding 6a. “Reclamation does not have a structured project management process to administer planning, design, and construction activities from inception through completion of construction and the beginning of O&M. Projects are developed in three phases: (1) planning (including appraisal, feasibility, and preliminary design studies), (2) construction (including final design), and (3) operations and maintenance, with each phase having a different management process.”
21	Study the merits of developing a comprehensive and structured project management process for managing projects from inception through the planning and construction stages and into operation, and make a determination of whether such a process should be developed.	Recommendation 6a. (See text above) Recommendation 6b. “Reclamation should develop a comprehensive set of directives on project management and stakeholder engagement that is similar to Technical Service Center (TSC) directives for agency-wide use.”	Finding 6a. (See text above) Finding 6b. “The <i>Reclamation Manual</i> includes a set of directives for managing projects, but it is incomplete, and there is insufficient oversight of its implementation. Central oversight of some projects is being developed in the Design, Estimates, and Construction Office, but policies and procedures have not yet been developed.”
22	If the results of the action item above so directs, develop this comprehensive, structured project management process and develop policies, directives and standards, and other guidance documents to assure effective implementation.	Recommendation 6a. (See text above) Recommendation 6b (See text above)	Finding 6a. (See text above) Finding 6b. (See text above)
23	Develop a training program for all personnel with project management responsibilities. This training program will incorporate existing project management tools as well as any processes developed as a result of the two action items above. It will also address decision making, stakeholder relations, the differences between project and program management, and other topics relevant to successful project management.	Recommendation 6d. A training program that incorporates current project management and stakeholder engagement tools should be developed and required for all personnel with project management responsibilities. In addition, project managers should have professional certification and experience commensurate with their responsibilities.	Finding 6c. “Reclamation needs to recognize project management as a discipline requiring specific knowledge, skills, and abilities, and to require project management training and certification for its personnel who are responsible for project performance. The committee observed the appointment of activity managers in the Pacific Northwest region who were responsible for communications and coordination among project participants for all phases of the project. These activity managers appeared to be beneficial for the execution of projects, but the committee believes that a project manager with responsibility and authority to oversee projects from inception to completion could be even more effective.”

3.0 Scope of Work

The PM Team considered action items 20-23 and developed the following scope of work to guide its efforts, approved by the Team’s Executive Sponsor:

Using stakeholder (internal and external to Reclamation) input, the PM Team was to examine Reclamation’s current practices for developing projects from inception to O&M to determine the most efficient and cost effective extent that project management can be implemented so that projects, or significant phases of large projects, are completed on time and within budget and scope; and develop implementing policies, directives and standards, other documents, and training by December 31, 2006.

Although the focus was on managing construction and infrastructure, non-construction projects were included as well.

The scope of this report is limited to “. . . examine Reclamation’s current practices for developing projects from inception to O&M.” Based on the recommendations in this report, the PM Team will then “. . . determine the most efficient and cost effective extent . . .” if necessary, in Phase II.

The scope of projects considered in this report range from small, single-office projects that may be implemented in less than a year to large, multi-purpose projects valued at millions of dollars, involving hundreds of stakeholders, and/or requiring multiple phases and an interdisciplinary team.

4.0 Project Management Team

Alan Candlish, P.E. – Regional Planning Officer, MP Region
Lauren Carly, P.E., Co-Team Leader – Office Engineer, MP Region
Rick Ehat, P.E., Co-Team Leader – Project Construction Engineer, UC Region
Kerry McCalman, P.E – Manager, Power Office, UC Region
David Palumbo, P.E., PMP – Project Manager, LC Region

Resources and assistance to the PM Team were provided by:

Mark Boyle, PMP – Chief, Infrastructure Services Division, TSC
Jayne Kelleher – Technical Writer/Editor, UC Region
MG Charles McGinnis, P.E., FASCE (Retired)
Brent Rhees, P.E. – Deputy Area Manager, UC Region
John Smart, P.E., PhD – Consultant

Appendix XI contains short biographies of the PM Team members.

5.0 Terms, Definitions and Concepts

The PM Team adopted certain terms, definitions and concepts to provide a common language for carrying out its work. The following terms adopted by the PM Team are described further in this section and in more detail in Appendix III.

- a project
- project management
- project success
- a project manager
- a project management plan

The terms, definitions and concepts were adopted largely from the Project Management Institute's (PMI) *A Guide to the Project Management Body of Knowledge (PMBOK Guide)* – Third Edition². Developed over the past 30 years, the PMBOK Guide is a consolidation and organization of knowledge on the PM profession. It is widely accepted to include the core elements of successful PM practices. It is a regularly updated and internationally referenced standard (American National Standards Institute/PMI 99-001-2004) and provides a basis for universal discourse on practices. More information on the PMI can be found at www.pmi.org. In addition, the PM Team used PMBOK Guide as a standard by which it evaluated Reclamation's current practices.

5.1 Project Management Terms, Definitions and Concepts

5.1.1 What is a Project

The context in which projects are performed is conceptually illustrated by Figure 1.

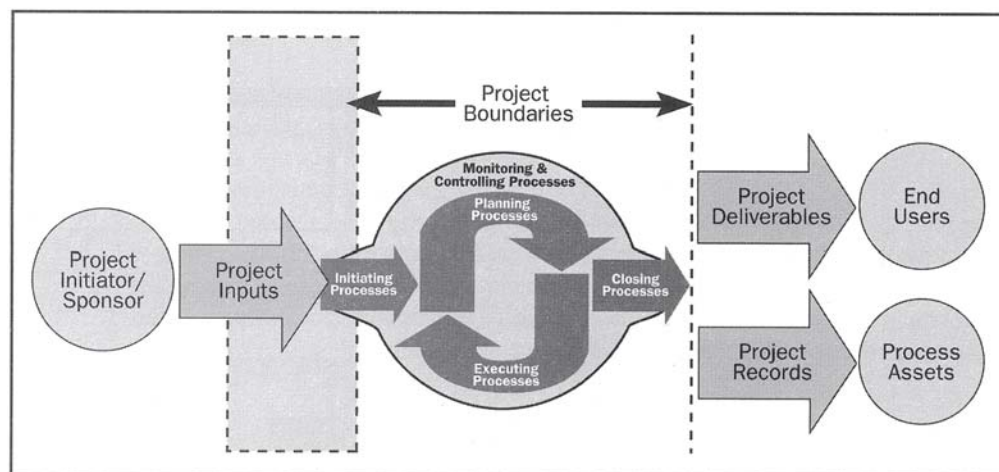


Figure 1¹

² *A guide to the Project Management Body of Knowledge (PMBOK® Guide)* – Third Edition, Project Management Institute, Inc., 2004. Copyright and all rights reserved. Material from this publication has been reproduced with the permission of PMI.

The fundamental nature of a project is that it is a “**temporary** endeavor undertaken to create a **unique** product, service, or result.”ⁱⁱ Projects are distinguished from operations and from programs. “A project is a problem scheduled for solution,” said Dr. J.M. Juran, a leader of the total quality management movement.

The temporary nature of a project signifies that there is a discrete and definable start and end date. A successful project is measured in part on how it performs against its schedule; that is, did it start and end on time.

The uniqueness of the deliverable, whether it is a product, service, or result, requires an approach tailored to that deliverable. Although similarities to other projects are taken into account, the scope for a particular project is unique in at least one way considering project constraints, risks, resources, location, and time period. Therefore, the process to produce the deliverable, as well as the deliverable itself, is unique.

A third project characteristic is: **progressive elaboration**. Progressive elaboration is the revealing and focusing of details through time. Projects are executed in increments and details are exposed and developed through the progression of time: objectives are developed; discoveries are made; investigations, studies, and surveys are completed; analyses are performed; constraints are changed; resources are amended; contingencies are exercised; changes are managed; and risks are mitigated until the project objective is met.

5.1.1.1 Other “Projects”

With respect to Reclamation terminology, a project is typically a congressionally authorized or directed activity that allows Reclamation to do something specific. Traditionally, projects are groups of infrastructure such as the Central Arizona Project, the Lower Colorado Dams Project, or the Central Valley Project.

The Reclamation “project” activities would range from the traditional planning, designing, and building of structures to negotiating and signing delivery contracts, developing operations plans, and completing environmental compliance documents.ⁱⁱⁱ In traditional Reclamation vernacular, the operations and maintenance of the completed project is often considered part of the “project.” Additionally, people managing projects are often referred to as something other than project managers: they may be called team leaders, coordinators, activity managers, or program managers. People managing Reclamation “projects” may be called area managers or facility managers. Because of these connotations, this report distinguishes between Reclamation “projects” and projects as defined in Section 5.1.1 above.

5.1.1.2 A Project vs. an Operation

The operations of an organization are continuing and repetitive activities that are executed to achieve its mission and sustain the business, but without a definable end to their performance, and without a unique output: that is, it is not produced or provided only once. Thereby routine operations are not considered a project and are not managed by project management business practices.

5.1.1.3 A Project vs. a Program

A project differs from a program in that “a program is a group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually. Programs may include elements or related work outside the scope of discrete projects in the program.”^{iv} Furthermore, programs often involve a series of repetitive or cyclical undertakings. In Reclamation, a program is typically a group of projects. Reclamation programs do not have to be specifically authorized, and a program’s schedule may continue past any individual project. Examples of Reclamation programs are the Safety of Dams Program, the Replacements, Additions, and Extraordinary Maintenance (RAX) Program, and the Title 16 Program.^v

However, many of the concepts and principles of PM apply to the management of a program. The quality of PM is greatly influenced by the quality of program management. Participation of program managers in the management of projects as the “sponsoring stakeholder” is critical to PM success. The PMI has recognized the importance of PM in the management of programs and is developing standards for portfolio management and program management.

5.1.2 What is Project Management

“Project management is the process of the application of knowledge, skills, tools, and techniques to project activities to meet project requirements.”^{vi} That application of knowledge, etc., is manifested in performing an interrelated group of processes to manage inputs *to* and produce outputs *from* specific activities. The progression from input to output is the nucleus of PM. Figure 1 illustrates the process groups:

- Initiating
- Planning
- Executing
- Monitoring and Controlling
- Closing

These five processes are interdependent, not exclusive of one another. They also continue throughout a project, varying in intensity as needed; one process does not simply end and the next one begins.

This interrelationship and range of intensity are a function of progressive elaboration. Active and proactive PM is required throughout the duration of a project. It cannot be simply initiated and/or planned and left alone; it must be continually planned, monitored, and controlled. Sustained reactive PM is indicative of incomplete or absent planning and/or monitoring and controlling. PM processes are not project phases; in fact, the processes may need to be repeated for each project phase such as planning, design, procurement, construction, and commissioning.

5.1.3 What is Project Success

Fundamentally, project success is meeting expectations regarding the delivery of the required product, service, or result on time and within budget. Balancing the triple

constraints of project scope, time, and cost to achieve a quality product is illustrated by PMI with Figure 2, sometimes called the “iron triangle.”^{vii}



Figure 2

Cost and time are easily understood, but the role played by scope warrants further discussion. To understand the significance of scope in project success, one must appreciate the relationship between scope and the project objectives. For the scope to contribute to project success, it must be managed to meet the demands of the project objective by providing the required functions; nothing more or nothing less. It is not simply a matter of keeping the scope from creeping, or a matter of completing the cheapest and fastest project; it is establishing the appropriate scope and delivering the commensurate product, service, or result on time and within budget. It is inherent in establishing the project scope that stakeholders are intimately involved in determining the project objective and resultant scope, and are integral members of the project team. The project manager does not operate in a vacuum or independent of stakeholders.

5.1.4 What is a Project Manager

The project manager is the person with the primary responsibility, and delegated authority, for successfully accomplishing the project objectives. This is done by balancing the competing demands for quality, scope, time, and cost.^{viii} Derivative responsibilities include: identifying the project requirements, establishing clear and achievable objectives, and adapting the specifications, plans, and approach to the different needs, concerns, and expectations of the various stakeholders. Fundamentally, the project manager must direct the project from its inputs, through its nucleus, to delivery of its outputs. In order to accomplish these multifaceted responsibilities, the roles of the project manager include that of a leader, administrator, entrepreneur, facilitator, arbitrator and mediator, liaison, and coordinator. The project manager stimulates communication and coordination among team members. To effectively manage these responsibilities and assume these roles, a project manager must have experience in the following PM knowledge areas: project integration, scope, time, cost, quality, human resources, communications, risk, and procurement management.^{ix}

5.1.5 What is a Project Management Plan

A project management plan is the plan for delivering the project. It is a strategic and formalized road map or guide to accomplish the project's objectives by describing how the project is to be executed, monitored, and controlled. It can include a project work breakdown structure; a risk management plan; a communication and stakeholder involvement plan; and a change management plan, among others. It should be created at

the beginning of a project and buy-in and approval from stakeholders and sponsors sought prior to commencement. The plan is then revised throughout the project at significant events (via the change management plan), reflecting the progressive elaborative nature of the project. The project management plan will vary based on size, complexity, risk, and/or sensitivity of the project. Appendix III provides more information on each of the above topics.

5.2 Planning Terms, Definitions and Concepts

The PM Team distinguished between two types of planning:

- The **planning phase** that is a formal, major phase of project development for many projects, where alternative solutions are compared, using factors such as risks, tradeoffs, and ability, to meet needs. This phase of project development is usually followed by the design phase.
- The **planning processes**, described in Appendix III, are carried out by a project manager or team leader at any given project development phase.

5.2.1 The Planning Phase

The **planning phase** in this report refers to “formal” planning studies that can precede a design phase. Not all projects have a planning phase, but instead include planning activities at their initiation. Based on a sampling of numbers of projects resulting in a construction contract, today many, if not most projects, are initiated at the engineering and design phase. Examples are most of the projects authorized under the RAX Program or initiated by the Safety, Security, and Law Enforcement (SSLE) Program.

In its most extensive form, the planning phase of a project can start with a reconnaissance study, proceed through an appraisal study, and be completed with finalization of a feasibility study. Feasibility studies require specific authorization by Congress. Non-construction or nonstructural projects may also use a planning phase where alternatives are developed and evaluated against a set of criteria to identify a preferred course of action to complete a project or satisfy a given set of needs.

5.2.2 The Planning Process

On the other hand, the **planning process** in this report refers to a PM process that defines and refines objectives, and plans the course of action required to attain the objectives and scope of what the project was undertaken to address. This planning usually includes such things as a communication plan, a monitoring plan, and sets baseline schedules and budgets, among other things.

6.0 Methodology

To carry out the Phase I work of evaluating PM in Reclamation, the PM Team compared PM in Reclamation today with PMI's PMBOK Guide and private industry practices and used the comparison to identify potential areas for improvement.

Although Reclamation is still organized largely along functional (planning, design, construction, O&M) lines, the PM Team's analysis focused on how Reclamation currently develops projects from inception to completion, wherever they are initiated, executed, and completed within the organization. This approach focused on the progressive elaborative nature of projects and the "hand-off" of a project from one phase to the next, rather than focusing primarily on how functional offices (e.g. a design office or construction office) handles PM.

The PM Team members collected information largely by conducting interviews with a cross section of Reclamation managers and staff, following an outreach plan, Appendix I. A complete inventory of Reclamation's current practices was not attempted or considered necessary to meet the objective of Phase I. Interviewees were people involved with executing the planning, design, construction and operation, and maintenance phases of projects. The PM Team members also applied their own experience to this topic.

People in peer groups such as other agencies and private firms were also interviewed to provide a basis for comparison of their practices, problems, and successes. The contacts were made pursuant to the PM Team's outreach plan.

Interviews were conducted informally and the results combined to identify trends and ranges of practices and experiences (see Appendix I). Reclamation PM practices were then generally compared to those recommended by the PMI and successful practices found in peer groups.

Sections 7.0 and 8.0 summarize the PM Team's findings on PM in Reclamation. Section 9.0 summarizes the findings and needs. Appendix IV presents the PM Team's findings on today's PM during the Planning Phase. PM during the Design Phase is found in Appendix V, with PM in Reclamation's Technical Service Center found in Appendix VI. Appendix VII presents PM during today's Construction Phase of projects, while Appendix VIII covers PM in the Operations and Maintenance Phase. PM in Reclamation today was further addressed by analyzing the Safety of Dams, RAX, and SSLE Programs. These programs recently have been significant sources of design and construction type projects. Details on these programs are presented in Appendix IX.

The interviews with representatives from private industry are summarized in Appendix X. In summary, the most salient responses from these discussions focused on (1) a project's integrated and iterative nature; (2) the need for active and proactive PM, continuous assessment, and its subsequent requirements, tools, techniques, and skills, including deconstructing the project (Work Breakdown Structure) before it starts; (3) the necessity for a project manager's responsibility, authority, and leadership throughout the complete life of the project; and (4) to create an organizational structure that enables a project team to function.

There was a high correlation among the feedback from these interviews in terms of philosophy, strategy, and methodology. Several significant concepts and understandings were elicited. All respondents were aware of the PMI and the PMBOK Guide processes and expressed a consensus with its methodology, terminology, and recommended practices. The PM Team did not evaluate the quality of PM performed by private industry in the performance of work for Reclamation.

7.0 Project Management in Reclamation

This section summarizes the PM Team’s findings on the general status of PM in Reclamation. Specific findings and needs are located in Section 9.0 and Appendixes IV through X.

7.1 Reclamation’s Changing Responsibilities and Organization

Issues being posed to Reclamation today cover a much broader range than in the past and Reclamation’s approach to managing issues has changed in response. Historically, much of Reclamation’s efforts were focused on water resource **development**, resulting in the planning, design, and construction of major infrastructure. Today, Reclamation’s focus is on the efficient and effective **management** of those water supplies and related resources. As a result, Reclamation’s organization and methods have evolved to meet the new needs.

With the evolution of its mission, many of Reclamation’s formal, highly-structured, decision, planning, design and construction processes were sunsetted in the 1990s. These processes had been developed by Reclamation and fine tuned over many decades. During that time, Reclamation also reorganized from a highly centralized organization to a more decentralized form, with the creation of area offices and the conversion of the Engineering and Research Center and the Assistant Commissioner Resources Management to the Reclamation Service Center. As a result, Reclamation’s PM processes have become much more dependent upon the individuals leading the efforts in “field” offices (their training, experience, strength of personality, and instinct) at lower levels in the organization, instead of upon the written prescribed processes carried out strictly by chiefs of functional offices in Denver or Regional offices (e.g. planning division, design division, O&M office).

Although more decentralized, Reclamation is still organized principally along functional lines. Reclamation is transitioning from a strictly functional-based organization, illustrated in Figure 3, where the project coordination is carried at the functional manager level, to a balanced matrix organization, illustrated in Figure 4, where a project manager is in a functional group.

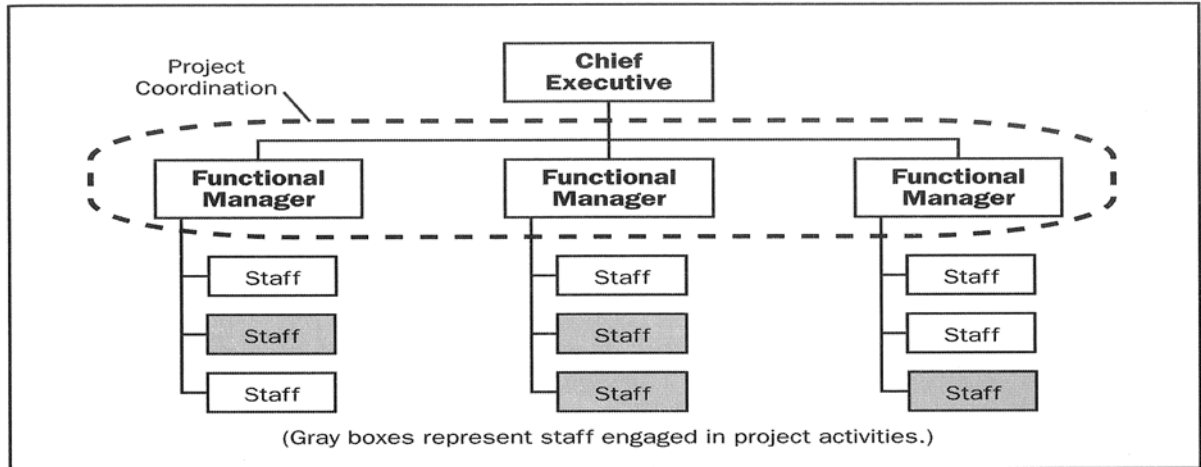


Figure 3^x

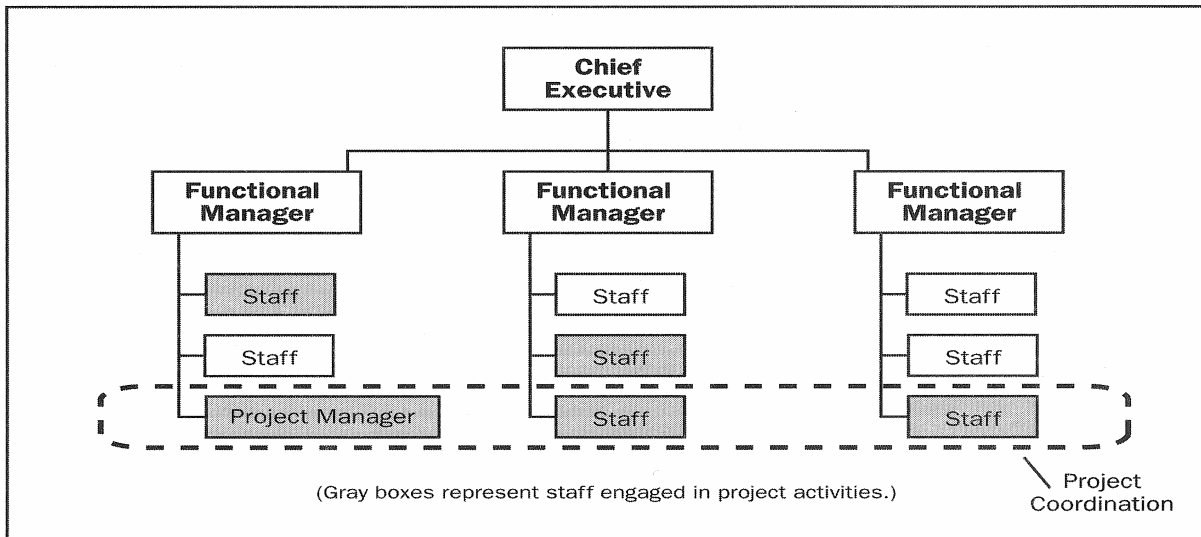


Figure 4^{xi}

In some cases, this shift in the organization and processes has been successful, resulting in greater flexibility and adaptability in addressing the unique and varied circumstances that Reclamation managers face today. In other cases, this transition has been a challenge, creating a disconnect between project phases leading to procedural problems such as skipping key steps in a project and overlooking key players.

Despite the challenges that Reclamation has faced, most interviewees acknowledged that the previous organizational structure used for the project execution would now be cumbersome, time consuming, and at times inappropriate because many situations are unique nowadays; most project are much smaller and of much shorter duration than in the past. They indicated that Reclamation’s processes, policies, and guidelines need to be timely, adaptive, and flexible to be able to address the wide range of issues Reclamation deals with today and in the future.

7.2 Origin of Projects in Reclamation

Understanding the origin of projects in Reclamation, can help in the understanding of how it manages projects. The origin of all projects carried out by Reclamation is a Congressional Authorization. These can be project specific, by project phase (e.g. Feasibility or Construction), or in the form of a broad program that spawns many projects. For example, the RAX program, which is a Reclamation program budget line item, has thousands of projects under its purview. The Safety of Dams Program has many projects under its umbrella authorization. In another example, the Central Valley Project Improvement Act (CVPIA) Program is a collection of hundreds of specific projects with over 90 stakeholders. Even projects that have completed a planning phase require a specific authorization to initiate design and construction. Reclamation also manages projects authorized and partially or fully funded by other parties such as power customers, water districts, local municipalities, other agencies, and environmental interests. A Reclamation project manager must abide by any directives and conditions set by Congress in its authorization language.

7.3 Use of Project Management

It is clear from the interviews that the five regions and the TSC have differing guidelines to determine when to use PM. But many interviewed agreed that everyone could benefit from at least a check list of factors and considerations to take into account when deciding when to apply PM to an activity. It was recognized that Reclamation still knows how to get projects through the design-procurement-construction phases, but integrating other factors such as environmental compliance and public involvement by other parties brings on the need for more PM techniques.

When to use PM, and at what level in a program, or a project, is complicated in many cases by a program that is so broad that it encompasses numerous projects. Some programs, like the RAX Program, are made up of multiple projects administered by the regional office. In some regions, managers of RAX Program line items are required to use PM. In other regions, no formal PM processes are required. In another example, the CVPIA program application of PM techniques has evolved from a strongly integrated system to one that is loosely integrated.

Some interviewees mentioned that a factor considered in determining when and how to apply PM was the extent of integrating PM processes with other entities. For example, such integration can effectively be used to leverage additional resources from those entities to benefit projects and add flexibility. Also, program offices can be valuable in providing certain PM functions and resources, such as organizing public involvement events, which takes much of the burden off of the individual project managers.

7.4 Assignment of a Project Manager and Responsibility

The delegation of responsibility from Congress to the Executive Branch of the Federal Government, and to and through Reclamation for a specifically authorized project, a

program consisting of many projects, or a project under an umbrella program is a significant factor in the success of Reclamation's PM. Pairing up a project manager's knowledge and skills in a particular functional organization with a particular project is an on-going challenge for Reclamation.

The responsibility for assignment of project managers follows the authority for program and budget execution. Sometimes the organizational location of this responsibility will shift, depending on the project phase. For example, if an area office has the budget authority for completing a RAX item, the project manager is usually assigned in that area office. However, for larger projects the management often shifts from a planner to a designer to a construction engineer. The significance of this is that in the majority of the programs, project responsibility is assigned to the area offices or to a functional office within a region. Also, the degree to which PM is applied to projects is determined by the area manager or regional functional manager. These managers decide, to the extent that they understand the principles of PM, to what degree the full array of PM practices will be applied.

In the majority of projects, a staff member is assigned to shepherd a project through the planning, design, procurement, and construction phases, whether they are called project managers or not. Using project managers from the TSC is considered, but interviewees stated that they prefer a project manager closer to the geographic location of the activity, the local stakeholders, and the local responsible program manager. It is thought that knowledge of local conditions, laws, culture, practices, history, etc., is important in selecting a project manager. Some of these opinions were based on experiences with remotely located project managers. Several interviewees said that they could benefit from a list of factors to consider when selecting a project manager, as well as a list of factors to consider for when to use PM. It was recognized that the TSC needs to continue assigning design team leaders when they are called upon to perform significant phases of work.

Absent a clear assignment of a project manager or project engineer and commensurate responsibilities to that individual, a functional manager, or group of managers (e.g., functional section chiefs, branch chiefs, etc.), takes on these duties by default, or by specific assignment because of their position in an organization, not because they necessarily have PM skills. It is the Reclamation culture to assume that the PM responsibility is derived from the organizational structure. However, most Reclamation offices are now organized as functional matrices, i.e., there are very few "project offices," and projects are accomplished using resources from many different functional offices. Many projects use resources from the TSC, the region, and the area office. This mixed bag of organizational managers and project managers is a strong indication of Reclamation transitioning from managing projects from a strictly organizational orientation to one based on a matrix.

Even given that an organizational manager might be responsible for a project, many cases were cited where at any point in time it was not clear who was the project manager, i.e., who was in charge; were the PM responsibilities delegated, and if so, what were they

responsible for (e.g., just design, environmental compliance, etc.). The responsibility and authority for assigning and supervising project managers and their scope of work and authorities needs to be clearly defined in a Reclamation policy.

For major programs with significant involvement by other organizations such as CVPIA, Cal-FED, and rural water, the assignment of responsibility needs to be clarified. For example, in CVPIA, PM responsibilities are shared by both Reclamation and U.S. Fish and Wildlife Service project managers. For a number of rural water projects, even through non-Reclamation entities have the PM lead, Reclamation managers reported that a staff member assigned as Reclamation's point of contact should have PM skills so they can relate better with the non-Reclamation project manager.

The survey also found that currently, people in the role of project managers are found throughout the organization. When asked where a project manager should reside, most interviewees stated that, at this time, it was hard to find a project manager with proven skills anywhere in the organization. Thus, it is much more important for a project manager to have good skills regardless where they reside. The second priority to having experienced project managers was that the project manager was located as close to the project as practical, preferably in the same state, as the project.

7.5 Understanding of Responsibility

The sampling of Reclamation managers found that the understanding and use of PM varied widely across the agency and was applied inconsistently from one part of the organization to the next. There is confusion over the meaning and definition of the terms “project” and “project manager” relative to a Reclamation project and a program manager.

Also, the survey found that universally, the application of PM, particularly the use of PMBOK Guide or PMBOK Guide based information, was initiated at staff level, based on staff knowledge and experience (bottom up), rather than from a management directive. There is an express need for management to establish their expectation with regards to the use of PM and evoke the creation of business practices, guidelines, and policies which address and support the use of PM.

More interviewees than expected had heard of the PMI and PMBOK Guide standard, but few outside of the TSC had a thorough knowledge of it and even fewer had “practice” experience.

In most cases, technical people on a project team needed a minimal level of understanding of PM to understand the role and responsibility of the project manager. There is also a call for guidelines on the minimum responsibilities one should have to be an effective project manager. Some offered that control of two out of the three following factors is essential: scope, schedule, and/or budget. This is more important when large program offices, such as the CVPIA office, are involved and have strong control over the integration of project budgets and the allocation of funds.

Even with an understanding of PM responsibilities, it was found that many project managers are not given the time it takes to perform any more than the bare minimum of activities.

7.6 Current Practices

The range of experience and current practices varied widely from region to region and from office to office within some regions. Currently, there are few people in Reclamation who have a full understanding of PM, let alone years of experience, practice, or certification. In most cases, their expertise in PM was incidental, although very useful, to their position description responsibilities, except perhaps in the TSC and in the IT functions. Development and use of PM practices has arisen from the staff level of the organization up. There is a need for management to establish clear policies and expectations on the use of PM.

Guidance is provided for design and construction in the Reclamation Manual. In recent years, additions have been made to the Reclamation Manual that define roles, responsibilities, and processes for design and construction. These provisions may be found at the following web sites: <http://www.usbr.gov/recman/fac/fac03-01.pdf>, <http://www.usbr.gov/recman/fac03-02.pdf>, and <http://www.usbr.gov/recman/fac03-03.pdf>.

7.7 Use of Project Management Plans and Tools

The most widely used PM tool was scheduling software programs (MS Project and Primavera). Although these programs are widely used internally, their full capability in a number of areas could be exploited to a much greater advantage. For example, schedules are used in a limited way for setting a baseline schedule agreed to by all parties and then tracking progress from that baseline and reporting progress relative to a clearly identified baseline. However, while MS Project is a great planning tool, and Primavera is great for managing construction in a project oriented organization, it was reported that neither one is very good at integrating cost and schedule in Reclamation's matrix environment. Earned Value Management has been the best tool to date for integrating cost and schedule using Reclamation's current finance tracking systems.

Float (time reserved for unknown delays) is rarely planned for up front and managed throughout the project. Further, there were very few cases found in the survey where a specific amount of float was identified up front as a contingency and responsibility for applying float established (e.g., the project manager could approve application of up to five days of float; more than that had to be approved through a change control process). In addition, the interrelationship between and tying float to contingency funding were rarely accounted for. Change management plans were also rare. It was reported that schedules should be used to a much greater extent for looking ahead, identifying unfolding risks, and proactively managing projects and changes.

OMB Circular A-11, Part 7 (Section 300), requires the preparation of a Capitol Asset Plan for all capitol assets. Included in the Capitol Asset Plan is a requirement to use

Earned Value Management to integrate cost and schedule. The TSC and Dam Safety Office used Earned Value Management to integrate cost and schedule and to determine timely and accurate project status reports. Consideration should be given to establish agency guidelines and tools for using earned value to monitor and control large projects and highly integrated projects.

Many interviewees cited the Dam Safety PM Guidelines as the “standard” that they were most familiar with and suggested that it be integrated with PMBOK Guide so that it would be usable for any type of project.

The PM Team found that outside of the Safety of Dams Program, specific, focused risk analyses and the development of subsequent risk management plans are rarely performed. Risk assessment is generally seen as incidental, or done in hindsight, whether for technical risk or for project risk (e.g., schedule and cost risk). It was recognized that smaller, more routine projects do not merit risk management. However, it appears that most projects would benefit from even a cursory, structured analysis during project initiation.

7.8 Continuity of Project Management

Predominantly, project activities are still provided by different functional offices during the planning, feasibility, design, authorization, National Environmental Policy Act compliance, budget development, stakeholder involvement, real estate acquisition processes, and construction. In many cases these activities are not well integrated for larger projects.

7.9 Interaction with Stakeholders

Numerous cases were cited where Reclamation spent considerable resources over many years (e.g., time, funds) to periodically and proactively meet with, update, and include non-Reclamation parties in project progress. In some recent cases, the stakeholders concurred that these activities should be curtailed due to reductions in federal budgets. However, these stakeholder involvement programs, although successful, are yet to be integrated into a PM plan where the outputs could be more specifically used in the monitoring and controlling processes. Yet the NAS Report criticized Reclamation for not involving its stakeholders enough in decision making and PM. Reclamation needs to integrate stakeholder involvement into our PM policies and guidelines.

8.0 Project Management Training in Reclamation Today

8.1 Standards

The PM Team was not able to find any Reclamation requirements for project managers to be trained or certified, except in the information technology area. Office of the Chief Information Officer Directive 2004-019, issued on June 23, 2003, established a

Department of the Interior standard and certification requirements for the Project Manager of Information Technology major and non-major investments. This directive can be found at <http://intra.do.usbr.gov/usbrit>. The directive bases the PM standard on the PMBOK GUIDE and the PM certification on the PMI Project Management Professional.

The Office of Management and the Budget (OMB) required reporting the name, role, and qualifications of the project manager(s) assigned to manage capital asset planning, budgeting, and acquisitions. This information is required per OMB Circular A-11, Part 7, dated July 2003, Form 300, which OMB uses to evaluate if the agency has “employed the disciplines of good PM, represented a strong business case for the investment, and met other Administrative priorities. . . .”

Also, the OPM has issued *Interpretive Guidance for Project Manager Positions*. Although it focuses on information technology manager positions, the information is useful for other types of PM positions. It contains the Office of Personnel Management’s view on the project manager function government wide, identifies a common set of characteristics for project managers in all occupations, clarifies existing policies concerning certification, and provides agencies with guidance on using organizational or functional titles to identify project manager positions other than information technology positions. This document can be found at www.opm.gov/fedclass/PM.

For many project managers in Reclamation today, Contracting Officer’s Representative (COR) training is mandatory. This is because of the vast amount of contract work that is done in the execution of the planning, design, and construction phases of projects and because of the requirements of the Federal Procurement Regulations for CORs.

8.2 Current Training Practices

The PM Team found that those who understand the nature of PM think training in PM is a good investment for Reclamation because of the resulting efficiency expected if the training is actually applied. Across Reclamation, a wide range of training has taken place from absolutely no training, which is a reflection of lack of understanding of PM, to comprehensive training and certification.

Some regions have conducted region-wide training on PM for planners; in one region it is mandatory. This training has also incorporated some aspects of federal planning requirements, primarily on the Water Resource Council’s *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation*, March 10, 1983, and environmentally related statutes such as the Clean Water Act, National Environmental Policy Act, and Endangered Species Act.

For people performing PM activities in the design, construction, and O&M phases, the PM Team found no region-wide training efforts. For the most part, regions rely upon on-the-job training from experienced project managers. A few area managers have provided training for their staff performing PM activities. In general, individuals involved with

construction management currently have obtained PM skills by practicing in the field. This is the traditional Reclamation method for acquiring skills in these positions. Specific PM training is lacking for construction managers. The individual or individuals often have to learn this by trial and error, wasting a lot of time seeking information. A more structured training, development, and mentoring program would aid these individuals in achieving results.

8.3 Training Sources

All of Reclamation's regions have utilized individual outside vendor-produced training classes. In addition, almost every region has initiated specific training activities for project managers that provide a consistent understanding of the processes or terms used by project managers within that region. However, to date, there is no consistent training for project managers from one region to the other throughout Reclamation.

Most regions were aware of the PMI and their offerings, but only a few individuals have taken any classes from or sanctioned by PMI. One of the region-wide training classes was presented by a PMI-sanctioned firm.

9.0 Findings and Needs Assessment

9.1 Findings

9.1.1 Findings About the Organization

- PM is a “business philosophy and a business practice” not yet adopted across all of Reclamation. Currently, PM is being implemented at the staff level of the organization, not as a result of a management directive.
- PM is not a consistently well understood process across Reclamation and has not been seen as a priority by management, except when projects are high profile.
- PM is not consistently practiced (approaches, solutions, and policies) across Reclamation. This has been characterized as being flexible, but has also lead to problems in some areas such as inconsistent communication with management and stakeholders.
- The success of a project manager in Reclamation has significantly more to do with their skills and knowledge of the context in which a project is to be carried out, then on where they reside in the organization.
- Utilization of matrix style organization structures to accomplish work requires stronger generic PM than vertical line type organizational structures.

- Some regions have criteria for determining when and what type of project manager to assign.
- The location of the project manager varied from “in house” for larger area offices to “centralized” in the regional office.
- There are only a few recent cases where a project manager has taken a project from inception to completion; rather, projects move from one phase to another along functional lines.
- Many functional managers saw the use of a project manager as a good investment and many, looking back on past projects, indicated that a project manager would have paid for itself.
- Each region identified a number of projects that were successful largely due to the use of PM practices and a strong interest from upper management and non-Reclamation interests. In general, the team found that in any case, when a project manager is assigned, a project is more successful. However, there is significant room for improvement, particularly in the initiating, integration, and closing processes.
- For larger, complex, and/or risky projects or groups of projects, there is a strong demand across Reclamation for experienced professional engineers with PM skills. A number of organizational managers in area offices stated that if they could trust that a project would be managed expertly, they would prefer to entrust larger more complex projects to an experienced project manager so that they and their staff could be freed up to focus on their operation and maintenance responsibilities. These same organizational managers also expected that having a project manager would result in good and timely feedback, status reports and risk management.
- However, managers very much wanted a say in who manages their project and how a project is managed (i.e., buy into a PM plan that will actually be used) because there is a lack of trust that just because someone is titled a project manager they may not be able to carry out the responsibilities effectively.
- It was seen that applying more PM processes could add efficiency. For example, a new engineer to an area office may understand design, procurement, and construction conceptually, but be very inefficient in moving a project through that office or may be unaware of the region’s specific process. They may not be effective in making sure all of the components of a project are integrated in a timely fashion. PM skills would teach them that an up-front PM plan, based on agreed to process inputs and outputs, would lead them to linking all of these things together, rather than discovering them as they move through the process. For example, finding out on the eve of a solicitation that a certain permit is needed before a contract can be advertised can add weeks or months to a

schedule. This could have been easily predicted if a PM plan/schedule was developed up front.

- The large number of discrete projects that are a small portion of an overall larger project with many components that come to the TSC requires almost everyone to be engaged continuously in the management of one or more projects. This requires careful attention to assure that individual employees' time and non-labor costs are being charged to the correct account. Considerable effort is required to establish each job in the management system and to monitor expenditures against the budget.
- The ease, speed, and informality of obtaining an agreement with the TSC for services are a major advantage for both the program managers (clients) and the TSC. The program managers (clients) are able to obtain services in the desired quantity with the flexibility to request changes without the administrative burden of a formal contract subject to the Federal Acquisition Regulations. However, with that ease comes the possibility that the statement and scope of work are not fully thought out, documented, and understood by all parties. There is also the possibility that planning will be neglected and budget estimates will be hastily produced. All of these factors can lead to unfulfilled expectations.
- The TSC staff is motivated to provide high quality engineering and scientific work. The staff also has a good understanding of the importance of good PM in a service organization. It is a continuing challenge to provide the appropriate PM tools to allow teams to be successful without creating the impression or the reality of burdening the team with PM exercises that do not improve project outcomes. In the TSC, Team Leader Forums are being held to further support team leaders and highlight new tools, forms, and lessons learned that are periodically posted on the TSC PM web page.
- The perceptions of the clients and the clients' stakeholders of the service provided by the TSC regarding cost and schedule (PM related items) are not fully understood by TSC staff and management. Many in the TSC believe that most work is completed within agreed upon schedules and budgets and client dissatisfaction is rare. Historically, there has been less effort focused on managing change (i.e., defining scope, cost, and schedule impacts to the client).
- Offices throughout Reclamation have experienced an increasing number of problems in various phases of RAX projects such as poor control over scope of contracted work, poor cost estimates, poor communication and coordination, poor construction management, poor specifications, poor planning for environmental compliance, etc.
- Issues arising regularly on new RAX projects and the effects on facility operation are many such as cost overruns, poor contractor performance, poor customer satisfaction, poor planning, etc.

- Initial justifications for RAX projects are often lacking in depth and supporting test data and documentation as to the need for the project. This can result in errors in work prioritization and intense scrutiny by customers.
- In some cases, projects seem to lack continuity in the start-to-finish cycle. “Ownership” is not clear: e.g., is this an area office project or a construction office project? There is no single project manager from conception to completion. Likewise, when a project is completed, there is often a lack of feedback to the designer on lessons learned or a formal project close out.
- The example of how the U.S. Army Corps of Engineers (Corps) implemented PM (in a centralized manner) was cited, but those familiar with this function said that the Corps model should not be applied and is not suited for Reclamation.

9.1.2 Practice of Project Management

- The understanding of and use of PM in Reclamation ranges from those who have not heard of it to certified PM professionals and others who have practiced it for years, whether certified or not. More functional managers than expected had heard of PMI and the PMBOK GUIDE, but few had practice experience.
- Almost all project managers’ expertise is incidental to their position descriptions except perhaps in the TSC.
- There is confusion over many PM terms such as “program management” versus “project management.”
- The full range of PM tools and techniques, as summarized in the PMBOK Guide is largely untapped by Reclamation project managers.
- Scope management through a formal change management process (connecting the initial scope with the end product) needs to be better managed.
- Documenting projects throughout their life, but particularly at close out, needs to be improved. Documentation cannot only provide past history (institutional memory) on a project when personnel changes, but can also provide future knowledge as to techniques that were useful in different situations, e.g., “lessons learned,” whether it be decisions on scheduling, budget, or how to get to a decision.
- Reclamation has spent considerable resources involving stakeholders over time, but it has not been enough. In addition, in a number of cases management is not kept aware of the status of a project. Better communication plans and better integration of communication into the change management process is needed.

- PM of smaller projects seems to be working well because the work is simple and involves a small number of parts of the organization.
- Reclamation does not have a formal or informal network or clearinghouse for PM processes and tools or for locating project managers.
- In many areas, budget constraints and performance have been identified as a constant area of weakness. With the limitations on budget today, this presents difficulty in accomplishing the project. These budget limitations and budget drains are requiring project managers to spend more time on managing the budget and less time on managing the quality and timeliness of the team's products.
- When projects were not going well, several factors were found to contribute to this poor performance: the project manager does not have control of staff resources or the ability to prioritize their time, or priority in the specific office or region is not there.

9.2 Needs Assessment

In addition to the above, the PM Team also found that the following needs were identified in its assessment of PM in Reclamation today.

9.2.1 Organizational Needs

- Reclamation needs to realize that the academic discipline of PM is no longer a “soft” science but is now an American National Standards Institute (ANSI) standard (ANSI/PMI 99-001-2004). The knowledge, skill, and ability of PM should be considered no less important than its science and engineering disciplines as they relate to the success of our agency's mission.
- PM expectations and performance standards need to be addressed by the upper most management of the agency.
- Implementation of a policy on management's role in project sponsorship is needed. Stakeholders and area managers with an understanding of what is required for project success would assist in enabling a project manager to implement project processes.
- Reclamation should focus on developing a project manager's skills and experience before considering, if at all, where to place a project manager in the organization.
- PM needs to occur at all levels within the TSC, regional, and area offices.
- Project managers with good skills and authority to solve project problems in real time are needed to improve the rate of completing successful projects.

- Both project managers and the managers above them need to be provided with an appropriate level of PM training. Ongoing continuing education requirements for both project managers and the line managers above them need to be established and met.
- Corporate management, top to bottom, must actively support the establishment and implementation of PM standards, project manager qualifications, and the need to and methods to integrate projects and their project managers into the overall program.
- Communicate standards and practices to our partners and stakeholders. Address the involvement of other entities in a federally-funded project and whether or not they would have to adhere to Reclamation's PM standards and directives. Ensure that any directives and standards (which were identified as needed) would be applicable to the wide range of projects and stakeholders that Reclamation is engaged with today.
- Establish benchmarks as a PM tool, particularly for a question and answer check in the initiating and planning process
- Provide great flexibility to choose when to use a project manager and which project manager. For example, many smaller projects can continue to be handled in house by an engineer with concurrent PM duties, although it was recognized that some training in PM would be a real benefit. The majority of projects handled at the area-office level fall into this category and although individually small, add up to a considerable investment in resources.
- Make the PM directives and standards applicable to any project for which it would be suitable; do not restrict the use of PM to design and construction projects.
- Give project managers the time to do it right. This involves a bottom up planning approach to building the project plan, schedule, and budget. Do not agree to unrealistic externally constrained budgets and schedules.
- PM skills must exist within construction management organizations and a variety of other organizational areas where construction type projects are planned and prepared for ultimate construction.
- Since the training and experience of those in the TSC that are assigned PM responsibilities are predominantly in the technical areas, continued emphasis on the PM aspects of the work is needed in order to strike the right balance.

- Continue, and expand to, areas outside the TSC, the Team Leader Forums being held to further support team leaders and highlight new tools, forms, and lessons learned that are periodically posted on the TSC PM web page.

9.2.2 Project Management Practice Needs

- Communication management and integration is needed with both internal and external clients, stakeholders, and other interests. For example, more information is needed on construction regarding real time information on costs as well as potential scope and scheduling impacts.
- Include change control plans on many more projects. This includes effective means to ensure that management is made aware of situations where they need to step in and provide assistance and direction or situations where they need to stay out of the way.
- The TSC needs to more closely link actual performance with client perception through improved feedback and monitoring processes.
- Improve the project close out process.
- More focus on PM or accomplishment reporting in Reclamation, improved quality control and quality assurance, and more attention placed towards a “lessons learned” approach for increased learning and feedback.
- Continuing efforts are needed to improve the management of issue evaluations performed by the TSC that may lead to modifications.
- Need to better developing and integrating the scope, budget, and justification for RAX and other projects.
- The integrated scope, justification, and budget needs to be better communicated throughout the process.
- Need better depth, a more detailed description, and supporting test data and documentation for RAX justifications.
- Plan sufficient time for completing environmental compliance and permitting required for RAX projects.
- For RAX projects, the following needs were identified:
 - Identify the required level of experience for designers at the initiation of the project and make every effort to fill the design experience during execution, or provide good oversight for designers who have little to no design experience on the equipment at hand, where this is a “first-time design.”

- Identify the required level of experience for overseeing design and construction at the initiation of the project and make every effort to fill the experience during execution, or provide good oversight for the staff available.
- In developing a PM plan, provide designers with up-to-date design standards, standard and typical drawings, and specification guide paragraphs or guide specifications for common equipment.
- In developing a PM plan, provide designers guidance on how to deal with Occupational Safety and Health Administration, National Fire Protection Association, etc., requirements that affect the design/specification of equipment.
- Integrate procurement planning into the PM plan and ensure that everyone on the team, including designers, is involved, as necessary, in the execution of procurement planning.
- The costs associated with doing quality construction management, adequate and qualified inspection, and contracting need to be estimated adequately and incorporated in the original planning to minimize any push to drive down costs for “administration” resulting in little to no oversight.

In other cases, such as the rural water program in some areas, local agencies (water districts, city governments, Native American tribes, etc.) have the PM responsibility and Reclamation provides oversight. Reclamation managers engaged in these types of relationships report that their staff would benefit from greater PM skills so as to be able to oversee and better relate to the local entities and their architecture and engineering firms who have the lead.

10.0 Conclusions and Recommendations

Through the needs assessment, the PM Team validated the three NAS findings presented in Table 1. Thus, the PM Team recommends that Reclamation diligently implement the practice of sound PM for all work that meets the definition of a project. A clear mandate from management (Reclamation Leadership Team) is necessary to ensure successful implementation. Therefore, the PM Team also recommends that Phase II be completed.

List of Acronyms

Action Plan	<i>Managing for Excellence, An Action Plan for the 21st Century</i>
ANSI	American National Standards Institute
COR	Contracting Officer's Representative
CORPS	U.S. Army Corps of Engineers
CVPIA	Central Valley Project Improvement Act
NAS	National Academy of Sciences
NAS Report	<i>Managing Construction and Infrastructure in the 21st Century, Bureau of Reclamation</i>
NRC	National Research Council
O&M	Operations and Maintenance
OMB	Office of Management and Budget
PM	Project Management
PMBOK	Project Management Body of Knowledge
PMI	Project Management Institute
PM Team	Project Management Team
RAX	Replacements, Additions, and Extraordinary Maintenance
Reclamation	Bureau of Reclamation
SSLE	Safety, Security, and Law Enforcement
TSC	Technical Service Center

Appendices

Appendix I – Outreach Plan

Appendix II – Summary of Interviews Conducted

Appendix III – An Introduction to Project Management

Appendix IV – Project Management in the Planning Phase

Appendix V – Project Management in the Design Phase

Appendix VI – Project Management in Reclamation’s Technical Service Center

Appendix VII – Project Management in the Construction Phase

Appendix VIII – Project Management in the O&M Phase

Appendix IX – Project Management in the Safety of Dams, RAX, and SSLE Programs

Appendix X – Biographies of Project Management Team Members

Appendix I

Outreach Plan

I. The purpose of the Project Management (PM) Team’s Outreach plan is as follows:

- a. Survey Reclamation to identify where it is today with using project management best practices, tools and staff to establish a baseline.
- b. Survey how Reclamation currently carries projects from planning, through design and construction to operations and maintenance (O&M).
- c. Identify areas that could benefit from PM.
- d. Learn how others instituted PM in their organizations.
- e. Gather information that can be the basis for training recommendations.
- f. Gather information that can be the basis for directives, standards and guidelines or using project management in Reclamation.

II. Methods – The Project Management (PM) team has divided up the work of gathering information from people internal to Reclamation to meet the objectives above as follows. See attached list. This information gathering will be in two phases. The first phase is to develop a baseline of where Reclamation is today with instituting PM in Reclamation and how this relates to non-Reclamation practices. All outside-to-Reclamation contacts will be by verbal discussions with appropriate knowledgeable representatives. No paper or other types of survey methods are envisioned at this time. The second phase will be to get feed back on proposed training, best practices and directives and standards for Reclamation. A very important part of the second phase is to gain acceptance by a critical mass of Reclamation leaders that using PM will add value to their projects and programs. An “Introduction to Project Management” and perhaps other documents will be used to introduce the concept. A similar approach will be used to seek input from and feedback to “peer” groups, A/E’s and other external organizations.

Contacts with Reclamation staff are generally divided up as follows among team members:

Kerry McCalman – Operations and Maintenance, Power and RAX

Rick Ehat – Construction and Program Leads and Engineering and Design (E&D) for Upper Colorado Region (UC)

Lauren Carly – Construction, Program Leads, and E&D for MP Region (MP) and Program Leads, E&D for Pacific Northwest (PN) and Great Planes Region (GP)

David Palumbo – Program Leads, and E&D for Lower Colorado Region (LC), O&M (assisting Kerry).

Alan Candlish – Planning through out Reclamation

Contacts with Outside Interests are generally divided up as follows among team members:

Lauren Carly – Corps of Engineers, Central Valley Project Water Users Association, Sacramento Municipal Utilities District, Glenn-Colusa Irrigation District and Executive sponsored meetings with national level stakeholders.

Rick Ehat - Executive sponsored meetings with national level stakeholders and select local A-LP Project stakeholders.

Rick Ehat and David Palumbo – Private Industry Groups

Kerry McCalman – Non-Reclamation Power interests.

III. Documents – The team is developing the following documents to use in out reach activities, at different stages.

Introduction to Project Management, Introduce people to Project Management terms, definitions, concepts and practices.

One-Page Briefing Paper – Purpose and status of the team’s work and desired outcomes of the outreach. This would put the team’s work in context for stakeholders to use to organize and direct input to the team.

Draft Report (Phase I) of Findings on Reclamation’s Status of Using Project Management (Phase I)

Draft Report (Phase II) Recommendations on means and methods for Reclamation to improve its processes for Project Management.

Others developed as needed.

IV. Meetings and Schedule – In addition to one-on-one phone calls and “interviews” with Reclamation staff, as indicated above, the team would make use of the following executive sponsored meetings:

July – Rick Ehat and Lauren Carly would present the team’s status and findings to date and “next steps”. A break-out session may be useful to provide for more in-depth discussion about how stake holders see Reclamation’s use of Project Management and to get input on their use of PM.

September – October - Rick Ehat and Lauren Carly (and maybe Palumbo) would present the team’s status and findings to date, feedback on the Phase I report and may have the draft Phase II recommendations for Reclamation to improve its processes for Project Management available for outside review. A break-out session may be useful to provide

for more in-depth discussion to get stake holders input on the team’s initial draft recommendations for Reclamation’s use of Project Management.

V. Web Site – The PM team expects to post documents at the appropriate Reclamation web pages and would welcome input through the Reclamation Internet page from outside interests from comments on draft documents and general comments.

The team also developed a comment and feed back sheet to use at public meeting break out sessions, attachment 1, to give the public another means to provide input.

Outreach List of Potential Contacts (Others may be contacted as needed)

1. A-E

- a. Roger Langille
Director of Projects
CH2M Hill Power

Mr. Langille has been the project manager, construction manager, and project director for multiple EPC power generating plants, petrochemical/chemical manufacturing facilities, food processing facilities, mining facilities among others for JA Jones Process and Industrial Group and Lockwood Greene Engineers. More importantly for our purposes, he oversaw the institution of project management practices and the merging of design and construction activities for these two companies owned by their parent company, The Jones Group. Mr. Langille’s tenure with this company and its successor company, CH2M Hill, has been for 25 plus years.

- b. Richard Capp, P.E.
Project Manager
Parsons Water & Infrastructure, Inc.

Mr. Capp was the Project Director for PBS&J under contract with the City of North Las Vegas to supply design and construction management services for the City. From my understanding, this arrangement to supplement/replace City staff was not successful; I believe the contract was terminated and the City went back to direct hiring. From this point of view, I thought he may be a good candidate. Also, he currently is the Project Manger for water conveyance and treatment projects in Southern Nevada specifically working with Southern Nevada Water Authority (SNWA).

- c. George Kunberger, P.E.
Executive Vice President
Jacobs Engineering and Construction

As with Mr. Langille, Mr. Kunberger has functioned as a project engineer, project manager though vice president for Jacobs, a firm that supplies professional technical services, including all aspects of engineering and construction, and operations and maintenance. Project management is one of his primary focuses which has allowed his successes with Jacobs.

- d. Contact TBD
Fluor Corporation

Fluor provides EPC and maintenance services to the energy, electronics and chemical manufacturing sectors and is often cited for its project management practices in partnering agreements with its customers.

2. “Peer” Industry

- a. Contact TBD
DuPont

DuPont is considered an industry leader in project management and safety, and partners with A&E firms where its in-house expertise and/or capabilities are exceeded. DuPont created the critical path method (CPM) for networking/sequencing a work breakdown structure (WBS) which is used now by most engineering and design planners throughout the world.

- b. Contact TBD
Chevron

As with DuPont, Chevron partners with private sector firms to complement its in-house capabilities and focuses on project management activities. Chevron is also cited in the industry as project management leaders.

- c. Jim Doubek, P.E.
Chuck Lenzie Generating Station (1200 MW) Facility Manager
Nevada Power

Mr. Doubek was involved with the design and construction of the 1200 MW facility he manages. These activities were partnered with Fluor, after Duke Energy sold its interest in this facility to Nevada Power.

3. Power Customers

- a. Leslie James
Colorado Energy Distributors Association
- b. John Allum
Western States Power Corporation
- c. Tom Graves
Midwest Electric Consumers Association

- d. Kevin Gaden
Loveland Area Customers Association
 - e. Ed Roman
Sacramento Municipal Utilities District
4. Colorado and New Mexico Sponsors for Animas-La Plata Project
- a. Bob Wolff
Animas-La Plata Water Conservancy District
 - b. Randy Seaholm
Colorado Water Conservation Board
 - c. Dan Law
Colorado Water Resources and Power Development Authority
 - d. Randy Kirkpatrick
San Juan Water Commission
 - e. Charlie Blassingame
La Plata Water Conservancy District of New Mexico
 - g. Jim Formea
Southern Ute Indian Tribe
 - h. Micheal Elkriver
Ute Mountain Ute Indian Tribe
 - i. John Leeper
Navajo Nation
5. Other Reclamation Customers
- a. Robert Stackhouse
Central Valley Project Water Users Association

 - b. Van Tenney (retired)
Glenn-Colusa Irrigation District

 - c. Sandy Denn
Glenn-Colusa Irrigation District and Family Farm Alliance
6. Bureau of Reclamation
- A. Lower Colorado Region
 - a. Tim Ulrich
Area Manager, Lower Colorado Dams
Bureau of Reclamation

 - b. Bill Bruninga, P.E.
Facility Manager, Hoover Dam (Former Facility Manager, Parker
Dam)
Bureau of Reclamation

- c. Dan Pellouchoud, P.E.
Engineering and Planning Office Director, Lower Colorado Dams
(Former Manager, Salt River Project)
Bureau of Reclamation
- d. Neil Messer, P.E./Scott Sutliff, P.E.
Facility Manager, Headgate Rock Dam
Bureau of Indian Affairs
- e. John Nickell
Yuma Area Office

B. Mid-Pacific Region (Program, Design and Construction)

- a. David Gore, P.E. Regional Engineer
- b. Rick Johnson, Deputy AM, Central California Area Office
- c. Brian Person, Northern California Area Office
- d. Barry Mortimer, Central Valley Operations Office
- e. Michael Jackson, Deputy AM, South Central Area Office
- f. Alan Oto and Pat Rivera, CVPIA/CAL-FED office
- g. Richard Welsh, Construction Engineer
- h. Locke Hahne, Lahonton Basin Area Office
- i. Alan Stoppini, Design and Construction Division

C. Pacific Northwest Region

- a. Bill Gray – Ephrata Field Office
- b. Chris Ketchum – Snake R. Area Office
- c. Gerald Kelso – Upper Columbia R. Area Office
- d. Dave Jennings – Design
- e. Steve Brawley
- f. Don Rosbaugh, Project Construction Engineer

D. Upper Colorado Region

- a. Carol DeAngelis – Western Colorado Area Office
- b. Brent Rhees – Provo Area Office
- c. Connie Rupp – Albuquerque Area Office
- d. Wayne Xia – UC Regional Office

E. Great Planes Region

- a. Don Moomaw
- b. Gary Campbell
- c. Dan Jewell
- d. Craig Peterson

- e. John Lawson
- f. Denny Breitzman
- g. Larry Schoessler

7. The Regional Planning Coordinators

8. Technical Service Center

- a. SOD group
- b. DEC groups
- c. Construction Group
- d. Mark Boyle

9. Others as needed.

Managing for Excellence
Project Management
Outreach Questions

These questions are intended for internal and external customers of Reclamation, as well as the Private Industry. The Private Industry feedback sought is focused on what PM practices they currently accomplish and what is important to them for successful projects. There is also some focus on what items would be improved.

1. In general, define the Project Management processes currently being used and describe the roles, responsibilities, and authority of those performing this function.
2. What is working and what is not for those processes.
3. Who in the organization makes schedule, budget, and scope decisions.
4. Describe the training conducted for the managers of projects.
5. Is there a written Project Management plan?
6. How much effort is performed regarding risk assessment, risk mitigation, and change management.
7. Are real time costs and schedules presented to stakeholders? Describe stakeholders involvement in decisions regarding costs, scope, and budget.

APPENDIX II

Summary of Interviews Conducted

Interviewer

Al Candlish – Mid-Pacific Region

List of People Interviewed

1. David Bradley – Pacific Northwest Region
2. Kip Gjerde – Great Plains Region
3. Richard Lasson – Upper Colorado Region
4. Amy Porter – Lower Colorado Region

Interview Questions

What is being done in your region in the planning realm of project management; identify what is working and what isn't; successes; shortcomings, etc.

This interview was directed at Project Management in Planning. Other members of the team will be addressing the aspects of project management in other areas such as O&M and construction. However, any insight outside of the planning arena that you might want to insert will be appreciated. You don't have to confine your thoughts to the planning arena. We will be developing two reports: Needs assessment relative to further implementation of PM in July; and a final report identifying policy statement, D&S, and implementation plan with tools and techniques in December.

1. How is project management done in your Region?
Project Managers? Activity Managers?
In Regional Office? In Area Office?
What is the experience level?
2. Is there any kind of training or licensing requirements for those given the responsibility for project management? Are project managers made aware of training opportunities? PMI?
3. What do you find is working in project management in your Region? What isn't?
4. Can you identify project management successes in your Region? And why were they a success?
5. Do you notice or are you aware of any project management shortcomings in your Region?

Interviewer

David Palumbo – Lower Colorado Region

These interviews were directed at architecture and engineering, construction, and peer industry (non-Reclamation examples).

List of People Interviewed

1. Richard Capp, P.E., Project Manager, Parsons Water & Infrastructure, Inc. (Engineering New Record, 2006: Number 9 in the Top 500 Design Firms and Number 32 in the Top 400 Contractors)
2. Vijay Daniel, Project Manager, The Whiting-Turner Contracting Company (Engineering New Record, 2006: Number 11 in the Top 400 Contractors)
3. Roger Langille, Director of Projects, CH2M Hill Power (Engineering New Record, 2006: Number 5 in the Top 500 Design Firms and Number 38 in the Top 400 Contractors)
4. Andy McNeil, P.E., Director of New Generation Projects, Nevada Power and Sierra Pacific Power (From 2005 to 2010 capital projects include more that 5,000 MW in new generation capacity.)
5. James B. Porter, Jr., Chief Engineer and Vice President, DuPont (\$33 billion in assets, Number 73 overall and Number 2 in the chemical industry in Fortune's Top 500)
6. XXX, XXX. Flour Corporation (Engineering New Record, 2006: Number 4 in the Top 500 Design Firms and Number 3 in the Top 400 Contractors)

Interview Questions

1. How would you define project management?
2. What is the span of project management activities?
3. Why type of organizational structure do you have or try to achieve (project based, functional based or a combination)?
4. How do you integrate/coordinate all of the architecture, engineering, and scientific disciplines and activities and deliverables of the same working on a project?
5. How do you ensure continuity as you move from concept to engineering to procurement to construction to turn-over?
6. What value do you give to active project management or does it just happen?

7. What value do you give to breaking down or “deconstructing” a project before it starts?
8. Would you comment on the concept of “progressive elaboration” and the need to monitor and react to changes or discoveries throughout the project lifecycle? Do you fight it or accept it?
9. What value/attention do you give to the function of planning, controlling, and executing a project? Do they occur discretely or are they interrelated?
10. What is effective communication on a project? How do you handle communication overload?
11. How do you solicit and communicate status (cost, schedule, issues) within your teams?
12. How do you communicate status (frequency, level of detail) to you customers?
13. How do you negotiate the delicate balance between managing a project and addressing customer demands, changes, and potential desires to “run the show”?
14. What are the qualifications of your project managers?
15. What are the roles and responsibilities of your project managers?
16. What is the level of authority of your project managers?
17. How do you communication project objectives to your teams?

These questions were directed at internal stakeholders.

List of People Interviewed

1. Jennifer McCloskey, Deputy Area Manager, Lower Colorado Region, Yuma Area Office
2. Bill Bruninga, Deputy Area Manager, Lower Colorado Region, Lower Colorado Dams Office
3. Dan Pellouchoud, Engineering and Planning Director, Lower Colorado Region, Lower Colorado Dams Office
4. Tim Ulrich, Area Manager, Lower Colorado Region, Lower Colorado Dams Office

Interview Questions

1. What would you say are the areas of successes and failures with project completed by BOR personnel; specifically, is it cost, schedule, and/or quality?
2. Would you elaborate on the successes and failures?
3. How do you perceive the non-contract costs of services provided by the BOR in comparison to private sector or “A&E” firms?
4. If there are cost issues, do you perceive they are on a unit or a total bottom line basis?
5. In defining and documenting project objectives, deliverables and risks, how have we performed?
6. How do you prefer project status (cost, schedule, issues) and frequency of the same to be communicated?
7. What would you say about communication on projects completed by BOR personnel?

Interviewer

John Smart – Technical Service Center

List of People Interviewed

Al Bourland	Client Liaison
Betty Dinneen	Client Liaison
Bob Pike (by phone)	GP Region Dam Safety Program Manager
Christi Young	Mgr, Client and Support Services Office
Craig Albertson	Acting Division Chief, Water Resources
Dan Drake	Mgr, Hydraulic Equipment Group
Dave Mayer	Dam Safety Program Specialist
Del Smith	Hydraulic Engineer
Harry Remmers	General Engineer
Jeanne Major	Civil Engineer
Karen Weghorst	Dam Safety Office Program Manager, PN
Kris Mills	Dam Safety Office Program Manager, GP
Larry Wolf (by phone)	PN Region Dam Safety Program Manager
Lowell Pimley	Division Chief, Civil Engineering
Mark Baker (by email)	Dam Safety Office Program Manager for BIA Dam Safety
Mark Boyle	Chief, Infrastructure Services
Nancy Lender (by email)	Chair TSC Project Management Steering Committee
Perry Hensley	Division Chief, Geotechnical Engineering
Scott Irvine	Environmental Engineer
Tedd Calhoun	Civil Engineer

Tom Bellinger	Hydrologist
Tom Luebke	TSC Business Manager and Client Liaison

Interview Questions

The interviews were structured by posing three questions as they relate to the basic project management process groups (initiating, planning, executing, monitoring and controlling, and closing). The questions were:

1. What is the current situation?
2. What is the desired future situation?
3. What improvements are needed to reach the desired future situation?

Interviewer

Lauren Carly – Mid-Pacific Region (Program Initiation and Design and Construction for MP Region)

List of People Interviewed

1. Don Moomaw – GP-100
2. Dennis Breitzman DK-100
3. Brian Person NC-100
4. Jane Todd DK
5. Locke Hahen LBAO
6. Rick Johnson SCAO
7. Alan Oto MP-120
8. Patricia Rivera MP-120
9. Steve Brawley PN-3010
10. Gary Campbell GP-1100
11. Craig Peterson GP
12. John Nickell YAO-2200
13. Doug McElhini MP-200
14. Larry Hobbs MP-200
15. Joan Goodwin MP-200
16. David Gore MP-200
17. Gary Egan MP-200
18. David Bradley PN
19. David Robinson SCAO

List of Questions

1. Types of programs (e.g. SOD, RAX etc.) containing work that may go to design and construction in the next 18 months, or have been in design or construction in the last 1.5 years.
2. How those programs are managed? More specifically:
 - Who is the project manager?
 - When are they assigned and by who?
 - What is the relationship between the PM's chain-of-command and that of the organization(s) performing design and construction?
 - What are the PM's duties, responsibilities and authorities?
 - Who plans and makes budgetary decisions?
 - Who plans and makes schedule decisions?
 - Who identifies the risk and uncertainties and contingency plans?
 - Who performed the design?
 - Is there a project management plan or process laid out?
 - Who developed it? Is it actually used to manage the project?
 - Is the "who" clearly defined and in what document?
3. Project Management Training
4. How stakeholders are rolled into the project development process
 - How often are "actual" costs presented to the stakeholders?
 - Do these "actual" costs represent the entire project costs or just a portion?
 - How often is the schedule presented to the stakeholders?
5. What would you like to see come out in the directives and standards on this subject?

Interviewer

Rick Ehat – Upper Colorado Region (Construction for all regions except the Mid-Pacific Region)

List of People Interviewed

1. Brent Rhees, Deputy Area Manager, Provo Area Office.
2. Carol DeAngelis, Area Manager, Western Colorado Area Office.
3. Connie Rupp, Area Manager, Albuquerque Area Office.
4. Don Rosbaugh, Construction Engineer, Pacific Northwest Regional Construction Office.
5. Larry Schoesler, Construction Services Chief, Great Plains Regional Office.
6. Richard Grotzke, Construction Management Group, Technical Service Center, Denver CO.

List of Questions

QUESTIONS FOR JOBS ACCOMPLISHED WITHIN THE LAST 18MOS AND THOSE EXPECTED TO START IN THE NEXT 18MOS.

WE REQUEST INFO TO BE AS GENERIC AS POSSIBLE FOR A GIVEN PROGRAM (SOD, RAX, ETC) (ie. applies to all, or list the extremes and the norm)

THE "WHO" QUESTIONS APPLIES TO "ORGANIZATIONS" OR POSITIONS

1. IDENTIFY THE PM AND THE PM-PROCESS (ESTABLISH THE BASELINE)

- Who is the project manager? When are they assigned and by who?
- What is the relationship between the PM's chain-of-command and that of the organization(s) performing design and construction?
- What are the PM's duties, responsibilities and authorities?
- Who plans and makes budgetary decisions?
- Who plans and makes schedule decisions?
- Who identifies the risk and uncertainties and contingency plans?
- Who performed the design?

2. TRAINING

- What training do the PM's get?

3. PROJECT MANAGEMENT PLANS

- Is there a project management plan or process laid out? Who developed it? Is it actually used to manage the project?
- Is the "who" clearly defined and in what document.?

4. CUSTOMERS AND STAKEHOLDERS AND COST SHARING SPONSORS

- Who are the stakeholders?
- How often are "actual" costs presented to the stakeholders? Do these "actual" costs represent the entire project costs or just a portion?
- How often is the schedule presented to the stakeholders?

Interviewer

Kerry McCalman – Power O&M

List of People Interviewed

- 1.
- 2.
- 3.

List of Questions

- 1.
- 2.
- 3.

Appendix III^{xii}

An Introduction to Project Management

The purpose of this briefing paper is to introduce key project management terms and concepts to provide a common language for discussion, including what is:

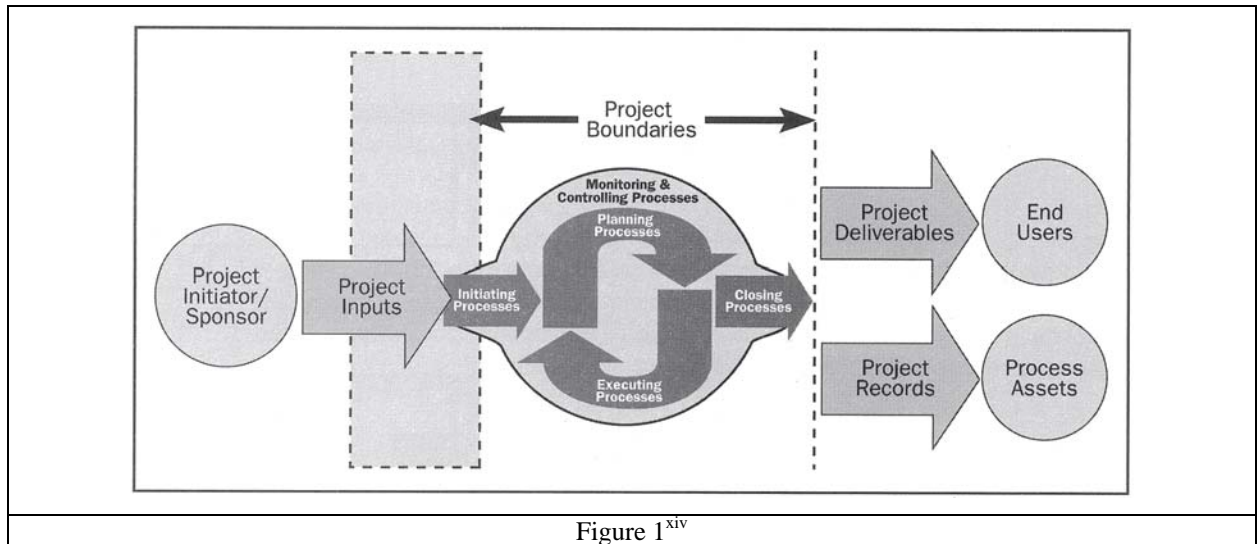
- a project
- project management
- project success
- a project manager
- a project management plan

Successful project management has several significant characteristics. To understand the value of project management, it is necessary to understand the fundamental nature of a project; the core characteristics of project management processes; how success is evaluated; the roles, responsibilities, and activities of a project manager and the expertise required; and the context in which projects are performed, conceptually illustrated by Figure 1.

Throughout this document, references are made to The Project Management Institute's (PMI®) Project Management Body of Knowledge (PMBOK GUIDE®). Developed over the past 30 years, the PMBOK GUIDE is a collection and organization of knowledge on the project management profession. It is widely accepted to include the core elements of successful project management practices. It is a regularly updated and internationally referenced standard (ANSI /PMI 99-001-2004), and provides a basis for universal discourse on practices. Most modern academic and practical publications on the subject of project management reference the PMBOK GUIDE, adopt its methodology, and incorporate its terminology.

What is a Project?

The fundamental nature of a project is that it is a “**temporary** endeavor undertaken to create a **unique** product, service, or result.”^{xiii} Projects are distinguished from operations and from programs.



Temporary Endeavor

To be temporary signifies that there is a discrete and definable commencement and conclusion; the management of a project requires tailored activities to support this characteristic, as such, a key indicator of project success is how it performs against its schedule: that is, does it start and end on time.

Unique Deliverable

The uniqueness of the deliverable, whether it is a product, service, or result, requires a special approach in that there may not be a preexisting blueprint for the project’s execution and there may not be a need to repeat the project once it is completed. Uniqueness does not mean that there are not similarities to other projects, but that the scope for a particular project has deliverables that must be produced within constraints, through risks, with specific resources, at a specific place, and within a certain period; therefore, the process to produce the deliverable as well as the deliverable itself is unique.

Progressive Elaboration

This unique process and deliverable produces the third characteristic of a project: progressive elaboration. Project management is a group of interrelated processes, implemented in a progressively elaborative manner, in which to produce the deliverable. Progressive elaboration is the revealing and focusing of details through time. For example, in the engineering design process, a general and broad concept may be a starting point for the design team, but through the design process, the concept is narrowed to a specific scope and is further elaborated to achieve the completed design; moreover, it may continue to be elaborated and not be finalized until the product, service, or result is delivered.

Other “Projects”

A clarification should be made with respect to Reclamation language. In Reclamation, a project is typically a congressionally authorized or directed activity that allows Reclamation to do something specific. Traditionally, projects

are groups of infrastructure, such as the Central Arizona Project, the Lower Colorado Dams Project, or the Central Valley Project. The Reclamation “project” activities would range from the traditional planning, designing, and building of structures, to negotiating and signing delivery contracts, developing operations plans, and completing environmental compliance documents.^{xv} In historic Reclamation vernacular, the operation and maintenance of the completed project is also often considered as part of the “project.” Additionally, at times in Reclamation the people managing projects are often referred to as something other than project managers: they may be called team leaders, coordinators, activity managers or program managers; people managing “projects” may be called area managers or facility managers. Because of these connotations, care should be taken to distinguish between Reclamation “projects” and projects as defined above.

A Project vs. an Operation

The operations of an organization are continuing and repetitive activities that are executed to achieve its mission and sustain the business, but without a definable end to their performance, and without a unique output: that is, it is not produced or provided only once.

A Project vs. a Program

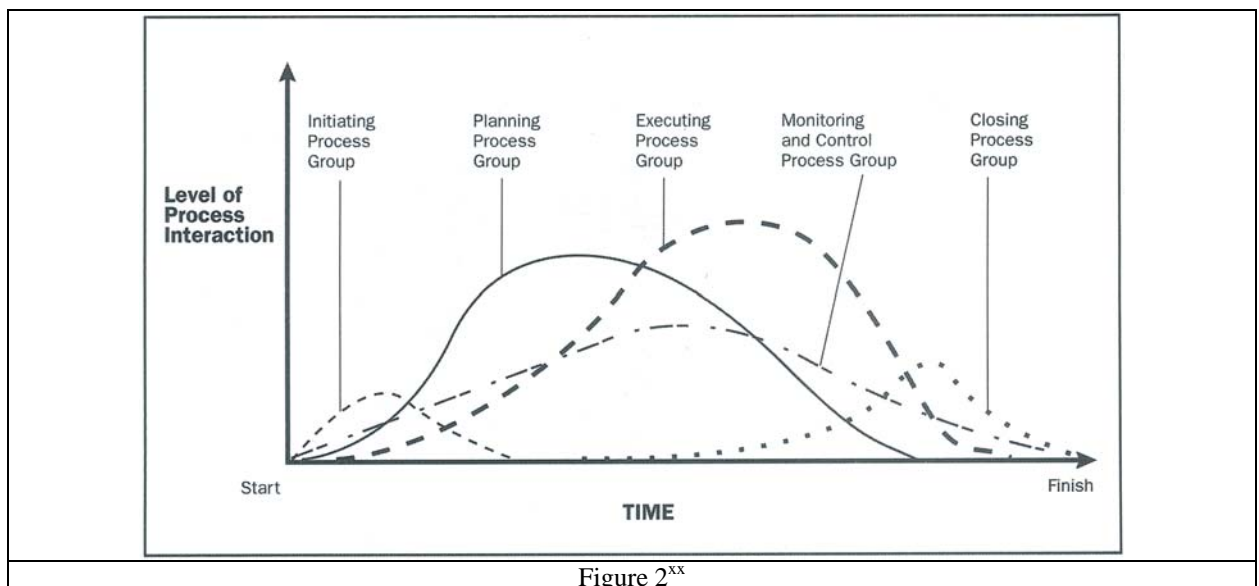
A project differs from a program in that “a program is a group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually. Programs may include elements or related work outside the scope of discrete projects in the program.”^{xvi} Furthermore, programs often involve a series of repetitive or cyclical undertakings. In Reclamation, a program is typically a group of projects administered by Reclamation. Reclamation programs do not have to be specifically authorized, and a program’s schedule may continue past any individual project. Examples of Reclamation programs are the Safety of Dams Program, the RAX Program, and the Title 16 Program.^{xvii}

What is Project Management?

“Project management is the process of the application of knowledge, skills, tools, and techniques to project activities to meet project requirements.”^{xviii} That is, project management is an interrelated group of processes that enables the project team to achieve a successful project. These processes manage inputs to and produce outputs from specific activities; the progression from input to output is the nucleus of project management and requires integration and iteration. For example, a feasibility report could be an input to a design phase; the output of a design phase could be a set of plans and specifications. This progression requires project management acumen, expertise, tools and techniques, including risk management, contingency development, and change control. Figure 1 illustrates the project context, its conceptual boundaries, or scope lines, as well as the process groups required to manage the inputs and deliver the outputs.

Process Groups

The project management process groups depicted in Figure 1 are initiating, planning, executing, monitoring and controlling, and closing. Initiating defines and authorizes the project or a project phase. Planning defines and refines objectives, and plans the course of action required to attain the objectives and scope that the project was undertaken to address. Executing integrates people and other resources to carry out the project management plan for the project. Monitoring and controlling regularly measures and monitors progress to identify variances from the project management plan so that corrective action can be taken when necessary to meet project objectives. Closing formalizes acceptance of the product, service or result and brings the project or a project phase to an orderly end.^{xix} Figure 2 illustrates the relative depth, breadth and interrelationship between these process groups.



Several significant observations regarding the nature of project management can be made from this figure. The breadth or range of project management is comprehensive: that is, it begins with initiating and continues through closing; these processes are coincident with the start and end of the specific project itself, respectively. Monitoring and controlling occur throughout the duration of the project and has a range relatively similar to that of executing. Indicating a project's temporary nature and the importance of the timing of the deliverable, closing begins relatively shortly after initiating concludes. Planning, and monitoring and controlling have a collective depth similar to that of executing, illustrating that these activities require a level of effort and have an implication similar to that of constructing the product, providing the service, or producing the result.

Process Group Interaction

The level of interaction of the five processes indicates a strong relational dependence not exclusive of one another. One process does not simply end and

the next one begins. The presence of this interrelationship and range is a function of progressive elaboration: projects are executed in increments and details are exposed and developed through the progression of time: objectives are developed, discoveries are made; investigations, studies, and surveys are completed; analysis is performed; constraints are changed; resources are amended; contingencies are exercised; changes are managed; risks are mitigated; and *Force Majeure* (unforeseeable or unpreventable circumstances) occurs.

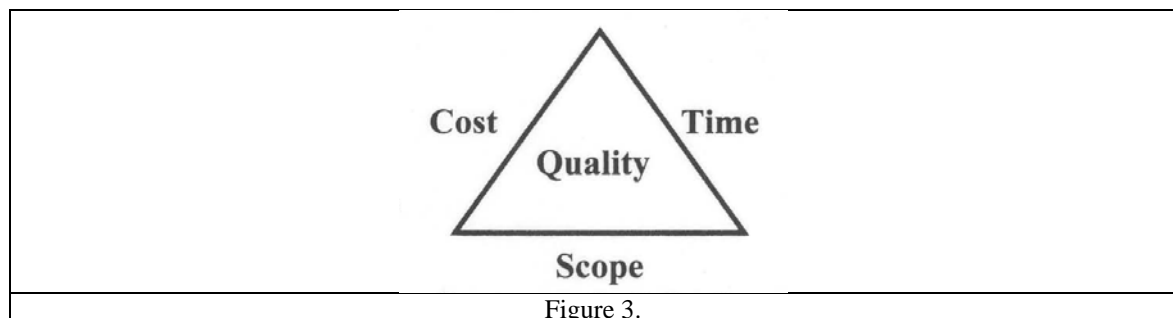
To manage the breadth or range of a project, active and proactive project management is required throughout the duration of the project. It cannot be simply initiated and/or planned, and left alone; it must be continually planned, and monitored and controlled. Sustained reactive project management is indicative of incomplete or absent planning and/or monitoring and controlling.

Project Phases vs. Process Groups

Project management process groups are not project phases; in fact, the process groups may need to be repeated for each phase, such as study, programming, engineering, procurement, construction, and commissioning. A process group or project phase is not discrete; they are interdependent and require integration. Also, project management must ensure continuity as a project progresses through processes and phases.

What is Project Success?

A standard must be established by which to define and measure project success. Fundamentally, project success is the delivery of the required product, service or result on time and within budget. To meet these objectives is to deliver a quality project. PMI illustrates project quality through the concept of the triple constraint: project scope, time and cost.^{xxi} Project quality is affected by balancing these three interrelated factors. “The relationship among these factors is such that if any one of the three factors change, at least one other factor is likely to be affected.”^{xxii} Figure 3 illustrates this constrained relationship; sometimes called the “iron triangle.”



Cost and time are intuitive, but the role played by scope warrants further discussion. To understand the significance of scope, one must appreciate the relationship between scope and the project objectives. For the scope to contribute to project quality, it must be managed to meet the demands of the project objective by reliably providing the required

functions; nothing more or nothing less. It is not simply a matter of keeping the scope from creeping, or a matter of completing the cheapest and fastest project; it is establishing the appropriate scope and delivering the commensurate product, service, or result.

What is a Project Manager?

The key responsibility of the project manager is to successfully accomplish the project objectives by balancing the competing demands for quality, scope, time and cost.^{xxiii} Derivative responsibilities include: identifying the project requirements, establishing clear and achievable objectives, and adapting the specifications, plans, and approach to the different concerns and expectations of the various stakeholders. Fundamentally, the project manager must direct the project from its inputs, through its nucleus, to delivery of its outputs. In order to accomplish these multifaceted responsibilities, the roles of the project manager include that of a leader, administrator, entrepreneur, facilitator, arbitrator and mediator, liaison, and coordinator.

The project manager must lead teams to operate cross-functionally towards a common objective while assuring cohesiveness and continuity as the project progresses through project processes and project phases. “The project manager acts as the key catalyst to stimulate effective communication and coordination between design, procurement and construction activities.”^{xxiv}

In order to effectively manage these responsibilities and assume these roles, a project manager must have experience in the following project management knowledge areas: project integration, scope, time, cost, quality, human resources, communications, risk, and procurement management.^{xxv}

What is a Project Management Plan (PMP)?

A project management plan is a fundamental tool for the project manager to deliver the project successfully. This document is a strategic and formalized roadmap to accomplish the project’s objectives by describing how the project is to be executed, monitored and controlled, which includes creating a project work breakdown structure; identifying and planning to mitigate risk; identifying manners in which to effectively communicate with stakeholders and other project team members; and developing a plan to manage changes. It is essentially a guide for executing the project, and a manner in which to gain buy-in and approval from stakeholders and sponsors prior to commencement. This plan is a living document that is updated and revised throughout the project at strategic milestones or significant events to accommodate the progressive elaborative nature of the project. The project management plan will vary based on size, complexity, risk, and/or sensitivity of the project. Implementing the project management plan requires competency in all of the project management knowledge areas, and is critical to the success of the project.

Summary

A project is temporary, unique, and the product of a multifaceted and progressively elaborated process that produces a solution for a specific objective. For the endeavor to be successful, the project must be accomplished on time, within budget and to the appropriate degree required to satisfy the objective. For success to be achieved, the project manager must be skilled and operate in an environment which enables a project team to function. Excellence in project management should be viewed as the positive trend in the performance of successful projects.

Appendix IV

Project Management in the Planning Phase

Process and Responsibility

Although the responsibility for project management in the Planning Phase of a project throughout Reclamation may have different position titles throughout the various regions of Reclamation, the general responsibilities remain the same. Depending upon the region, project management responsibility is assigned to a Project Manager, Activity Manager, or Team Leader. In some regions, project management responsibility is a collateral duty to a person whose primary responsibility is not project management. Throughout the remainder of this section, Project Manager will be used interchangeably with all of these classifications.

Project Managers assigned during the planning phase in planning are primarily at the GS-11 or GS-12 level, although in some circumstances, additional duties or the sensitivity or complexity of a particular investigation may have a GS-13 performing the role the Project Manager. It is difficult to establish the number of planning Project Managers for each region, because of the collateral duty responsibilities, but 10 seems to be the median amount. The location of planning project management varies from region to region, with some regions carrying out the majority of work in the Area Offices. In other regions, project management is primarily undertaken in the Regional Office. Experience levels range from recent hires with no specific project management experience to Project Managers with over 25 years of experience.

Although the Project Manager works under the supervision of an Area Manager or Regional Division manager who will have overall responsibility for the work, Project Managers in planning are generally empowered to carry out all project management activities related to a planning investigation. An investigation could be an appraisal, feasibility, or “special” study as directed by Congress or management, or a planning activity could be limited to a task such as completing an environmental document. That empowerment would include developing and monitoring a schedule and budget, deciding on planning team membership in terms of expertise (subject matter expert) and sometimes specific individuals, public involvement, keeping upper management informed, identifying project sponsors and stakeholders and coordinating with them, and ultimately to carryout project closeout. It was discovered that project closeout is a step that sometimes gets overlooked.

In some cases, an actual study may be performed by the Technical Service Center (TSC) or a private consultant. In those cases, the TSC or consultant will assign their own Project Manager to carry out a particular study. However, the individual Region’s Project Manager will still need to carry out many of the project management functions such as monitoring schedule and budget, carrying out public involvement activities, and briefing management, while also carrying out the responsibilities of a Contracting Officer’s Representative (COR).

What is Working

Each region felt that there were things that were working. Projects that have had full-time Project Managers or experienced Project Managers seem to have been the most successful. These individuals feel that they know project management, so why change. However, there is always a potential to improve, or tighten up, their management skills.

When a project is properly managed, time is taken on identifying the needs. A well rounded interdisciplinary group or study team, with different areas of expertise, is put together. The successes seem to be focused on areas that are more specific or have specialized processes or are more unique in their evaluations. These areas include: drought, water conservation, groundwater and conjunctive use investigations, Title 16, Native American Affairs, wetlands, and water quality planning.

In one region, a specific process has been developed for project management and it seems to be working. Nothing seems to be “falling through the cracks.” However, it is not certain as to whether the credit lies with the process or the individuals.

In another region, guidelines for assigning a Project Manager have been established. However, it is not perfect. Changes along the way are not always documented. Scope and budget creep still occur without any documentation as to the need for, impact of, and results identified. This kind of documentation often does not occur because of the rush of time to keep things moving.

Project Management Plans (PMP) are developed as a tool of laying out the pieces to successfully accomplish projects. They include among other things: a project baseline schedule with milestones, proposed budget, and make-up of the study management team along with a definition of responsibilities, and public involvement processes. The development of PMPs is an inconsistent practice throughout Reclamation. The development of a PMP does not guarantee success. The PMP does provide assistance in managing the project. Frequently, a PMP will not be developed for projects that are small or are expected to be completed in a short period of time.

Each region could readily identify a number of successes. Various reasons were identified for these successes. The most frequent reason was strong interest, both from upper management and within the project study area, which often included the Area Office. Because of this strong interest, the planning activity stayed on task and schedule.

Other reasons for success were driven by short deadlines. With short deadlines there was either no opportunity to have project management failures identified or, more likely, there was a need for efficient project management to assure a successful completion. What often occurred under the short deadlines was that a more experienced Project Manager was assigned to the project.

Other successes were identified in project management where funding from several sources had been leveraged together to address a larger problem that was beyond the specific individual authorities.

At the same time that successes could be identified, some planning activities that were not successful could also be identified. Lack of success was generally identified as missing project management tasks. Activities were allowed to run on their own without oversight and check-in, lack of communication created turf battles, there were thoughts on what needed to be done without checking in with management or stakeholders, or there was no check-in when there were personnel changes either in the study team or upper management.

Appendix V

Project Management in the Design Phase

Background

For the purpose of this report, the Design Phase includes any design processes to produce a set of plans and specifications and cost estimates to be used to procure the materials and services to complete a project, as well as the procurement process. During this phase, environmental quality requirements are met, along with activities such as real estate acquisitions, stake holder involvement etc. In some cases a project manager assigned during the planning phase will transition the project from the planning phase, through the design and construction phase and into O&M.

When to Use Project Management

It is clear from the interviews that some Regions have some good guidelines to determine this, but a request was made to develop a check list of factors and considerations to take into account when deciding when to apply PM to an activity. It was recognized that Reclamation still knows how to get a project through design-procurement-construction but these days, integrating other factors such as environmental compliance and public involvement bring on the need for more project management techniques. This was brought up by quite a number of interviewees.

This question is complicated in many cases where a program is so broad that it encompasses numerous projects. In some regions, the RAX program has a Project Management structure but in other cases it is lacking. However, it was recognized an integrated Project management among cost sharing agencies can be used to leverage additional resources to benefit projects and add flexibility. Program offices can also be very valuable in organizing public involvement, taking much of the burden off of the individual PM's.

Assignment of Responsibility

In today's organization the majority of the program and project responsibility is assigned to the area office, or in some cases to a functional office within a region. The degree to which project management is applied to projects starts with the manager and the chain-of-command for that manager with the principal responsibility. It is that manager who decides, to the extent that they understand project management, to what degree the full array of project management practices will be applied and who will be the project manager.

In the majority of design-type of projects, a staff engineer is assigned to shepherd a project through the design, procurement and construction process. The staff engineer usually resides in an area office, but can be in an engineering group in a regional office,

or another office. Using project managers from the TSC was considered by a number of area office and regional managers, but interviewees stated that they needed a PM closer to the geographic location of the activity, the local stakeholders, and the local responsible program manager. It was thought that knowledge of local conditions, laws, culture, practices, history etc was important in selecting a PM. Some of these opinions were based on experiences with remotely located PM's. Several cited the need for a list of factors to consider when selecting a PM. However, it was recognized that the TSC needs to continue assigning design team leaders.

In the absence of a clearly identified PM or staff or project engineer and assignment of responsibilities to that individual, an organizational manager or group of managers (e.g. functional section chiefs, branch chief) takes on these duties by default, or by specific assignment because of their position in an organization, not because they necessarily have PM skills. This mixed bag of organizational managers and project managers is a strong indication of Reclamation making the transition from managing projects from a strictly organizational orientation to one based on a matrix.

Even given that an organizational manager might be responsible for a project, many cases were cited where at any point in time it was not at all clear who was the PM, i.e., who was in charge, i.e. was the PM responsibility delegated, and if so, what were they responsible for (e.g. just design, environmental compliance, etc.)

In other cases, such as the rural water program in some areas, local groups have the project management responsibility and Reclamation provides oversight. Reclamation managers engaged in these types of relationships report that their staff would benefit from greater PM skills to be able to relate the local entities, and their A/E firms who have the lead.

The responsibility for assigning and supervising project managers needs to be clearly defined in some parts of the organization.

For major programs with significant involvement by other organizations such as CVPIA, Cal-FED, rural water the assignment of responsibility needs to be clarified. For example, in CVPIA, PM responsibilities are shared by both a Reclamation and FWS PM. Issues can arise in appointment of replacement PM's, which should be ironed out by the agencies' management.

People in the role of PM's are found through out the organization. Where they are located had minimum impact on their success as a Project Manager, as long as they are geographically in the same region, preferably the same state as the project. Almost every other factor that has a bearing on a successful Project manager and a successful project is much more significant.

Understanding of Responsibility

The survey of a sample of Reclamation managers found that the understanding and use of project management varied widely and was applied very unevenly across the organization. There is a lot of confusion over the meaning and definition of the terms “project” and “project manager”, as opposed to a Reclamation project and a program manager.

Also, the survey found that universally, the application of project management, particularly the use of PMBOK GUIDE or PMBOK GUIDE based information was initiated from the bottom of the organization up, not from the top down, relatively speaking. More people that expected had heard of PMI and the PMBOK GUIDE standard, but few outside of the TSC had a thorough knowledge of it and even fewer had “practice” experience.

This section describes projects from inception (in the case of projects with no planning phase) or in any case initiation of engineering and design up to award of a construction contract.

It was recognized that technical people on a project team needed a minimal level of understanding of PM so they could understand the role and responsibility of a project manager. There is also a call for guidelines on what are the minimal responsibilities one should have to be an effective PM. Some offered that control of two out of the three following factors is essential: Scope, schedule and/or budget. This is more important when large program offices are involved that have a strong control over integrate projects budgets and allocating funds.

Even with an understanding of PM responsibilities, many PM’s are not given or insist on the time it takes to perform any more than the bare minimum of activities.

Current Practices

The current practices varied widely from region to region and office to office in some regions. Here and there through out Reclamation, exclusive of the Technical service Center and the Information Technology groups, people with the full understanding of project management, years of practice and even certifications exist. In most cases these peoples’ expertise in PM was incidental, although useful, to the position description responsibilities. Development and use of project management practices has arisen from the “bottom” of the organization up.

Use of Project Management Plans and Tools

The most widely used PM tool was scheduling software programs (MS Project and Primavera). Although these programs are widely used internally, their full capability in a number of areas could be exploited to a much greater advantage. For example, schedules are used in a limited way for setting a baseline schedule agreed to by all parties and then tracking progress from that baseline and reporting progress relative to a clearly

identified baseline. Float is rarely planned for up front and managed through out the project. Further, there were no cases found in the survey where a specific amount of float was identified up front and responsibility for applying float allocated (e.g. the PM could approve application of up to 5 days of float; more that that had to be approved by someone else). Conjunctively, change management plans were rare. It was reported that schedules could be used to a much greater extent for looking ahead, identifying unfolding risks and proactively managing projects and changes.

Interaction with Stakeholders

Numerous cases were cited where Reclamation spent considerable resources over many years (e.g. time, funds) to periodically and proactively meet with, update and include non-Reclamation parties in project progress. In some cases recently the stakeholders concurred that these activities should be curtailed due reductions in federal budgets. However, these stakeholder involvement programs, although successful, are yet to be integrated into a project management plan, where the outputs could be more specifically used in the monitoring and controlling processes.

The survey of current practices found that outside of the safety of dams program specific, focused risk analyses and the development of subsequent risk management plans are rarely performed, are seen as incidental or done in hindsight. It was recognized that smaller, more routine projects do not merit risk management. However, it appears that most projects would benefit from even a cursory, formal analysis during project initiation.

Many interviewees cited the Dam Safety PM Guidelines as the “standard” that they were most familiar with and suggested that it be crossed with PMBOK GUIDE to be usable when ever application of PM was determined appropriate.

Appendix VI

Project Management in Reclamation’s Technical Service Center

Multiple interviews were conducted with senior staff from the Technical Service Center (TSC) including the TSC Leadership and the Project Management Steering Committee. Current TSC project management practices, roles, and responsibilities were discussed in addition to desired future practices and improvement ideas. The following describes the historic and current practices and challenges for project management of design work at the TSC.

Background

The Technical Service Center (TSC) manages all assigned projects as a matrix organization. The TSC organization is described in a document available at the following intranet site: http://www.usbr.gov/pmts/tech_services/tsc_dir.pdf Products are delivered to programs (clients) by teams that are staffed by the functional line organization and led by a team member designated as the team leader (refer to Figure 2-10 of the PMBOK GUIDE Guide). The project management component of the matrix organization has evolved from non-existence in the late 1970s to the current status of the normal way of product delivery today.

In the Assistant Commissioner of Engineering and Research organization (ACER), one of the predecessor organizations of the TSC, the project management approach was introduced into the organization by identifying Principal Designers who led design teams, Project Management Teams made up of line managers that provided guidance to the teams, and ACER Project Managers who provided ongoing oversight of multiple projects with primary emphasis on schedule. The Project Management Teams included Regional and Construction Office representatives and provided oversight on all issues related to project implementation.

The concept of project management was carried into the TSC when it was formed in 1994. The TSC has fewer layers of line management than the predecessor organizations. With fewer line managers, the TSC placed even more responsibility on the project management process and started using the term Team Leader rather than Principal Designer to reflect the broader variety of projects that extended beyond design. Client Liaison positions were created to carry on the ACER Project Manager function under redefined responsibilities. The Project Management Team continued for dam safety modification projects.

Operating guidelines, processes, and tools have been developed during the implementation of project management in the ACER and TSC organizations. There was a major guideline development effort during the reorganization that formed the TSC in 1994 to provide guidance that was consistent with the new organization. Some reworking of that guidance has been done over the last decade, and additional guidance

and training in the area of project management have been provided recently. The operating guidance is available at the following intranet site:

<http://intra.usbr.gov/%7Etsc/guidance/operating/op-guide.pdf#page=2>

Project management guidance is available at the following intranet site:

http://intra.do.usbr.gov/tsc_pm/

General Description of Current Projects in the Technical Service Center

Projects in the TSC cover a wide range of engineering and scientific work that generally reflects the needs of Reclamation programs. The TSC maintains capabilities to provide water resource related civil, geotechnical, mechanical, electrical, and environmental engineering and scientific services. The primary work products produced are as follow:

- Reports, analyses, inspections, and modification designs for Dam Safety Program including dam safety work for other Department of the Interior agencies.
- Construction specifications that include designs, estimates, drawings, and specification paragraphs and requirements for construction and maintenance projects.
- Reports documenting data collection and analysis, investigations, applied research, modeling, engineering analyses, and scientific studies to support maintenance and management decisions and NEPA and ESA compliance including economic, social, and cultural resource impacts.
- Specialized technical guidelines, advice, and troubleshooting to help resolve resource management issues and expertise to review work products of other Reclamation offices or contractors.
- Specialized technical support services including instrumentation, inspections, and GIS, drawing production and conversion, and technical writing and editing.

The program management in Reclamation results in a large number of projects to be managed in the TSC. Work comes to the TSC from clients that may be termed Reclamation program managers, Reclamation project managers of a larger project, or program managers for other agencies' work. The first contact made by clients is often with the technical specialist who will be involved in providing the service. For the current fiscal year, there will be in excess of 2,000 cost authorities used by the TSC that each represent a client requested work product or associated group of work products. The average size of these projects is approximately 50 staff days during the fiscal year. Fewer than 100 (5%) of the projects will require more than 200 staff days (1 FTE) during the fiscal year, and only 12 (0.5%) are projected to require 4 FTE or more. The largest single project is expected to require approximately 15 FTE with fewer than 5 individuals dedicated full time to the project and more than 75 individuals contributing to the project during the fiscal year.

Several conclusions may be drawn based on the above description of TSC projects:

- Almost every technical position in the TSC will be called upon to manage a TSC project during a given year.
- Even if individuals are not designated as team leaders they will be asked to participate in project management as team members. The success of the project management process is dependent on participation of team members.
- Even when work comes to the TSC in relatively large packages, fulltime dedicated staffing of projects is not utilized and is not a very practical approach given the large number of TSC projects that must be managed.
- For the TSC to be economical and efficient, the organizational matrix must work.

Support Systems for Project Management in the Technical Service Center

The TSC support systems for project management fall in the areas of enterprise environmental factors and organizational process assets shown on Figure 3-4 of the PMBOK Guide. Processes, procedures, and guidelines for project management are presented in the TSC Operating Guidelines that were developed when the TSC was established. These have been updated several times and are currently being updated. These guidelines establish the responsibilities of line management, team leaders, team members, and the client liaisons as it relates to project management. These responsibilities are outlined below. The tools used to manage projects are also presented in the operating guidelines. Over the past few years, the TSC Project Management Steering Committee has prepared more detailed guidelines on the use of project management tools and managed the delivery of training on the tools. These project management guidelines are generally consistent with terminology and project management philosophy found in the PMBOK Guide, an approved ANSI Standard published by the Project Management Institute. The TSC Project Management Guidelines and the TSC Operating Guidelines are made available on the TSC website as noted above.

A key tool used by the TSC to provide information for project management is the management information system (NewMIS) developed and maintained to supplement the reporting available from Reclamations Time and Attendance System (TAAS) and the Federal Finance System (FFS) and to allow comparison of project budgets contained in NewMIS to expenditures on a near real time basis. The need for such a system was recognized in the early 1980s. The supplemental system allows those managing projects in the TSC to monitor, control, report, and manage change. NewMIS is available only in the TSC.

The line organization provides administrative support for the team members. This includes office space, computer and other necessary equipment, training, assistance with travel, personnel management requirements, time and attendance, etc. Specific project

related administrative/project management assistance is provided to the team by the designated Client Liaison, Program Assistant, and/or Program Analyst who are assigned to the Client and Support Services Office.

The primary responsibility for keeping work products with schedule and budget falls on Team Leaders, they are required to:

- Identify team resource needs and work priorities to Group Managers for potential team assignments.
- Monitor the accomplishment of team products and services. Ensure the PMP and Service Agreement continually reflect the needs of the client and TSC.
- Serve as primary point of contact on issues of budget, schedule, technical matters, and quality of products/services delivered.

Client Liaisons serve as point of contact with the client on issues related to budget and schedule for the client's program, assist in setting up agreements, monitor work accomplishment and budget status, and provide budget reports and notification when budget or schedule targets are near.

Responsibilities of line managers noted in the guidelines focus on establishing and promoting processes to ensure that products and services provided by the TSC are client-focused, high quality, on-time, and within budget. Group Managers are also responsible for monitoring the use of resources provided to teams and working with Team Leaders to actively resolve resource conflicts when necessary. With input from the Group Managers, Client Liaisons, and clients, Division Chiefs are responsible for establishing workload priorities and supporting resource assignments within the TSC to best meet immediate, long-term, and mission critical needs of Reclamation and TSC clients.

Appendix VII

Project Management in the Construction Phase

Project Management as it relates to today's Reclamation construction activities has evolved from the traditional large projects such as the Central Arizona Project, Dolores Project, Central Utah Project, etc. where all project management for the design and construction phases was led by and controlled by the local project office and the Project Construction Engineer. Today there are "construction offices" that are service-type organizations which support the construction phase of work for Area Offices, Power Offices, and Regional Office's programs. There are some exceptions to this, in particular, the Animas-La Plata Project which functions with the traditional style organization using a Project Construction Engineer. Today, full project management from planning to transfer is rarely led by the current construction management staffs.

The predominant construction management today is essentially a support effort for other offices. This can involve pre-design investigations, gathering of design data, procurement planning, construction inspection, contract administration, right-of way support and transfer to O & M. The construction management organizations vary from stand alone offices to sub organizations of Area Offices, Power Offices, Regional Offices and the TSC. The construction management service is provided under a formal "service agreement" or it is provided on a much less formal arrangement for other offices or within the same office.

In general, many current construction management practices lack focus on stakeholder (internal and external) communication and reporting of real time cost reporting, management of contingency and change control specific to items where schedule could be impacted. The predominant perception is this information is usually known by those who are the apparent "need to know" managers and often times subtle impacts to other interested parties result in significant problems later. Without a project manager to integrate activities such as planning, feasibility design, authorization, NEPA compliance, budget development, stakeholder involvement, real estate acquisition processes, and design implementation, the overall project accomplishment and significant budget, schedule and scope decisions and responsibility usually remains with the Area Manager or the Regional Director's staff.

Reclamation has made the transition from constructing large projects utilizing self contained management organizations to smaller support style projects by inventing a wide variety of Project Management processes. These build-to-suit processes fit the individual office or particular situation and sometimes individual personalities, however some lack important good Project Management procedures.

Appendix VIII

Project Management in the Operations and Maintenance Phase

Project Management within the Reclamation Operations and Maintenance (O&M) Community can be broken down into three categories:

- Project Management of recurring O&M work
- Project Management of Programs
- Project Management of Replacements, Additions, and Extraordinary Maintenance Program (RAX) (Reported below as a specific major program)

Project Management of Recurring Operations and Maintenance Work

Recurring O&M work is preventive maintenance and low cost replacements, additions, and extraordinary maintenance work. Examples of this include periodic testing of equipment and water control and regulating structures, installation of equipment, small construction projects (i.e., walls, concrete pads, etc.), minor sedimentation control, control system changes, limited bank line stabilization, relay replacements, etc. While the definition of “low cost” varies from region to region, it is usually considered to be projects costing less than \$25,000. While this is fairly routine work, it does require some level of project management. Materials have to be ordered and received, and work has to be scheduled. Some of the work is done with Reclamation forces and some is contracted so there can be contract administration and inspection duties involved.

Most Reclamation offices are performing the project management of this work in-house. For preventive maintenance work, project management is performed by the Facility Manager and craftsperson with the assistance of Purchasing Agents, Contract Specialists, Maintenance Coordinators, and Planners. If the preventive maintenance requires engineering support, that support is usually obtained from engineers located in the Area Office. In addition, other resource services may be provided by the Area Office for NEPA and Clean Water Act (Section 401, 402, and 404) compliance, and resolution of real estate issues.

Project management of recurring O&M work appears to work well, especially in the power projects using Maximo to plan, schedule, and track maintenance. The success of project management of this type of work can also be attributed to the relatively small scope and the fact that most of the project management activities can be performed at the facility with relatively few personnel. Such personnel have the authority and responsibility to make decisions.

Project Management of Operations and Maintenance Programs

Within O&M, various programs and initiatives develop that require some level of project management. Examples of these are Hazardous Waste Programs, Spill Prevention, Control, and Containment Programs, Arc Flash Protection, and NEPA Studies. Project

Management of these programs usually occurs at the local level by Engineers, Facility Managers or Craftspersons. While successful at the local level there are several concerns about the current processes being used, summarized in Section 11.

Some of these programs are left to the Regional, Area, or local field office to implement without much overarching guidance. This leads to inconsistent approaches, solutions and policies. While this isn't necessarily a problem, it can lead to consistency issues. This is especially true when labor unions or outside stakeholders are involved. Within union contracts, there needs to be consistency in approach to matters affecting personnel and customers expect consistency within the agency.

Appendix IX

Project Management in the Safety of Dams, RAX, and SSLE Programs

Project Management in the Safety of Dams Program

Project management for Safety of Dams modifications follows a project management team approach. Construction, in general, and project management follow the Safety of Dams Project Management Guidelines referenced elsewhere in this report. There appears to be general satisfaction with the construction aspect of following those guidelines. However, these guidelines could be improved to capture some aspects of good Project Management practices for communications and information distribution with project stakeholders, particularly associated with issues which result in potential impacts to cost and schedule. Also, improvement to the Safety of Dams guidelines could be made for project risk management, cost reporting and security during construction plans.

Work Products in the Dam Safety Program

The primary work products produced by and for the Dam Safety Program are as follows:

- Comprehensive Facility Reviews conducted every six years
- Dam safety issue evaluations
- Reports of finding and associated decision documents
- Corrective Action Studies
- Modification reports
- NEPA and Endangered Species Act compliance documents and permits required for construction of modifications
- Modification designs
- Modification feature construction and construction documentation

Dam Safety Program Management Staff

There are Dam Safety Program Managers in the Dam Safety Office in Denver and in the Regional Offices. A Program Manager that reports to the Chief, Dam Safety Office, is assigned the responsibility for program management for each region. Within each Regional Office, there is a Regional Dam Safety Program Manager who works with the Dam Safety Office Program Manager in a collaborative effort to see that the program

objectives are met for the region. In the Mid-Pacific Region there are also three Project Managers assigned to the Regional Program Manager to provide project management for specific modification projects. The Regional Program Managers are responsible for overseeing and coordinating the full range of Dam Safety Program activities including comprehensive facility reviews and issue evaluations that may or may not lead to modifications.

Project Management for Dam Safety Work Products

Project management for the first two work products listed above is performed by the TSC according to processes that have been described for that organization. The reports of finding are prepared by the TSC, and the Dam Safety Office Program Manager prepares the associated decision documents. There is not much project management associated with the production of this joint document since it is a summary of the outcome of an engineering investigation, study, or analysis and a presentation of the program decision based on that outcome. That is not to minimize the effort needed to prepare the document and obtain the decision maker approvals. Project Management Guidelines for Safety of Dams Projects have been prepared and are available on the Dam Safety Program website at: <http://sodis.usbr.gov/dam%5Fsafety/documents.asp>. The guidance is for project management from the time it is determined that a modification is required until construction is complete. This means the guidance applies to the last five work products listed above. Overall project management for modifications is typically provided by a Regional Office representative or an Area Office representative who is accountable to the Project Management Team. In the Mid-Pacific Region, it would be one of the Project Managers assigned to the Regional Dam Safety Program Manager. In the Great Plains Region and in the Pacific Northwest Region, it would be the Regional Dam Safety Program Manager. In the Upper Colorado Region, the overall Project Manager is in the Regional Office.

As the modification projects move from the corrective action through to completion of construction, the successive project components or phases are managed in the organization where the work is being performed. Typically that would mean that corrective action studies and designs would be managed in the TSC, the NEPA compliance and permit work would be managed in the Regional or Area Office, the modification report preparation would be managed by the Project Manager in collaboration with the Dam Safety Office, and the construction would be managed by the construction office. Throughout these phases there is an overall project management function that is performed as described in the previous paragraph. Project management practices are those used by the performing offices, as influenced by the Safety of Dams Project Management Guidelines.

Supplemental Guidance for the Dam Safety Program

In addition to the project management guidelines for modifications described above, the Dam Safety Program has provided additional project management requirements for work performed in the TSC. There is a requirement for monthly status reports that are prepared by the TSC Team Leaders and submitted to the appropriate Dam Safety Program Manager. There is also a requirement for monthly meetings organized by the

TSC Dam Safety Program Client Liaison with the Dam Safety Office Program Managers and line managers (Group Managers) who manage the resources for dam safety projects in the TSC. This meeting serves as a forum to address resource issues and project progress issues. Information from these monthly meetings is informally relayed back to the Team Leaders and Regional Program Managers by the Dam Safety Office Program Managers and the TSC Group Managers.

Guidance for the preparation of work products has also been provided for Comprehensive Facility Reviews and the reports produced from the review, the conduct of risk analyses, and the preparation of reports of finding and decision documents. This guidance is provided on the Dam Safety Program website in the form of written guidelines and report templates. The intent is to provide for consistency and efficiency in the project work that supports the program. A summary report titled Quality Assurance in the Dam Safety Program that places the project management guidance described above in context is also available on the above website.

Project Management in the Replacements, Additions, and Extraordinary Maintenance (RAX) Program

Large RAX projects within Reclamation's O&M community involve some or all of the following tasks, as appropriate:

- Identification of the need to replace or rehabilitate (or add something new), feasibility study, and development of initial scope
- Initial cost estimating, budgeting, discussions with stakeholders
- Value Engineering and Design, Estimating, and Construction Reviews
- Development of service agreements
- Gathering design data
- NEPA and National Historic Preservation Act activities, land and right-of-way activities, and permit applications
- Refining of estimates and scope
- Development and review of specifications
- Preparation of contracting documents, advertisement and award
- Construction, construction inspection, and contract administration
- Commission testing and acceptance
- Resolution of latent defects and items identified during testing

These tasks are typically provided by different Reclamation functional offices. In some cases, the work is contracted outside Reclamation. Project management of a RAX project is usually shared among multiple offices and not overseen by one project manager.

Organization and Project Management

The current project management infrastructure supporting RAX work is usually a distributed structure with different parts of the project being managed by different people, along functional lines. It is often confusing and less effective than it should be. Budget, finance, design, contracts, construction, and O&M personnel as well as stakeholders are all involved in construction projects. Roles include:

- Customer for the finished produce – i.e., O&M
- Designer – at the area office, regional office, TSC, or contractor
- Design project manager – at the TSC for larger jobs
- Construction project manager at the area office or regional construction office
- Contracting Officer (CO)
- Contracting Officer's Representative (COR) and COTR
- Construction inspector
- Factory inspector
- Ultimate paying customer (power customer or district)

Each region – maybe each Area Office – has developed its own processes for accomplishing RAX work, including which roles to fill (or not), what their responsibilities are, and how they interact. At least two regions utilize construction offices to manage RAX work. Sometimes these offices do not have any electrical or mechanical expertise. Relative authorities and responsibilities of the area and construction offices often are not clear. Even within one region, the roles and responsibilities and workflow are not understood. This leads to confusion, lack of or misinformation, delays, and extra costs.

Project Management in the Safety, Security, and Law Enforcement (SSLE) Program

Upper Colorado Region

The following focuses on the PM of security programs after the security contract is installed or security guards and surveillance force contract awarded, or Federal security guards hired. It also focuses more on the project management of the guards and surveillance program more than the physical security systems. The project management of the physical security systems is not unlike any other piece of equipment and its O&M, replacement and upgrade is performed much like any other Reclamation operating system.

In Upper Colorado Region, guards and surveillance are achieved by two means. The first way is through agreements with cooperating agencies or government entities (i.e. National Park Service Law Enforcement, local sheriff's office). The second method is through contracts with security companies.

The project management for these is presently being performed at the Area/Field Office level, usually by an O&M person that has security as a collateral duty. The benefits to this approach are that the local office has created and can maintain a close and good working relationship with the local law enforcement groups or security contractors. This working relationship facilitates quick response to heightened threat levels. It also facilitates an ability to receive and deliver intelligence on security incidents to the appropriate levels. It also helps keep costs under control.

The local collateral duty security project manager is assisted by the Regional Security Officer and the Regional Law Enforcement Officer.

Some of the problems that have arisen as part of this method of project management are:

1. The local collateral duty security manager usually does not have a security background so there is a learning curve involved in getting them knowledgeable on their new duties.
2. In some cases, the local collateral duty security manager, division manager, and Area Manager get blindsided by actions that the Regional Security Officer and Regional Law Enforcement Officer's interventions with local law enforcement without the knowledge of the prior.
3. The transfer of essential information from the upper level security offices to the local level has been poor. Examples of this include failure or refusal to pass down vulnerability, risk, or threat information and failure to give feedback on intelligence gained regarding local security incidents.

Any adjustments in the project management of guards and surveillance need to consider the importance of the local office relationships with their security partners and not interfere with those relationships.

Mid-Pacific Region

In the case of this Mid-Pacific Region, the focus is on construction contracts. The construction office has the lead in regional project management of the pre-award and post-award activities and provides direct liaison with the Safety, security and Law Enforcement office in Denver, which has the program lead.

The project management is a collateral duty for a field engineer. Only the basic project management tools and techniques are applied due to lack of time to peruse others.

The SSLE office focuses their efforts on contract award and budget obligations and awards the contracts out of the Denver office. The hand off of the contract from the Denver Office to the Mid-Pacific Region has been inefficient and lends itself to a transfer plan. Management of the entire contract execution process is then handled by the MP Construction Office to close out and transfer to O&M.

APPENDIX X

Non-Reclamation (Private Industry) Examples

A number of peer-group architecture and engineering and construction professionals were interviewed with respect to best PM practices for their respective sectors. Appendix I list the interviewees.

There was a high correlation among the feedback from these interviews in terms of philosophy, strategy, and methodology. Several significant concepts and understandings were elicited. All respondents were aware of the PMI and PMBOK Guide processes and expressed a consensus with its methodology, terminology, and recommended practices. The PM Team did not evaluate the quality of PM performed by private industry in the performance of work for Reclamation.

What is Project Management

The question, “What is project management?” was asked; the responses varied from, “an integrated approach to make sure what in concept is realized,” “from conception to turnover, all of the actions and processes needed to convert an idea into a product,” “an integrated work process,” to “a leadership process whereby a concept is transformed into reality.” The most poignant statement was “the care, custody, and control of all aspects of a project.”

There was an overwhelming positive response that PM must be active and proactive throughout the duration of the project. A comment was made that “once the project goes into reactive mode, there is a good chance it will not recover.” It was also noted that without active PM, “safety, schedule, cost, and operability are compromised.” Another participant noted that no matter the number of current projects in a project manager’s portfolio, “all of them must be reviewed every day.” The unanimous consensus was that even with the best plan conceivable for a project, a project cannot be put in automatic mode.

Progressive Elaboration

When asked about the concept of progressive elaboration, all parties agreed that it is the fundamental nature of a project and concurred that projects develop and evolve through time. It was noted that, “no organization or person is 100 percent smart on day one.” It was also noted that this elaborative nature of a project must be accepted and responded to. Additionally, the following sentiment was expressed: a project may be in design and have to go back to planning if revealed details warrant; furthermore, if the project is only being coordinated and not managed, “the coordinator will use progressive elaboration as an excuse.” That is why an empowered and skilled project manager is needed to be proactive with the project and must have a sense of ownership of it.

Many interviewees cited the progressive elaborative characteristic alone as being justification for a central project manager throughout the project processes and phases. All interviewees indicated that a project manager was selected at the outset of a project whether it be in the conceptual or programming phase; and that the project manager, barring any atypical circumstances, remained with that project as its leader through the engineering, procurement, construction, commissioning, and turn-over phases. It was noted that a project manager is critical during the design phase “to organize the technical data across all technical silos and to communicate across all boundaries, whether it means that the project manager forces people to sit across the table from one another and communicate or work with the team members’ functional manager to address issues.” Additionally, “it is equally as important that that project manager be the leader to take the project to the next phase: this continuity is critical.” It was also noted that “the project manager is needed on day one; the later the project manager gets in the game, the more he or she does not know.”

Progressive elaboration was also related to the common opinion that planning, monitoring and controlling, and executing a project are interrelated. In other words, because of the progressive elaboration nature of projects, the project planning persists throughout the project life cycle and is managed by a formalized change management process. Change happens – always. Additionally, it was noted that this is the reason you bring on a project manager “right away” and that “this is the reason you need one central project manager for continuity.” One interviewee noted that their firm “plans how to execute, puts that plan in place and controls it, measures against the plan, and executes changes as necessary. This is the job of the project manager.” Another interviewee strongly expressed that “project management is not only coordination, but more importantly leading, executing, and controlling.” The notion that PM is a group of interrelated processes and responsibilities that require integration was confirmed. It was also agreed that one process does not simply end and the next one begin. This same sentiment was expressed as being applicable to project phases as well.

Risk Management

There was an ardent expression that continuing and regular risk assessment and contingency planning take place. When asked about managing float, all interviewees responded that this was critical due to inevitable impacts and changes to the project’s original critical path. One participant noted that a schedule is worthless unless it is regularly updated and reviewed, and further noted that on all projects there is at least one control engineer focusing on the monitoring and controlling process. Another noted, “the initial plan never ever stands up to reality.” All participants gave an essential and vital value to managing the scope, controlling and managing changes, and understanding and mitigating risks. Finally, an interviewee noted that a “project is a living and breathing organism that wants to grow and mutate, and that organism needs to be directed and molded into the final required deliverable.”

Work Breakdown Structures

It was the overwhelming sentiment that a work breakdown structure was obligatory and indispensable for scheduling, costing, and performing the work. Comments included: “It is step one” and “a work breakdown structure is invaluable: it is used to bid the job and to perform the job.” One participant, when asked if a work breakdown structure was important, stated, “You have to do it. How else are you going to understand the project?” It was also noted that generating a useful schedule and compiling an accurate estimate are dependent on a solid work breakdown structure: “you need it for your manpower projections and work plan.” Also, it was noted that the work breakdown structure “should be organized to get maximum, effective use of work areas and responsibilities.” It was further expressed by multiple interviewees as an endorsement of the importance of a work breakdown structure that the Construction Industry Institute, Construction Management Association of America, Construction Specifications Institute, and American Institute of Architects all have methods for breaking down projects into discrete elements and value it as a critical practice. While the methods and classifications slightly vary among these organizations, the fundamental principal is the same.

Stakeholder Involvement

All participants said that it is critical to communicate with stakeholders on a regular basis, and that communication with their staff stakeholders is different from customer stakeholders; not to avoid transparency, but to tailor the quantity and type of information appropriately. It was expressed that communication should not be for its own sake, but to convey purposeful information. One interviewee stated, “A communication matrix was established at the beginning of a job and included in the project execution plan.” It was noted that due to e-mail, there is a tendency for information overload and critical correspondence to get lost in translation; that is why a communication and information sharing and filing plan should be formalize and implemented at the project’s outset . It was also expressed that other project managers in the organization be briefed on the status of projects in the spirit of information sharing and lessons learned.

Organizational Structure

Unsolicited, most respondents identified their organizations as having functional groups that transformed into a strong matrix or project based organization. When discussing this topic, all the respondents noted that the functional manager needs to ensure that the project manager and the organization are staffed with capable team members. It was also expressed that the organization culture should be developed to dissuade functional managers from being impediments to efficient work, effective communication, or strong horizontal relationships: that is, to avoid a stovepipe paradigm. It was repeatedly expressed that team building and team effort was critical.

Authorities

All respondents expressed the sentiment that they endeavor to have the project manager’s authority commensurate with his or her responsibility: “Authority must match responsibility.” An interviewee noted that their project managers have authority to

negotiate settlements and claims, have all control over the design and construction process, and have control over the money being funded through that project for the latest approved scope of work. Another participant noted, “The project manager is empowered to make any call without higher approval for any element within the scope, estimate, and schedule.” All participants noted that their project manager has the authority to staff their project teams and remove team members that are not effective.

Project Management Skills

All respondents noted that although a degree or formal education is important in a related field, experience and intangible competencies such as interpersonal, communication and organizational skills are critical. One interviewee stated that “some people do not have the skills or the ability to acquire the skills to be a good project manager. It requires a positive attitude, good personality, and technical intellect.” Another participant noted that “project managers have to be good at working by influence.” It was also noted, “project management skills come through experience,” and “that they try to identify good project engineers as project manager candidates, and if practical, test them as an assistant project manager first.” Additionally, all participants indicated that a project manager has substantial responsibilities and the roles of the project manager include that of a leader, administrator, entrepreneur, facilitator, arbitrator and mediator, liaison, and coordinator.

Summary

The most salient responses from these discussions focused on (1) a project’s integrated and iterative nature; (2) the need for active and proactive PM, continuous assessment, and its subsequent requirements, tools, techniques, and skills, including deconstructing the project before it starts; (3) the necessity for a project manager’s responsibility, authority, and leadership throughout the complete life of the project; and (4) to create an organizational structure that enables a project team to function.

Appendix XI

Biographies of Project Management Team Members

Alan Candlish, P.E.
Regional Planning Officer
Mid-Pacific Region

After receiving a B.S. degree in Civil Engineering from Oregon State University, Mr. Candlish began his career with the Bureau of Reclamation in project construction office in central Washington. Shortly after a 2-year U.S. Army service, he transferred to the Division of Planning, Mid-Pacific Region of Reclamation in Sacramento as a Project Manager. He has managed and supervised water resource related planning projects and activities for over 30 years, for both Reclamation and in the private sector. Currently, he is the Regional Planning Officer in the Mid-Pacific Region, overseeing the Region's planning activities.

Lauren Carly, PE
Co-Team Leader
Mid-Pacific Region

BSCE in Civil Engineering from Univ. of the Pacific, CA

Career is based on engineering work in planning, design, project management and construction.

1993 to Present – Reclamation, Office Engineer, MP Construction Office. Concurrent duties as project manager GCID Fish screen. 7-agency, \$70 million effort; project manager Grey Lodge water deliver project, \$8 million.

1983 to 1993 – Corps of Engineers, Sacramento District. Design team leader, hydraulic structures and general civil. About 1986 transferred to the first project management groups as a Senior Project manager. Managed 5 projects simultaneously, out of which we built 2 dams, raised a dam, 3 detention basins and completed two Feasibility studies. Responsibilities included negotiating cost sharing agreements, audits, and public involvement. Total value around \$200 million. While at the Corps, was requested and trained to teach a week long class in Washington DC on Initial Project Management Plans. Published 2 papers on aspects of project management (project management plans and one on float and contingencies)

1976 to 1983 – Reclamation, Planning Division – Managed 7 simultaneous projects (the terrestrial wildlife group) under the Central Valley Fish and Wildlife Management Study. This study was the basis for authorization of the Central Valley Project Improvement Act (CVPIA). Responsibilities included public involvement, budgets, cost control, technical

studies on needs and baseline resources and compliance with the then new Principals and Standards, NEPA and other environmental requirements.

Rick Ehat
Project Construction Engineer
Upper Colorado Region

Team co-leader: Rick Ehat, P.E., Project Construction Engineer, Animas-La Plata Project, Durango Co., UC Region. [Const Mgmt (CM) work in 3 Regions, CM with other agencies (EPA and DOE), Republic of China, construction representative on over 100 design teams in the TSC]

Kerry McCalman
Power Manager
Upper Colorado Region

After receiving a degree in Engineering Physics and Mathematics from Northeastern Oklahoma State University, Mr. McCalman began his career working in the oil and gas industry in southwest Texas. He then worked for the U.S. Air Force as an Electronics Engineer managing a program to replace the Air Force's Long Range Radar Systems throughout the United States and abroad. From there he went to work for the Corps of Engineers where he planned, designed, installed and commissioned major hydropower replacements and additions. In 1994 he was promoted to Hydropower Manager for the Corps of Engineers in Tulsa, Oklahoma where he managed the operation and maintenance of eight powerplants, five navigation locks, 136 miles of navigation system and all district dams, levees and flood control structures. In 1998 he accepted a position as Operations and Maintenance Manager for the Bureau of Reclamation's Snake River Area Office in Burley, Idaho. From there he moved to Reclamation's Eastern Colorado Area Office as Operations and Maintenance Manager then to the position of Power Manager for the Great Plains Region, Bureau of Reclamation in Billings, Montana and oversees the operation and maintenance of 21 hydroelectric powerplants. He is currently the Power Manager for the Bureau of Reclamation's Upper Colorado Region. Throughout his career he has been involved the project management of major construction and O&M work.

David Palumbo, P.E., PMP
Project Manager
Lower Colorado Region

David Palumbo has a BS in Civil and Environmental Engineering from the University of Nevada, Las Vegas with an emphasis in structural engineering, and an MS in Civil Engineering and Engineering Mechanics from Columbia University with a split emphasis in structural engineering and construction and engineering management. He is a licensed P.E. in the State of California and has a PMP (Project Management Professional) credential from the Project Management Institute. Prior to studying engineering, David

received a BA and an MA in English Literature from the University of Notre Dame and the University of Nevada, Las Vegas, respectively.

David spent approximately 11 years with Kerr-McGee Corporation and a related company, AVESTOR (a joint venture between Kerr-McGee and Hydro-Quebec). While at Kerr-McGee and the joint venture, he held the positions of Contract Services Administrator, Senior Project Engineer, and Project Manager. Prior to working directly for Kerr-McGee, David was a Purchasing Agent for JA Jones/Lockwood Greene under contract with Kerr-McGee. Additionally, he held the position of Senior Structural Engineer with Thornton-Tomasetti Engineers.

David is currently a Project Manager with the Bureau of Reclamation's Lower Colorado Region where he manages the Engineering Services Office project portfolio, is developing project management guidelines including those in which to enhance project controls, and communications with clients and stakeholders, and is managing individual projects. David is also an Adjunct Professor at the University of Nevada, Las Vegas School of Architecture teaching coursework on integrating and coordinating engineering and construction deliverables.

David has managed all elements of multiple simultaneous projects of various scopes, schedules, budgets, financial sources and complexities. The projects have included the design and/or construction of facilities, infrastructure, environmental control and remediation systems, power and steam generation equipment, utility distribution systems, pressure and gravity piping systems, retention ponds, tanks, and miscellaneous process equipment. He has also managed non-technical projects such as those in the information technology, land acquisition and transfer, water rights, transportation logistics, and production management areas. David has developed programs, policies and procedures for project portfolio management, design engineering protocol, and plant operations.

Project teams under David's direction have included members working directly and indirectly for him in several engineering disciplines including civil, chemical, structural, mechanical, electrical, geotechnical, fire protection and industrial; and science disciplines including chemistry, geology, biology, and electrochemistry. Additionally, he has worked with a variety of stakeholders and sponsors, including senior managers, plant and production managers, financial analysts, risk managers, lawyers, governmental entities, and authorities having jurisdiction.

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